DEVELOPING A SUSTAINABLE SUPPLY CHAIN MANAGEMENT FRAMEWORK

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ABSTRACT
Firms operating within supply chains need to understand and consider whether their respective supply chains are sustainable or not. Sustainable supply chain relates to supply chain issues that can range from child labour and exploitation of workers at suppliers’ premises on one hand to ozone depletion, deforestation and global warming on the other. These sustainability dimensions can be analysed through 3 main perspectives which are according to mainstream sustainability framework: the environmental, social, and economic consideration. In order for a supply chain to be sustainable, there is a need to balance these three proposed dimension of sustainability.

The purpose of this paper is to develop a framework to assess the sustainability of any supply chain based on the three sustainability dimensions of the environment, social and economic requirements. It is expected that based on these 3 sustainability dimensions, the characteristics for sustainable supply chain can be defined and proposed for further empirical research.

KEY WORDS
Sustainable, Supply Chain Management, Theoretical

1. Introduction
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, need to understand the 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 economic 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/economic criteria), purchasing guidelines and supplier partnerships, and development.

2. Objective
The purpose of this research is to provide an overview of the advanced techniques in SCM and SSCM, and an overview of the application of SSCM. The initial conclusions from discussion are aimed at providing stimulus for discussion and to provide a baseline for the remainder of the Supply Chain Performance Evaluation research stream. The results of the research will then act as an input into the overall research that aims to examine the feasibility of developing a sustainable supply chain management system for public and private organisations.

On a more detailed level, the objectives of this research are defining SSCM and developing the metrics to measure SSCM performance.

3. Literature Review
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. [1]

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 organization performs to ‘add value’ to its products or services for its customers [2]. 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 points 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. 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.’

Moreover, the definitions of Supply Chain Management (SCM) differ across authors as shown in the following Table.

<table>
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<tr>
<th>Authors</th>
<th>Definition</th>
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<td>Jones and Riley (1985) [3]</td>
<td>“Supply chain management deals with...”</td>
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                                 (1) The supply chain is viewed as a single process. Responsibility for the various segments in the chain is not fragmented and relegated to functional areas such as manufacturing, purchasing, distribution, and sales.  
                                 (2) Supply chain management calls for, and in the end depends on, strategic decision making. “Supply” is a shared objective of practically every function in the chain and is of particular strategic significance because of its impact on overall costs and market share.  
                                 (3) Supply chain management calls for a different perspective on inventories which are used as a balancing mechanism of last, not first, resort. A new approach to systems is required – integration rather than interfacing. |
| La Londe and Masters (1994) [6] | Supply chain strategy includes: “...two or more firms in a supply chain entering into a long-term agreement; ...the development of trust and commitment to the relationship; ...the integration of logistics activities involving the sharing of demand and sales data; ...the potential for a shift in the locus of control of the logistics process.” |
| Cooper et al. (1997) [7]       | Supply chain management is “...an integrative philosophy to manage the total flow of a distribution channel from supplier to the ultimate user.” |
| Monczka, Trent, and Handfield (1998) [8] | SCM required traditionally separate materials functions to report to an executive responsible for coordinating the entire materials process, and also requires joint relationships with suppliers across multiple tiers. SCM is a concept, “whose primary objective is to integrate and manage the sourcing, flow, and control of materials using a total systems perspective across multiple functions and multiple tiers of suppliers.” |

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.”

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.

**Sustainable Management**

Sustainability aims to reverse these downward trends. There is a growing consensus that sustainability means achieving a quality of life that can be maintained for many generations because it is:
- **Socially desirable**, fulfilling people’s cultural, material and spiritual needs in equitable ways.
- **Economically viable**, paying for itself, with costs not exceeding income, and
- **Environmentally sustainable**, maintaining the long-term viability of supporting ecosystems.

The three dimensions of sustainability.

Sustainability will entail integration of these three objectives where possible, and making hard choices and negotiating trade-offs between objectives where integration is not possible. These negotiations will be greatly influenced by factors such as peace and security, prevailing economic interests, political systems, institutional arrangement and cultural norms. For example, the role of women in shaping policies and action may be more restricted in Muslim countries, and the ability of the public to participate in this process may be more limited under authoritarian systems. There is no blueprint for sustainability. It needs to be defined to meet and respect the particular needs and circumstances of individual countries, societies and cultures.

Traditionally, societies have attempted to set social, economic and environmental goals, but often in isolation from one another. Thus, nature conversation targets have been set without regard to the goals for economic growth or poverty reduction. The result has been the creation of short-lived ‘green islands’ in a sea of sustainability. Decision-makers are now becoming aware that environmental goals can be achieved by integrating them into mainstream social and economic policy-making.

Accordingly, sustainability involves three broad interacting realms or in the other words “triple bottom line”: environment, economics, and social equity. These triple bottom lines could be called the environmental imperative, the social imperative, and the economic imperative. It has been said that “These three aspects are in separable and our ability to develop deeper understanding of this linkage is critical to our prospects for our sustainability [9]

**SSCM**

Sustainability is in itself a complex concept and supply chain management is usually a complex management process. Bringing these two together certainly does not add clarity to the sustainability discussion. Nevertheless this is where business, value creation and sustainability meet reality, in difficult-to-manage and increasingly globalised and commoditised supply chains. Sustainability in the supply chain is fundamentally about identifying problematic social, environmental and ECONOMICAL issues throughout the supply chain, assessing their impact and risks, and then trying to improve them.

Traditional supply chain management focuses on the streamlining of the supply chain by cutting down on supplier numbers, reducing the collaboration costs and getting better deals with the remaining suppliers. The main aim has been cost-cutting and the tools used focus on logistics, IT and systems thinking. Many companies have experienced that an additional mechanism is needed to ensure that suppliers also meet certain standards within environment, health and safety (EHS), and more recently within human and labour rights. Companies do this in order to protect the brand value of their own EHS and sustainability work and to satisfy demands from their customers. The main objective is to maintain control with the associated difficulties of establishing exactly what to control and ensuring that the costs are kept at a level where the company is still competitive.

The framework for this is also systems thinking, and the tools used are checklists and audits. On the other hand, dealing with the supply chain provides a strategic opportunity to learn more about both current and future markets. Many companies have started to look more strategically at supply chain management as a source of innovation. Rather than seeing supply chain management as merely a control and cost cutting concept, these companies look for partnerships in specific supply chains, have relatively few suppliers and put the emphasis on the values and vision that bond such partnerships together.

Many companies, NGOs and authorities agree that it is important and necessary to aim at achieving sustainability in all stages of the supply chain. If this is the case why doesn’t it happen to a far greater extent? There are few obvious reasons:
Sustainable supply chain management is still too complex and there is too little knowledge available. Sustainability itself is an ambiguous concept, thus the idea of creating sustainability in the supply chain is one that provides a serious management challenge.

There are no easy win-win scenarios. The consumer market is not really interested in sustainable supply chains. It appears to add control cost and even for the last company in the supply chain it is impractical to add the cost to the price unless you can get a brand premium.

There are no low-hanging fruit. Unlike the early introduction of environmental management, where to some extent savings on resources and waste taxes could balance efforts, the low-hanging fruit for sustainable supply chain management are not yet ripe. And the environment-related fruits have been picked already.

Fear of NGOs. Partnerships between business and NGOs may be a way to get things going. The majority of business, however, still have a simple, antagonistic view of NGOs and vice versa.

Companies are generally too small to matter. Even for international companies it take a lot of effort to make supply chains more sustainable. When it comes to commodities, no business alone can accomplish the changes needed.

The business of business is business. Unless there is a clear indication that dealing with sustainability in the supply chain will benefit business, it will take more than just business and NGOs to make it roll.

The long-term/short-term perspective. Working with sustainability is for long-term reasons, while business – especially during recessions - pursue short-term economical interests.

Ultimately, sustainable supply chain management should add value to the consumer, with the consumer rewarding that value with a (small) price premium. However, environmental and social values are normally not ‘visible’ for the consumer and sustainability is not a visible product quality that sells by itself. Currently consumerism is geared more towards materiality than values, and at best consumers punish companies for doing wrong rather than rewarding them for doing well. Thus balancing between cost and control can become precarious and often unviable in business terms, unless you have a brand to protect.

Sustainability in the supply chain requires more than just the producer involvement, and goes beyond the businesses in the supply chain. Supply chains today are increasingly global and the outsourcing of production to countries with cheap labour, differing values, and human and labour rights issues is part of the picture. In addition, factors such as international institutions and regulations and the development need of countries targeted for outsourcing add to the complexity of the issue. Partnerships between business and NGOs are important to help identify the problems and bridge the knowledge gaps, as well as find the relevant stakeholders and ensure that long-lasting solutions are forged.

Sustainability in the supply chain is not a one-size-fits-all concept, applicable to anyone. It is a journey with its own learning curve. The concepts are taken up slowly inside companies and rewarded externally even more slowly. But time must be invested in building transparent and democratic relations between stakeholders for significant changes to be achieved. At this point, companies can manage their risk, whilst getting new insights into the process and finding business opportunities.

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’[10], the vast majority define this in terms of ‘environmental sustainability’ or more specifically environmental management. Most efforts to integrate social, economical, and environmental issues into SCM have so focused on environmental issues. From this has developed terms such as supply chain environmental management [11] 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 economical issues, a few organisations, such as BandQ, Co-operative Bank and The Body Shop in the UK, and Ben and Jerry’s Ice Cream (now part of Unilever) in the US, are looking at social and economical issues in their supply chains, alongside environmental issues. For these organisations, SSCM does mean the integration and management of social, economical, environmental and economic issues in their supply chains.

There are numerous definitions of the terms “Sustainable” and “Supply Chain” Management of raw materials and services from suppliers to manufacturer/service provider to customer and back with improvement of the social and environmental impacts explicitly considered. [12]

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 supply chain, environmental, social, and economics aspects. Below are some examples:

(i) Supply chain issues:
- Order lead-time;
- Capacity utilization;
- Measures for delivery performance evaluation;
- Supply chain and logistics cost;
- etc.

(ii) Environmental issues:
- natural resource use;
- emissions;
- waste;
- hazardous substances;
- energy use;
- loss of biodiversity and deforestation;

- nuclear radiation;
- ozone depletion;
- global warming;
- etc.

(iii) Social issues:
- the role of the company to the local community;
- direct and indirect employment in developing countries;
- investment in education/training;
- etc.

(iv) Economics issues:
- profitability ratios;
- short-term liquidity ratios;
- long-term liquidity ratios;
- etc.

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 literature, 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 economical 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 economical 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 economical issues. For example, BandQ (retail), The Body Shop (retail) and Co-operative Bank (financial services) in the UK and Ben and Jerry’s Ice Cream (now owned by Unilever) in the US have highly integrated social and economical programmes in their organisations which also address issues in their supply chains (alongside environmental issues).

The Example of SSCM Works

Professor Martin Charter, Aleksandra Kielkiewicz-Young, Alex Young and Andrew Hughes from The Centre for Sustainable Design conducted the research about SSCM named ‘the Sixma Project’. The aim of the report is to document six case studies on how organisations have implemented Sustainable Supply Chain Management (SSCM) into their supply chain strategies, highlighting the organisational drivers behind this development, as
well as the state-of-the-art in SSCM tools. The information in this report was gathered through interviews with people within the organisations concerned, with literature used for further background material.

The report highlights the conclusions as follows:

- There is confusion over semantics in the SCM tools, which is likely to add another level of difficulty when working towards a generic business model for SSCM. There are terms that are used in individual organisation’s language, and organisation-based solutions, that are customised to the needs of the individual organisation.

- In the future, it is possible that individual companies will not compete against companies, but rather that entire supply chains will compete against other supply chains. This will require whole supply chains to be tighter and have closer relationships. Adding value through those chains would be a key feature of a successful supply chain management approach.

- SSCM champions are questioning if the current metrics used in supply chain management are adequate to enable a shift towards the ‘triple bottom line.’ They have suggested that rather than present ‘reduction of waste’ or ‘percentage of on-time deliveries,’ metrics should include the number of years that a company has remained a supplier to its customer or the average life span of the customer base. Stable relationships with suppliers building trust mechanisms will make supplier-customer influence easier.

- Environmental management systems (EMS), such as ISO14001, can be a powerful tool for incorporating environmental issues into supply chain management practices and relationships. However, an EMS is only as effective as the underlying corporate culture and the level of commitment that the organisation allow.

- Governmental sustainable supply chain management approaches and tools are restricted by the EU and National procurement rules, particularly regarding the pre-selection of suppliers and postcontractual obligations. The rules force public bodies to concentrate more on tender specification criteria. These criteria are also true for other regulated industries such as the utilities sector in procurement of large cost goods and services.

- Many of the leading organisations do not use the term supply chain, but supply network and engage in managing the supply network.

Moreover, the research stated that the development of SSCM has influencing within the organization by the cross-functional teams are important ways to collect and spread environmental information, as well as access valuable knowledge in the organisation and the supply chain. These approaches also help to spread ownership and responsibility for environmental issues from more than just the environmental departments.

Best practice appears more likely where there are strong communication links between supply chain management and environmental management. This can be accelerated by facilitating informal networks between product buyers or procurement and environment, health and safety.

There is great value in Customer-Supplier partnership arrangements, as a way of sharing learning from the customer to the supplier and the supplier to the customer. A key example is Unipart, where corporate culture and philosophy are very strong. This culture is cascaded down through the organisation to the work that is undertaken with suppliers. This is a sophisticated tool in building supplier relationships and an effective top-down approach to SSCM development.

Third-party tools for evaluating and categorising supplier companies are also useful techniques that can influence the further development of company approaches to sustainable management practices. This is highlighted by the Achilles software tool in the utilities sector, where companies can be chosen for tender purely on the presence (or not) of an Environmental Management System.

There is value in developing champions of sustainable practice who work at the supplier interface. Key examples of success where this has worked has been in Marks and Spencer, where product technologists drive environmental best practice into the supply chain through an interest in the environmental issues and the ability to influence suppliers ‘on-the-ground’. This is a good example of bottom-up approach to SSCM development.

4. Framework and Methodology

A new framework for performance measurement is described. It is based on quantitative and qualitative measurements. Some performances are simply quantitative and can be observed easily. This means that they are easily understood as they are usually represented numerically, such as cost represented by money. It is no doubt understood that a lower cost would be preferred in most cases. Other common criteria are cost and resource utilisation, which are the first and are believed to be the most important measures for most people. Qualitative criteria, such as trust and visibility, which are more conceptual, also have an influence on the performance.
Quantitative measurements, such as cost and resource utilization are direct concepts which can be immediately related to how they are judged. Cost should be kept as low as possible, and resources should be kept to an optimum amount for effective use.

Some other factors are recognised and understood to be important for performance; however, it is difficult to quantify them. Many quality assurance systems have been launched to approve products or services as meeting the above standard. The measurements should be quantified as time and accuracy. Details of these measurements will be discussed in the following section.

In the environment of supply chains, the involvement of different companies has also relied on their trust and visibility. These two concepts have not been discussed in detail in previous work. They are also qualitative, but can be measured. Two other concepts are also the current issue in any business, they are the flexibility and innovativeness. They are still new issues and can be investigated for the development of a good supply chain.

5. Empirical Results

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.

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.

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Specific Supply Chain Indicator

According to the previous section, the customer satisfaction is one of the effective SCM performance measures. To understand more about the customer satisfaction, the definition of satisfaction must be defined.

In 1987, Kotler and Clarke defined the satisfaction as the state felt by a person who has experienced a performance (or outcome) that has fulfilled his or her expectations. Satisfaction is thus a function of relative levels of expectation and perceived performance…Expectations are formed on the basis of past experiences with the same or similar situations, statements made by friends and other associates, and statements made by the supplying organization.

Satisfaction was defined by Oliver (1997) as the consumer’s fulfillment response. It is a judgment that a product or service feature, or the product or service itself, provided (or is providing) a pleasurable level of consumption-related fulfillment, including levels of under- or over-fulfillment.

From the above definitions, it can conclude as customer satisfaction considers the fulfillment response. This satisfaction fulfillment should be the performance of the order management process from the time the order is taken through to the time the product is delivered to the customer. Then, the Delivery In Full and On Time (DIFOT) will be recommended as the supply chain performance measurement.

Specific Social Indicator

The transparency, companies are facing increased demands for transparency and growing expectations that they measure, report, and continuously improve their social, environmental and economic performance. Companies are expected to provide access to information
on impacts of their operations, to engage stakeholders in meaningful dialogue about issues of concern that are relevant to either party and to be responsive to particular concerns not covered in standard reporting and communication practice. Leadership companies are also investigating various types of audit and verification as a further means of increasing the credibility of their transparency and reporting efforts. Increasingly, demands for greater transparency also encompass public policy; stakeholders want to know that the way companies use their ability to influence public policy is consistent with stated social and environmental goals. As part of this move toward greater disclosure, many companies are putting increasingly detailed information about their social and environmental performance -- even when it may be negative -- onto their publicly accessible websites.

**Specific Economic Indicator**

The key metric driving the performance improvements, **C2C or cash conversion cycle**, is a composite metric. It has been described as “the average days required to turn a dollar invested in raw material into a dollar collected from a customer” [13]. Dell’s cash management has resulted in a negative cash conversion cycle that has improved from four days in 1997 to 30 days in 2001. It is argued that with a negative C2C, the Dell model will generate cash, even if the company was to report no profit whatever [14]. Existing definitions of C2C are not always consistent. Definitions can range from a general statement, such as “C2C is a composite metric describing the average days required to turn a dollar invested in raw material into a dollar collected from a customer” to the simple description that C2C reflects “the length of the time between cash payment for purchase of resalable goods and collection of accounts receivable generated by sale of these goods” [15]. A later definition uses the operating cycle as the primary criteria stating, “the cash conversion cycle measures the number of days the firm’s operating cycle requires costly financing to support it. You can think of the operating cycle as the number of days sales (are) invested in inventories and receivables” [16].

**Specific Environmental Indicator**

Product stewardship and life-cycle assessment is increasingly being used as a way of ensuring supplier and buyer organisations and the sourcing of raw materials are meeting ethical guidelines. The Body Shop, for example, undertakes a life-cycle assessment for all suppliers of raw materials. The focus of the assessment is on origins of feedstocks, methods of extraction and cultivation, processing, resource consumption, waste generation, and distribution [17]. Unilever has also conducted life-cycle assessments for several of its key products: tea, frozen vegetables, ice-cream, margarine and tomato-based sauces [18].

The extent to which environmental factors are integrated into management decisions varies. For example, all the large banks have implemented a number of internal environmental policies and programs, including: efficient energy and water management, recycling and sponsoring community-based environmental initiatives. However, many of these are ad hoc and do not appear to form part of an overall business strategy. The recent PriceWaterhouseCoopers UNEP (2000) Financial Initiatives survey found that it was difficult to establish managerial accountability for these programs, their objectives, targets and performance.

Moreover, an increasing number of companies are beginning to ‘green’ their supply chain by working on environmental initiatives with their suppliers. Examples of supplier environmental management include screening suppliers for environmental performance, working collaboratively with suppliers on green design initiatives and providing training and information to build suppliers’ environmental management capacity. It is becoming more common for companies to include ISO 14001 compliance as a minimum standard in their procurement policies. Several multinational companies, such as Ford, now require that all suppliers with manufacturing facilities become ISO 14001 certified. Other companies adopting this approach include SouthCorp (a wine producer), which has committed to reject grapes from growers who by 2005 have not implemented ‘worlds best practice’ salinity controls and water quality measures, and Unilever, which has committed to sourcing all its fish from sustainable sources by 2005.

Then this research, the waste management and environmental standard policy will be used as a performance measurement.

6. Conclusions and Extensions

This research investigated the environmental, social and economic impacts in supply chain management (SCM), and how different organisations are addressing the issues of sustainable development. The main finding of the research is a lack of clarity in the definitions and scope of the terminology used in SCM and sustainable SCM. The 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’.

Another finding is 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.

On the other hand, social and economical management strategies have appeared most commonly in the retail sector, where customers consist of the general public and social and economical 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 appears to be the amount of buy-in from senior management. The further research is needed to determine a more thorough understanding of SSCM practices and tools of performance measurement.

References