Supply Chain Strategy and Evaluation

First Report

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Executive Summary

Key findings

This research investigated the economic, social and environmental impacts in supply chain management (SCM), and how different organisations are addressing the issues of sustainable development. The main findings of the research were:

- There is a lack of clarity in the definitions and scope of the terminology used in SCM and sustainable SCM.
- Definitions of 'supply chain', 'demand chain' and 'value chain' are sometimes used interchangeably, although there are differences. Similarly, 'logistics' is often substituted for 'SCM '.
- The term 'sustainable supply chain management' (SSCM) is not in common usage and there is considerable lack of clarity due to misunderstandings on the meaning and scope of the term 'sustainable'.
- Most organisations have concentrated their SCM efforts on environmental issues e.g. 'environmental SCM ', 'supply chain environmental management' or 'green procurement'. These definitions depend on the scope of the organisation's understanding of the term 'supply chain'.
- The most common tools for SSCM have been environmentally based, especially where the environmental drivers have been linked to business risk.
- Social and ethical management strategies have appeared most commonly in the retail sector, where customers consist of the general public and social and ethical issues are more salient due to the physical association of the product with the supply source.
- Key factors that have influenced successful SSCM have been the power of companies over the supply chain and the role of business risk drivers in forcing companies to manage risk more effectively into their supply chains.
- However, the key measure of the success of SSCM tools appear to be the amount of buy-in from senior management.
- Further research is needed to determine a more thorough understanding of successful and unsuccessful SSCM strategies and tools.

The most advanced techniques

Some of the key management approaches to SCM today include outsourcing of procurement processes, collaborative planning and partnerships between customers and suppliers, and Integrated Supply Chain (ISC) design, involving all areas of the organisation. These approaches are closely linked to the latest advances in manufacturing technology including agile manufacturing and postponement technology. Dell, Nokia and Tesco are some of leaders in SCM strategies and tools.

Organisations with long and complex supply chains, whether they are at the beginning (such as chemicals), in the middle (such as logistics companies), or at the end (retail businesses) of the supply chain, are increasingly needing to understand sustainability aspects of their supply chains. Supply chain sustainability issues can range from child labour and exploitation of workers on the one hand to ozone depletion, deforestation and global warming on the other. These issues can be broken down according to environmental, social, and ethical aspects. Some of the tools used in sustainable supply chain management (SSCM) include written policies and communications materials, pre-qualification of suppliers (using environmental and/or social/ethical criteria), purchasing guidelines and supplier partnerships.

Sector Findings

(i) Utilities - water and power companies

The utilities sector included water and power companies. Analysis of water companies revealed tools used in environmental procurement such as pre-qualification using software tools, environmental evaluation questionnaires for sourcing new suppliers and engaging suppliers in environmental issues at contract stage. Social and ethical issues were not found to be issues that were examined in any depth. Electricity companies were involved in supplier dialogue and supplier self-assessment of environmental issues, while one company promoted ISO4001 as model of best practice of environmental management for its partner ventures and interaction with suppliers.

(ii) Transportation

The transportation sector was analysed with a focus on automotive, railways and logistics companies. The tools found in railway companies included training for procurement-staff in environmental issues, R&D partnerships with suppliers, development of environmental purchasing manuals and supplier environmental assessment. Again, there was little evidence of the use of social or ethical management tools. However, the automotive companies had highly developed relationships with their suppliers including requirements for ISO14001 certification, formal partnership programmes for decreasing environmental impacts and transferring knowledge to suppliers on environmental best practice. The automotive industry encompasses social and ethical issues that need to be addressed within the supply chain, but management tools addressing these were not found. Logistics companies have programmes to manage environmental issues both up the supply chain and down towards their customers, as environmental best practice and reverse logistics.

(iii) Information, Consumer Electronics and Telecommunications (ICT)

Telecommunications companies have developed strong environmental strategies, especially in supplier assessment and evaluation in areas such as risk (including take-back requirements), hazardous material handling and continual improvement. There is some integration of these policies into quality controls, but little contribution on social issues. Other tools used included training purchasing and sales staff in environmental aspects and supplier co-operation programmes.

Consumer electronics firms have had labour rights issues highlighted in global production facilities, but have developed strong environmental tools driven by legislative and business-to-business (B2B) pressures. Pre-selection and evaluation of suppliers on environmental compliance issues, partnering with suppliers to influence environmental performance and assisting suppliers to implement EMS through loans were other tools identified in this sector.

(iv) Retailing

This sector included food, clothing and DIY retailing. All retail segments differed from the other sectors by including social and ethical issues into SCM , often alongside environmental issues. Food retailers used a number of tools including social and ethical auditing processes of high-risk suppliers on labour and working standards. The aim of these is to ensure supplier-compliance with company ethical policy, environmental vetting of suppliers and partnering with suppliers to ensure that they were aware of customer needs. Although there was little integration of environmental and ethical issues, both were observed in supplier management.

The clothing sector has a high profile in terms of social issues e.g. the use of child labour. Some of the environmental tools appearing here included environmental training of suppliers and knowledge transfer. Ethical tools used included third-party social auditing and compliance monitoring of supplier working conditions and health and safety practices. The DIY area faced some of the same issues as the other retail sectors. One company has responded to the sustainability agenda through integrating both environmental and social concerns into a complete auditing process for suppliers both at contract stage and throughout the term of supply. Third party certification of wood products against social and environmental issues has also been adopted throughout the DIY retail industry.

(v) Leisure and tourism

This sector included tour operators, airlines and hotels. Tour operators face increasing pressure to take environmental and local social considerations into account when dealing with local host destinations. Some of the tools used include environmental certification of tour operator's activities, host destination education programmes and supplier partnerships. Most of these tools come from smaller operators, with an absence of management tools from larger operators, especially in relation to social concerns.

Hotels have developed environmental purchasing guidelines and partnership programmes that aim to produce greener practice including the minimisation of waste and increase in energy efficiency. Developing local businesses to supply material and goods and encouraging supplier diversity were social tools identified in relation to SCM. There was no integration of environmental and social issues in managing the supply chain.

(vi) Public sector

The public sector was analysed as a whole and not split into differing sections, as public supply chains are vast. Despite various international and supranational restrictions by trade laws, some national, local and regional governments are involved in promoting sustainable supply chain policies. Most of this is undertaken by purchasing programmes within regional public authorities, with guidance booklets on 'green procurement' and material codes being the most active tools available for SSCM. Social issues were not found to be integrated into the development of management tools or strategies.

(vii) Building and construction

The building and construction industry was analysed under house-builders and general construction companies. House-builders are facing problems in introducing construction systems that minimise costs of materials and use recycled and energy efficient materials. However, material specification guidelines have been produced for assessing environmental impacts and supplier partnerships have also been developed between designers, constructors and environmental consultants to address both social and environmental issues of complete housing developments.

Generally, there is little integration of environmental and social issues into supplier management of housing design. Some of the larger construction firms are actively involved in supplier assessment of environmental management at the procurement stage and during supply contracts and are actively trying to influence larger suppliers to develop formal EMS. Industry bodies also produce environmental supply chain workshops, but social issues such as labour sourcing are not commonly included in supplier tools.

(viii) Chemical industries

The chemicals sector included petroleum companies and companies involved in producing plastics, polymers and organic chemicals, i.e. petrochemical industries. Petroleum companies face human rights and social issues from some of their supply source communities and this has led to business integrity principles being developed in some cases that require buy-in by partner organisations and the integration of an ethical policy into procurement guidelines. However, the petroleum companies have been more proactive in auditing contractors on environmental 'duty of care' and offering management support and training in environmental best practice. Product stewardship of chemicals is a key issue and this has led to the development of the Responsible Care programme which has been adopted by most chemical companies. Tools under the umbrella of Responsible Care have included reverse logistics of products and risk identification of supplier and customer practices. Supplier auditing of environmental practices has also been developed. However, there appears to be a lack of social issues used in SCM in this sector.

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1.0

Introduction and background

1.1 Introduction

The aim of this report to contribute to the SIGMA project initiative that aims to assess the feasibility of to developing an integrated sustainable (social, ethical, economic, environmental) management system. Given the trends toward greater specialisation and global sourcing, lengthening supply chains, and increasing attention on social, ethical and environmental issues, the SIGMA Project Management Team was interested in better understanding sustainable supply chain management (SSCM) issues and what organisations in different sectors are doing to address these issues.

Companies are now realising that the value they provide to their customers is the sum of all the 'value added' along the supply chain. In the same way, the sustainability of the goods and services an organisation provides is also the sum of all the social, ethical and environmental impacts of these goods and services along the supply chain. Therefore, organisations are beginning to recognise that they have to identify, understand, and manage sustainability issues within their organisation, but also co-operate with other organisations in the supply chain to ensure that these issues are successfully managed throughout the supply chain.

1.2

Objective

The purpose of this report is to provide an overview of the most advanced techniques in SCM and SSCM, and an overview of the application of SSCM in eight sectors. The initial conclusions from this overview are aimed at providing stimulus for discussion for SIGMA project management and partners, and to provide a baseline for the remainder of the Supply Chain and Evaluation research strand. The results of the research will then act as an input into the overall SIGMA project that aims to examine the feasibility of developing a sustainability management system for public and private organisations.

On a more detailed level, the objectives of this report are:

∑ to examine current terminology and definitions within the field of SCM ;
∑ to identify the advanced techniques in SCM and SSCM and strategy for organisations;
∑ to identify sustainability issues (social, ethical, environmental, economic) that organisations have recognised and are addressing within their supply chains;
∑ to identify leaders and the centres of expertise/excellence in SSCM (i.e. academia, research institutions, and 'think-tanks');
∑ to identify the tools and strategies that organisations are using to incorporate and integrate sustainability issues into SSCM;
∑ to identify the obstacles that organisations face when implementing sustainability into their supply chains;
∑ to identify gaps in knowledge, tools and strategies related to SSCM;
∑ to develop initial conclusions.

1.3

Scope

The research examined general SCM issues and the strategies and activities used by organisations that aim to incorporate and manage sustainability issues into their supply chains. The report begins by giving an overview of the definitions and the most up-to-date techniques in SCM and SSCM. It then goes on to examine SSCM issues in eight sectors:

- utilities (water, electricity);
- transportation (rail, automobiles, logistics);
- information and telecommunications technology [ICT] (consumer electronics, telecommunications);
- retailing (food, clothing/shoes, do-it-yourself hardware);
- leisure and tourism (tour operators, airlines, hotels);
- public sector;
- building and construction (large scale construction and house-building);
- and chemicals (petroleum and petrochemicals).

The report is not intended to be an exhaustive analysis of each of these sectors and is primarily based on initiatives, information and contacts available in the UK. The viewpoints of sectors are based on desk research and a limited numbers of interviews, and should not be taken as representative of the sector. However, the global nature of many supply chains and sectors has been captured by interviewing representatives from UK-based Trans-nationals (TNCs). Also, where possible, individuals from other European countries and the US have been interviewed to add the global dimension. However, the report should not be taken as representative of the supply chain activities and initiatives in all parts of the world. In particular, Japanese SCM activities are un-represented.

1.4

Case studies

A set of case studies is documented in Appendix IV, which is bound as a separate report.

2.0

Methodology

2.0.1

2.1

Approach

The information contained in this report is based on a review of the literature and interviews with company, research, consultancy, non-profit and governmental representatives. These individuals were identified via The Centre for Sustainable Design's network and through additional desk research and correspondence with relevant email lists. This included requests for contacts and/or organisations (private, research, non-profit, governmental) working on supply chain and SSCM. In all, over 70 people were identified and contacted (see Appendix I). The desk research and semi-structured telephone and email research was undertaken between 26th July and 25th August 2000.

2.2

Caveats and limitations

However, due to the short duration of the desk research and that it took place primarily in August, a traditional time for holidays, not all the identified people were available to be interviewed. Beyond this, many requested not to be interviewed or were restricted by company policy from being interviewed. In addition, many identified people were environmental specialists or worked in environmental departments and were not always knowledgeable enough to answer some of the more technical questions on supply chain issues, such as those related to specific tools and metrics used to measure supplier performance, and/or had insufficient knowledge of organisational initiatives related to social or ethical issues.

Therefore, these interviews should be seen as individual reflections rather than a full analysis of the organisations they represented. To achieve a more representative view of organisational position, it will be necessary to undertake a series of in-depth interviews with a broader range of business function from each organisation. In addition, board level directors should be interviewed to give a clearer strategic overview of organisational approaches to sustainability and the relationship with supply chains. Given the time constraints of stage 1 of the research and the number of sectors covered, this was not possible.

The short time period for desk research also meant that only a small number of organisations in each sector and sub-sector could be reached, and that those were mostly UK-based and more proactive in the field.

A few sub-sectors were removed from the interview schedule due to lack of response from organisations. Therefore, interviews should not be taken as representative of the entire sector.

3.0

Key Issues

3.1

Background

Overview of sustainable business thinking

Throughout the eighties many large companies started to gain success from pollution prevention e.g. 3M PPP+ (Pollution Prevention Pays Plus), Dow WRAP (Waste Reduction Always Pays) programme. Following The Earth Summit in Rio in 1992 many trans-nationals started to focus on eco-efficiency, an approach developed by the World Business Council for Sustainable Development (WBSCD). Since then other concepts have also emerged including 'Factor 4, 10, X' and industrial ecology, however these models tend to focus on environmental aspects of resource and energy reduction.

Businesses have some difficulties in tackling the ethical and social elements of sustainability, so the integration of 'triple bottom line' thinking is proving to be complex and problematic. Organisations such as the WBCSD appear to be separating Corporate Social Responsibility (CSR) and eco-efficiency e.g. WBCSD are not promoting an integrated model for business sustainability. However, recently, the Brent Spar, Ogoni, GMO and WTO (Seattle) incidents have ensured that sustainability can no longer just be seen as an environmental issue, particularly when we live in a 24 hour 'CNN' world. The majority of companies - especially SMEs - do not consider 'business and environment' issues when they do it is in a uncoordinated and isolated manner, e.g. plan for waste, a plan for energy management but no EMS.

John Elkington, Chairman of SustainAbility encapsulated the context of sustainable business thinking in a recent article (Elkington 1999), "If Wave 1 marked the period when the West experienced a growing sense of environmental responsibility and Wave 2 was the era of corporate environmentalism, Wave 3 will be the global sustainability wave." Table 1 shows the key elements of these three waves.

The first wave went back to the sixties and Rachel Carson's book Silent Spring. The second wave followed industrial disasters: Seveso, Bhopal, Chernobyl and fed second wave of activism. Band Aid 1984 and Live Aid 1985 exploited for the first time new media technologies to link concerned people around the world to tackle environmental and development issues. This is when industry started to push the responsibility envelope, e.g. launch of Responsibility Care in 1985. Undoubtedly, though, the discovery of Antarctic ozone hole created one big trigger for the second wave, with an effect that many leading politicians "went green." The Exxon Valdez spill in 1989 triggered further progress. Then the Earth Summit in 1992 – crystallised the vision of industry as part of the solution. Norsk Hydro and Monsanto – published first voluntary environmental performance report.

Then in the late 1990's Shell's plans to dispose of the Brent Spar oil rig in the sea, and alleged negative impacts of local communities in Nigeria – catapulted stakeholder dialogue onto the world stage. Elkington suggests The Third wave is about to break. Environmental justice, human rights, diversity (biological, human, social, ecological) and inter-generational equity are the top items on the sustainability agenda. A sustainability wave will build a new language e.g. eco-audits, ISO 14001 and LCA in the 1990s.

Paradigm Shift		
Subject	**1950-2000: Cornucopian**	**2001-2050: Gaian**
World views	First, second third worlds	One world
Politics	Capitalism vs. communism	Soft vs. hard capitalism
Economy	Growth	Sustainability
Focus	Quantity, adding volume	Quality, adding value
Measures	Financial bottom line	Triple bottom line
Capital	Physical, financial, intellectual	Human, social, natural
Governance	Exclusive, shareholders	Inclusive, stakeholders

SOURCE: ELKINGTON, J. "THE THIRD WAVE," TOMORROW, NO. 6, VOL. IX, DECEMBER 1999, PP.40-42.

In the years ahead, there will be broader acceptance of the right to know – greater corporate transparency and companies will have to demonstrate that stakeholder input is having material business impact.4 The third wave will focus on changing cultures – corporate, economic and political. The level of emotional, political and economic energy that will be unleashed in and increasingly "Gaian" world (whether right or wrong) will have growing influence on business functions.

As companies become increasingly responsible for the environmental, social, and ethical impacts of their products, they will need to examine, identify and manage these impacts not only within their own manufacturing or other operations, but throughout their supply chain. This is especially true in product or service companies at the end of the supply chain. For these companies, many of the impacts of their activities are in their supply chains.

As companies increasingly outsource manufacturing and "purchase in" components, sub-assemblies and increasingly whole products, impacts are shifted to earlier points in the supply chain, making SCM an increasingly important business issue. Answering customer inquiries and ensuring access to markets in the face of new regulations will require companies to understand the environmental, social, ethical aspects of the materials and components they buy from suppliers. The advent of ‘take back‘ regulations in various markets is now extending companies responsibilities throughout their product's entire life cycle.

> *"[Sustainability] is not a soft issue, or a passing fad. When people are empowered with knowledge and choices, they will do what’s best for themselves, their families, and their communities. And in fiercely competitive global market, where information is shared instantly, consumers will virtually have all the knowledge and choices in the world. Companies that don’t do the right thing will find that they are not sustainable."*
>
> (William Clay Ford, Jr., Ford Chairman).

3.2

Definitions

This section looks at the terminology used in the field of SCM and SSCM, including its definitions, scope and level of acceptance. 'Supply Chain Management ' (SCM) is a relatively new term for a concept that is still evolving. Consequently, there still exists a certain lack of common understanding in organisations about what SCM means and how it differs from other similar terms, such as 'demand chain', 'value chain' and 'logistics', which are sometimes used interchangeably. This lack of clarity is carried over into the concept of 'sustainable supply chain management' (SSCM), which at the moment is seldom used and as a term is subject to considerable misunderstanding. This misunderstanding is complicated by the general lack of a clear definition of 'sustainable'.

Supply Chain

It was found in the literature and through the interviews that various terms are used interchangeably for 'supply chain', such as 'demand chain' and 'value chain'. However, these terms convey slightly different conceptual meanings. For example, the Massachusetts Institute of Technology (MIT), a leading US institute researching supply chain issues defines 'supply chain' as the flow of materials, information and funds between different parties or organisational functions (Metz, 1998).

According to MIT, a single-stage supply chain, typically representing a single organisation, incorporates a range of material flow functions (receiving, processing, distributing and delivering), a complex array of information processing and decision making functions (based on information flows from customers, suppliers and internal functions), and functions for handling incoming and outgoing funds. In this model, materials flow in one direction, funds flow in the other direction, and information flows in both directions between all functions. As more organisations become involved in the chain this basic single-stage model is multiplied rather than expanded, with each organisation representing a single-stage.

This relatively generic definition of a supply chain differentiates the term slightly from related terms, such as 'value chain' and 'demand chain' in that the latter two terms imply a customer focus, while the former concentrates on the operational flows. For instance, value chain, a term coined by Professor Michael Porter at the Harvard Business School in the US, is used to describe all the strategically relevant activities, such as inbound logistics, operations, outbound logistics, marketing and sales, service, etc., that an organisation performs to 'add value' to its products or services for its customers (Kennedy, 1993). While this concept includes many of the same organisational functions as the MIT supply chain definition, the emphasis is clearly on the customer and the customers needs, rather than on a description of the operational flows. Similarly, demand chain is a way of looking at the steps involved in the creation of products and services from a customer viewpoint. From an organisational perspective, the concepts of value chain and demand chain are conceptually important as they stress the need to focus material, financial and informational flows (the MIT definition of supply chain) from the perspective of customer(s), without whom the supply chain would not exist.

However, the MIT view of the 'supply chain' is not the only definition. Others, such as the UK-based Institute of Logistics (IOL) highlight a multitude of definitions of supply chain, from the process of supplying customers from the factory 'to the total process from raw materials to the customer'. However, both point out that supply chains are intended to satisfy customers. This definition is much more closely related to the concepts of value chain and demand chain described above; the initial desk research, it seems that at present, there is no one agreed definition of supply chain.

This conclusion is reinforced by the interviews e.g. supply chain definitions vary considerably. For instance, most interviewees defined their supply chains as only representing their immediate 1st or 2nd tier suppliers. Others saw their supply chains as representing only the process of distributing and delivering products and services to their customers. Only a few of the most proactive organisations (in terms of supply chain issues) defined their supply chains as stretching from their most distant suppliers to the end-user, and everything in between.

These differences demonstrate a significant lack of consensus in the scope and understanding of the term 'supply chain' in many organisations, across all sectors. Often the difference related to the position of the interviewee in the organisation and his/her particular perspective. In other words, people in the purchasing department most often defined supply chain exclusively in terms of the organisation's upstream suppliers, while those in other functions had different perspectives and different definitions. Taking the broadest definition of the supply chain as representing all activities from resource extraction to the customer (and back again), this indicates a significant lack of integrated supply chain thinking within many organisations.

SCM

Given the lack of consensus on the meaning and scope of 'supply chain', it is not surprisingly that the definition and understanding of the term 'supply chain management' (SCM) also differs considerably. For most interviewees, SCM denoted the management of that part of the supply chain which they recognised. Again, this was very much based on the position and perspective of the particular person interviewed. For purchasers, it meant the management of suppliers, for those in distribution, it meant the management of distribution and delivery. Only in the most integrated supply chain organisations, such as Dell Computer, Walmart, Tesco and Volkswagen, does SCM appear to mean the integrated management of materials, information and financial flows from raw material extraction to end-user.

In some organisations, notably governmental bodies, the term 'SCM ' is not considered relevant, i.e. not part of the terminology used. In these organisations procurement is the term used to denote the relationship between the organisation, its direct suppliers (vendors, contractors) and its customers (various departments and agencies). Rather than managing their 'supply chain,' they manage the 'procurement process'.

Another term that is commonly used interchangeably with SCM is logistics. However, some undertaking research in this area do see a difference. For instance, according to Professor Martin Christopher of Cranfield School of Management in the UK, logistics is more focused on the planning and synchronisation of material movements within an organisation and to the customer, while SCM is a more holistic term referring to the management of information, materials, funds and relationships outside and through the organisation, from the "supplier's supplier to the customer's customer."

This is just one view of logistics, however. The US-based Council of Logistics Management (CLM), defines logistics as "that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers' requirements" (CLM, 2000). This definition broadens the scope of logistics bringing in a customer focus. Similarly, Dr. Ian Canadine, former Director-General of the Institute of Logistics in the UK, described logistics as "the management of the supply chain," with the supply chain being the total process from raw materials to the customer, with an emphasis on satisfying the customer (Canadine, 1998).

From these definitions it can be seen that the definitions of SCM and logistics are still evolving (as are the processes they define) and therefore, there is no universally agreed definition at this time.

SSCM

Given the uncertainties and lack of clarity involved in defining 'supply chain' and 'SCM ', it is not surprising to find a considerable amount of confusion over 'sustainable SCM '. In addition to the differences already mentioned above, the definition of 'sustainable supply chain management' (SSCM) is further confused by a lack of understanding and clarity regarding the term 'sustainable'. Many of the interviewees had to ask what we meant by the term sustainable before they could answer questions about it.

Some interviewees saw 'sustainable' from a purely economic perspective, i.e. that SSCM meant the long term profitability, or at least solvency, of the supply chain over time.

Of those that saw 'sustainability' from the perspective of 'sustainable development', i.e. in the sense of "[development that] meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987), the vast majority define this in terms of 'environmental sustainability' or more specifically environmental management. Most efforts to integrate social, ethical, and environmental issues into SCM have so focused on environmental issues. From this has developed terms such as supply chain environmental management (US-AEP, 2000) and green procurement, both of which focus on the environmental aspects of managing supplier/customer relationships, with the former taking a broader approach and definition of 'supply chain' and the latter being more concerned with the incorporation of environmental issues into the purchasing process with 1st tier suppliers. Many interviewees claimed to have environmental programmes and not 'sustainability programmes'. Many interviewees were aware that there were other issues involved in sustainability and that they were not addressing them as thoroughly as environmental issues.

As for social and ethical issues, a few organisations, such as B&Q, Co-operative Bank and The Body Shop in the UK, and Ben & Jerry's Ice Cream (now part of Unilever) in the US, are looking at social and ethical issues in their supply chains, alongside environmental issues. For these organisations, SSCM does mean the integration and management of social, ethical, environmental and economic issues in their supply chains.

3.3

Overview of advanced techniques and key issues in SCM

Traditional SCM concerns relate to keeping prices low whilst providing high quality products and services. The process aims to deliver products sooner and more customised to individual needs, while the costs to the customer are reduced.

"Industry has realised that the quality and cost of their products depend on their suppliers throughout the world" (Krut, R, Karasin, L. Supply Chain Environmental Management. Lessons from the leaders in Electronic Industry).

Historical development of SCM

The concept of SCM has moved from managing a two-process supply chain to managing a seven-process supply chain, and onto co-ordinating ten and more processes linked into an integrated process. (Metz, 1998). The developments in SCM have been enabled due to "the explosive development of computer technology and communications technology". ICT makes it possible to have more information, more accurately and more frequently, from more sources, from all over the globe. More efficient ICT also makes it possible to digest, to understand, and to act on the growing volume of information through more sophisticated analysis, modelling and decision-support capabilities. Another factor that contributed to the development of SCM has resulted from the rise of "system thinking" in business management. Metz states that:

> *"Better data and more advanced analytical techniques facilitated better decisions among more complex set of factors. In fact ever improving communications and analyses continually enhance our ability to make more complex decisions"*
>
> (Metz, 1998)

Some key points to note here are:

- In the early 1960s SCM focused on the integration of warehousing and transportation i.e. Physical Distribution Management (PDM). Improvements were made possible as a result of the growing capacities in data communications between different parts of the distribution chain. In this phase the following achievements were made:
  - inventory reduction (faster, more frequent and more reliable transportation);
  - faster order response times due to faster warehouse handling and faster transportation;
  - optimisation of warehousing for better service and lower total costs.
- The next stage of SCM developments led to integration across corporate functions (internal integration). Manufacturing, procurement, and orders management functions were "added" to SCM at this stage.
- Further developments have led to integration across supply chain (external integration), which is considered by some the current stage of SCM. Suppliers have been added at one end and customers at the other, with SCM moving from a two to a seven-function process. The key components of this stage are advanced ICT and training.
- The next stage is expected to include the involvement of even more business functions, such as product development, marketing and customer service. It will require participation from product designers, as the design of products facilitates manufacture of customised versions, easier installation and serviceability- this is already being seen in some companies in the electronics and automotive sector.

How companies define their SCM

There are a wide variety of interpretations of SCM in organisations. Many companies tend to focus almost exclusively on purchasing function, and for those the supply chain usually ends with themselves, (as they are the customers to their suppliers). Some companies focus more on logistics, and SCM is primarily about making sure that the internal operations are lean and efficient.

Only a very few companies stretch their supply chain from their suppliers' supplier to their customer's customer, or include end-of-life management of their products and reverse logistics or take-back services. In addition, even within a single company there appear to be differing interpretations of SCM and much depends on the background and a position of the person in a company. For example, it is quite common for the environmental department (working on the incorporation of environmental issues in the supply chain) to interpret the supply chain quite differently than a person in purchasing or logistics department.

One public sector organisation was addressing this by seconding personnel from the environmental management department into the procurement department. Box 1 contains several examples of interpretation of SCM in companies.

BOX 1: ORGANISATIONS RESEARCHED

Cable and Wireless (telecommunications)
SCM at C&W relates to the sourcing of products and services which business requires and the management the relationships between C&W (the customer) and its suppliers. The main business function involved in SCM is the purchasing (procurement) department, although it deals mainly with 1st and 2nd tier suppliers, and rarely reaches beyond this. C&W is very customer-orientated, but do not really consider them as a part of supply chain. (Mark Cannon, Environmental Manager)

Vauxhall (automotive)
Vauxhall considers their supply chain from supplier's supplier to the actual Vauxhall customer down the chain. 'End of life' and reverse logistics would not be considered SCM issues. (Michael Galley, Environmental Manager)

SJ (rail)
At SJ, SCM is mainly understood as the procurement of goods and services from suppliers. (Anna Granholm-Thoren, Environmental Department)

Schenker-BTL (logistics)
SCM at Schenker-BTL covers several aspects: responsibility for "traditional" logistics business, i.e. moving goods from A to B; management information systems and establishing nodes and terminals; and the purchasing function. (Ian Norde, Business Process Development)

Lucent Technologies (telecommunication)
SCM at Lucent Technologies is about managing relationships with suppliers, vendors or services, i.e. everything that contributes to creation of value in Lucent products, including recycling and reverse logistics. (Arjen Salemnik, Environmental Policy)

DSB (rail)
At DSB, SCM is understood as maintaining daily operations of the trains to the level that meets the targets set for them. This includes workshops (daily maintenance), purchasing and technical departments. (Mats Bergendorf, Environmental Department)

Key Issues in SCM

SCM faces a range of key issues, and as a business discipline or concept its success depend on its ability to respond to a range of issues:

- agility (response to market volatility);
- time compression (reduction of "non-value added time in the pipeline");
- globalisation of supply chains;
- developments in ICT.

According to Scott Elliot of Hewlett-Packard, (PDBPR, 1999), "Supply chain managers strive for high product 'velocity', rapid movement of inventory through the value chain. [The idea is to] …move risk as far upstream as possible, and move customisation decisions as far downstream as possible."

Management Approaches

SCM aims to develop the best solutions to customer problems taking account of the need for agility and time compression, while coping with long globalised chains of suppliers and customers, capitalising on growing capacities of ICT. This often comes down to organisational design and change (e.g. through using Business Process Re-engineering (BPR)), incorporating team based approaches, and approaches based on closer co-operation along the supply chain.

The key management approaches related to SCM include the following:

(i) Outsourcing

Outsourcing business functions to external specialists is one way in which organisations can reduce costs whilst improving performance. One of the most common approaches for any company is to outsource services that are not core business for the organisation, for example Personnel, Legal R&D, Transport and IT. Outsourcing is also being applied to the function of Procurement and Purchasing. In 1999 Siemens set up Siemens Procurement and Logistics Services as a separate business entity that acts as a supplier to Siemens as well as external companies. It has around 400 staff and generates around DM1.2 million a year in sales revenue from its purchasing and logistics services (Koppelman, 1999). Another example is Purchasing Solutions UK, who provide purchasing and niche SCM services for the hospitality industry.

(ii) Collaborative Planning

Collaborative planning is a business process that relates Original Equipment Manufacturers (OEM's) and their relationships to their suppliers. Suppliers are given access to the manufacturers data in real-time, enabling them to track manufacturers needs and respond to them as soon as manufacturers need support (Boyson and Corsi, 1999). The advantage of this system is that it allows the manufacturers to replace physical inventory with information. Inventories can be kept low and suppliers can deal directly with customer demands, rather than relying upon the manufacturers static forecast data. Some logistics companies have offices within clients facilities e.g. Lane Group and Body Shop.

(iii) Development of Supply Chain Partnerships

There are two broad approaches to establishing environmental goals for suppliers e.g. reduce substance X by 2005 or the supplier will be de-listed, or "we will work with you to help you reduce substance X by 2005"

(iv) Integrated Supply Chain Design

An integrated supply chain co-ordinates all aspects of the supply chain, including procurement, product design and planning, order processing, managing inventory, transportation and warehousing, as well as customer service. These agile and flexible supply chain arrangements are characterised by a "dynamic flow management of products, information, cash, and even ideas. The focus is on co-ordination across the entire supply chain, both within a corporation and--critically--linking backwards to suppliers and forward to customers and end-consumers." (Bovet and Sheffi, 1998). A successful integrated supply chain is focused around customer needs, rather than the product. By organising supply chain this way, the flow of raw materials and inventories can be reduced to a minimum and business risk can be reduced and performance savings can be made. The integrated supply chain is able to respond rapidly to constant changes in customer demand. ICT can link all areas of the supply chain, thus eliminating static forecasting from isolated parts of the supply chain, by providing management with data from the total supply chain.

Tools

The tools to facilitate better management of the supply chain are built around the following issues:

- customer focus at every stage in the supply chain;
- allow agile manufacturing;
- cheaper and more reliable transportation;
- advanced use of ICT;
- wider bandwidth/global communications;
- more powerful data processing;
- information flows to all parts of supply chain;
- computer-aided decision-support systems;
- improvements in financial accounting ("soft technology"), e.g. activity-based costing (ABC) highlights the financial trade-offs necessary to understand to design the supply chain;
- quantitatively based performance management;
- metrics and measurement of performance at each stage of supply chain;
- reduced time;
- reduced costs;
- advanced organisation management concepts that facilitate better teamwork and communication (horizontal communication);
- teams from interrelated functional operations work together to remove organisational barriers and find improvements to supply chain performance (cross-functional teams);
- attention to organisation dynamics.

Key concepts

Some key concepts are outlined in the following subsections.

(i) Real-time data-handling and ICT solutions

Using advanced ICT systems, data and information can be obtained from all parts of the supply chain. Information systems that are able to track and monitor all areas of the supply chain are necessary tools for an integrated supply chain. There are three levels of software within an organisation that helps manage the supply chain:

- decision support tools and supply chain planning systems;
- Enterprise Resource Planning (ERP) and order management which support the operation of the business and usually collect financial, customer service and accounting data;
- execution systems which include transportation and warehouse management, as well as shop floor management.

The key for the organisation is to gather all this information into the middle layer ERP as the supply changes occur, which delivers real-time data to management.

(ii) Supply Chain Learning (SCL)

Supply chains can be a conduit for best practice, which is in the interest of the complete supply chain to adopt. The supply chain should have a common interest, which is to deliver value to the customer and improve the core processes along the whole supply chain. Potential benefits of learning within the supply chain can include risk reduction, technology transfer, and operational and strategic knowledge development.

(iii) Implementing manufacturing technologies

Latest techniques in manufacturing technology are key contributing forces that have helped in increasing the efficiency of the total supply chain (Metz, 1998).

- Agile Manufacturing. Manufacturing that is able to change quickly between different production runs at short notice, as well as producing low volumes efficiently is considered agile. It is agile manufacturing that helps achieve mass customisation in production, which is the ability to customise product ranges quickly for different customer specifications.
- Postponement. Moving the finishing of the product in the chain closer to the customer. The most common application of this technique is packaging. An example of this comes from Gillette, where basic razor blades are produced and shipped to distribution centres closer to the customer, where they receive final packaging. This final packaging is done to customer order, so response times are quicker and inventories of products are low.
- Production at consumption. Distribution centres are production centres, and customers may "produce" a "customised product on the spot".

Benefits from implementation of SCM into business operations

The key business benefits that can result from the implementation of SCM are cost reduction and value enhancement. This can be achieved through:

∑ reduction of lead times and shorter delivery time;
∑ lower inventories;
∑ improved supplier relations;
∑ higher utilisation of equipment/production capacity;
∑ improved legislative compliance;
∑ risk reduction and security of supply;
∑ creating new market opportunities;
∑ enhancement of product/service quality;
∑ increased innovation;
∑ raised productivity.

Problems in the implementation of SCM

Many interviewees underlined that problems with SCM implementation are as a result of organisational inertia and difficulties of corporate culture change. One key obstacle is that in most organisations people operate (and think) in narrow, compartmentalised channels related to their field of speciality. To break this and implement horizontal structures, and create cross-functional teams remains one of the greatest difficulties. A solution to this has been seen as improved use of ICT e.g. intranet and extranet in creating cross-national, virtual teams. However, there is some evidence that the use of "virtual solutions" may not bring the results that may be expected. Direct "human interaction" is of key importance overall and are very true in development of sound SCM.

Leaders in SCM

A number of companies have been mentioned as undertaking cutting edge work in SCM. The short list below is intended to give just a few examples of companies that have been referred to as leaders in SCM :

- Dell (computers): for its lean SCM , which turned Dell into a real global supply chain company.
- Volkswagen-Audi (automotive): VW provides an example of a multi-stage supply chain working with its dealers to get advance order information and actual orders electronically, feeding the data directly into the daily automobile production planning. VW is also working with its in-house supply plants and contract suppliers to deliver electronic parts and sub-assemblies Just-In-Time (JIT) for the daily production schedule VW uses integrated supply chain operations in order to reduce its present order-to-delivery cycle time from many weeks to two weeks and eventually a few days.
- Tesco (retail): have implemented very efficient SCM, using extranet for on-going communication with their suppliers, where information is updated every 24 hour.
- Nokia (telecommunications): have managed to gain success worldwide with short life-cycle products, SCM is seen as central to the success.
- Hewlett-Packard: is known for inclusion of design aspects into SCM .

Centres of expertise

Professor Martin Christopher of Cranfield School of Management suggests that there are a number of institutes in the UK, that are involved in research into SCM and related fields. Traditionally there is more of a focus on logistics and transportation where the leaders are Cranfield Centre for Logistics and Transportation (Professor Martin Christopher, Professor Alan Harrison) and Heriott-Watt University, Edinburgh, Scotland (Professor Allan McKinnon). Other research centres are more focused on the inbound aspects of the supply chain, such as purchasing and procurement. The leading institutes in SCM appear to be the Centre for Research in Strategic Purchasing and Supply at the University of Bath (Professor Richard Lamming), and the universities of Glasgow, Durham, and Birmingham. According to Professor Christopher, UK institutes are the leaders in the filed in Europe.

However, there are many European centres involved in similar work, such as the University Eindhoven and Erasmus University in Rotterdam in the Netherlands and Nykoping University in Sweden. Outside Europe, according to Professor Martin Christopher, the leading institutions in supply chain issues are predominantly in the United States and these include State University of Ohio, State University of Michigan, University of North Florida, MIT and the University of Stanford. Besides the US, some recognised work in SCM is carried out in Japan, however, the Japanese tend to be more focused on the technical aspects e.g. modelling, while the UK or US tends to focus on managerial implications. Non-academic centres in UK, that have undertaken research into SCM include Institute of Logistics and Chartered Institute of Purchasing and Supply.

3.4

Overview of advanced techniques and key issues in SSCM

This section explores supply chain sustainability issues facing organisations and examples of the advanced strategies and management practices being used. This section also looks at some the organisations that are currently involved in projects, programmes and activities on various aspects of SSCM.

Sustainability issues in supply chains

Current trends towards the increasing globalisation of consumption patterns, global sourcing, outsourcing and specialisation are both causing and the result of increasingly long and complex supply chains. In parallel, 24 hour CNN style news reporting and the explosive growth of the Internet are increasingly exposing the unsustainable practices 'hidden' in some supply chains e.g. use of child labour. Organisations with long and complex supply chains, whether they are at the beginning (e.g. chemicals), in the middle (e.g. logistics companies), or at the end (e.g. consumer electronics, automotive, retail, government, etc.), are increasingly having to come to terms with the sustainability aspects (particularly environmental) of their supply chains and are needing to find ways of managing them.

Supply chain sustainability issues can range from child labour and exploitation of workers on the one hand to ozone depletion, deforestation and global warming on the other. These issues can be broken down according to environmental, social, and ethical aspects. Below are some examples:

(i) Environmental issues:

- natural resource use;
- emissions;
- waste;
- hazardous substances;
- energy use;
- loss of biodiversity and deforestation;
- nuclear radiation;
- ozone depletion;
- global warming.

(ii) Social issues:

- ∑ the role of the company to the local community;
- ∑ direct and indirect employment in developing countries;
- ∑ investment in education/training.

(iii) Ethical issues:

- ∑ labour practices (e.g. child labour, discrimination by race, gender and religion, wage issues, unions, working hours, and employee privacy.)
- ∑ irresponsible marketing (e.g. marketing to children and misrepresentation);
- ∑ supporting oppressive regimes;
- ∑ honesty, trust, respect and fairness in corporate or organisational relations;
- ∑ bribery and corruption.

Despite the list, organisations implementing SSCM activities are still focused on environmental issues. This is partly due to significant external pressures to address these issues, in the form of standards, regulations and business-to-business pressures, and partly as a result of environmental issues receiving increasing attention in the media. For most of the organisations interviewed in this report, environmental issues were already part of the corporate agenda with clear lines of responsibility within organisations and an increasingly focus on supply chains.

Social and ethical issues were seen as less tangible and more difficult to address, the notable exception was the retail sector where a number of initiatives have started. Some interviewees saw these issues as too political (as meaning party political) and others indicated that social and ethical issues were not in the lexicon of their organisations.

However, it should be noted that a few of the most proactive companies implementing SSCM have found ways to address social and ethical issues. For example, B&Q (retail), The Body Shop (retail) and Co-operative Bank (financial services) in the UK and Ben & Jerry's Ice Cream (now owned by Unilever) in the US have highly integrated social and ethical programmes in their organisations which also address issues in their supply chains (alongside environmental issues).

Advanced tools and strategies

Generally speaking, the ability of an organisation to engage in SSCM activities will depend on a number of factors. In particular, it depends on the ability of the organisation to influence its supply chain. This is not an issue of absolute size, but more one of relative size and buying power in its particular market, as well as its ability to leverage its position. For instance, Philips (electronics) is able to directly influence its packaging suppliers, setting requirements and working with them to design smaller, lighter and more environmentally friendly packaging systems, because the company represents a large part of their business. However, Philips has very little ability to influence its plastics suppliers, because the amount of plastics Philips buys represents a very small percentage of the plastics supplier's business.

On the other hand, some companies are willing to work with very small customers if they feel there is something to gain from it. For instance, Patagonia has worked with one of their textiles suppliers to develop greener coatings, even though Patagonia represents a very small part of their business. The textile company is willing to work with Patagonia, because Patagonia's environmental credentials helps to legitimise the company's environmental claims and because the results of the collaborative work will eventually be able to be sold to other customers (Goodman, 1998). From this, it can be noted that dominance in the supply chain is not the only prerequisite for bringing about change. Other strategies include partnerships, to influence larger customers and suppliers.

The following tools and strategies represent the advanced techniques methods and approaches used by organisations to manage their SSCM issues.

(i) Written policies and communications materials

Many companies use written policies, statements and other communications materials to inform their supply chain partners and potential suppliers about their sustainability goals and expectations. These include letters, brochures, articles in supplier newsletters and through internet/intranet.

(ii) Pre-qualification of suppliers

A common method for pre-qualifying suppliers is setting supplier requirements, such as certification to ISO14001. Questionnaires are another pre-qualification tool and are perhaps the most common SSCM tool used. Through them, it is possible to ascertain if potential suppliers comply with all relevant standards and regulations (however, these still tend to be environmentally focused) e.g. whether they have ISO14001 or EMAS, if they use certain restricted substances, etc

(iii) Purchasing specifications

Another SSCM tool is to place requirements in the specifications for products and services they plan to purchase. Through the specifications organisations can demand, for example, that suppliers do not use certain substances, that the products meet certain standards of recyclability or contain certain amounts of recycled content, that life cycle data is provided or that the supplier will 'take back' products or packaging after use. Setting product or service specifications can be a powerful mechanism for influencing supply chains.

(iv) Supplier/Customer Partnerships

Some of the more proactive organisations are going beyond just setting product and service specifications and are starting to establish co-operative partnerships between customers and suppliers. However, these partnerships require openness, trust and transparency. Despite this, examples of supply chain partnerships are numerous. Partnerships can take range from working together on research and development projects to providing training and assistance . The hallmark of successful partnerships is good two-way communication.

(v) Supplier/Customer meetings

These can be one-to-one meetings, seminars, workshops or conferences. Meetings allow organisations the opportunity to share ideas, work together and solve problems together.

(vi) Validation of Performance

Validating supplier claims is an important part of the management process. Tools for validation include reviewing questionnaires and documentation from suppliers, site visits, third-party audits.

(vii) Working with industry peers

SSCM is not only about working with suppliers and customers, but also working with industry peers to develop industry best practice and standards. According to Lippmann (1999), the following characteristics typify effective SSCM programmes:

- top-level leadership;
- cross-functional integration;
- involving different supply chain related functional areas within the company (procurement, EHS, manufacturing, marketing , R&D, distribution);
- integration into existing SCM processes (design, procurement, distribution);
- effective communication within companies and with suppliers (internally and externally);
- multiple information channels (mission statements, codes of conduct, meetings, questionnaires, contract conditions, supplier newsletters, periodic performance reviews);
- effective processes for targeting, selecting, working with and evaluating suppliers;
- most target first-tier suppliers (they have the largest stake in the relationship), as well as contract manufacturers/suppliers that handle hazardous substances (corporate reputation);
- incorporate environmental performance as part of supplier solicitation, selection and monitoring to ensure that only environmentally aware suppliers approach them for business;
- work with suppliers to ensure continuous improvement over time;
- willingness to end relationships which fail repeatedly to meet environmental expectations;
- allow for collaboration and joint problem solving - leverage the expertise of suppliers and engage them as business partners to address common environmental and business goals.

Supporting Organisations

Most of the interviewees noted that there were few if any centres of excellence on SSCM. Furthermore, it was noted that academia, and research institutes in general are lagging far behind the 'advanced techniques '. However, there are some organisations that are involved in research and promotion of SSCM, or at least some aspects of sustainability. In most cases this means environmental aspects.

The following organisations are involved in projects, programmes or activities on various aspects of SSCM. They are presented only as examples to demonstrate the breadth of current activities.

(i) Business for Social Responsibility (BSR)

- BSR promotes social, ethical and environmental corporate responsibility through benchmarking studies, publications, the Business for Social Responsibility Education Fund, awareness training and workshops.
- BSR has a Supply Chain Working Group composed of 12 leading companies in the field which is looking at best practice and ways to promote supply chain issues
- BSR also maintains an extensive website covering social, ethical and environmental issues in corporate responsibility. However, their section on supply chain strategy and management deals only with environmental issues. They refer to this as 'supply chain environmental management' (SCEM). The website includes information on drivers and benefits of incorporating environmental issues into SCM, as well as examples of best-practice and links to other organisations working in the field.

(ii) United States-Asia Environmental Partnership (US-AEP)

- This organisation works closely with Business for Social Responsibility (BSR) promoting SCEM.
- Among other activities it has carried out a benchmarking study on SCEM in the electronics sector.
- Its key activities include: identifying and supporting international corporations who champion greening of SCM (companies that not only green their own supply chains but also work to green supply chains industry-wide); collaboration with US and Asian companies who seek to create supplier outreach programmes; provision of technical assistance and training to Asian industry associations that provide expertise to Asian suppliers; and support for the activities of BSR.

(iii) Business in the Environment (BiE)

BiE has developed a CD-ROM based tool for benchmarking suppliers, called 'Buying into the Environment.' It is modelled on the BiE's 'Index of Corporate Environmental Engagement', and measures ten key areas of environmental management concern:

- corporate environmental policy;
- board member with environmental responsibility;
- formal environmental management system;
- environmental objectives;
- measurable targets;
- internal audit process;
- employee environmental programme;
- environmental stewardship of products;
- processes and services;
- supply chain programme, and;
- environmental communication with stakeholders.

(iv) Organisation for Economic Co-operation and Development (OECD)

- The OECD researches and promotes green procurement in government

(v) The International Council for Local Environmental Initiatives

The International Council for Local Environmental Initiatives (ICLEI) has a European Eco-Procurement Initiative, which has been designed for local authorities. The aim is to combine the power of public authority purchasing to create a 'cumulative demand' for greener purchasing practices. (ICLEI, 2000). Some of the tools that ICLEI have produced include a workbook called "Green Purchasing in Europe", 1998, and a study on green purchasing structures and practices, 1997

(vi) Japan Green Purchasing Network

The Green Purchasing Network (GPN) was set up in 1996 to promote 'greener purchasing from governmental organisations, consumers and businesses in Japan. It has members from environmental NGO's, consumer groups and businesses including Sony, Toyota, Cannon and Nippon Steel.

The GPN has produced guidelines on purchasing specific products based on its 3 core principles of green purchasing. Some of the product groups include office furniture, personal computers, refrigerators and washing machines. The principles that GPN uses include:

- the environmental impact of the product over its life-cycle;
- the environmental performance of the supplier;
- benchmarking of products across a wide range of options.

As well as producing guidelines, GPN are involved in conducting surveys on the state of green purchasing, establishing networks led by local governments and companies and awarding prizes to outstanding members of the network.

(vii) European Green Purchasing Network

The European Green Purchasing Network (EGPN) is organised by the European Partners for the Environment (EPE) - which is a multi-stakeholder forum for consensus on sustainability actions. Its members include local and national public authorities, trade unions, companies, environmental, consumer and ethical NGO's.

EGPN is designed to facilitate joint purchasing by public and private sector bodies, stakeholders, and has established objectives for voluntary initiatives for purchasing (in conjunction with industry) for the water sector, agri-foods, cars and information technologies and produced a workbook on green purchasing.

(viii) Adapt Supply Chain Environmental Train Project (ASCTP)

In 1997, CAPITB Trust received £1.7 million from the European Social Fund (ESF) to develop ASCTP and involved the following project partners to explore environmental management training through the supply chain: Blackburn College, Fife College, the Construction Industry Research and Information Association (CIRIA), Excel Waste Management Training, Kemira Agro UK Ltd, British Aerospace, Reemploy and GEE Publishing. ASCTP covered six sectors:

- construction;
- agriculture;
- aero-engineering;
- food and drink;
- clothing and textile;
- waste recycling.

The supply chain partners were British Aerospace, Kemira, Morrions Construction and Remploy. A range of training material and courses were developed as part of the project focused on environmental management, and transnational links were made with New Eco-Enterprise, Products and Services (NEEP) network with participants from Germany, Italy, Spain, Denmark and the UK.

(ix) Project ACORN

Project ACORN is a two year project that was established in 2000, to develop a scheme for a staged certification of SMEs. ACORN is funded by DTI with support from DETR and managed by BSI with consultancy support from 14000 & ONE Solutions. The aim to is cascade environmental management through the supply chain using a six stage model. There are 28 mentor companies and 250 supply chain companies (suppliers and customers) involved in the project.

(x) Environmental Supply Chain Forum (ESCF) (UMIST, University of Manchester)

- ESCF is a forum for professional purchasers, which promotes the integration of environmental criteria into purchasing through training, seminars and consultancy.
- ESCF is currently involved in a project involving the construction, chemicals, automotive and aerospace sectors.
- It is also involved in developing a policy statement on environmental aspects of purchasing with the Chartered Institute of Purchasing and Supply (CIPS), for purchasing professionals. This will be followed by the development of a guidance document, methodologies and training materials.
- The project is funded via the EC.

(xi) The Green Supply Chain Network and Project (University of Middlesex)

- This project is focused on SME suppliers in the North London area (Lee Valley region).
- It involves mapping the supply chain in this region, identifying best practice and SME supplier needs and bringing together experts on the issue. Activities include promoting local sourcing and working on packaging design issues.
- There are several partners involved in the project including the Regional Supply Network and Business Link.
- The Green Supply Chain Network is focusing on five sectors: food, logistics, furniture, printing, clothing.
- The project is funded via the EC.

(xii) The Centre for Sustainable Design (CfSD)

- CfSD recently completed a two-year project entitled "Eco-design Training for Manufacturing, Use and 'End-of-life' for SMEs" (ETMUEL). Part of the project involved working with large electronics companies on supply chain partnerships with SME suppliers.
- ETMUEL is funded via the Adapt programme of the European Social Fund (ESF).

(xiii) TNO Institute of Environmental Science, Energy Research and Process Innovation

TNO has developed a software tool for electronics companies to work with their suppliers to develop more environmentally friendly electronics products.

(xiv) US projects

SSCM (primarily environmental) projects and research has been identified at the following US institutions:

- University of Oklahoma.
- Massachusetts Institute of Technology (MIT).
- Bath University (New Academy of Business).
- Carnegie Mellon.
- Pennsylvania State.
- Rochester Institute of Technology.
- Clark University.

4.0

Research findings and analysis

The report analyses eight broad sectors. Information is based on desk research and the authors' knowledge of the sectors. Interviews were undertaken because information provided should not be seen a necessarily representative of the sub-sector or its segments.

4.1 Utilities

Overview

The utilities sector was formerly managed by public sector operators. With the liberalisation of the electricity market and the privatisation of companies there has been marked improvements in service operations to the consumer. With this improvement of service, there has also been the introduction of environmental initiatives, such as public environmental reporting and energy efficiency advice. The utilities sector is characterised by high-energy usage needed to deliver common products, such as electricity and water, as well as maintain the large infrastructure network that is used for delivery and storage of these products.

Since 1993, the procurement procedures of entities operating in the water, energy, transport and telecommunications sectors are governed by Directive 93/38/EEC commonly known as the "Excluded Sectors" Directive or the "Utilities Directive". Any tendering for major supply contracts over a certain monetary value for service contracts and works contracts have to conform to specific rules of competition. Even though the directive does not use environmental or general sustainability criteria for deciding upon suppliers, many of the utilities are now building environmental criteria into procurement management policies as a first step into environmental management of the supply chain.

The water industry is responsible for the whole water cycle, from abstraction of groundwater reserves and surface water collection and storage to collection of waste-water and dispersal of sewage products. This management of the whole cycle requires a great deal of energy use and so water companies look to reducing the energy needed for supply of these services.

The electricity market in the UK generates most of its power through the burning of fossil fuels. In 1995 oil and gas fired power generation made up 64% of the total market (The UK Electricity System, 2000). The UK government has now introduced a target for the UK electricity generation. By 2010 it expects that the total country renewable electricity generation should be 10%.

Water

(i) Sustainability Issues

North West Water pointed out that two key issues for sustainability and supply chain for them were:

- Energy reduction, especially in the transport side of supply. The water industry is a major energy user in electricity supply and in the use of transport.
- Local supplier sourcing. The North West of England has a strong historical policy of local sourcing of suppliers. The company also points out that its suppliers are also customers, and that, where possible, supply contracts are awarded to local companies, which in turn helps the local region to regenerate economically.

Freshwater supply of water is the core business of water companies. Government policy and the Environment Agency guide management of the abstraction process. Sustainable abstraction of water resources should ensure appropriate demand management on the part of the water companies, as well as addressing the issues of water redistribution where necessary.

BOX 2: UK WATER RESOURCE POLICY

The UK water industry expects the following 5 principles to be adopted in water resource policy:

1. **Companies must continue to have a sufficiency of raw water to be able to deliver their statutory obligations for a public potable water supply.**
   - ∑ The review of abstraction licences may introduce tensions between the demands from a public potable water supply and the environment, deriving the balance between the two must be undertaken in a fair and open manner. The detailed process must be transparent.
   - ∑ Environmental economics and estimates for environmental value should be used objectively in the decision making process. Changes in licences should be shown to have a cost/benefit ratio <1.
2. **If the cost of the raw water changes, then this cost must be recoverable from the end user.**
   - ∑ An increase in the cost of raw water will introduce additional economic tensions in terms of the other sources for water (leakage, demand management etc.)
   - ∑ These costs must be recoverable and not funded by further "efficiencies".
   - ∑ Where lost sources have to be replaced by new sources, we should expect the EA to support the development of new sources.
3. **Water resources will be a central element in any competition scenario. Competition must be fair and open.**
4. **The Water Industry is a long run business which must have certainty for the long term planning of water resources.**

∑ Long term investment, asset lives and stranded assets are crucial issues for the water industry and society as a whole.

5. **The Water Industry runs a major risk of being between an unfunded rock and a very green place. Both the economic and environment regulators must have due regard to each other's aspirations and a fair and equitable process derived.**
   - ∑ Ultimately, customers have to pay for environmental gains, unless the polluter pays principle is followed.

Source: A Consultation Document for Catchment Abstraction Management Strategies (CAMS), Water Information Note, Water UK.

(ii) Proactive companies

Severn Trent Water plc have a policy of minimising waste and maximising the use of renewable and recyclable materials through their procurement policy, as well as encouraging third parties to adopt standards as high as their own (Severn Trent Water, 2000).

North West Water are developing environmental initiatives with their suppliers that go beyond the tendering process. They are currently developing a programme in conjunction with Sunderland University for a partnership programme on sustainability in the supply chain. This programme will target the top 20 SME suppliers that North West Water uses.

(iii) SSCM Tools

a. Procurement pre-qualification

North West Water has developed a system of pre-qualification that is used in the tendering process of all new supply contracts. The software developers Achilles have developed a utilities vendor database. This database is currently in use with 43 utilities companies in the UK. The database provides North West Water with a list of suppliers that meet legislative requirements, while also highlighting any environmental standards that have been achieved by the respective suppliers. North West Water can use the results of the vendor database as a screening process for companies that commit themselves to environmental principles.

b. Environmental Evaluation Questionnaire

When North West Water put out a tender contract for new suppliers, they include an environmental supplier evaluation document. The purpose of the document is to help understand some of the environmental issues they will face with potential suppliers. It includes 9 questions around compliance, standards and environmental initiatives. Severn Trent also use an environmental questionnaire in their procurement policy.

c. Supplier Engagement

North West Water are currently developing an approach for selecting suppliers, which goes beyond the introduction of an environmental rating. They have developed a website that lists their environmental goals and objectives. When engaging suppliers at contract stage they are asked to look at the North West Water website and comment on how they can contribute to the environmental goals of North West Water. This process has already been used with the tender process for obtaining water meters.

(iv) Gaps in SSCM

There appear to be few strategies (other than North West Water) that take into account social concerns of the supply chain, either through purchasing controls or supplier engagement. The prime concern of sustainable issues for water utilities is environmental best practice.

Power supply

(i) Sustainability Issues

The EU target, set in the ALTENER Programme, is to triple electricity production from renewable sources in the EU as a whole, in the period 1991 to 2005. This commitment has been re-affirmed by the UK government, by setting a standard for a total of 10% renewable energy production for 2010. Sourcing renewable energy has now been taken up by some of the larger electricity providers such as Eastern Electricity, though this target has not been met yet.

A major retail electricity provider (name withheld) responded that the biggest issue for the environmental management of their supply chain was managing the environmental performance of their suppliers. Many of their suppliers of electricity for the company have larger businesses. Influencing the supply chain when suppliers are larger than your company in these cases proves difficult. Some of the other major issues when dealing with the supply chain was minimising business risk, promoting good practice and creating partnerships with suppliers.

The Renewable Energy Company UK is a renewable electricity provider for a number of local authorities, the Dome and the Co-operative bank. It is also the largest supplier of 'Green electricity' for Europe. They have entered into a joint venture with Thames Water called Ecotricity, which will supply domestic renewable electricity for similar prices to regular electricity generation. Adrian Robinson from the Renewable Energy Company pointed out that home generation of electricity may in the near future become more popular, as the cost of micro Combined Heat and Power generation (CHP) plants are coming down. Future supplies of energy may be sourced locally, which could have huge impacts on the ownership of electricity.

(ii) Proactive companies

PowerGen Renewables Holdings Ltd is a developer and owner/operator of wind farms, which generate electricity in an environmentally beneficial way - the green alternative to fossil fuel generating plants.

The company currently sources renewable electricity from 12 operational wind farms in Cornwall, Cumbria, Northumbria, Norfolk, Yorkshire, Wales and Northern Ireland have a total capacity of around 59 MW (enough to supply the needs of over 50,000 households). They are also building two further wind farms, totalling 20 MW capacity: the UK's first offshore wind farm, 1km from Blyth Harbour in Northumbria; and the other in Ireland. Offshore wind turbines are an important contributor to achieving the UK Government's target of generating 10% of electricity from renewables by 2010. Since commissioning, the electricity generated by the wind farms has prevented almost 600,000 tonnes of carbon dioxide greenhouse gas emissions (PowerGen, 2000a).

TXU Europe and Eastern Energy have introduced a commitment to buy back any 'surplus' green energy that is generated by domestic solar generation suppliers for the same price that they supply main power to the customer. TXU Europe also uses an environmental questionnaire in their procurement process. National Power plc have a 2 year business objective for 1999/2000 for having an environmental SCM system in place.

(iii) SSCM Tools

a. ISO14001

Since 1991, PowerGen has operated its own EMS. In 1996 they decided to upgrade this system to meet the requirements of ISO 14001, the international standard for environmental management. Corporate certification was obtained for the electricity production and gas elements of the business on 1 January 1999. The environmental policy for international projects is to implement ISO 14001 wherever there is at least a 50% equity stake, or where PowerGen are operations and maintenance contractors.

In projects where PowerGen are a minority stakeholder, they will try to introduce ISO 14001 to their part of the operation and try to influence the partners to set the same standards in other parts of the operation. (PowerGen, 2000b). ISO 14001 requires companies to improve their own performance, and influence or control the companies in their supply chains to do the same. Suppliers are asked for confirmation that they meet certain environmental standards, and are also frequently being asked the same question by PowerGen's business customers as they themselves gain certification to ISO 14001.

b. Independent Environmental Reporting and Benchmarking

Business in the Environment (BiE) offers businesses with the opportunity to benchmark their environmental performance with those of the top FTSE 100 and 350 indexes and provides guidelines on issues such as environmental purchasing and supply, as well as other management tools for better environmental management of the supply chain. BiE benchmarking can act as a catalyst for business to adopt environmental SCM tools and strategies in accordance with best practice companies.

c. Renewable Demand and Accreditation

Some of the larger electricity generators, for example PowerGen, Northern Ireland Electricity and Eastern Energy offer 'green' tariffs to customers for providing renewable energy. These tariffs, paid by customers, guarantee that the respective companies will source renewable energy for their mainstream electricity supply in accordance with the percentage that customers demand through their tariff. The customer tariff is higher than regular tariffs, but it covers the higher cost of companies' supply of renewable energy. The Energy Savings Trust verifies that companies comply to their sourcing requirements under the accreditation scheme, Future Energy.

d. Environmental Questionnaire

One of the major retail providers of electricity (name withheld) uses a short environmental questionnaire when vetting potential suppliers, based on 10 questions. TXU Europe also produces an environmental questionnaire in their procurement process to help with contract vetting.

Innogy UK use the Achilles software tool as a means of attaching information to their suppliers for reference and pre-selection of suppliers.

e. Supplier dialogue/engagement

A major retail electricity provider (name withheld) is starting on a programme to identify the top 30 to 40 suppliers for their business and engage those suppliers in 'positive dialogue'. The goal of the dialogue is to attempt to look into potential cost savings for both the supplier and the company by reducing resource intensity. The process will be managed through business contract managers, who will be trained through the environmental department.

Innogy have produced a booklet of environmental best practice that is available to their suppliers. This is based upon the ideas that are produced by the BiE programme for best practice environmental management. Innogy have also been previously been involved with SME suppliers in working out a scoring system for environmental issues.

f. Supplier Self Assessment

TXU Europe has developed an environmental performance self-assessment questionnaire with the help of the 'Business in Environment' and the Government Office for the East of England. They have sent this out to 50 of their suppliers for a response and then analysed the responses that were obtained. Feedback was then supplied to all companies who responded to the questionnaire in terms of help and encouragement of environmental performance.

(iv) Gaps in SSCM

There is little evidence of ethical and social issues being used in the development of SCM measures for the electricity management. Environmental concerns over best practice, waste minimisation and energy efficiency are the key drivers for SSCM in the UK, partly driven by the increasing lobbying for cleaner fuels. Although there is sourcing of fuels from global sources, social issues for these suppliers have not been included in any sustainability debate.

4.2

Transportation

Overview

This section is based on an overview of rail, logistics companies (service providers) and automotive companies (manufacturing). Rail companies were previously public sector owned, providing the service of carrying goods and people on the national scale. Recent trends indicate that a number of rail companies, such as SJ (Swedish) or DSB (Danish) tend to separate their passenger and cargo traffic, often sub-contracting the cargo business to other companies. In the UK passenger traffic has been privatised and separate companies currently serve individual lines or regions.

The logistics sector previously focused on the transport of cargo by various modes of transportation. Recently, however, the core nature of the logistics business has changed significantly. Most leading companies are currently moving away from only providing goods transportation services to offering integrated logistics systems. This trend in logistics follows other sectors where companies are outsourcing parts of their businesses that are not viewed as part of the firms' core competency. Logistics companies have now begun to widen services to include the management of supply chains, interpreted by some_ as taking responsibility of "the process getting the right products to the right place at the right time in the right condition" (Ryder, 2000).

The cutting edge logistics companies describe their service as managing information to provide a customer with lean SCM in the form of inventory management, delivery and distribution. For this purpose they have to work closely with their customers to obtain an intimate knowledge of their order, production, administration and delivery processes. Advanced techniques companies, like Schenker-BTL are managing the entire production lines based on their networks of nodes and terminals.1Currently many logistics companies are a form of hybrid that delivers both types of services, traditional goods transportation and modern logistics.2 . Ryder, Schneider, Schenker-BTL, Danzas, ASG (owned by Danzas/Deutche Post) are some of the largest logistics companies in the world.

The automotive industry is characterised by increasing frequency of mergers and acquisitions, but also strategic divestment, with the sale of non-core parts of the business. In the past three years several major organisational re-alignments have taken place in the global automotive markets. Daimler Benz merged with Chrysler into Daimler-Chrysler, Renault purchased 33% stake in Nissan, Volvo was acquired by Ford and Saab by General Motors. Market analysts predict further take-overs, even with giants such as BMW at risk. There has been some speculation that major automotive production will be concentrated in hands of just six multinational car conglomerates within the next decade (Ethical Consumer, 2000). Over past years the automotive industry has been moving away from the model of traditional manufacturing to the model of industry based on global supply chains. Currently automotive companies rely on a very long chain of suppliers which provides them with the materials, parts, and assemblies required to manufacture a car.

Railways

The information below is based predominantly on interviews held with two European rail companies, DSB (Danish Railways) and SJ (Swedish railways). Both companies are often referred to being among environmentally "best-in-class" in the sector worldwide.

(i) Sustainability issues

Rail transport is usually considered to be the most environmental way of moving goods and people. However, there are various environmental impacts generated at each stage of providing this service. This includes , for example:

- ∑ impacts generated during rolling stock production use and maintenance (primarily consumption of energy, lubrication, washing etc.) and end-of-life (disposal of used, complex products)
- ∑ impacts related to construction (e.g. aggregate consumption for track production) and maintenance (use of herbicides) of rail tracks;
- ∑ impacts related to production, maintenance and end-of life of various office products and infrastructure;
- ∑ impacts related to food catering and impacts of other passenger services provided on trains and at station facilities.

Rail companies often directly control various impacts related to the use and maintenance of the equipment and infrastructure. However, many rail companies have started to outsource various parts of non-core business operations (catering, etc). Therefore rail companies have increasingly larger supply chains, with potentially greater environmental and social impacts.

(ii) Proactive companies

According to Anna Granholm-Thoren from the environmental department of Swedish Railways (SJ), SJ and DSB (Danish Railways) are considered to be the most advanced European rail companies in relation to implementing sustainability issues, especially in terms with work with suppliers. The work of the companies, however, focuses primarily on environmental performance. It has been observed that, as with other sectors, rail companies like SJ and DSB have established policies related to health and safety, employee rights and community relations.

However, they do not recognise these as sustainability issues. They tend to understand that their operations rely on very advanced technologies provided by the western world, where, social issues are not of key importance. This indicates that the understanding and awareness of the supply chain rarely goes beyond 1st or 2nd tier of suppliers, ignores globalisation and/or does not tend to integrate social or ethical considerations. In SJ, purchasing of green (eco-labelled) electric energy has been prioritised highest on the environmental agenda. The company is the single largest purchaser of energy in Sweden, therefore its decisions have a strategic impact on the market of energy production.

(iii) Tools and strategies

a. Overall strategies

At SJ environmental co-ordinators are employed at various levels (national and departmental). Currently they play the most important role in the incorporation of environmental issues into the SCM, working closely with the procurement department. The marketing department are also involved in environmental issues and suppliers, as environmental performance is seen as a selling point for the company.

b. Environmental manuals

SJ has developed environmental manuals for purchasing of the following products: batteries, computers, textiles, lamps and lighting, cleaner chemicals, paper and office materials, soap and shampoos, washing detergents, office equipment, printed brochures and marketing materials.

c. Requirements from suppliers

Both, SJ and DSB have developed a set of requirements that they expect their suppliers to meet. They collect specific information from their suppliers, which is fed into the regular tender process. DSB is currently working on the standardisation and simplification of the assessment of the environmental performance of its suppliers and is developing specific requirements for suppliers and their products. The requirements are not generic and have been established for specific products or services. To compare performance and establish relevant targets a simple Excel spreadsheet model has been developed in the environmental policy department. Generally speaking product and supplier requirements are divided into 3 categories (Box 3).

BOX 3: CATEGORIES OF ENVIRONMENTAL REQUIREMENTS FOR PRODUCTS IN DSB

∑ Product Compliance with Regulations (products general documentation, product data sheets) .

∑ Secondary Product Requirements (e.g. packaging).

∑ Primary Product Requirements (e.g. only eco-labelled products).

Source: Mads Bergendorf, DSB

BOX 4: CATEGORIES OF SUPPLIER ENVIRONMENTAL REQUIREMENTS IN DSB

∑ Compliance with regulations (supplier has to have their process documented)

∑ Officially approved Environmental and Occupational Health and Safety Policy and Impact Reduction Programmes

∑ Officially approved and recognised Environmental Management System, integrated with the Occupational Health and Safety

Source: Mads Bergendorf, DSB

SJ is also working towards ISO 14001 and will eventually require such certification from its suppliers.

d. Training for purchasing staff

DSB provides special training for their purchasers, where environmental, health and occupational aspects are being explained and related to product groups that employees are responsible for

e. R&D through partnership with suppliers

SJ, together with DBS and a number of companies upstream of their supply chains (ATRANZ - train producers, Woodwill - polymer producer) work in partnership on an EU co-funded project RAVEL, which aims at the development of sustainable and environmentally-efficient railway systems. This project is focused on the development of software which will enable environmentally friendly design and evaluation of train systems.

(iv) Benefits

The following benefits have been observed as a result of work on environmental issues through SCM:

- leads to higher environmental efficiency;
- substantiates company claims (SJ) to be most environmentally friendly transportation system;
- often results in lower purchasing costs of products, not because environmental criteria are considered but because the procedures lead to "thinking before buying", i.e. smarter purchasing;
- leads to the reduction of the variety of products, thus reduces the complexity of waste streams.

(v) Obstacles to implementation of Sustainable SCM

SJ has not yet recognised a relationship between the impacts of its suppliers and its own impacts, especially in relation to social and ethical issues. About 2 years ago SJ tried to work with suppliers by using a tool, which was developed by an NGO - Swedish Society for Nature Conservation. The tool that was developed was far too complicated and it was felt to discourage rather than enhance co-operation. SJ as a state-owned company has to follow EU regulations for public purchasing. On a number of occasions SJ has been accused of breaching the EU free trade rules by imposing strict environmental rules for purchased products. So far, however, the SJ purchasing policy has been defended.

Automotive manufacturers

(i) Sustainability issues

According to William Clay Ford, Jr., the chairman of Ford corporation, the following factors have had a profound influence on the automotive industry (WestStart:CALSTART, 2000):

- The rise of Internet as a tool for business and commerce, "Internet is going to be the moving assembly line of the 21st century, and will improve productivity, lower costs, and delight customers."10 In the movement to use Internet effectively throughout the entire automotive value chain (from suppliers to manufacturers to consumers), "those who are first to integrate the Internet into their business model will have a major competitive advantage."
- The arrival of mass-production alternatives to the internal combustion engine may soon become a competitive issue for companies. It is because technology is now allowing larger scale production of alternatively fuelled cars. There is speculation that hybrid fuel cars might account for 20% of the market within 10 years.
- The growing demand for greater corporate social responsibility (CSR). CSR is seen by a lot of people as a "soft" issue, well down the priority list, 11 however some senior executives in automotive industry, have indicated that this will be "the most important issue facing automotive industry - and industry in general - in the 21st century." (Ethical Consumer, 2000).

In addition, there are a number of environmental, ethical and social issues, which have already had a profound impact on the entire automotive sector.

(ii) Environmental issues

The automotive industry is one of the largest contributors to air pollution (e.g. CO2 emissions, NOx, SOx), resulting in adverse human health and environmental degradation, and depletion of fossil fuels. 80% of life cycle environmental impacts of cars are assigned to their use phase. The sector is also being increasingly regulated by various laws e.g. End of Life Vehicles (EOLV) Directive. Environmental performance in the use phase is being addressed by automotive manufacturers at the R&D level. There have been improvements, but these have been incremental. e.g. research on alternative fuels has been taking place in partnership with other companies.

A trend towards environmental changes in car technology was seen at the Tokyo Motor show in August 1999 in Japan, where nearly every Asian manufacturer featured one or more cars utilising what up to now had been considered alternative technologies. (The Green Business Letter, 1999). In the UK, The Environmental Transport Association now publish an annual Car Buyers Guide, which ranks around 500 models of new cars on the basis of environmental performance (Ethical Consumer, 2000).

(iii) Social and Ethical Issues

As with some other sectors, social and ethical issues in automotive industry refer to human rights, child labour, equal opportunities and contribution to local communities. In addition, the automotive industry has links to defence issues and the arms industry e.g. Mitsubishi Heavy Industries has been listed as the World's 16th largest defence company in 1996, while Mitsubishi Electric 30th. Land Rover's 4x4 Defender model was used by the military in East Timor (Ethical Consumer, 2000). Some automotive companies have divested parts of their defence business: Saab after being acquired by GM, and Volvo Motors sold to Ford, (while Volvo AB continues to produce for defence), Rolls Royce Group plc - owns munitions manufacturer, but its motor division is now owned by Volkswagen (Ethical Consumer, 2000). Due to the size of automotive corporations, they wield enormous political influence. A number of automotive companies have been connected with anti-environment lobby groups (Ethical Consumer, 2000).

BOX 5: EXAMPLES OF SENSITIVE SUSTAINABILITY ISSUES IN AUTO COMPANIES:

- ∑ BMW owns Rover Group and that in Feb.1995 prevented its employees from speaking out by including a "gagging clause" in workers' contracts.
- ∑ Daewoo Group is involved in the construction of a motorway in Pakistan, known for poor working conditions and harassment and intimidation of union members.
- ∑ Fiat SpA own subsidiary Fiat CIEI which makes equipment for both nuclear and defence industry.
- ∑ Ford Motor Co. owned in 1998, five of top ten highest Toxic Release Inventory emitting factories in the US automotive industry.
- ∑ GM has been criticised in the US for its use of maquiladora factories - Mexican facilities renowned for their low wages and long working hours.
- ∑ Peugeot Citroen has been recognised to run operations in oppressive regimes such as Algeria and China.
- ∑ Nissan Motor Co. is a part of Fuyo Zaibatzu, which has been involved in PVC production, dam building and meat industry.

Source: "Who is in the driving seat?" Ethical consumer, April/ May 2000, pp.6-11

(iv) Proactive companies

Companies in the automotive sector are beginning to realise that it is very important for them to address CSR and wider 'triple bottom line' issues. A number of automotive companies produced sustainability reports in 1999, some of them for the first time. Among those were Ford's "Connecting with Society," and "The Vauxhall Report for 1999. Raising the Standard in Economic, Social and Environmental Performance". Environmental reports were published by other companies, such as BMW, Fiat, Honda, Mazda, Peugeot, Citroen, Renault, Toyota, Volkswagen. Many companies decided to followed Global Responsibility Initiative (GRI) guidelines. Other proactive initiatives include the development of cars powered by alternative fuels (UK less so than in continental Europe). Among those are models which run on Liquid Petroleum Gas, Compressed Natural Gas (Volvo), electric cars (Peugeot 106, Citroen Berlingo van, Ford 2 seater), hybrid and dual engine cars (Vauxhall Astra, Vectras, Omegas, Combos, Daihatsu in UK markets only) (Ethical Consumer, 2000).

Some automotive companies have also started to promote car sharing initiatives e.g. Hertz is involved in the BART (San Francisco Bay Area Rapid Transit District) initiative, which is one the first experimental "station car rental service." (Business and Environment, November 2000). Honda and Volkswagen signed the public-private California Fuel Cell Partnership with the aim of helping to commercialise fuel cell technology in vehicles. The partnership (1999) includes automotive manufacturers: Daimler Chrysler and Ford Motor Company, energy providers ARCO, Shell and Texaco, fuel cell company Ballard Power Systems and California Air Resources Board plus California Energy Commission. In California fuel-cell electric vehicles will be launched over next 4 years, Honda aims to have a model by 2003. (Business and Environment, November 1999). Ford became the first automotive manufacturer to certify its plants worldwide to ISO 14001, which includes 140 facilities in 26 countries. GM expects to finish its certification by the end of 2001. (Business and Environment, November 1999).

(v) How companies are managing SSCM tools

In the opinion of a number of interviewees the automotive industry is a very powerful actor in the supply chains of many sectors. Some interviewees, for example observed, that due to growing demands for electronics in the automotive sector, the potential influence of a single automotive manufacturer is far greater than a single company in consumer electronics or telecommunication sectors. Therefore the activities of automotive companies is very important when implementing sustainability through supply chains. Now, some environmental issues are being addressed through working with suppliers. These are listed below.

a. Partnerships with suppliers

Saturn Corporation in co-operation with US EPA ('Design for Environment' (DfE) programme) and the Centre for Cleaner Products and Clean Technologies in the University of Tenessee (UT) is working on a project to establish "strong partnership" with suppliers. The partnership aims to highlight examples of how to work with suppliers to help promote best practice in other industries (home appliances, computer electronics). The network of relationships among Saturn suppliers provides increased access to lower tier suppliers. Working with the all elements of the chain allows the reduction of environmental burdens over the entire chain, while limiting the shifting of burdens from one link in the chain to another. Saturn identified 375 supplier companies at 425 locations, and sent out a questionnaire, inviting companies to establish a partnership with Saturn Automobiles. More than half of responding companies indicated willingness to participate in such partnership activities. Subsequently, Saturn Supplier Partner Council was established which is made up of 9 suppliers who are mentors to 40-45 other suppliers.(The Green Business Newsletter, 1999)

b. Supplier Environmental Requirements

A number of automotive manufacturers have defined environmental requirements from suppliers. Ford and GM announced in September 1999 new procurement guidelines. Both companies will require their suppliers to conform to ISO 14001. Ford will require all manufacturing sites shipping products to Ford to be ISO 14001 certified by 1st July 2003 and GM by December 2002.

c. Supplier partnership and training programmes

For both, GM and Ford, ISO 14001 is just one part of much larger effort to engage suppliers more directly into their work on environmental improvements. Both companies perceive ISO 14001 as the minimum requirement. The goal is to help the automotive manufacturers to find eco-design or DfE solutions that will help to build better cars and operate cleaner factories. Both companies plan extensive training and mentoring efforts to help suppliers meet newly established mandates. (The Green Business Letter, 1999). Rover as part of its purchasing policy, opened dialogue with its 1st tier suppliers in 1998 (700 companies) about working towards ISO 14001 certification. Rover decided to cascade the message down to 2nd and 3rd tier suppliers, and to create awareness by working with supplier companies. Rover teamed up with Jaguar to provide free consultancy to SMEs.

The co-operation included all aspects of SCM and included advice on recycling, energy efficiency, pollution and waste reduction. As a result of the co-operation Rover helped various SMEs to reduce their landfill tax costs by decreasing their waste to landfill, decreasing their transport costs and selling materials that would otherwise have to be land-filled. Daimler Chrysler recently invited 26 suppliers to develop green concepts for vehicles, design components for recyclability, and reduce the use of certain hazardous materials, such as mercury. It resulted in 500 environmentally beneficial design changes (Lippman, 1999).

BOX 6: PARTNERSHIP WITH SUPPLIERS IN GENERAL MOTORS

In 1989 General Motors developed a supplier training programme (PICOS), that was focused on efficiency and competitiveness. In 1996, through the Initiative on Resource Conservation and Pollution Prevention in PICOS, 140 engineers were trained to help suppliers identify opportunities to improve energy efficiency, reduce material use and reduce of pollution. Engineers conducted workshops at supplier facilities. In 1998 PICOS workshops were renamed Lean Implementation Workshops. In 1998 GM invited 8 key suppliers to form a Supplier Environmental Advisory Team (SEAT). The team has identified short and long-term opportunities for collaboration on environmental management systems (EMS), DfE, and environmental metrics in the supply chain and has developed a policy statement, which is issued by GM's purchasing department which was sent to 650 of GM's largest suppliers. Meetings, seminars and workshops with suppliers have subsequently been implemented. GM is also planning to involve suppliers in a DfE project. GM is also starting to use life-cycle costing to assess suppliers' innovations that might cost slightly more but which offer environmental benefits.

Source, Lippmann S, "Supply Chain Environmental Management: Elements for Success," Corporate Environmental Strategy, Elsevier Science Inc., Vol.6, No.2, 1999

BOX 7: SUSTAINABILITY AND SCM IN VAUXHALL

- Vauxhall signed Global Sullivan Principles, which contain codes of contact with respect to social and ethical aspects of business.
- Specific supplier requirements include traditional business issues (just-in-time (JIT), price, and quality), but also environmental management (ISO 14001).
- Social policy and management in Vauxhall concentrate on health and safety, equal opportunities, employee development, family friendly policies, and community involvement (mainly donations).
- Supplier environmental performance issues include: certification according to ISO 14001 by 2002; support ACORN programme (prior to the Acorn Project, Vauxhall has been a founding patron of the Enviromark scheme for suppliers); requirements for all contractors to undergo environmental, health and safety training; product suppliers are also required to meet Vauxhall internal standards for banned and restricted toxic substances.
- Partnerships are key to Vauxhall's approach to stakeholder relationships (including suppliers).
- Vauxhall have also established other industry partnerships to work on sustainable issues, e.g. with BP Amoco to reduce exhaust emissions through complementary fuel and engine development and promoting the use of and availability of alternative fuels like LPG, Vauxhall also developed with BP Amoco a child and adult safety programme: Glow Power and Living with the Traffic, Vauxhall dealership in the Midlands and BP Solar have developed pilot solar-power project, in which BP Solar provides technology to power significant proportions of dealerships with solar generated electricity.
- In order to improve supplier performance - Vauxhall organises environmental conferences to explain Vauxhall and GM objectives plus it provides advice and assistance to suppliers that aim to improve their environmental management.

Source: "The Vauxhall Report for 1999"

(vi) Obstacles in implementation of SSCM

Companies have indicated the following obstacles to implementation of sustainability in their supply chains:

- GM indicated that there is a lack of a common language with their suppliers in relation to DfE or eco-design.
- Vauxhall also indicated that clear definitions of supply chain are lacking. It is open-ended and understood differently by different partners.
- Vauxhall feared that incorporation of sustainable issues through supply chain might generate overall higher costs. The parallel has been made with implementation of quality management standards, which incurred extra costs due to the necessity for better manufacture processes under more specific procedures, with higher quality materials.

Logistics companies

One interview was held with a logistics company (Schenker-BTL in Sweden). However, the majority of the information below is based on desk research, includes visits analysis of the home pages of several leading logistics companies.

(i) Sustainability issues

Logistics companies, have historically moved goods from point A to B and environmental concerns have related to the operation and maintenance of transportation fleets e.g. trucks, often owned by a company but sometimes operated by sub-contractors. Environmental considerations have included the type of fossil fuels and amount consumed, emissions of CO2, NO, and SO, emissions of CFCs (used in refrigeration), spills of hazardous substances during accidents and the handling of various substances used in the maintenance of the fleet. Furthermore, the use of energy and waste generation is also an issue, including office waste, truck batteries, used transport packaging and used tyres.

Recently, the sector has shifted from moving goods to providing integrated logistics systems, including the provision of SCM systems. This means that environmental considerations have become much more complex, as direct and indirect supply chains get larger . Most logistics companies operate worldwide, which is almost a prerequisite to achieving success in this sector. What it means, however, is that companies in the sector have particularly strong inter-linkages, as they interface with many customers and customer's suppliers, in many countries and cultures.

(ii) Proactive companies

Sustainability issues have been recognised, although not clearly addressed, by most leading edge companies in the logistics sector. Environmental issues are most often addressed.

BOX 8: INDUSTRY COMMENT

"Being an industry leader means more than being the biggest – it means providing services that have the highest value for our customers. Increasingly, this means providing the environmental support necessary to ensure logistics operations run cleanly and efficiently."

Source: Ryder home pages <http://ryder.com/enviro/envrpt09.shtml> (cited 24.08.2000)

The most proactive companies, e.g. Ryder, ASG (currently Danzas-ASG), Schenker-BTL have repositioned themselves away from "moving goods" to "providing logistics solutions".

A number of logistics companies have implemented or are in the process of implementing EMS and some e.g. Ryder, ASG, Danzas, Schenker-BTL are starting to communicate their environmental policies to their stakeholders by producing annual environmental reports. Some also (Ryder, ASG) have devoted significant amount of space to environmental issues on their websites. However, social and ethical issues are usually addressed in a form of commitments to follow various corporate codes of conducts, but beyond this not many activities are observed.

(iii) How companies are managing SSCM tools

The leading edge logistics companies are in a unusual position, in that they are a) part of a supply chain to their customers, and b) often they create and manage supply chains. At the same time, logistics companies have long and complex chains of suppliers. These provide them with products and services for the movement of goods and the provision of integrated logistics systems. Logistics companies are in a unique position to gain an understanding of supply chains, from a supplier and customer viewpoint.

a. Strategies and tools to work with customers

ASG provides tailored services and consultation to customers on everything from reverse logistics to product and packaging design for transport.

- The company is helping their manufacturing customers to reduce environmental impacts, whilst aiming to improve product manufacturing and distribution times, reduce costs and improve quality.
- ASG uses software to help customers analyse life cycle environmental impacts of various transportation scenarios and benchmark their performance on energy, quality, costs, and environmental impact with respect to transportation and logistics.
- ASG helps customers to rethink their businesses, e.g. it claimed to have helped an automotive manufacturer reduce its European warehouses from three to one and their logistics costs by 30% through use of assembly-in-transit.

Ryder is offering the delivery of environmental solutions through:

- Working with customers to improve overall compliance.
- Providing specialised environmental services.
- Ryder included in its environmental policy a commitment to encourage all its suppliers of product and services to develop programmes that consider life-cycle impacts of products and services.

BOX 9: ENVIRONMENTAL SERVICES OFFERED BY RYDER TO ITS CUSTOMERS

Ryder offers the following environmental services to its customers:

- Storage Tank Services
- Vehicle Spill Services
- ExpressDDSM (express due diligence property assessment services)
- Environmental Training and Auditing
- State Trust Fund Reimbursements
- Stormwater Management
- Vehicle Washwater Issues
- Emergency Spill Plans

b. Strategies and tools to work with suppliers

Logistics companies have also developed programmes to work with their suppliers.

To give an example, Ryder has defined the following programmes and requirements for their suppliers:

- requirement from all their environmental services providers to meet the minimum standards described in Ryder's standard professional services agreements;
- partnering with suppliers to establish effective environmental programmes, which aim at the development of products that are non-toxic, easily recyclable and manufactured with post-consumer materials;
- partnerships with vendors for waste reduction, in which original manufacturers or product distributors are required to be responsible for disposal of any waste created by their product;
- development of purchasing guidelines aimed to increase the use of reuse, recycling and take-back programmes and to encourage accountability for environmental excellence across all operational areas.

A number of companies have seen clear benefits from the incorporation of environmental issues into the supply chain. ASG have won several exclusive contracts based largely on environmental performance and Schenker-BTL stated that environmental services have helped them to gain trust and confidence of customers and improved the communication.

(iv) Obstacles to implementation of SSCM

Organisational and corporate culture issues as major obstacles to incorporation of environmental issues into the SCM e.g. lack of awareness and compartmentalisation of tasks. It was stressed that at various levels of the company there are people who do not understand the challenge of sustainability.

4.3

Information and Communications Technology (ICT)

Overview

The ICT sector is a globally expanding sector. It represents an inseparable part of the worldwide economy, allowing rapid communication almost anywhere in the world and 24 hour "real time" access to information. With its ability to transfer, store and analyse increasing amounts of complex data, ICT is also playing an increasingly important and crucial role in the management of supply chain issues.

The ICT sector can be characterised by rapid technological change, extensive specialisation and outsourcing, and long and complex supply chains. ICT is a broad sector, including both products (equipment) and services (communications, data analysis and storage, entertainment, etc.). Within the product side, there is also considerable variation, from relatively short-lived mass produced consumer electronics (TVs, VCRs, personal computers, telephones, audio equipment, small appliances, etc.) to longer-lived custom-made medical, aerospace and scientific instruments and equipment.

Despite these differences, several common trends within the sector can be noted. These include the extensive outsourcing of manufacturing, particularly to lower wage countries in South-east Asia, Latin America and Central and Eastern Europe, the consequent global distribution of the industry and the consolidation of companies through mergers and acquisitions. There is also the formation of strategic alliances, blurring the lines between companies involved in supplying and buying goods and services. All these trends are leading to increasingly long, complex, highly competitive and geographically spread supply chains, such that very few products (if any) on the market come from a single country or a single source. Furthermore, few, if any, ICT products are made by a single organisation. Almost all are an amalgamation of components and parts sourced from a wide variety of large and small specialist companies spread throughout the world.

For the purposes of this report, the ICT sector has been divided into Consumer Electronics and Telecommunications. However, this is somewhat of an arbitrary division, since although ICT provides many different services, the underlying equipment, whether it is televisions, complex instruments, or large switching and exchange equipment used by telecommunications providers, is based on semiconductors, printed circuit boards (PCBs), relays, capacitors, switches, connectors, etc., which are common to all electronic equipment. This means that from a supply chain perspective, there are many similarities between the supply chains of a consumer electronics firm and a telecommunications service provider, even though they are aimed at very different customers.

Other similarities result from the fact that there is a significant trend towards consumer electronics companies moving into the telecommunications sector. Consumer electronics companies like Ericsson, Siemens, Motorola and Nokia, for instance, are increasingly positioning themselves as both equipment providers and total network solutions providers. The deregulation of the telecommunications sector in many countries has increased this trend by allowing cable operators, long distance providers and mobile networks, as well as Internet companies to move into the sector. The telecommunication sector therefore, represents a wide range of organisations, from those providing networks and equipment (of which one of the fastest growing is the mobile phone market) to telecommunications operators that provide only services. This range of companies creates at least two levels in the supply chain, as network and equipment providers, providing communications solutions, are most often 1st tier suppliers to telecommunications service operators.

In the consumer electronics sector, market saturation, particularly in Western markets has led to a need for constant innovation and development of new products. This has created a significant impact on supply chains, with pressures to constantly develop and implement new technologies to stay competitive on the one hand, and increasing regulatory pressures to deal with the growing amounts of waste electronic consumer goods on the other. In non-Western markets, electronics consumer products continue to expand at a rapid rate.

Telecommunications

(i) Sustainability issues

Most telecommunications companies market themselves as already contributing to sustainable development, especially in environmental terms. They emphasise that the sector is providing dematerialising technologies which allow a reduction in the use of natural resources in manufacturing processes and lead each succeeding generation of products to be smaller and lighter. Furthermore, telecommunications providers stress that they provide solutions which allow for the replacement of physical goods by immaterial services, such as software, design, new media and other telematic services, as well as reducing travel impacts.

However, the sector directly or through its supply chains, copes with the same sustainability issues as the rest of the electronics sector. This includes both environmental issues, such as hazardous and toxic substances and energy consumption of the equipment, as well as ethical and social issues, such as investments in nations with poor human rights records and labour issues, even if these appear in distant parts of the supply chain (Ethical Consumer, 1999).

Most of the major telecommunications companies do recognise these issues as important parts of their businesses. Most interviewed companies demonstrated their awareness of the issues and admitted a growing interest from their customers. However, their responses were not comprehensive. While most of the key players in the world telecommunications sector are tackling sustainability issues in one way or another, most have concentrated their SCM efforts on the environmental aspects of sustainability, rather than on social and ethical aspects. A number of interviewees indicated that there are clear drivers (legislative, 'business to business') for companies to address environmental issues. There are not as clear drivers for social and ethical issues.

(ii) Proactive companies

The extent to which companies have placed sustainability issues on the agenda varies, but in general most of the recognised names in the sector e.g. Nortel, Marconi, Ericsson, Nokia, Lucent Technologies and Siemens, as well as the telecommunications operators e.g. BT, Deutche Telecom or Swedish Telecom (Telia), have implemented environmental management initiatives. Many companies have already put into place EMS, and are addressing environmental issues in their supplier relationships.

These companies have also started programmes that aim to reduce the total environmental impact of their companies and supply chains. For example, Nortel launched in 1992 a Product Life Cycle Management programme, with the aim of reducing inefficiencies and waste in the design, delivery and use of its products. Ericsson has been often pointed out as one of the leading companies in the sector addressing environmental issues. Its environmental goals for 1999 are as follows:

- Environmental Management Systems - to implement more systems at more sites.
- Life Cycle Assessment (LCA) - to develop a common database system for Life Cycle Assessment (LCA)
- Design for Environment (DfE) - to create routines for environmentally adapted design.
- Material database and analysis - to implement computer support systems for material declarations.
- Global Product Take-Back - to establish recovery and scrapping methods.

When considering social and ethical issues in the telecommunications sector, most companies recognise them but in general have not yet established concrete measures to address them in their business operations or supply chains. Companies such as Cable & Wireless, Lucent Technologies and BT all admit that they are recognising increasing interest in these aspects of sustainable performance, but do not place them high on their lists of priorities.. An example of growing customer interest was given by Cable & Wireless, which had received enquiries for details regarding the social and ethical performance of a supplier in Mexico. Some companies also admitted that implementation of ISO 14001 unearthed issues which had not been considered previously e.g. the social and ethical implications of components being produced in China, which is considered to be an "oppressive regime".

Social and ethical issues have been recognised in telecommunications companies as clearly linked to corporate reputation and image and are increasingly being considered in measuring risk. However, it was emphasised by telecommunications companies that while there are clear drivers for raising environmental standards, drivers for social and ethical issues are clearly lacking.

(iii) Tools and Strategies for SSCM

Many leading telecommunications companies have recognised the key role that their suppliers and customers play in their overall environmental performance. Therefore, a number of telecommunications companies have begun to adopt tools and strategies to manage the environmental aspects of their supply chains. These tools and strategies include.

a. Partnerships with suppliers

Many companies in the sector stress the importance of partnership development with suppliers, rather than one-way communication that forces changes up the supply chain. Nortel, for instance, developed an innovative way of working with its suppliers as a part of its Product Life Cycle Management Programme. In 1995 Nortel, recognised supplier partnerships as a key issue and applied the "shared savings" or "double dividend" model in a plant in Monktown, Northern Ireland. This led to a 46% reduction in water consumption. The model structures the relationship between the supplier and the customer to give financial incentives to reduce resource consumption and waste, rather than only to increase returns by maximising sales to the customer.

Some companies, such as Cable & Wireless, have organised workshops for their suppliers. This not only helps build relationships between Cable & Wireless and its suppliers, but also allows suppliers to meet each other, which has a beneficial team building effect.

Several interviewees in the sector stressed, however, that on average they deal with so many suppliers that the development of partnerships is virtually impossible. The trend seen in other sectors of rationalising 1st tier suppliers to a small number of ‘key suppliers’ has been recognised in a few of the leading telecommunications companies. However, some have indicated that the need to reduce the number of suppliers might be in conflict with other business requirements, such as the flexibility to pick and choose between a wide number of suppliers to develop the best design options.

c. Supplier Assessment/Evaluation Programmes

Many leading companies in the sector have developed programmes to evaluate environmental aspects of their suppliers. Among those are Ericsson, Nokia, Lucent Technologies, and BT.

For example, Ericsson has developed "Supplier Environmental Requirements." These are environmental requirements that are included in standard contracts and treated in the same way as quality, production capacity requirements, i.e. they are integrated into the overall evaluation of the supplier. A self-assessment questionnaire is sent to suppliers, and Ericsson evaluates their performance.

BOX 10: ERICSSON'S MAIN ENVIRONMENTAL REQUIREMENTS FOR SUPPLIERS

- Implement an EMS that considers environmental impacts when selecting materials or new design solutions, and also avoids specified substances.
- Be able to provide an environmental declaration (including material contents and life cycle inventory data) concerning products supplied.
- Have a plan for, and be prepared to 'take back' all products or product parts that contain hazardous substances.
- Not use substances on the Ericsson list of banned substances, and to avoid use of substances on Ericssons' list of restricted substances.

Source: Ericsson home pages <http://www.ericsson.com/environment/n> (cited 22.08.2000)

Nokia makes sure that supplier compliance with environmental standards is an integral part of Nokia's SCM through the implementation of its Supplier Assessment Procedure. In this procedure, suppliers are monitored by Nokia's supplier quality engineers and sourcing personnel. Nokia's supplier criteria are the same in all parts of the world. Nokia's environmental requirements are integrated into the overall quality assessment process, and suppliers' environmental performance is monitored by quality audits. More specific Nokia environmental requirements are presented in Box 11.

BOX 11: NOKIA'S MAIN REQUIREMENTS FOR SUPPLIERS

- ∑ Have an up-to-date environmental policy.
- ∑ Develop an EMS documented according to ISO 14001 or other nationally or internationally recognised standard.
- ∑ Conform to legislative requirements and applicable industry codes of practice for environmental protection.
- ∑ Have programmes for waste management and air, water and soil emissions and eliminate or have a detailed plan to eliminate the use of ozone depleting substances.
- ∑ Have a register for recording all incidents affecting environment.
- ∑ Have a system for reporting all incidents to appropriate local and governmental authorities.
- ∑ In case of non-conformities, suppliers are required to submit detailed corrective action plans and reports for all failed elements. Subsequently, Nokia makes a full or partial check of effectiveness of the corrective actions made by suppliers.

Source: Nokia home pages <http.//www.nokia.com/environment> (cited 22.08.2000)

BT uses a tool called GS13 which is mandatory for all suppliers. In GS13, a survey of environmental performance of the supplier is combined with other aspects of business performance. Environmental questions seek to determine whether the supplier has implemented an EMS, whether it has an environmental policy, targets, and most importantly whether there is an understanding of what is being done.

One aspect which BT considers important is whether there is commitment to continual improvement in a supplier's environmental work. Other questions refer to the content of hazardous materials, DfE, environmental training, audits and prosecutions. Answers from GS13 lead to further categorisation of suppliers into high, medium and low risk categories with the information included as a part of the tendering process. Currently, G13 evaluation is still a form-based technique, but it is expected that in the near future an electronically-based tendering process will be introduced. BT has also developed metrics and targets, which are reviewed periodically, and which set the level of performance that suppliers need to comply with.

At Cable and Wireless (C&W), an evaluation of environmental performance is also integrated to the overall assessment of suppliers. C&W uses a short questionnaire, which allows for an initial assessment of suppliers against C&W requirements. This generic questionnaire contains only a few environmental questions. (e.g. do you have an environmental policy). The questions are included at the pre-selection stage in the tender process. In the next stage of the tender process, a supply-chain decision-matrix is developed and analysed and requirements are translated into quantitative measures. However, environmental issues are not being considered at this stage at the moment.

At Lucent Technologies (Lucent) suppliers are required to have environmental issues included into their management system. On a product level, the environmental performance of suppliers is measured, with an emphasis on continual improvement. Currently, one of the key issues for Lucent has been "to get a grip on hazardous substances," therefore lists of banned and avoided substances have been developed as guidance for suppliers.

Lucent has also developed a specific tool for measuring environmental performance of PCB suppliers. The tool was developed in co-operation with 4 key PCB suppliers, which has now been expanded to about 25 PCB suppliers. It is designed to measure all inbound and outbound flows of environmental impacts, and measure them in relation to a kg of product. The detailed calculations are currently carried out by hand, but the tool is likely be developed into electronic format. The mathematical calculations are used to qualify suppliers into 5 categories of environmental performance. Lucent has also developed a set of metrics for the tool described above, which are dynamic and were developed through a benchmarking exercise. In short, based on this input information (inbound and outbound flows) different vendors are being compared and "the best in class" are selected.

d. Training of sales and purchasing staff

A number of companies have recognised that training of sales and purchasing staff is of key importance when introducing environmental aspects into their supply chains, as they are the interface between the organisation and their suppliers and customers. Such programmes, for example, have been developed in Lucent and BT.

e. Co-operation with other companies to develop sustainable supply chain methods

A number of companies in the sector indicated that incorporating sustainability issues into the supply chain is a partnership and/or dialogue opportunity for telecommunications companies rather than competitive issue. Co-operation between otherwise competing companies on supply chain issues has been recognised as important, as it enhances the power of telecommunications companies in the SCM . Despite the significant size of the sector, the throughputs of an individual company are far lower than those, for example in the automotive sector. Thus collective pressure has been recognised as a prerequisite for bringing about significant changes. The following are a few examples of co-operative initiatives:

- Co-operation between Lucent, Motorola, and Nokia in the supply chain working group of the European Information and Communication Association (EICTA). The association has been established specifically to enhance a co-operation between various partners and to develop common solutions.
- On-going co-operation between German, French, British and Swedish telecommunication operators to develop solutions for sustainability in the SCM
- Co-operation within project ACORN, in which a number of large companies, representing various sectors, are mentoring Small and Medium Enterprises (SMEs) and providing assistance to them in implementation of EMS. Through this project Cable & Wireless has managed to identify and encourage a number of suppliers to undertake a fast track process of EMS implementation. Project Acorn is managed by BSI and funded by the Department of Trade and Industry (DTI).

(iv) Obstacles to implement SSCM

A number of obstacles are summarised in the list below:

- lack of awareness of sustainability issues;
- compartmentalisation of tasks between various departments and difficulty into breaking down traditional boundaries; difficulty in achieving ‘buy in’ into the process at both the management level and the purchasing level (the real interface with suppliers);
- difficulties in changing corporate culture (especially true in international companies, which are often inherited from the company’s country of origin and biased towards "one way of doing things");
- strong business focus in SCM and a lack of drivers to convince senior management of importance of sustainability issues, especially those of a social and ethical nature;
- lack of experts and centres of expertise which have a good grasp of real the issues in SCM (hands on, company experience) and that good understanding of the business realities of sustainability issues.

Consumer electronics

(i) Sustainability issues

Similarly to telecommunications companies, consumer electronics companies have long, complex and globally distributed supply chains, which give rise to a number of significant sustainability issues. On the environmental side, consumer electronics are made up of a wide range of substances, many of which are known to be toxic or hazardous. Some have never been tested, such as the rare earth elements used in some components and in the phosphorescent coatings on TV screens and computer monitors, and their potential toxicity remains unknown despite their wide distribution in society.

Furthermore, production processes for many components, particularly printed circuit boards (PCBs), are extremely chemical intensive and result in significant amounts of hazardous waste. Besides toxicity issues, consumer electronics also accounts for significant energy consumption during use, which, from a life cycle perspective, leads to ICT's greatest environmental impact. Finally, waste consumer electronics products are a growing problem in many countries. Due to their content of heavy metals and persistent organic compounds, they pose an environment threat in normal municipal waste disposal methods.

On the social and ethical side, generally the electronics industry is viewed by many countries to be an economic asset. Its phenomenal growth rate over the last 50 years has made the development of electronics an attractive opportunity to some developing countries. Consequently, the electronics industry has grown to account for a significant percentage of GDP in a number of developing countries, such as in Southeast Asia where, for instance, in the Phillipines it makes up over 50% of GDP (Salazar, 1998).

In general, it is one of the main industries to have taken advantage of wage differentials and improved communication and transportation technologies in developing and transition countries, particularly in Asia, Latin America and Central and Eastern Europe. However, this move has given rise to concerns over worker health and safety, labour rights and investments in "oppressive regimes." Labour issues in the "maquiladora" export zones of the US - Mexico border illustrate this. 75% of workers in these zones live below the poverty line, there is exploitation of female workers, women found to be pregnant are often sacked, and exposure to high levels of hazardous substances is common (Atkinson, 1998/9). A number of the leading names in consumer electronics have suppliers or production and assembly plants in these zones.

Despite these issues, many consumer electronics firms, like the telecommunications companies, see themselves as part of the solution for sustainable development, particularly in the computer market.

Beyond this, consumer electronics firms have so far mostly concentrated their sustainable SSCM efforts on environmental issues, particularly conserving resources, conserving energy, packaging, recycling and hazardous substances. Social and ethical issues remain largely untouched beyond signing up to corporate and international 'codes of conduct'.

(ii) Proactive companies

There is a considerable overlap between the proactive leaders in consumer electronics and those in the telecommunications sector, since many companies in the telecommunications sector also produce and/or sell consumer electronics. Siemens, Ericsson, Nokia and Motorola are key players in the consumer electronics industry (as well as producing components and other electronics products). Beyond these, other companies in the sector are active in environmental SCM include Philips, Texas Instruments, Fujitsu, Eastman Kodak and Hewlett-Packard.

(iii) Tools and Strategies for SSCM

Rather than repeat the tools and strategies already discussed under telecommunications, this section will explore a few examples of how consumer electronics companies are managing sustainability issues in their supply chains

a. Supplier partnerships

Philips has developed partnerships with it key suppliers to work together on DfE or eco-design solutions. Philips defines its key suppliers as those suppliers that play a crucial role in its supply chain by either supplying a key technology or in some way significantly influencing Philips's environmental performance. Philips works with these suppliers through a series of procedures, including brainstorming sessions, meetings, seminars and workshops. It has also produced guidelines and manuals for suppliers. Further details of Philips's environmental SCM strategy is shown in Box 12. Even among small companies, it is possible to develop supplier partnerships. For example, CHK in the UK has worked closely with its printed circuit board (PCB) supplier to develop a leadfree PCB (See www.cfsd.org.uk/etmuel, for case studies.)

BOX 12: ENVIRONMENTAL SCM AT PHILIPS

Philips has been working for the last five or six years to integrate environmental issues into their value chain, both internally and externally through their supply chain. To do this, Philips breaks these issues into three main areas: defensive (regulatory compliance), performance and eco-design issues. It then applies specific strategies and tools to manage these issues in the supply chain.

To ensure that all Philips suppliers comply with all relevant standards, legislation and regulations, Philips uses supplier questionnaires. It also requires suppliers to provide certificates of compliance of specific issues, such as on the use of certain hazardous substances.

To ensure that environmental criteria are met, Philips asks suppliers to provide certain life cycle data and to improve this, it is developing a "tool" that will allow suppliers to self-assess their own environmental life cycle performance. This will involve tracking seven environmental performance indicators. These will then be consolidated into a single number, which can be read out either as a financial number, an environmental performance number relative to best practice, or weighted to allow for the setting of priorities. The idea is that this tool will be a type of "cook book" with easy to follow instructions that will not need support from Philips.

Finally, Philips works with its key suppliers on eco-design issues. To do this, the company uses roadmaps of where it wishes to go in terms of environmental goals, and then works closely with these suppliers to attain these goals. This requires close and open supplier partnerships, with mutual trust.

Source: Ab Stevels, Philips Consumer Electronics

b. Helping and assisting suppliers

Texas Instruments (TI) has developed a method for helping its suppliers in South-East Asia to implement certified ISO14001. TI does this by providing subsidised loans to its suppliers, as well as hands on assistance through EMS specialists.

c. Screening and evaluation of suppliers

Philips uses a questionnaire to screen and evaluate potential suppliers. The questionnaire checks if potential suppliers are complying with all relevant standards, legislation and regulations. Philips also requires potential suppliers to provide certificates of compliance with specific issues, such as the avoidance of certain hazardous substances.

c. Working with industry peers

Hewlett-Packard (HP), as both a producer of consumer electronics and a supplier of components to other electronics companies, recognised the problem of suppliers responding to long and involved questionnaires. In response, HP worked through the Pacific Industry and Business Association (PIBA) and the Computer Industry and Quality Conference (CIQC) and industry peers to develop a common supplier questionnaire that addresses environmental practices at supplier companies. Based on the questionnaire, CIQC developed an environmental practice standard, which acts as a common tool for gathering supplier environmental practice information and for optimising the transfer of environmental performance information between suppliers and purchasers (Krut and Karasin, 1999)

d. Communication of expectations

Many companies have developed ways of communicating environmental expectations to their suppliers. For example, some publish their environmental policy and/or send it directly to their suppliers. Others include environmental issues and concerns in their supplier newsletters. Fujitsu includes information about its green procurement policy on its website and encourages potential suppliers to notify the company of "materials, parts, products, production equipment, and production methods that offer superior environmental protection" (Fujitsu, 2000). HP has developed a "Statement of Expectations for Suppliers," in which they set out their expectations from their suppliers regarding environmental issues. HP's statement is shown in Box 13

BOX 13: HEWLETT-PACKARDS STATEMENT OF EXPECTATIONS FOR SUPPLIERS

We want our product material suppliers to act as responsible corporate citizens and take a positive, proactive stance regarding environmental issues. We ask that they pursue a policy of continuous improvement in this area and be forthright about sharing relevant information with us. At a minimum, we ask that they do the following:

- ∑ Develop and adhere to an environmental improvement policy
- ∑ Create an environmental policy implementation plan with defined metrics
- ∑ Eliminate ozone-depleting substances from their manufacturing processes
- ∑ Complete the HP Supplier Environmental Performance Review Questionnaire (CIQC STD 0014)
- ∑ Ensure that all parts, components, materials, and products supplied to HP comply with HP's General Specification for Environment Dwg. No A-5951-1745-1

(iv) Obstacles

The obstacles to incorporating sustainability issues into SCM observed in consumer electronics companies were similar to those experienced in the telecommunications sector. These include organisational problems resulting from "departmental empires", lack of awareness and knowledge of sustainability issues, lack of top management support, difficulties in changing corporate culture and having to wait for "top-down" approval, lack of drivers (particularly for social and ethical issues), a lack of internal/external expertise and no centres of excellence that combine knowledge of SCM and sustainability issues.

4.4

Retailing

Overview

The retail sector is characterised by being the final link in the whole product supply chain that reaches the general consumer market. In other words, it is exposed to the scrutiny of the discerning consumer and the products delivered by the retail sector are heavily shaped by consumer demand. In the UK the retail industry is one of the country's top service sector industries with a £157 billion turnover, and employing about 2.2 million people (The Retail Industry, 2000). The supply chain is one of the main catalysts for improvements in quality and costs, and the best partnerships between manufacturers and retailers have led to close long-term trading relationships and encouraged innovation. For the purpose of this report, the retail sector has been divided into Food, Clothing, and DIY, though it should be noted that many companies work in all 3 of these areas.

The supply chain in the food industry is characterised by large buyers. The best examples of this can be seen in large supermarket chains, such as Wal-Mart, Tesco and Sainsbury. Many suppliers for the food retailers are small, especially suppliers of raw produce, such as vegetables and meat products. This influence has had positive benefits in ensuring greater environmental standards from suppliers, but has also forced many suppliers into a demand driven market, where average incomes for producers has dropped due to lower prices being determined by larger buyers.

Farmers are now blamed for over-production due to agricultural subsidies from the EC, and food retailers have benefited from this situation by getting lower prices for their produce. The clothing business is also typified by large buyers and brand image. Much of the supply of clothing products to western countries is contracted out to factories in countries with lower operating and labour standards in production to allow greater profit margin for the retailers. This practice has led to pressure groups, such as the Clean Clothes Campaign call for greater ethical management of clothing retailers' supply chains.

This has been typified by a Benetton case, where one of their sub contractors' factories in Istanbul found to be using child labour in (Spotlight on Benetton, 1999). The DIY, or home improvement stores also have global sources of suppliers for many of the materials that are sold to the consumer. Issues such as deforestation, air pollution and hazardous waste, as well as the working conditions for many of the overseas supplier factories have led to consumer calls for improvements in these areas. For DIY stores to continue to sell to their affluent consumer base, they have had to address at least some of these issues.

Food

(i) Sustainability issues

Food is an important issue for the consumer as it is related directly to personal health. Consumers have the most concerns about health and safety in food products and so food outlets have responded to the challenge by demanding standards from their suppliers. Rowland Hill from Marks and Spencer points out that product-based standards for food are a key issue in dealing with suppliers, especially where the supplier makes claims for how the product is produced or what the product does or does not contain. Public alarm over such issues as BSE and the intense debate over genetically modified organisms has led to demands upon suppliers for labelling of products and segregation of crops. Some of the issues include:

- Sourcing organically produced produce;
- Reducing pesticide use for crops;
- Labelling food as GM free.

There are also ethical and social issues in food supply chains. Many of the larger supermarket chains and other food retailers are involved with ethical trading initiatives to ensure suppliers meet international and local labour and employee safety standards. Another key initiative is the Fair Trade scheme. Fair Trade is about giving poorer people power, by paying producers a fair price for their work, and by strengthening their hand in trading relationships. Fair Trade offers Third World producers support, training, fair prices and decent working conditions. (Fair Trade, 2000) Sainsbury now stocks over 20 different Fair Trade products.

(ii) Proactive companies

Sainsbury has a number of initiatives with their suppliers. They source a large range of organic produce from their supplier base and have required all of their own-brand products to be GM free. As well over 50% of their product range (around 23,000 products) are Sainsbury own brand products, this has required a massive investment in ensuring their suppliers have GM free produce.

Sainsbury have also developed an ethical code of conduct in conjunction with the Ethical Trading Initiative (ETI), which is an private alliance of companies, NGO's and Trade Unions that provides advice on ethical SCM . The ethical code of conduct includes a statement on child labour practice, general health and safety for employees, fair trading principles, as well as labour rights and privilege expectations.

Max Havelaar, a Dutch fair trade group, are also finding significant market share in Northern Europe by ensuring that they source both bananas and coffee from certified fair trade suppliers.

Unilever, although not a direct retailer, owns many retail brand products. Unilever have helped develop third-party certification of fish stock supply by helping to set up the Marine Stewardship Council (MSC), which provides certification of fisheries against sustainable fishing practices. They have a commitment to source all consumer fish products that originate from sustainable sources by 2005.

Marks and Spencer, Iceland, Tesco and Safeway now all source a range of organic produce. Safeway, Tesco and Marks and Spencer are also all members of the ETI.

(iii) SSCM Tools

a. Supplier Partnerships

Both Tesco and Sainsbury use a web-accessed extranet to link suppliers directly into their businesses. This allows suppliers to use the internet to gain access to their customer needs and so develop an efficient consumer response. This technology is useful for pushing environmental efficiency, by allowing suppliers to view their customer needs as those needs appear and helping lower transport, distribution and storage costs. Sainsbury have around 2500 suppliers, but where possible they work on a one-to-one basis with their suppliers on environmental issues. This relationship is managed through Product Managers, who are the main interface with suppliers for Sainsbury.

b. Supplier Questionnaires - Environmental

Sainsbury have developed a supplier questionnaire for environmental issues with the Business in the Environment programme (BiE). Sainsbury include environmental questions in all new tenders that are sent our through procurement. Although only a small part of the tender vetting includes environmental questions, they are still used within the decision-making process.

c. Supplier commitment – Ethical

All new suppliers for Sainsbury are contacted in order to inform them of Sainbury's ethical code of practice and then asked for their commitment to these principles within the code.

d. Social/Ethical Auditing

Both Sainsbury and Marks and Spencer are members of the Ethical Trading Initiative. Other retail members include ASDA, Tesco and Safeway to name a few. The ETI is an alliance of private companies, NGO's and trade union organisations. It promotes good codes of practice in implementing labour standards and rights, as well as providing a system of monitoring and independent verification of these practices. It provides guidance on ethical SCM .

It's aim is to ensure that the working conditions for employees of companies that supply products and services into the UK are at least as good as international standards based upon the International Labour Organisation Guidelines. Members are required to carry out some audits of 'high risk' suppliers. Marks and Spencer are undertaking some of these audits in conjunction with NGO's in order to maintain some transparency in the process. The company has also trained its own suppliers to carry out their own audits.

Sainsbury have sent 1117 own brand suppliers a copy of the code of practice, an accompanying letter from the Group Chief Executive and a reply slip to confirm commitment to the principles of socially responsible trading.

To date, 773 (70%) suppliers have replied, and it is targeted for all those outstanding to have done so by the end of the financial year (Sainsbury, 2000). Product Managers are trained in the use of the ethical code when dealing with suppliers and highlight potential issues to the commercial arm of Sainsbury. Suppliers have been categorised as high, medium or low risk according to compliance to the social code of conduct. Ninety-seven high risk suppliers and 75 medium risk suppliers were visited during 1999. In addition 11 independent 3rd party inspections, using the SGS certifying agency have been carried out in order to make initial assessments of their capacity to monitor against the Sainsbury Code of Practice (Sainsbury, 2000).

e. Supplier Meetings

Marks and Spencer will not initiate a supply contract without first meeting their potential suppliers and visiting their sites " ..we will never buy from anywhere we haven't been to" (Rowland Hill, personal communication, 2000). They are also currently in discussions with some food suppliers through the ACORN project to get a better understanding of what they should expect from their suppliers. Sainsbury are also committed to supplier meetings through their product managers, who monitor both ethical compliance and environmental issues with their supply base.

(iv) Gaps in SSCM

There appears to be a lack of integration between environmental concerns and ethical issues in the retail food sector. As retailing is near the end of the supply chain, sourcing of materials can often be from global sources, so ethical and social auditing of suppliers is common. However, there does not seem to be a common methodology for integration of ethical concerns and environmental concerns into common tools, such as auditing.

Clothing

(I) Sustainability issues

Clothing has more than just environmental issues associated with it in relation to the supply chain. For clothing and textile producers, there is pressure to ensure that suppliers of these products to the larger retailers have workplace and labour rights that are at least as stringent as the legal local standards. Many of the suppliers of clothing for the larger brand names such as Benetton and Levi Strauss sub-contract the clothing production to other countries were operating costs are substantially lower. Unfortunately lower operating costs have often gone hand-in-hand with lower labour standards, which has forced many of the clothing companies to develop tighter controls on the activities of their supply chains.

There is a growing market for using more environmentally friendly material alternatives in clothing design. Patagonia have exploited this option by designing outdoor fleece jackets that use recycled plastics as the main material in the make-up of the jacket.

There are also a number of companies that now produce organically produced cotton products as a clothing material. Much of this material has been produced in response to the use of synthetic pesticides, fertilisers and defoliants that are used to increase crop yields for cotton. Unfortunately, much of this material can cause depletion in of soil, water and air quality.

Another key issue is the development of on-line clothing retailing. Organic cotton retailers have taken advantage of this new form of consumer retailing in order to get their products to the consumer.

(ii) Proactive companies

Nike has recently developed their transparency 101 scheme. This scheme has been set up to monitor its suppliers' compliance to Nike's code of conduct, leadership and labour standards. Nike has also been involved in environmental training of their supply base in order to improve the environmental standards of its suppliers.

Marks and Spencer have developed Global Sourcing Principles, which they apply as a minimum acceptable standard for all suppliers that reflects internal social policy. Workforce rights, local environmental minimum standards and assessment policy are all specified as part of this policy.

Sainsbury have developed a code of practice for socially responsible trading. This code applies to both food products as seen in section 1.1.2, as well as clothing and non-foods.

C&A clothing retailers have also developed a code of conduct on human rights and fair trade. All of its suppliers are asked to comply with this code of conduct through a written agreement, at the time of tendering contracts. Auditing of supplier practice is also carried out to ensure compliance.

Patagonia is actively involved with its suppliers in developing less environmentally damaging water-proofing chemicals for its range of outdoor fleeces, as well as sourcing recycled materials for its clothing range.

(iii) SSCM Tools

a. Environmental Training

Nike has engaged in environmental training of its own sub-contractors around the world through its Nike Environmental Action Team (NEAT). They held environmental forums in five Asian countries for its sub-contractor footwear companies. The aim of these forums was to communicate the environmental expectations of Nike to its suppliers in areas such as pollution prevention and chemical waste management (Lippman, 1999).

b. Supplier Partnerships/Knowledge Transfer

Patagonia has developed a unique relationship with one of its suppliers, Amberbelle Corp. Amberbelle Corp produces the waterproofing for the Patagonia fabrics. Although Patagonia is one of their smaller customers, they have invested time in co-operation with Patagonia in order to develop a water-based water-proofing coating that can replace solvent based water-proofing. One of the drivers for this was for Amberbelle Corp to develop a technology that could then be used to market to other larger customers (Goodman, 1998).

c. Social Auditing and Compliance Monitoring

Nike contract factories are monitored to identify areas of non-compliance and develop ways to improve conditions. They specify that there is a great deal of variance in how working conditions are evaluated, and look forward to the development of a set of international standards for the social auditing of labour practices. Nike uses an internal monitoring tool called SHAPE (Safety, Health, Attitude of Management, People, Environment) to monitor compliance in their contract companies factories. Nike has a Code of Conduct on labour practices and requires that this code is posted in workspaces (translated in the original language of the worker). It also has specific requirements that it demands of its partners under the following headings:

- Forced Labour.
- Child labour.
- Compensation.
- Benefits.
- Hours of Work/Overtime.
- Management of Environment, Safety and Health (MESH): The manufacturer has written health and safety guidelines, including those applying to employee residential facilities, where applicable; has a factory safety committee; complies with Nike's environmental, safety and health standards; limits organic vapour concentrations at or below the Permissible Exposure Limits mandated by the U.S. Occupational Safety and Health Administration (OSHA); provides Personal Protective Equipment (PPE) free of charge, and mandates its use; and complies with all applicable local environmental, safety and health regulations.
- Documentation and Inspection: The manufacturer maintains on file all documentation needed to demonstrate compliance with this Code of Conduct; agrees to make these documents available for Nike or its designated auditor to inspect upon request; and agrees to submit to labour practices audits or inspections with or without prior notice. Nike has launched training and education programmes in factories to ensure the Code of Conduct is understood and applied. This training has included all levels of the factory, from production line workers to first-year supervisors, to section and plant managers, and all Nike production employees. PricewaterhouseCoopers (PwC) has been brought in as an independent company that monitors global labour practices in Nike's contract factories. PwC teams are asked to look at labour practice performance at every factory making Nike products around the world, at least once each year in accordance with the Nike code of conduct.

C&A also monitor the compliance of its suppliers to its ethical code of conduct. It has developed an internal organisation – SOCAM (Service Organisation Compliance Audit Management) to visit supplier sites in order to monitor supplier compliance to the C&A code of conduct.

d. Contractual binding

C&A require their suppliers to contract into their Code of Conduct for Supply of Merchandise before they will do business with a supplier. The contract is in the form of a written agreement.

(iv) Gaps in SSCM

The gaps in some of the SCM tools are similar to those found in the food sector. Although there are both social and environmental measurements and SCM tools, there does not appear to be a corporate strategy that integrates these 2 issues together into one management plan. Marks and Spencer include environmental and social issues together within their global sourcing policy, but the environmental standards do not cover product standards, such as dying and finishing, but rather simple adherence to minimum local Heath, Safety and Environment standards.

'Do-It-Yourself' (DIY)

(i) Sustainability issues

The home improvement market deals heavily in procuring materials for building and home construction. The environmental impacts of obtaining these materials can be great. One of the largest issues for the home improvement sector has been the effect of timber sourcing, due to the effects deforestation. This is one of B&Q's key concerns - about 22% of B&Q's turnover comes from timber based products.

Other environmental issues include:

∑ Destruction of peat bogs by the removal of peat products for compost and grow bags.

∑ Air pollution and hazardous waste from paint and wood preservers.

As well as environmental issues there are social issues around the sourcing of DIY products. B&Q buys products from over 40 countries from around the world. The working conditions of employees making products for DIY stores are important issues. B&Q has embarked on a number of projects in Papua New Guinea, India and the Philippines that have addressed the social and economic well-being of supplier communities.

(ii) Proactive companies

B&Q has developed a very integrated approach to SSCM . In 1993 they developed a Supplier Environmental Assessment (SEA) of their supply base. In 1995 SEA was replaced with QUEST (QUality, Ethics and SafeTy). B& Q have used QUEST to assess their own stores, as well as applying it to measure the performance of their suppliers. B&Q is assessing the quality and environmental performance of its supply base against 5 principles in QUEST:

∑ Environmental Policy and Awareness.

∑ Environmental Action and Achievements.

∑ Working conditions in developing countries.

∑ Packaging and Environmental Claims.

∑ Timber.

Both Home Depot in the US and Homebase in the UK have commitments to ensure that a percentage of their timber products from their supply base is certified in accordance with FSC standards.

(iii) SSCM Tools

a. Integrated Supplier Assessment Interview and Auditing

B&Q is using their QUEST specification as a means to audit the practices of its suppliers. The QUEST programme has merged the Quality and Environment departments, which has helped manage the overlap between the responsibilities of these 2 departments. New suppliers are issued with a pre-assessment pack outlining B&Q's requirements and are then interviewed and assessed against these qualifications.

The existing suppliers are also assessed by interview, rather than a questionnaire. For existing suppliers, the method of assessment is targeted at each buying group in the business, for example paint, timber, hand tools. B&Q hopes that by targeting each product group, key issues for that product group can be addressed. B&Q, however, does not believe in demanding third-party certification for its suppliers as they believe this can undermine trust between the company and the supplier (B&Q, 1998).

b. Environmental certification of Supplier products and Labelling

One of the key concerns of B&Q and the Home Depot has been the environmental impact of sourcing timber products due the problems of deforestation. The Forest Stewardship Council (FSC) was set up as an independent non-governmental organisation. It was formed as a means to provide consumers with a way of identifying timber products that are sourced from well managed forests (Grayson and Maynard, 1997). It is an umbrella organisation that provides a structure, where independent qualified certifiers operate to clear guidelines using standards covering issues from social, environmental and economic aspects of forest management. The FSC provide a logo trademark as a consumer label that can be used to determine certified timber products. B&Q has a commitment to source all timber from FSC certified sources.

c. Supplier Development

B&Q is also actively involved with improving the quality of suppliers' economic and social community conditions. In the Philippines, India and Papua New Guinea, B&Q has worked with its supplier populations in order to improve working conditions and local environmental conditions where necessary (B&Q, 1999).

(iv) Gaps in SSCM

B&Q is one of the best examples of integrating both social issues and environmental issues together for a more sustainable management of the supply chain. Although B&Q is an excellent example of an integrated sustainable supply chain strategy, this is not typical of the DIY and home improvement market, where social and environmental issues are not generally well integrated.

4.5

Leisure and Tourism

Overview

Tourism and the Leisure industry is probably best described as a concept rather than an industry, even though it is recognised as the largest industry in the world (WTO, 1999). The tourism industry has a large number of inputs that come from the transport sector, accommodation, catering and public information, as well as numerous smaller private services. As well as these industries there are also the providers of booking services and the operators of package holidays. The tourism industry also includes natural products and services such as flora and fauna, host cultures, sun and sea.

As Tour Operators are service providers, it is fair to say that Tour Operators are the sum of their suppliers. A Tour operation requires host destination, accommodation, food services and transportation suppliers in order to make up its operation. There are 2 common supply problems for any tour operator. Firstly, ensuring that the economic benefits of the tour operation filter through to the host destination. The second is an environmental issue – it is to ensure that their supply base does not have an adverse effect upon the local ecosystems. The huge demand for tourism has meant that tour operators call upon a large supply pool from which potential tourists can chose their holiday. Unfortunately this can often lead to over-development and adverse environmental impact with the natural resources of the tourist destination.

Hotels are another service provider with a strong link to tourism and holiday industry. The vast majority of hotels are small to medium sized enterprises, though both environmental and social best practice is more likely to come from the large global hotel chains such as Hilton, Accor, and Forte. There is growing pressure on the hospitality industry to implement environmentally sound management practices. Siting, design and development are attracting increasing attention and concern from a range of stakeholders from the private and public sectors. ISO 14000 affects hotels most obviously in their role as suppliers to corporate accounts, as they will increasingly be asked to provide evidence of sound environmental programmes before securing business from corporations signed up to ISO 14000 (IHRA Industry Affairs, 2000).

Hotels also have an increasing part to play in local economic development, especially if located in less developed countries that have high tourist turnovers. Hotels have an important social responsibility to return some of the fiscal benefits that receive from host destinations back to the local communities, through developing local supply ranges and labour forces.

Tour operations

(i) Sustainability Issues

The economic structure of 'host destinations' in the tourism industry often becomes dependent upon tourism and tourists as the main source or sole source of revenue generation (Archer & Cooper, 1994). This gives the industry a power differential over other industries or possible public interest in the development of that destination. Suppliers can often become dependent upon Tour Operators in order to make their livings.

The popularity of the 'all-inclusive' or 'package' holiday has led to potential problems with the social aspects of sustainability. Although tourism generates huge revenues, much of this money is channelled back into the tourist community rather than the host destination, due to Tour Operators ownership of hotels. Package holidays have the potential to keep tourist spending within the confines of the Tour Operators package deal. Sourcing local hotel options for tourists is one way to ensure that there is a better movement of revenue into local host communities. Sourcing local food and labour forces into Tour Operator owned hotels is another option that generates better revenue for the local host economies.

The large demand in the UK for package holidays has led to huge competition and price wars between tour operators (Mintel, 1998), with a huge increase in the turnover of tourist numbers, but little increase in profit. It would be fair to say that tour operation is demand driven, which does not bode well for tourism destinations and suppliers that rely upon tourist patronisation. Tour Operators hold much responsibility for tourism development, but may be likely to invest in destinations only when it favours market demand.

One of the driving forces behind direct booking of tour operations is the increase in technology used by both the industry and the consumer. At the forefront of the technology drive is the Internet. According to DCMS (1999), 29% of UK adults now use the Internet and 27% of the US population engage in online shopping. There are several direct flights and holiday booking services, based on the Internet, available to UK based customers.

Microsoft now offer Expedia, a free internet site that can search all flights to any destination from the UK and book these immediately. It also has the ability to search and book hotels and accommodation in most destinations from the same site. This service has been available to US customers for some time now and is reported to be the fifth largest travel agency in the world. Another similar website example is Travelocity, run by the technology giant Sabre, who provide a central reservations network for over 40,000 travel agents in over 100 countries (Travelocity, 2000). Co-op Travelcare, run by the Co-operative Bank has also followed this trend. The internet can be a force for good in sourcing sustainable tour operations, as it opens direct communication between tourists and the suppliers of the tourist experience in host destinations.

(ii) Proactive Companies and Organisations

BA Holidays have gone further than most of the larger UK outbound tour operators by offering consumers the choice hotel accommodation that has been designated 'eco-friendly' in several of their worldwide destinations. They also have a policy commitment to working to develop awareness among staff, suppliers and customers in assisting conservation practices for the host destinations, particularly with ecology sensitive destinations, such as islands with coral reefs.

Community Aid Abroad Tours is a not-for-profit travel agency run by Australia's own aid and development organisation, Community Aid Abroad. Community Aid Abroad has been involved with local community work for more than 40 years. Community Aid Abroad Tours supports responsible and sustainable tourism and it claims to:

- put people, their culture and environment first;
- show people the inspiring community work supported by Community Aid Abroad and others;
- introduce people to host communities and their worlds, at their invitation;
- bring small groups of like-minded people together to have fun, relax and learn;
- provide comprehensive pre-tour briefing materials to make people's tours safe, healthy, informed and rewarding ;
- show people what's really going on;
- share the economic benefits of travel, paying fair prices for modest accommodation, local guides, restaurants, entertainment and transport; and working, where possible, with local tourism initiatives;
- support people with bi-lingual, bi-cultural guides, familiar with both local and Western cultures.

Source: Community Aid Abroad 2000

Tourism Concern is an NGO that has campaigned for several years regarding the issue of all-inclusive holidays to less developed countries. They promote best practice in fair tourism practices and provides links to many locally supplied Tour Operations.

(iii) SSCM Tools

a. Tour Operators Initiative/Policy Objectives

The Tour Operators initiative is a membership of Tour Operators in Europe and abroad that attempts to encourage best practice in sustainable tourism. Some of the goals of the project are to provide the implementation of management systems and training for local partners involved in sustainable tourism operations, as well as building partnerships with local authorities and other stakeholders. Other actions related to better management of the supply chain include involving local host destination communities in the planning and operation of tourism developments, as well as creating a greater awareness to the benefits of sustainable tourism.

b. Accreditation Schemes

The Centre for Environmentally Friendly Tourism (CERT) was established in 1994 as an independent organisation, to demonstrate how responsible tourism can protect the environment, wildlife and cultural aspects of holiday destinations. CERT involves the traveller, the travel industry and conservationists in the achievement of its aims. Tour Operator members of CERT are recommended to use locally owned services – hotels, lodges and transport companies – to ensure that as much revenue as possible stays within, and therefore benefits local communities. Travellers are encouraged to purchase local goods and to be selective when purchasing souvenirs. CERT offers an accreditation scheme for Tour Operators that seek to ensure responsible tourism through the supply of their service to the tourist.

c. Host Destination Education

The Kathmandu Environmental Education Project (KEEP) aims to help minimise the negative influences of tourism by advocating and promoting "minimum impact" trekking, and by offering presentations and lectures to travellers and trekking industry professionals. KEEP encourages visitors to contribute to organisations working for the long-term welfare of Nepal, rather than handing out rupees, sweets and pens to begging children. KEEP is committed to training local travel professionals to do their jobs more effectively. KEEP offers courses in mountain safety and first aid, English language, mountaineering and rock climbing, and safety-oriented eco-trekking workshops. These training activities have proved valuable for trekking staff, national park rangers, and others working in the tourist service industry. Other KEEP programmes involve workshops in leadership training, lodge management, sanitation and eco-tourism.

Source: KEEP's mission (2000) http://www.keepnepal.org/mission.htm

d. Supplier Partnerships

Organisations such as Community Aid Abroad (CAA) work with their suppliers to ensure that the suppliers of the tour experience reap the economic benefits of the tourism experience with the least possible impact upon the local culture and the environment. This relationship is one way which tries to minimise the extreme power differential that tour operators have over the operations of their suppliers.

(iv) Gaps in SSCM

There are many examples of best practice in managing sustainable supply chain issues by Tour Operators. Unfortunately there does not appear to be any integrated management tools that look into both the social/economic development and the environmental protection of tourism suppliers sites.

Most of the tools for SCM come from smaller and 'niche' Tour Operators, and those tools that exist from the larger Tour Operators usually only involve aspects of environmental management, rather than the social and economic welfare of host destinations. Large Tour Operators' profit margins are small, due to the heavy competition in the market and they are still quite reliant upon volume sales to be profitable. Investment in supplier welfare is only likely to be common with large tour operations when they are assured their own financial security. Tour operations supply what their customers want, which in most cases is security and convenience for a comfortable and carefree tourism experience at minimal cost. Identifying and tackling supplier sustainability requires investment that most tour operators are not willing to give.

The tourism industry is very fragmented, made up mainly of smaller companies and organisations that have little interest in sustainability issues. Bringing these parties together under some form of industry association to implement best practice has not been very successful and so the industry response to sustainability has been slow.

The negative impacts of tourism are usually seen at host destinations that many tourism operations serve. It is therefore difficult to attribute blame to any specific operation for causing tourism problems. This lack of attributable blame provides little enforcement for tour operators in how they manage their suppliers.

Hotels

(i) Sustainability Issues

Hotels account for a great deal of waste flow. Minimising waste output and increasing the efficiency of materials is a key issue for hotels in reducing costs and prolonging the durability of its products. Hotels are likely to pass the costs of achieving these goals on to their suppliers.

For many of the global hotel chains that work with tour operations, employment practices are an important part of managing sustainability. Procuring and training local labour sources in host tourist countries to work within the hotel chains are an issue that hotel operations should look into. Supplying local foodstuffs and services into tourist hotel chains are important for local economy development and social involvement in the tourist experience.

(ii) Proactive Companies

Marriott International has an active policy that looks into the issue of worker diversity for their suppliers. They want to encourage suppliers to explore employee diversity in their staff range, as well as work to ensure economic benefits in the local communities where Marriott hotels are based.

Skandic hotels have developed a hotel room that is 97% recyclable, with a minimum of metal and chrome used in the room. Approximately 2,000 rooms are being refitted each year. This management decision has forced suppliers to adapt their own products to meet Skandic's design requirements.

Accor Hotels has an active environmental agenda. They own many different hotel chains, one of which is the Coralia group, which is involved in local labour sourcing issues.

(iii) SSCM Tools

a. Supplier Purchasing Guidelines

The International Hotels Environmental Initiative (IHEI) launched a programme in 1998 to involve suppliers to the hotel industry to help hotels to green their purchasing practices. The programme had 3 parts. The first stage of the programme was to create a 'Register of Industry Suppliers' who had an environmental policy and could show that their products currently meet the best available environmental standards, or were willing to improve current specifications to reduce impact on the environment. The second stage of the programme was developing 'Best Environmental Specifications' for product groups with the participation of registered suppliers. The final stage of the project was listing a buyer's guide, guidelines for environmental purchasing of product categories, and profiles of products (IHEI, 2000).

b. Environmental Audit Guidelines

Inter-Continental Hotels audits all suppliers on the basis of environmental criteria. The aim is to comply with the company's six-point commitment to the environment:

- ∑ To conserve the natural resources and energy within its hotels without sacrificing safety standards or jeopardising guest standards.
- ∑ To select the products and materials from environmentally responsible resources, whose use, wherever possible, has positive beneficial effects.
- ∑ To minimise and efficiently manage waste production, ensuring the least possible negative impact on the environment.
- ∑ To acknowledge regional differences in environmental needs and practices by establishing adaptable local programmes designed to improve the performance of each individual hotel.
- ∑ To identify ways to participate in local community action on the environment world wide.
- ∑ To develop awareness of environmental issues internally and externally through a variety of education and training initiatives.

Source: Logistics managers and socially responsible business practice, Alistair C Ping, September 1998

d. Encouraging Supplier Diversity

Marriott's policy of supplier diversity is an example of how social issues can be managed down the supply chain. The object of the policy is to work with locally owned businesses in the communities that Marriott uses as supplier sources. Marriott provides a questionnaire to register suppliers and monitor company approaches on social issues of as women's and ethnic movements (Marriott, 2000).

e. Environmental Dialogue and Supplier Pressure

Skandic Hotels have an active environmental agenda, which includes dialogue and partnership with suppliers. When they developed the 97% recyclable hotel room they put some tough demands upon their supplier base. In 1998 they worked in partnership with Thorn to develop a temperature control system that works through TV signals in hotel rooms (Goodman, 1998).

f. Developing Local Suppliers

Coralia, part of the Accor group has a commitment to the local community in its hotels in Tanzania. It does this by supporting local economic interest by purchasing fresh products from communities located near the reserves, and sponsors efforts to raise the environmental consciousness of its associates, notable through identification of waste products (IHEI, 2000).

g. Certification Process and Guidelines

There are cases where bodies have developed certification schemes for good practice in ethics, social and environmental management in the tourism sector. For example, the Costa Rican Tourism Institute (ICT) has developed a scheme called The Certification in Sustainable Tourism Program (CST). This scheme is designed to differentiate hotel businesses according to their degree of compliance with a sustainable model of natural, cultural and social resource management. The criteria for assessment include employment of local people, training, and job opportunities which favour the local community.

(iv) Gaps in SSCM

One important gap in SSCM tools is the lack of guidelines on the procuring of local services for hotels or the development of these services where they are not found. This is especially important where hotels are placed in host destinations where the local economic conditions are not as advanced as those of the more developed world.

Although there are a number of initiatives that address social issues, such as diversity and local community labour sourcing, these issues are not integrated into environmental management best practice.

4.6

Public sector

Overview

Governments have extensive supply chains due to their role as service providers of a broad range of public services, from roads and transport to housing, communications, tax collection, policing, education, health care and waste collection. To make this possible, governments (central, regional and local) make use of an wide range of products and services from an extensive supply network, from major infrastructure construction companies, to office equipment and local cleaning services. The broad, horizontal nature of these supply chains sets governments apart from many of the other sectors in this report, which tend to have narrow and vertical supply chains which focus on a single product or service sector.

Approaches

Government approaches to managing supply chains also differ from private sector programmes in that they are subject to international and supra-national trade rules. These rules are set out in the various international and regional trade agreements and treaties, such as the World Trade Organisation's (WTO) Government Procurement Agreement (GPA), the rules on the internal market within the European Union (EU) Treaty, NAFTA, etc. Through these various treaties and agreements, governments are subject to strict rules on 'open tendering' and non-discrimination in procurement practices which private companies are not subject to. In particular, governments that have signed-up to these agreements are restricted in their procurement practices from distinguishing between products or services based on how they are made (their process and production methods (PPMs)) or their country of origin (Young, 2000). Therefore, governments are not allowed to base their procurement contracts on differences between whether a product is made using child labour, is extremely polluting in its production process, if it comes from a country with a oppressive regime, or if the company producing it is involved in other environmentally, socially or ethically damaging practices.

BOX 14: EU AND WTO PROCUREMENT RULES

Within the European Union (EU), governmental SCM practices are constrained by the European Union (EU) rules on government procurement, which are contained in four principle public procurement Directives, covering services, supplies, utilities and public works. EU public procurement policy within the boundaries of these rules is determined by the European Commission (EC), with principal "ownership" of the issue by the Directorate General (DG) Internal Market, whose main concern is the free flow of goods and services across Member State borders, rather than sustainability issues. However, sustainable development is now one of the core aims of the EU, on an equal footing with economic growth and market integration. DG Internal Market is therefore, preparing an interpretative document to clarify uncertainties between the interaction of the EU public procurement rules and the use of environmental criteria in public procurement. This document should be finished in September 2000. However, beyond clarification, DG Internal Market sees no widespread support for changes in this area.

The EU procurement rules are aligned with the World Trade Organisation (WTO) rules contained in the Government Procurement Agreement (GPA). Both sets of rules restrict the use of specifications that are based on upstream process or production methods (PPMs) or specific countries of origin. While this is unlikely to affect specifications for content or performance based criteria, such as recycled content, energy efficiency or the use of specific hazardous substances, it can affect specifications for organically grown food, sustainably harvested timber, discriminatory or unethical labour practices or products from companies that do business in countries with records of human rights abuses. In other words upstream supply chain issues.

Despite these restrictions, some national, regional and local governments around the world are involved in promoting sustainability through their supply chains, although these activities vary considerably both between countries and within countries. This is due largely to different organisational and strategic approaches. Some countries have centralised procurement offices with direct responsibility for supply chain policies, strategies and practices. In other countries, responsibility for procurement and supplier interactions is decentralised both vertically (to the different levels of government) and horizontally (to the various departments within each level). This leads to very different issues of ownership of supply chain issues within each organisational model, as well as the need for different strategic approaches.

(i) Sustainability issues

The broad nature of government supply chains means that governments are faced with a wide range of sustainability issues in their supply chains. Most, if not all, of the other sectors in this report are represented in governmental supply chains, as are their sustainability issues. Despite this fact, most governmental bodies have so far emphasised environmental, rather than social or ethical issues in their SCM activities. As one local government official in the UK noted, "social and ethical issues are too broad and too political, while environmental issues are better understood". Notable exceptions to this are the issues of equal opportunity (race, sex, religion, etc.), the promotion of small and medium sized enterprises (SMEs) and economic regeneration. The later is particularly true in economically depressed areas, where there is a concerted effort to direct public funds toward local suppliers.

(ii) Proactive leaders

There are significant variations between governmental SCM approaches in different levels of government within countries and between countries around the world. Some governments (both locally and regionally) in the US appear to be very proactive on environmental SCM e.g. the State governments of Massachusetts, Minnesota and Vermont, King County in Washington State, and the Municipality of Santa Monica in California.

Governmental efforts in these locations are relatively advanced, not only from a governmental perspective, but also by business standards (at least by business standards in the US). As one SCM researcher in the US pointed out, "governmental 'green procurement' efforts are the main impetus for the greening of supply chains in the United States," rather than ‘business to business’ (B2B) pressures as in Europe (Mark Sharfman, University of Oklahoma). According to the same researcher, SSCM in Europe, particularly the European Union (EU), are being driven much more by companies (due to much more rigid environmental legislation).

BOX 15: GREEN PROCUREMENT PRACTICES IN MASSACHUSETTS

Examples of government and SCM

The Commonwealth (State) of Massachusetts in the US is one of the most progressive state governments in integrating sustainability (mostly environmental) issues into their supply chain activities. This is done through their Environmentally Preferable Products (EPP) Procurement Program, administered by the Central Purchasing Office (CPO), which is responsible for establishing State-wide contracts.

Procurement contracts in Massachusetts are decided based on the concept of "Best Value," i.e. bids are evaluated on criteria beyond just the "lowest bid." This has allowed the CPO to develop criteria and goals for the purchasing of environmentally preferable products. This in turn has allowed Massachusetts to buy US$41 million worth of environmentally preferable products in 1999, out of a total procurement budget of US$600 million (Guillemin and Sutherland, 2000).

One of the key strengths of the programme is attributed to the integration of environmental specialists into the purchasing office. These Environmental Purchasing Co-ordinators conduct research, develop outreach and education programmes, add environmental criteria to product specifications and bridge the communications gap between the environmental department and the procurement agency. The environmental criteria they incorporate into product specifications are based mostly on existing, publicly available specifications, such as the US EPA's energy star criteria and recycled product guidelines, as well as other State's environmental product specifications. Eco-labelling criteria are scanned for informational purposes but not generally used.

Strategies for managing environmental issues in the supply chain in Massachusetts include:

- ∑ cross-functional teams for developing criteria. including buyers, customers, suppliers and environmental specialists;
- ∑ flexible specifications: including specifications to allow voluntary information from potential suppliers to be evaluated in the bidding process, and specifications giving the government the right to require continuous improvement in products or services during the contract period;
- ∑ pilot programmes to test new environmentally friendlier products and services;
- ∑ green procurement conferences/vendor fairs - for vendors and State customers;
- ∑ supplier meetings;
- ∑ supplier partnerships;
- ∑ monitoring and helping of suppliers;
- ∑ promoting green procurement activities, both in other governments and in the private sector.

Source: Based on: Interview with Eric Friedman and OECD, "Trade Issues in the Greening of Public Purchasing," COM/TD/ENV(97)111/FINAL, 1999; Guillemin, R, and Sutherland, L, "Environmentally Preferable Purchasing in the Public Sector," paper presented at the National Pollution Prevention Roundtable Conference, Boston, Massachusetts, March 22, 2000; "The Commonwealth of Massachusetts Environmentally Preferable Products Procurement Program," <http://www.magnet.state.ma.us/osd/enviro/enviro.htm> [cited 17.08.2000].

In the EU, a number of countries are engaged in green procurement activities. Leading countries are Denmark, Sweden, Austria, Germany, The Netherlands. In the UK, national, regional and local government bodies are only just beginning to tackle SSCM issues.

(ii) Strategies and tools

The most proactive governmental bodies are using a broad range of strategies and tools to manage their supply chains. These include:

- internal cross-functional teams;
- internal training and awareness programmes;
- supplier partnerships;
- supplier meetings;
- environmental supplier conferences;
- mandatory and voluntary product specifications;
- requirements in procurement contracts for suppliers to work with the government to continuously improve the environmental performance of their products and services;
- monitoring and assisting suppliers;
- the production of fact sheets on more environmentally friendly products and services;
- guidelines and product criteria;
- purchaser networks for sharing information;
- websites.

BOX 16: UK PUBLIC PROCUREMENT POLICY AND STRATEGY AND SUSTAINABILITY

Public procurement policy

The overall UK procurement policy is based on the concept of "value for money." This is defined as the optimum combination of 'whole-life cost' and quality to meet the customer's requirements. Whole-life cost includes not only the initial price, but also direct running costs, indirect costs, administrative costs, possible savings, recyclability and end-of-life costs.

Beyond the possibilities this "whole-life costing provides," there is no specific national sustainable procurement policy, although a "Green Guide for Buyers" with general advise on greening procurement was produced by the Department of Environment, Transport and the Regions (DETR), which also maintains a green procurement web site. How the "value for money" policy is actually put into practice is therefore, largely left up to the different levels of government and the specific departments at each level (due to the devolved nature of procurement responsibilities in the UK).

These practices have so far focused on the interpretation of national and EU procurement rules and general advise on the types of language that can and cannot be used in tenders for public contracts (i.e. model clauses). Advise on specific product or service specifications have not been common, while supplier partnerships have been almost non-existent. Notable recent exceptions to this rule are the national pilot projects looking at the promotion of recycled paper and the use of certified sustainable timber, both of which have received political support and encouragement from the Cabinet Office. These projects have been quite proactive in working closely with the supply chain. The recycled paper initiative has involved working closely with paper mills on issues of price, quality and availability, while the timber project has been working with the Forest Stewardship Council.

(iii) Obstacles

The main obstacles to incorporating sustainability (social, ethical, environmental) issues into governmental supply chains have been identified as organisational barriers, little of high quality product and service information, and a lack of knowledge and expertise of SSCM issues.

Organisational barriers result from overly rigid departmental and functional areas of responsibility and a certain level of mistrust of new ideas and responsibilities, i.e. purchasing staff being asked to take on responsibility for sustainability issues in purchasing.

Product and services barriers relate to a lack of readily available and independently certifiable information on the sustainability aspects of products and services on the market. Currently governments must rely for most product and service information on the organisation providing the product or service which makes it difficult to ascertain if supplier claims are true.

Finally, there is a lack of awareness and understanding of sustainability issues in the supply chain. Often responsibility for green procurement programmes is given to purchasing staff in various departments who have little or no knowledge of sustainability issues or who do not have the skills to determine product and/service specifications or characteristics. While devolved government is a way to integrate sustainability issues into the whole organisation, without the knowledge and expertise to make these issues operational, it will be difficult to overcome the other obstacles.

4.7

Building and Construction

Overview

The construction industry has many direct impacts upon the environment. The impacts derive from many different areas, including extraction of raw materials, assembly of components, transport and construction. In the UK alone, 10% of CO2 emissions are from building material production, while waste from production of materials and construction accounted for 30% of the UK total (Construction and the Environment, 2000). As well as environmental impacts, the construction industry is associated with a number of social issues, including the development of adequate and fairly priced social housing, better public consultation over large public construction projects and the need for better involvement of local labour sources for large construction projects.

The Construction Best Practice Programme (CBPP) has pointed out from a survey of SCM that, in recent years, relationships between clients and contractors in the construction industry have become increasingly adversarial. This has led to an increasing number of disputes and growth in litigation. The consequences for all members of the supply chain, from end-customer downward, need not be spelled out (Construction Supply Chain Management, 2000). Rethinking Construction is the main policy driving Government's relationship with the Construction industry. The Rethinking Construction report from the DETR has identified a number of targets for the industry to improve its performance. To achieve these targets the industry will need to make radical changes to the processes through which it delivers its projects. It goes on to say that the industry should create an integrated project process around the four key elements of product development, project implementation, production of components and partnering the supply chain (Rethinking Construction, 2000).

Construction is characterised by a long supply chain from specification to product delivery. Clients usually engage engineers and architects as the designers in a construction project. They, in turn, hand the construction activity to construction managers. The construction managers may hand the construction project over to contractors, or they may be the contractors themselves. A final link in the chain is the use of sub-contractors who may be involved in some or possibly all of the construction activity. One of the main issues for supply chain sustainability is ensuring that specification of more sustainable materials, development activity and labour roles is able to be transferred to contractors who in most cases carry out the procurement of materials, hiring of labour and general site management. All these issues are the ultimate responsibility of the client, but contractors undertake the operation of these issues. Tools for sustainable specification of material, labour challenges and construction practice need to be easily available for contractors to use upon client specification. Although many of the supply chain issues are similar for all construction work, issues for house-builders have been analysed separately from other construction issues.

House builders

(i) Sustainability Issues

One of the key issues for the house-building supply chain is obtaining standardised materials and pre-configured building components for building work. Standardised and pre-configured materials lower the costs of housing construction in terms of time and financial outlay. Affordable homes are important to provide fairer access to people from less economically advantaged backgrounds.

Another key issue is engaging designers in specifying less resource and energy intensive materials for contractors to work with. The Building Research Establishment (BRE) have found that contractors are likely to have the most influence for environmental improvements in the supply chain, but it is architects, in conjunction with clients and designers who set up initial specification for the construction materials in the design phase. Forming partnerships between building contractors and housing designers early in the design phase of housing projects can achieve greater sustainability throughout the supply chain.

(ii) Proactive Companies

Westbury Homes are pursuing an innovative approach to housing. They are developing new customer-focused approaches to develop products, which will enable them to expand into new markets. They are performing trials of new component systems and production processes in demonstration projects and they are developing partnering arrangements with their suppliers. Both Wimpey Homes and Westbury have brought in board-level expertise from manufacturing industry in order to implement new supply-chain management techniques (Rethinking Construction, 2000a).

Over the last three years Bovis Homes, like many volume housebuilders, has standardised its product by using standard plan forms built from bulk-purchased parts. The standard types of house are regularly redesigned the product development team in response to feedback from the sales and marketing team and customers. Research into what the customer wants is continually carried out using questionnaires, and value for different types of customer is defined in terms of price, locality, number of rooms, appearance, and quality of construction.

Housing associations such as Southern Housing Group, Peabody, Hyde Housing Association and Guinness Trust are implementing lessons from abroad to improve the procurement of low-cost, high quality adaptable housing. For example, modular industrialised housing systems such as those used in Japan by Sekisui and Toyota are being tested to reduce the cost and time of construction and provide tight quality control. This can deliver housing with zero defects on-site, which removes the need for expensive customisation activities on the built product where specifications are often not correct (Rethinking Construction, 2000a).

Laing Construction is working on the development of more collaborative working practices with suppliers and designers, leading to leaner forms of construction. Laing Homes has also committed to source timber from well-managed forests (Business and Environment Trends, 2000).

(iii) SSCM Tools

a. Quality Labelling

The Quality Mark initiative is a Government-sponsored scheme aimed at raising the standard of workmanship in the domestic repair, maintenance and improvement sector. Quality Marked builders are "Builders Consumers Can Trust". Under the scheme, consumers will be able to identify and select reputable builders (including plumbers, electricians, decorators and other specialist trades), who have shown to independent assessors that they possess the skills and competence to complete work to a high standard. In addition, consumers will be safe in the knowledge that all work will be protected by a comprehensive third-party warranty covering them against defects and unfinished work (Quality Mark Scheme, 2000).

b. Materials Specification Guidelines

The BRE developed the Green Guide to Specification for design professionals in conjunction with the Post Office. The guide provides a simple tool for assessing the environmental impact of a wide range of commonly-used building materials. The method used within the guide is based upon the BRE's extensive database of life cycle assessment information. It has the advantage of being simple and applied to commonly used building materials means that specifiers do not have to place difficult demands upon contractors for sourcing their materials.

c. Supplier Partnerships

The Beddington Zero Energy development in Sutton is a good example of a total supply chain partnership between a housing association, architect, environmental consultants and the cost and construction consultants. Bioregional, the environmental consultants who initiated the project have worked to ensure that sustainability criteria were used in all aspects of the development, from sourcing local certified wood products to using ethical financing. The design team were briefed on all requirements early in the project and given advice on where and how to source the sustainable materials needed for the sustainability criteria to be met.

(iv) Gaps in SSCM

One of the key obstacles for moving sustainability through the supply chain is the role investors play in financing construction projects. A report on sustainable construction by the construction federation reports that it is investors who are most likely to inhibit change towards sustainable construction. Investors have to be influenced through the supply chain if long-term sustainable change is to occur.

There does not appear to be tools readily available to housing construction for integrated SSCM , which can be brought into use quickly for projects and link the requirements of clients and designers with the sourcing ability of construction managers.

Construction

(i) Sustainability Issues

As supply chains can be so immense in the construction sector, the development of more collaborative working practices with suppliers and designers is quite common now. This in turn can lead to greater efficiency (called 'lean construction'). Lean construction is a philosophy based on the concepts of lean manufacturing, based on managing and improving the construction process and its profitability to deliver what the customer needs. This Introduction outlines the elements of lean manufacturing and suggests how these might be adapted to deliver lean construction in practice (Introduction to Lean Construction, 2000).

The Building Research Establishment (BRE) and the Construction Products Association (CPA) completed a survey of materials producers to see what they identified as the key environmental pressures for the supply chain. A major finding was the influence of contractors appeared to be the most direct motivating force for environmental action and improvement. Actual performance was more important than having an environmental management system for the contractors (Environmental issues and SCM , 2000).

One of the bigger issues for larger construction firms is the need to reduce the number of virgin materials in building projects. Furthermore, there is also a need to obtain a greater amount of secondary aggregates from suppliers for use in major construction projects, such as infrastructure.

Construction noise and nuisance is a major consideration of many construction projects that needs to be controlled down the supply chain from the construction managers to the contractors and sub-contractors. This issue was also pertinent for infrastructure clients such as BAA plc.

Dave Copeland from the Earth Centre has pointed out that many of the larger construction projects do not adequately assess the impact the project might have upon the local economy. Using local labour for contractors and sub-contractors is an important part of managing sustainability down the supply chain.

(ii) Proactive Companies

Carillion has created a taskforce on Environmental Supply Chain Management. In 1997 they produced a position statement defined to reflect best practice. Carillion's commitment to implementing this position statement requires each of Carillion's businesses to consider the risks of its own supply chains, and then develop action plans to address high risk supplier (Davidson, 2000).

BOX 17: THE CARILLION POSITION STATEMENT ON ENVIRONMENTAL SCM

An example of a position statement on SCM

Carillion states that it is committed to minimising the environmental impacts of its operations, to improving the built environment and to achieving world class performance in environmental management. It is recognised that meeting these goals will require the active involvement of all supply chain participants including customers, suppliers, sub-contractors and designers.

- The company will achieve best practice performance in environmentally aware Supply Chain Management by:
- Identifying the significant impacts of materials and services in use and purchasing these to specifications which are compliant with legislation and environmentally sound.
- Considering, and encouraging other Supply Chain partners to consider, environmentally positive alternative specifications.
- Demonstrating efficient use of energy, water, packaging and raw materials and taking appropriate opportunities to minimise waste and to re-use and recycle.
- Assessing the environmental commitment of suppliers and sub-contractors, monitoring their performance and providing feedback and advising on performance and improvement opportunities.
- Working in partnership with other participants in the Supply Chain to achieve continual improvement in performance and cost effectiveness.
- Provide relevant training.
- Establishing systems, targets and action plans for the effective environmental management of the Supply Chain, communicating these to other participants and reporting on performance.

Source: Environmental Supply Chain Management - A Risk based Approach

Dr. Sarah Davidson, Stanger Science & Environment, 2000

Balfour Beatty companies are increasingly assessing the environmental arrangements and performance of their suppliers. The group is in the process of reducing its preferred suppliers and assessing the environmental performance of the suppliers is one of the tools they use.

Skanska have maintained that continuous dialogue with their suppliers and sub-contractors is necessary for better environmental relationships. They have engaged their top suppliers in a questionnaire about environmental management, as well as introducing environmental profiles for their building materials to aid in purchasing decisions.

BAA plc have developed a partnering approach to construction work. They have taken this approach into account when developing design briefs for construction works. They have also developed an environmental framework for materials that contractors use when sourcing.

(iii) SSCM Tools

a. Supply Chain Workshops

The Construction Industry Environmental Forum (CIEF) have completed 3 workshops in May and June 2000 (CIEF, 2000). The aim of these workshops was to provide guidance to companies on integrating environmental issues into the management of their supply chains.

b. ISO4001 Environmental Management Commitment

Carillion has a commitment to developing business-specific EMSs which meet the requirements of the ISO 14001. A large number of Carillion businesses and operational units (representing 60% of 1999 turnover) have now achieved ISO 14001 certification for the development of their environmental management systems. The certification of the majority of the remaining Carillion operations is expected in 2000. Outlined in its approach to ISO4001, Carillion has outlined its call to influence environmental management of the supply chain.

c. Supplier Assessment

Carillion has developed a risk-based approach to environmental supply-chain management that uses third-party certification combined with the use of environmental criteria in assessing the performance of suppliers and subcontractors. (Making Choices, 2000). A range of assessment tools were used in 1999 to assess environmental performance and associated risk of bought-in products and suppliers. In the UK, half of Carillion's suppliers generally met these requirements or were worse. Action plans have been specified for both Carillion and its suppliers.

In 1999 more than 7,000 suppliers were contacted by Skanska construction group to outline their environment policy, while Skanska Sweden has evaluated 100 of its top 120 suppliers. The outcome of the evaluation was to classify the suppliers according to an environmental approval rating. Those suppliers with the highest approval could only qualify by having a certified environmental management system in place.

RMC are currently piloting an environmental assessment procedure with their sub-contractors who work on infrastructure contracts. They are building the environmental criteria into the current quality assessment procedure. RMC are also about to launch a mail shot to their main suppliers detailing RMC's commitment to environmental practices.

d. Behavioural Code of Practice

The Construction Industry Board for the UK have a 'Considerate Contractor' scheme, whereby parties signing up to the scheme partake in a voluntary initiative for better site management initiatives. Any constructor site can gain membership and members in the UK now number of 300 contractors. It is considered good practice and makes business sense, according to Construction Industry Board. Some of the benefits include reductions in site waste, better working relationships between contractors and sub-contractors, as well as reduced site noise and nuisance.

e. Local Supplier Policy

The Earth Centre hires people from the local community and provides training, including basic employment skills, and education on sustainability. When they built the conference centre in Doncaster, they ensured that they hired local labour for construction, according to Dave Copeland of the Earth Centre. The local supplier policy is useful where there will be knock-on effects for associated businesses in the local economy

d. Gaps in SSCM

The major gap that appears in SSCM is the lack of any suitable guidelines on the use of local labour sources for major construction works, especially when they are public infrastructure projects. Dave Copeland from the Earth Centre remarks that there should be closer links to Local Agenda 21 for some of these larger construction projects in order to ensure local participation of suppliers wherever possible. Apart from the Considerate Contractor scheme there are little social issues addressed in sustainable strategies for the supply chain.

Claire Williams at BAA plc pointed out that environmental management of sub-contractors was harder than that of the first tier suppliers of contractors. Further tools for sub-contraction management are needed.

4.8

The chemical industry

Overview

This sector is one of the largest industries in the world. The European Chemicals Industry Council (CEFIC) estimates that overall output in the European chemical industry will grow from 3.5% last year to some 4.5% this year; Germany and Netherlands are likely to experience higher growth than the other European countries. Next year, overall output in the industry is forecast to grow by just 3.5%. The acceleration of output growth in the industry is driven by the positive prospects for world trade and economic activity, and the dynamic recovery of most Asian economies (CEFIC, 2000). The chemical industry is not getting any smaller, but voluntary standards and codes of practice increasingly drive environmental issues more strongly than in the past. The chemicals industry also has a profile that is the opposite of the retail industry, because it is much shorter and further upstream from the consumer, though petroleum companies may differ slightly from this model. For the purposes of this document, this sector has been split into the petroleum industry and plastics, polymers and organics business.

The petroleum industry has specific issues that differ from the rest of the chemical industry in that they work heavily with extraction of the raw materials right through to delivery to the consumer. In the words of Jim Hopwood of ExxonMobil "Supply chains for the main raw materials are very simple and the companies tend to be strongly vertically integrated so have full control of their key supplies". Although they have structured environmental controls, petroleum and oil companies have come under the spotlight of human rights and social issues for their involvement in sourcing products from socially sensitive situations.

In contrast to the petroleum sector, other chemical companies have not had the more recent coverage of human rights abuses and involvement in social injustice. Once defined as environmental weak links, the chemical sector had a rude awakening to the sustainability agenda: change or be legislated out of existence. It responded with voluntary measures, such as Responsible Care, to clean up its act. Since then toxic emissions have fallen dramatically and the UK and the chemicals industry association (CIA) now reports that over 65% of sites have environmental management systems (Business and Environment Trends, 2000).

Responsible Care is one of the main strategies that the chemical industry has adopted to show commitment to continual improvement in all aspects of health, safety and environmental (HS&E) performance and to openness in communication about its activities and its achievements. This management style dominates chemical companies outside of the petroleum industry and incorporates environmental and safety policy to suppliers, as well as distributors and customers.

Petroleum Industry

(i) Sustainability Issues

A key issue for all chemical industries including the petroleum industry is the concept of Product Stewardship. Product Stewardship is a management concept or ethic that ensures the responsibility for the personal and environmental safety of products is not passed on wholly to customers. Retaining product stewardship over products means that the company has a duty of care over the distribution and use of those products in the value chain.

BOX 18: BP CHEMICALS PRODUCT STEWARDSHIP MANAGEMENT FOR SOLVENTS

An example of chemicals Product Stewardship

The solvents business in BP Amoco Chemicals has developed an extensive Product Stewardship offer over the last few years, aimed at supporting our customers in HSE aspects of the use of products. This has now been collated into a single merchandising package, the Green Box, which is specially designed and delivered by distributors to their customers. This enables Product Stewardship to be taken down the demand chain, extending the reach of Responsible Care and ensuring that distributor customers will be able to make informed decisions regarding solvent use.

Source: http://www.bp.com/alive/

Companies traditionally associated with 'dirty' products have been forced to adopt cleaner stances due to environmental lobbying, in particular climate change lobbying. The Kyoto Protocol has set up targets for reductions in CO2 emissions for the major industrialised nations to 95% of 1990 levels by 2012. With these targets behind them and the continuing lobby for cleaner fuels, some of the larger Petrochemical producers have started to invest in the development and supply of renewable energy to consumers.

BOX 19: BP SOLAREX, PART OF BP

Switching to renewable energy

BP Solarex develops and implements solar power solutions. They are the world's largest manufacturer of solar electric panels and systems. Their network of distributors provides solar power for industrial, commercial and residential customers throughout the world.

BP have developed a solar vision for renewable energy supply. This is split into two key challenge areas:

- integrating solar panels into buildings;
- large-scale "21st Century Solarplants".

Source: http://www.bp.com/frameset.asp?page=/earthday/solar.asp

Oil extraction and supply has also had implications for human rights abuses around the world in places such as West Papua (Irian Jaya) and Nigeria. In Nigeria the rights to minerals were declared government owned in 1989, regardless of the tribal ownership of local lands where oil extraction was taken from. The multi-national oil companies have not handled the growing social and environmental problems well, which has led to international calls for Oil companies to be more transparent in their dealings with partner companies and supply of oil products.

(ii) Proactive Companies

Shell has developed set of nine general business principles, and all group companies within Shell are expected to comply with these principles, which include statements of Business Integrity and Environment and Safety standards. Shell expects that all contractors that work with Shell companies should conform to these principles relating to the conduct of the work they undertake. Shell will work to resolve any difficulties that these principles may cause with contract parties.

BP Amoco has an ethical conduct policy, which it applies to all employees within its businesses. It undertakes audits of its businesses to ensure that these principles are adhered to. The ethical conduct has also been used to help company purchasing policy.

The Ipiranga Group is privately owned and consists of companies that refine and distribute petroleum products, and others that operate in the chemicals and petro-chemicals fields. It is wholly owned and funded by Brazilian capital. Due to tighter Brazilian environmental legislation, Ipiranga set up a pilot project in a distribution centre which gained ISO 14001 certification. As part of this management approach, supplier training and qualification schemes were set up to meet environmental targets.

(iii) SSCM Tools

a. Contractual Compliance

In 104 countries around the world, Shell writes the Shell General Business Principles into contractual agreements for supply of work. In some cases compliance screening of these principles is undertaken. In 1999, there were 62 contracts cancelled because of incompatibility with Shell Business Principles and in 1998, the figure was 69.

b. Training and Management Support

Shell offers a range of help mechanisms to its contractors and suppliers to meet Shell's required Business principles. Supplying documentation, management support and videos to support ISO quality assurance.

The Londrina distribution centre in Brazil (part of the Ipiranga group), for example, completely re-trained all its suppliers in eco-efficiency best practice, in order to meet environmental goals and improve the efficiency of the distribution centre (Cost Savings with Best Practice, 2000).

c. Procurement and Contract Guidelines

A Group Procurement Handbook has been published by BP Amoco, which was aimed at all employees engaged in the procurement process. The Handbook reinforces the ethical conduct policy by clarifying how relevant aspects of the policy apply to the procurement process.

The Londrina distribution centre in Brazil reclassified all its solid wastes in accordance with its new waste reduction targets. As part of that program, they required that all suppliers handling the disposal of waste products held or obtained environmental management certification (Cost Savings with Best Practice, 2000).

d. Auditing/Operations Integrity

ExxonMobil have an environmental auditing policy for all their contractors, that is managed though the environmental department. This process is part of the ExxonMobil formal duty of care. ExxonMobil have produced an Operations Integrity Manual, which specifies what type of environmental monitoring and controls should be undertaken, which included third-party services such as contractors. Individual businesses within the group set up their own management systems to comply with the parent company's environmental requirements.

e. Diversity Initiative

Shell in the US have a diversity initiative for the contracts they make with suppliers. They have made a commitment to provide supply contracts to a certain percentage of women and minority owned businesses.

(iv) Gaps in SSCM

Product Stewardship delivers strong environmental practices down the value chain, but does not concentrate as strongly on upstream supply operations. Even where this is the case, the environment, health and safety seem to be the prime aims of any SCM operations. BP Amoco and Shell both have strong ethical policies in their management strategies of employees, but do not appear to link these into the safety and environmental management systems for products and materials.

The petroleum companies are actively involved in exploration and extraction of raw materials around the world involving many supply operations. Auditing the social effects to local populace and economic conditions of the supplier regions does not appear to be a strong as found in the retail sectors.

Plastics, polymers and organic chemicals

(i) Sustainability Issues

There is a growing public desire to conserve materials and energy resources, to reduce waste, and to manage solid waste in the most environmentally sound ways. Chemical industries are under pressure to re-use and recycle their chemical products where possible down the value chain to their customers. Introducing reverse logistics into the value chain is a concept, which aims to take back used product from the customer and recycle that into customer supply.

Educating the consumer, as well as providing cost-efficient facilities for the consumer to accept recycled products instead of virgin products are important issues for chemical suppliers to adopt. Chemical companies have increased the image of service providers instead of product providers to match the product stewardship ethic.

The internet is allowing faster transfer and more up-to-date information for logistical purposes. Chemical service companies are now available on the web that allows buyers and sellers of chemicals to trade in real time. Chemconnect provides an internet service portal for chemical companies to access the world chemical exchange where they can effectively source their supply needs online. The increase in on-line chemical sourcing is likely to provide improvements in efficiency, cut costs of supply and, most importantly for the sustainability issue, to reduce the amount of waste from over-production.

(ii) Proactive Companies

Dow has a commitment to promote Responsible Care ethic among major associations, customers, suppliers and policy makers in order to advocate global regulatory harmonisation among the chemical industries. Part of the Responsible Care commitment is to ensure suppliers have a responsible environmental and safety management system. Box 20 shows the company's public statement regarding Responsible Care.

BOX 20: AIMING FOR ZERO –DOW'S PUBLIC COMMITMENT TO RESPONSIBLE CARE

An example of Responsible Care

Our industry creates products and services that make life better for people around the world - both today and tomorrow. The benefits of our industry are accompanied by enduring commitments to Responsible Care in the management of chemicals worldwide. We will make continuous progress toward the vision of no accidents, injuries or harm to the environment and will publicly report our global health, safety and environmental performance. We will lead our companies in ethical ways that increasingly benefit society, the economy and the environment while adhering to the following principles:

- To seek and incorporate public input regarding our products and operations.
- To provide chemicals that can be manufactured, transported, used and disposed of safely.
- To make health, safety, the environment and resource conservation critical considerations for all new and existing products and processes.
- To provide information on heath or environmental risks and pursue protective measures for employees, the public and other key stakeholders.
- To work with customers, carriers, suppliers, distributors and contractors to foster the safe use, transport and disposal of chemicals.
- To operate our facilities in a manner that protects the environment and the health and safety of our employees and the public.
- To support education and research on the health, safety and environmental effects of our products and processes to foster the safe use, transport and disposal of chemicals.
- To work with others to resolve problems associated with past handling and disposal practices.
- To lead in the development of responsible laws, regulations and standards that safeguard the community, workplace and environment.
- To practice Responsible Care by encouraging and assisting others to adhere to these principles and practices.

William S. Stavropoulos, January 12, 1999

Source: http://www.dow.com/environment/care_info.html

Ashland Chemical is a US based company. It has a policy statement under the umbrella of its Responsible Care commitment to ensure that its customers and suppliers adhere to good product stewardship principles and to operate in a safe and responsible manner.

BASF are a major supplier to many smaller customers in dye products. As part of their supplier role they offer advice upon environmental management best practice for their smaller customers as free technical advice.

Thomas Swann is a UK based company that produces fine and speciality chemicals. They have achieved ISO14001 accreditation and were registered to the EMAS standard in 1996. As part of their environmental management programmes they look into the environmental management systems of their suppliers.

(iii) SSCM Tools

a. Partnership Agreements

The Chemical Strategies Partnership (CSP) is a tool that is managed by the Tellus Institute. Developed in 1996. the CSP offers a manufacturer-supplier relationship model with the aim of promoting chemical-use reduction and creating environmental performance objectives. CSP offers a manual 'Tools for optimising Chemical Management', which offers a decision framework in developing a chemical management services program, identifying the total chemical lifecycle costs and supplier negotiation incentives. Incentives and bonuses can be built into the model to ensure savings in costs and chemical use.

b. Supplier Auditing

Thomas Swann state that they scrutinise the environmental management of their suppliers through environmental questionnaires and auditing techniques.

c. Responsible Care

Responsible Care is a voluntary initiative within the global chemical industry to safely handle chemical products from inception in the research laboratory, through manufacture and distribution, to ultimate disposal, and to involve the public in the decision-making processes. Born in Canada in 1987, Responsible Care has quickly spread to 45 countries.

The formation of partnerships to seek to promote continual improved HS&E performance through the supply chain is part of the Responsible Care code. Partnerships are a practical response to the challenges posed by Product Stewardship and the need for effective communication with distributors, resellers, haulier and others involved in the marketing of chemicals.

Dow uses a qualification system for their suppliers, based around quality and value objectives. If the companies that are supplying them do not use Responsible Care or similar management system, they carry out a review of the company using Health, Safety and Environmental considerations.

The Responsible Care commitment also requires Dow to carry out risk identification of its raw material suppliers. Material Safety Data sheets (MSDS) from raw materials is one way that they collect this material risk information. If suppliers change any materials, then new MSDS's are required from the supplier.

d. Knowledge Transfer

BASF provide free technical support for their customers on environmental best practice. This practice is used to help their customers develop their environmental performance and help market themselves as adding value to customer.

e. Reverse Logistics

Engaging the entire value chain is also part of SSCM practice. DuPont Petretec polyester regeneration technology breaks down polyester molecules into their raw materials. Because these raw materials retain their original properties, they can be reused as new in any first-quality application. DuPont have introduced this technology as a way to introduce reverse logistics into the value chain. They have set up a distribution network that can regenerate polyester film into a virgin-quality product, which is available for use by some of their customers.

Dow Chemicals have introduced a similar concept to their chlorinated solvent distribution system in Germany through one of their subsidiaries, SafeChem Germany (Box 21).

BOX 21: SAFE CONTAINMENT, TRANSPORT AND RECYCLING OF SOLVENTS

SafeChem distributes chlorinated solvents to its customers. These solvents include trichloroethylene, perchloroethylene and dichloromethane, all of which are used for metal and surface cleaning. SafeChem takes back and recycles the used solvent from its customers, once they have used fresh solvents using a closed-loop delivery system called 'Safe-tainer'. The used solvent is then re-processed and sold back into the marketplace to customers. The 'Safe-tainer' system combines the supply of fresh chlorinated solvents and the collection of used solvent with the professional management and disposal of the waste. With this system, chlorinated solvent users can improve their solvent operations by implementing safer and emission-free handling of solvents and effective waste management, as well as re-using recycled solvents. SafeChem supplements the Safe-tainer system with educational training for its customers on the optimisation of application use for Chlorinated Solvents as well as correct methods for handling and recycling.

Source: Andrew Hughes, Case Study on Product-Service Systems, 2000

(iv) Gaps in SSCM

Other than a strong commitment to the principle of Responsible Care, there is not much formalised way to ensure the environmental management of suppliers to the chemical industry. Product Stewardship of products supplied to customers is far stronger than the management of upstream environmental practices. Product Stewardship also targets safer ways of transport and handling of chemicals, which can possibly have negative consequences for the development of better strategies of SCM tools, such as investing in product substitution.

John Easton from BASF states that there is " a dilemma between purchasing and marketing in chemical companies because purchasing don't have the same standards as marketing to customers".

Steve Elliott from the Chemicals Industry Association points out that the industry is still sceptical or lacking in knowledge about sustainable development. They need their members to buy into a long-term education process, starting with the value of long-term economic thought for the company, rather than relying upon the short-term financial value that a company produces. This long-term approach will help in defining better integrated management approaches that incorporate both social and environmental methods.

5.0

Analysis and Conclusions

5.1 Key Gaps

An analysis of all the case studies revealed the following common gaps in the application of sustainability thinking to SCM.

- There is a lack of knowledge and experience for integrating the 'triple bottom line' thinking into SCM.
- Tools that enable the incorporation of social and ethical issues and eco-efficiency issues into organisations and their supply chains do not exist (i.e. reliable, cost effective methods, tools and metrics). Social and ethical issues are considered by many to be too difficult to put into operational practice.
- A lack of tools to upgrade environmental SCM or green procurement to true SSCM are lacking.
- There is a lack of metrics to measure the effectiveness of SSCM.
- Centres of expertise/excellence in SSCM issues do not exist, i.e. centres that combine cutting edge expertise on both SCM tools, strategies and metrics as well as an in-depth knowledge of sustainability issues in specific sectors.
- There is a lack of reliable information on product and service-related sustainable performance, i.e. which product or service is better from an environmental, social and ethical perspective.
- Reliable third-party certification of sustainable issues in relation to product and service groups does not exist. Reliable third-party certification removes the research burden from organisations wishing to purchase products and services that are considered more sustainable.

5.2

Conclusions

The research produced the following conclusions:

- There is a lack of clarity in the definitions and scope of the terminology used in SCM and SSCM. Definitions of the 'supply chain' and terms such as 'demand chain' and 'value chain' are sometimes used interchangeably. Similarly, 'logistics' is often substituted for SCM although again some claim they are different. Finally, the term 'SSCM ' is not in common usage and there is a considerable confusion over the meaning and scope of the term 'sustainable'. Furthermore, most organisations have concentrated their SCM efforts on environmental issues, referring to these activities as 'environmental SCM ', 'supply chain environmental management' or 'green procurement'; this depends on the scope of the organisations understanding of the term 'supply chain'.
- There is no common definition of SCM among academics or business. There is also a vast diversity of interpretations among companies as to where supply chain begins and ends, and what the main functions of SCM are. In addition, even within the same company employees seem to interpret SCM differently depending on what position in the company they have and their background. In other words, there is no common terminology or business language when considering SCM.
- MNCs using SCM are able to exert a lot of power and influence in the supply chain and have the potential to push forward sustainability issues. However, the size and power in the supply chain is relative. A company has to have enough throughput to exert real pressure. Automotive manufacturers have very high throughputs and their decisions have significant impact on initiatives taken by their suppliers. Large chemical companies located at the far end upstream of the supply chain have a very strong position and power to make decisions for change.
- It seems that ISO 14001 certification is being increasing required amongst suppliers in certain sectors.
- There are no recognised centres of excellence or expertise on SSCM. While there are a number of researchers and projects working on various issues (mostly environmental), these tend to be small. Furthermore, there is a consensus among organisations active in SSCM issues that academic and research centres are lagging behind the most proactive organisations and therefore can add little value to companies that developing SSCM.
- Companies are working on environmental projects. However, much less work has been done on social and ethical sustainability, except perhaps those companies that have committed themselves to various ethical codes. This position appears to be exaggerated by the political drivers of sustainability best practice e.g. social and ethical concerns are still driven by the NGO community and human rights campaigns. Measurements for the ethical and social concerns appear to be diverse and less accepted among industry.

- When examining examples of sustainability and SCM, there are almost no organisations which could demonstrate or are known for successful integration of all the issues. Some companies are known for good work related to suppliers' environmental requirements, some in the development of environmental indicators, some in tackling ethical issues (Body Shop, B&Q and the Co-op Bank), but there are really no examples of companies that have adopted an integrated approach to sustainability and successfully incorporated them into SCM.
- It seems quite clear, that environmental (not sustainable) work through the supply chains is most advanced in sectors which are exposed to the strongest drivers: legislative (electronics sector, which has been under pressure from the proposed Waste from Electrical and Electronic Equipment (WEEE) Directive and Restriction of Certain Hazardous Substances (ROS) Directive, previously from the Directive on elimination of CFCs, and in the automotive sector from End of Life Vehicles (EOLV) Directive and Kyoto Protocol on CO2 reduction) and customer (the automotive sector has been under pressure from the general public, even though currently customers do not choose environmentally yet, the public debate is quite intense). Where drivers are lacking (most sectors face less than automotive or electronics), initiatives, are not nearly as advanced.
- Many interviewees observe that existing tools are too complicated.
- Some interviewees said that there are a general lack of tools covering sustainability in services. Most are product oriented.
- There appears to be little integration of environmental or broader sustainability thinking into procurement or SCM.
- Secondments of environmental staff into procurement or SCM may be a useful strategy to start to integrate thinking and practice.
- This position appears to be exaggerated by the political drivers of sustainability best practice e.g. social and ethical concerns are still driven by the NGO community and human rights campaigns. Measurements for the ethical and social concerns appear to be diverse and less accepted among industry.
- It seems clear that TNCs are able to exert a lot of power and change in supply chains and are also able to push for the advancement of many sustainability issues if they decide to. However, size and power in the supply chain is relative and often determined by whether the market is driven by demand, or controlled by supply. A company with high throughput of volume sales can exert pressure in the supply chain.
- The main driver for high throughput is high market demand. With higher throughput, the company is more meaningful for the economy of supplier, as income generation is greater. Automotive manufacturers have very high throughputs and their decisions have vast impact on initiatives taken by their suppliers.

- Original Equipment Manufacturers (OEM's) are usually one of the last elements downstream in the supply chain before the customer, and not as large as some of their suppliers, but still exert upstream pressure on suppliers for best practice, due to huge consumer demand for their products. Many chemical companies are in the opposite position to OEM's, as they are found at the far end of the upstream supply chain. However, they are in a position to exert a great deal of pressure on the downstream supply chain, due to their size and the unique requirements of many of their products.
- Many of the chemical industry's products have properties that make them a risk to the health and safety of its customers, or an environmental risk for global and local environment. After the introduction of stricter legislative requirements on products and product development, the chemical industry have pushed for downstream improvements of the supply chain through the development of initiatives such as Product Stewardship and Responsible Care. The chemical industry controls its supply chain from upstream.
- When producing examples in SSCM, there are almost no companies that could demonstrate or are known for successful integration of all the issues. Some companies are known for good work on suppliers' environmental requirements, some in development of environmental indicators, some in tackling ethical issues. B&Q is one of very few exceptions to the rule of integrating both environmental and social concerns into SCM. This derives from their comprehensive QUEST policy, which takes into account both new and existing suppliers and involves assessment and auditing processes. The key point to how this integration has been achieved is the merging of the strategic issues of quality and environment. Merging the departments that had responsibility for environmental and quality issues reinforced. Quality and environmental departments have since been de-merged, but the QUEST process is currently run from the Quality department and includes formal processes for social, environmental and quality points from suppliers.
- Social and ethical sustainability supply chain policies are far less developed, as are the drivers for these issues. Environmental management of the supply chain has had an impact through reducing company risk (for example legislative compliance), whereas social and ethical concerns have only recently affected company risk in only some sectors. Environmental management is unrelated to global sourcing of suppliers, but social management only appears prevalent where global sourcing occurs.
- The strongest examples of social issue management has been in the retail (especially clothing) sector, where labour rights campaigners have influenced retail organisations to adopt standards with which to assess supplier organisational practices. It is hard to judge why calls for social and ethical management have been adopted in the retail sector more readily than in the ICT or chemicals sector, where global sourcing also occurs.
- This may be due to the close relationship of the consumer to the retail trade in the supply chain, but also the fact that the retail trade produces physical products direct to the consumer in a final form that can be associated with social and ethical concerns. The tourism industry is also close to the consumer in the supply chain, but produces a service rather than a product, with less obvious social impacts on suppliers and a highly salient consumer hedonistic experience. This is perhaps why social management issues are not high-risk issues for companies.

5.3

Recommendations

∑ Development of SSCM tools needs take account of total ‘triple bottom line’ processes in existing SCM processes. Applying a new SCM approach that replaces existing systems will not be attractive or cost-effective.

∑ Developing SSCM tools and strategies must be linked to best practice methods in general SCM where possible, in order to gather business credibility and support business efficiency goals.

∑ SSCM tool development needs to be kept simple and should be adaptable to the supply structure of specific companies. Breakdowns of tool inclusiveness should include:

∑ service versus product outputs of companies;

∑ the range of supplier sourcing (global versus local/regional);

∑ common product groups for materials purchasing;

∑ relative distance in the value chain to the end consumer;

∑ size of supplier base;

vorganisational responsibilities for supplier relationships.

These questions can provide a guide to the necessary elements of SSCM strategy targeted for specific companies, rather than providing an over-specified system that will be unattractive and complicated for the target company.

∑ There is a need for further research into SSCM tools and strategies, as well as a better understanding of successful and unsuccessful SCM developments at company level. Only with more a concise understanding of the issues can effective tools be developed.

6.0

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Appendices

Appendix I: Contacts and Interviewees
Appendix II: Questionnaire to companies
Appendix III: Questionnaire to governmental bodies
Appendix IV: Case Studies.

APPENDIX A: CONTACTS AND INTERVIEWEES

The list below contains the names of people who have been planned to be contacted for this research. It has been marked where despite several attempts, the contact was not possible.

Name	Position (if known)	Organization	Sector	Type of contact
Annabel Gaywood	PA to director	IHEI	Leisure and Tourism	Contacted Sent info, but no questions answered
?		Chartered Institute of Purchasing and Supply	SCM & auto	Not Contacted
A.M.M. Asens		TNO Institute of Environmental Science, Energy Research and Process Innovation	Environmental purchasing	Out of office
Adrian Robinson	Consultant	Renewable Energy Company	Utilities	Contacted Some information
Alan Knight	Environment Director	B&Q	Retail	Blocked from contact, but sent information
Andrew Collins	Purchasing Manager	North West Water	Utilities	Contacted Interviewed
Andrew Fearne	Editor	Supply Chain Magazine	SCM	Complicated and time consuming procedure of request
Anna Granholm-Thoren		SJ Environmental Unit	SCM & rail transport	Interviewed
Arnie Vetter	Environmental consultant		Building and Construction	Contacted Required consulting fee
Barbara Morton	Co-ordinator	Environmental Supply Chain Management Forum Manchester School of Management	University, Environmental SCM	Interviewed
Bob Andrew		DETR, Green Purchasing Unit	Central government	Answered by e-mail

Name	Position (if known)	Organization	Sector	Type of contact
Carl Mead		Nortel Networks	SCM & telecommunications	Contacted No info due to company procedures
Chris Rowat		Institute of Logistics	Logistics	Contacted but no information
Chris Spray	Environmental Manager	North West Water	Utilities	Contacted Interviewed
Chris Sweda	UK deputy Environment Manager	RMC aggregates	Building and Construction	Contacted Interviewed
Christer Herrstrom		Telia	Telecommunication	E-mail No response
Claire Dynan		English Tourism board	Leisure and Tourism	Contacted Referred to industry names
Claire Williams	Environmental Manager	BAA	Building and Construction	Contacted Interviewed
Dan Green	Environment Manager	Wessex Water	Utilities	Contacted On holiday, then no response
Daniel Waller	Consultant	The Housing Forum	Building and Construction	Contacted Referred to contact names
Dave Copeland	Consultant	Earth Centre	Building and Construction	Contacted Interviewed
David Buck	Business Network Broker	Business Link Hampshire	Business Advice Centre	Interviewed
David Burt		Cellnet	SCM & telecom	E-mail but no response
David Miller		Durham County Council Environmental and technical services dept	Local government	Interviewed
Deborah Blackburn		Jaguar Cars Ltd	SCM & auto	Holiday
Diana Montgomery	Environmental Manager	Centrica	Utilities	Contacted Interviewed
Dr Balinda Howell		Business in the Environment	NGO	Interviewed
Geoff Barlow	Environment Manager	Rohm and Hass UK ltd	Chemicals	Contacted (late) Not enough time to gather information
Graham Fronnell	Manager of Supplier Development Group	Vauxhall Motors Ltd	SCM & auto	Interviewed

Name	Position (if known)	Organization	Sector	Type of contact
Jacquetta Lee		Rolls-Royce plc		Answer via e-mail
James Farrar	Environment consultant	BA	Leisure and Tourism	Contacted Return calls missed
Jason Perks		SG3 Consultants (Vauxhall Motors)	SCM & auto	Contacted but no response
Jayn Harding	Environmental Manager	Sainsbury	Retail	Contacted Interviewed
Jill Ransom Lena Prip		Dell	Consumer Electronics	Out of office
Jim Hopwood	Technical manager HSE	ExxonMobil	Chemicals	Contacted Interviewed
Joe Marchado	Sustainability manager	Shell Chemicals	Chemicals	Contacted Did not have enough information
Johan Gerklev	Environmental Manager	Skanska	Building and Construction	Emailed Missed contact
John Easton	Environmental Manager	BASF	Chemicals	Interviewed
John Hill	Environmental Director	TXU Europe	Utilities	Contacted Not interested
Joy Boyce		ICL	SCM & electronic components	E-mail but no response
Julie Frew Barry Dambach Arjen Salemink	Sales Support Manager	Lucent Technologies	SCM & telecommunication	Contacted Interviewed
Justin Woolford	Tourism policy officer	WWF	Leisure and Tourism	Contacted Referred to industry contacts
Keith Richards	Legal consultant	ABTA	Leisure and Tourism	Contacted Referred to contact names
Kieren Mayers Andy Baynes Dr. Huesmann		Sony	Consumer electronics	Contacted Holiday
Lars Petterson		Scandic Hotels	Leisure and Tourism	Contacted Did not have information
Leah Corr		The Green Supply Chain Network Center for Environment and Safety Management for Business	University	Interviewed

Name	Position (if known)	Organization	Sector	Type of contact
Lise Jensen	Environment department	Thames Water	Utilities	Contacted Asked for email – no reply to questions
Mads Bergendorf		DSB (Danish Railways)	Rail transport	Interviewed
Marianna Muller		European Commission DG Internal Market	International rules	Out of office
Mark Cannon	Environmental Manager	Cable & Wireless Communications	SCM & telecom	Interviewed
Mark Sharfman	Associate Professor	University of Oklahoma's Michael F. Price College of Business and Science and Public Program	University, LCA oriented management	Interviewed
Martin Hunt	Sustainability consultant	CIRIA	Building and Construction	Contacted Referred to contact names
Michael Galley	Manager of Environmental Affairs	Vauxhall Motors Ltd	SCM & auto	Interviewed
Nicola Lazarus	Consultant	BioRegional	Building and Construction	Contacted Interviewed
Paul Monaghan		The Co-operative Bank plc	Finance Integration of ethics	Interviewed
Paul Philips		Sharp Electronics	Electronics	Answered by email
Peter Arnfalk	Researcher	International Institute for Industrial Environmental Economics	SCM & telecom	Contacted Forwarded to Telia
Peter Taylor		South-East England Development Agency (SEEDA)	Regional government	Interviewed
Prof Ab Stevels		Philips Consumer Electronics		Consumer Electronics Interviewed
Prof Lars Hansson			Rail transport	Out of office
Prof Martin Christopher Prof Alan Harrison		Cranfield Centre for Logistics and Transportation	Marketing and Logistics	Interviewed Not contacted
Prof Richard Lamming		Centre for Research in Strategic Purchasing and Supply	SCM	Holiday
Richard Mellish	Head of Green Government Team	DETR, Sustainable Development Unit	Central government	Interviewed

Name	Position (if known)	Organization	Sector	Type of contact
Richard Parnaby	Lecturer	University of West England	Building and Construction	Contacted Referred to contact names
Robert Guillemin	Environmental Purchasing Co-oridnator	Connecticut Department of Administrative Services	Regional government	Interviewed
Robin James	Environmental Manager	BT	SCM & telecommunications	Interviewed
Ron Donmall	General Manager	Regional Supply Network	SCM	Not Contacted
Rowland Hill	Environment Manager	Marks and Spencer	Retail	Contacted Interviewed
Sally Uren	Environmental Managing Consultant	Stanger	Building and Construction	Contacted Sent information
Stephen Charter			Building and Construction	Emailed No response
Steve Beckett-Doyle		London Borough of Sutton	Local government	Answered by e-mail
Steve Bushnell		IBM	Electronics	Holiday
Steve Elliot	Consultant	Chemical Industries Association		Chemicals Interviewed
Suzy Edwards	Environmental Consultant	Building Research Establishment	Building and Construction	Contacted Interviewed
Tom Massey	Environment manager	Innogy UK	Utilities	Contacted Interviewed
Ulla Ahrlin Jan Norde		Schenker - BTL	Logistics	Interviewed
Ursula Tischner	Director	Ec(o)ncept	SCM	Interviewed

APPENDIX B: THE QUESTIONNAIRE SENT TO COMPANIES

Sustainable Supply Chain Strategy and Management (SIGMA project)

The Centre for Sustainable Design (CfSD -- http://www.cfsd.org.uk) is currently undertaking a research project looking at Sustainable Supply Chain Strategy and Management. In particular, we are looking at how organisations manage their supply chains and how they integrate ethical, environmental, and social (sustainability) issues into their supply chain management approaches and practices. As part of this research, we have prepared this questionnaire. We hope you will take a few minutes to help us by answering these questions.

{This research is part of Project Sigma <http://www.bsi.org.uk/sigma>, which aims to investigate the feasibility of developing sustainable (triple bottom-line) management systems}.

Questionnaire:

1. **What would you describe as Supply Chain management in your organisation?**

2. **Which business function or position:**
   a) "owns" the Supply Chain management process in your organisation?
   b) formulates Supply Chain management strategy?

3. **What are the sustainability (social, ethical and environmental) issues for Supply Chain management in your organisation?**

4. **Which business functions in your organisation are involved with implementing sustainability (social, ethical and environmental) issues in the Supply Chain? Please rank in order of involvement (1=most involved, 10=no involvement):**
   - ∑ Environment/EHS
   - ∑ Logistics
   - ∑ Transport/Distribution
   - ∑ Purchasing
   - ∑ Procurement
   - ∑ Training and Development/Personnel
   - ∑ Research and Development
   - ∑ Manufacturing
   - ∑ Marketing/Sales
   - ∑ Supply Chain
   - ∑ Other:

5. **How does your organisation manage sustainable Supply Chain issues?**

   a) What tools do you use?

   b) Do you have any metrics and/or measurement techniques?

   c) What benefits have you achieved?

   d) What problems have you encountered?

6. **Who do you consider to be:**

   a) The leaders in implementing sustainability into Supply Chain management?

   b) The centres of expertise in sustainable Supply Chain management?

7. **If you have any further thoughts on sustainability and the Supply Chain, please list these below:**

Thank-you for your co-operation.

APPENDIX C: THE QUESTIONNAIRE SENT TO GOVERNMENTAL BODIES

Sustainable Supply Chain Strategy and Management (SIGMA project)

The Centre for Sustainable Design (CfSD -- http://www.cfsd.org.uk) is currently undertaking a research project looking at Sustainable Supply Chain Strategy and Management. In particular, we are looking at how organisations manage their supply chains and how they integrate ethical, environmental, and social (sustainability) issues into their supply chain management approaches and practices. As part of this research, we have prepared this questionnaire. We hope you will take a few minutes to help us by answering these questions.

Governments make extensive use of product and service suppliers, from office equipment and supplies to major infrastructure construction. Therefore, governments are involved with extensive supply chains and the social, ethical and environmental issues associated with them. This questionnaire aims to explore how different levels of government, in different countries, manage these issues.

{This research is part of Project Sigma <http://www.bsi.org.uk/sigma>, which aims to investigate the feasibility of developing sustainable (triple bottom-line) management systems}.

Questionnaire:

1. **What would you describe as Supply Chain management at your level of government?**

2. **Which department/position:**
   a) "Owns" supply chain issues at your level of government?
   b) Formulates supply chain management policy/strategy?
   c) Is responsible for 'sustainable' supply chain issues (env, social, ethical)?

3. **What are the 'sustainability' issues (env, social, ethical) in the supply chain for your level of government?**

4. **Which departments are involved in implementing 'sustainability' (env, social, ethical) issues for Supply Chain management at your level of government?**

5. **How does your level of government manage 'sustainable' Supply Chain issues?**

   a) What tools do you use (for targeting, selecting, working with and evaluating suppliers)?

   b) Do you have any metrics and/or measurement techniques (for targeting, selecting, working with and evaluating suppliers)?

   c) What benefits have you achieved?

   d) What problems have you encountered?

6. **Who do you consider to be:**

   a) The leaders in implementing sustainability into Supply Chain management?

   b) The centres of expertise in sustainable Supply Chain management?

7. If you have any further thoughts on sustainability and the Supply Chain, please list these below: