Green light for greener supply

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Greener supply in manufacturing: a sub-optimal and uneven performance

Authors writing on the role of supply chain management in manufacturing companies have regularly highlighted the transformation the function is going through, a transformation which is making it a corporate function of growing strategic importance (Hall and Braithwaite 2001, Schary and Skjott-Larsen 2001, Baily et al. 1998, Dobler and Burt 1996). At the same time scholars have been exploring the contribution supply chain management could make to environmental protection initiatives (Lamming et al. 2001, Carter and Dresner 2001, New, Green and Morton 2000, Walton, Handfield and Melnyk 1998). Occupying an important boundary-spanning role, supply chain management could become a major change agent by starting and coordinating upstream internal and downstream environmental initiatives. It could even initiate a green multiplier effect by requiring suppliers to achieve certain environmental standards in their products and processes. These environmental credentials could then be used to gain additional business from new customers and thus spread environmental know-how into the supply chains of other manufacturers (Preuss 2001).

Evidence for an active environmental involvement of supply chain management has been found in studies of large, highly visible companies (see the examples of Xerox, Digital Computers, Procter & Gamble, IBM and B&Q in Russel 1998, and of British Telecom, Ciba, London Underground and B&Q in Lamming, Warhurst and Hampson 1996). There is also tentative evidence of a green multiplier effect: a chemical plant, a manufacturer of pigments located in Scotland, had traditionally bought a hazardous chemical in fibreboard kegs. Together with the supplier, the company developed a returnable container which cuts out the need to landfill 30,000 contaminated kegs a year and also discharges straight into the equipment thus significantly reducing operator exposure to the chemical. Within a short time the innovation has become industry standard (Preuss 2001).

However, when a wider spectrum across manufacturers of different products and sizes is studied, a less sanguine picture emerges: While they demonstrate some environmental awareness, most supply chain managers are not significantly involved in environmental initiatives. The examples above are exceptions rather than the rule and they are furthermore concentrated in specific sectors, which are in the public limelight because of their environmental performance, such as electronics, chemicals and paper making (Russel 1998, Hill 1997, Green, Morton and New 1996).

A study undertaken by the author (Preuss 2001) into greener supply at some 30 manufacturers across Scotland found that environmental initiatives in the supply chain were hampered in a number of ways. The environment was included in the supplier selection and evaluation criteria of seven companies only, which means that an above-average environmental performance of a supplier is unlikely to be detected unless the supplier excels in the traditional assessment criteria of cost, quality and delivery too. Supply chain management thus forgoes an opportunity to direct the flow of materials into an environmentally friendlier channel. In terms of information management in the supply chain, procurement managers showed awareness of environmental issues in their supply chains, yet of the issues referred to as important most often – packaging, waste, production materials, paints and solvents – the first two only marginally impact on the environmental performance of the supply chain. Furthermore a gap...
between the environmental issues cited as important by procurement and by environmental and production managers was detected.

In the management of supply chain relationships, an arm’s length approach was found to dominate, where the buying company sets a certain threshold but leaves it to the supplier how it should be met. This echoes the traditional arm’s length relationships in supply chains which were found to be insufficient for modern, more efficient supply strategies, such as just-in-time delivery and total quality management. Environmental initiatives are, of course, not impossible under such a regime, yet the benefits of a more comprehensive approach are often forgone. The complexity of environmental issues may additionally lead to an uneven performance for those companies which seek to address the environment; an active approach in the downstream value chain can, for example, contrast with a marginal involvement in the upstream supply chain.

Thus a discrepancy emerges between the growing economic importance of supply chain management and its often marginal contribution to environmental protection. This is accounted for by acknowledging the reactive nature of the function, where supply chain managers are subjected to a number of continuous constraints, internally to financial targets from the Board of Management and to technical requirements of internal user departments, while external pressures emanate from legislation and customer requirements. This situation is underpinned by performance measurement criteria which emphasise economic factors (Preuss 2001).

This paper will explore obstacles to, and potential avenues for, a greater supply chain management contribution to environmental protection. These suggestions require attention to several levels, ranging from the values of the individual manager and the ways in which these are shaped by business schools and professional bodies, through changes to the organisational hierarchy and structure, including a rewards structure based on more comprehensive criteria and a possible seat on the Board of Management for the supply function, to new modes of supply chain management based on improved dissemination of environmental information, utilising better support tools for environmental decision-making and applying novel ways of organising supply.

Values of supply chain managers

Similarly to most industrialised countries, the Surveys of Public Attitudes to the Environment by the United Kingdom Department for Environment, Food and Rural Affairs and its predecessors document that the state of the natural environment has consistently remained an issue of concern for the British population. In the most recent (1996/7) survey most of the environmental issues, which range from chemical emissions into rivers and the sea, through exhaust fumes and effects of live-stock farming to the decay of inner-cities, attracted a greater level of concern than other failings of British society, such as health and social services, education and unemployment.

Strong public concern over environmental issues has important repercussions for industry. On the one hand, increasing regulation looms while, on the other, some employees might see opportunities to push new ideas along. For example, the idea of greening the supply chain by requiring suppliers to undergo accreditation for an environmental management standard is gaining currency in manufacturing. The purchasing manager of an electronics contract manufacturer in the Scottish sample stated that currently the supply base of accredited companies is too small to make such a requirement viable, “although I think that point in time will come, the same as ISO 9000,” (the quality standard which is today expected of many suppliers).

One avenue for greener supply is thus to strengthen a manager’s personal responsibility for the natural environment. While the environment has become a topic of greater public interest in recent decades, managerial thinking has seemingly not kept pace. A study of top and middle managers in the UK automotive industry (Fine-man 1997) found that respondents’ personal environmental concerns range only from non-existent to mild interest. The majority of managers (it is not known whether the sample included supply chain managers) did not feel that it was up
to them personally to do something, nor that the environment had any special meaning to them due to their position in the car industry. This applies even to managers with a special responsibility for environmental affairs.

Environmental initiatives in the supply chain, research by Drumwright (1994) found, require two types of employees: ‘policy entrepreneurs’, who enthusiastically champion the ideas, often working outside their formal job responsibilities, and ‘converts’, who after initial resistance become convinced of their merits. Notably, in her study procurement managers were not represented in either group, rather in some cases they were referred to as resisters. Against a backdrop of general managerial disinterest, one could thus conclude that supply chain managers are even less likely to take up the environmental challenge than most of their colleagues.

This disinterested attitude to the environment is, at least in part, created during the education process of prospective managers, as business schools typically pursue a mechanistic approach with an emphasis on quick answers and a narrow focus on ‘technical’ management issues rather than on the wider social context. In 1988 a study of teaching and research at US business schools (Murphy 1992) concluded that graduate business schools did not have on offer any established courses on the management of environmental issues. If the environment was discussed at graduate level at all, this happened in classes on business and society, business law or business ethics, with the first two stressing the influence of environmental compliance on business strategy. Ten years later, there was some progress, in that most schools today offer at least one elective on the environment (Finlay, Bunch and Neubert 1998). However, only 16% include the environment in the core curriculum and the inclusion of environmental concerns into specialisms, like marketing or finance, is even rarer. “Thus most MBA students are not trained, either as generalists or specialists, to consider the natural environment as a key factor in business decision-making” (Bunch and Finlay 1999: 71).

The hurdles cited by lecturing staff and administrators for including environmental courses are numerous. Demand is low, as corporate recruiters hardly ever refer to environmental knowledge in job advertisements or interviews. Since MBA students are particularly concerned with improving their employability, they then do not select such courses. Teaching staff lack familiarity with the subject, as those with an environmental interest are often younger and receive little support and understanding from more established colleagues. Adding new subjects to the curriculum usually requires dropping others, and environmental matters are rarely considered as warranting such change. The ideological culture of business schools also hampers their adoption, since the environment is usually seen as a social concern, not as a market driver which managers need to understand.

Established managers can turn to their professional associations for help and environmental information, for example the Chartered Institute of Purchasing and Supply, CIPS, in the United Kingdom organised a two-day workshop on environmental issues (Lamming, Warhurst and Hampson 1996). It brought together environmental and purchasing practitioners with the aim of developing new practices for environmental supply. UK charity Business in the Environment and the Chartered Institute of Purchasing and Supply (1997) also produced case study material, which is designed to encourage environmental aspects of supply chain management.

The question remains whether such initiatives are perceived as useful. A survey by Cooper, Frank and Kemp (1997) of CIPS members in the UK asked whether members find their Institute helpful in non-financial aspects of their job. While not specifically referring to the environment, the study included ethical issues in a general sense. The replies, however, are not encouraging, as only 2% of respondents found the current standards and 5% other material provided by the Institute to be useful. Support by professional bodies needs to be improved and is best complemented by other initiatives, including those provided by public sector bodies. Birett (1998) describes initiatives by the regional municipal authorities of Waterloo in Ontario, Canada, who developed a series of initiatives to encourage environmentally responsible buying among local businesses.
It is thus argued that one way in which greener supply can be supported is by encouraging greater awareness and a more active approach to environmental challenges in supply chain managers. This would not only aid greener supply but also bring managerial values back in line with those of the wider society. Such a change in values needs support from business schools and professional bodies, yet both are currently far from using their full potential in addressing the natural environment.

**Changes to organisational structure and hierarchy**

Within the organisation, greener supply can be facilitated by establishing a more comprehensive range of criteria for managerial performance evaluation and by widening the traditionally limited role supply chain management has in corporate strategy making.

The impact of performance criteria on buyer behaviour is illustrated by a purchasing manager (anonymous) of a specialist cable manufacturer:

> “Some buyers can be very, very hard on their suppliers. They see that as their job: my job is to supply at the lowest unit cost. And that is how they are evaluated. If their performance is based on that, then it is too narrow a view, I would say, because a man or a woman will perform to that and if they started to take other considerations in, they would deny the very criteria that measure them”.

In other words, greener supply requires the environment to be one of the criteria by which supply chain managers are measured. In addition to stimulating any latent interest they might have in the natural environment, the inclusion of the environment into the rewards structure would signal to supply chain managers – as well as to their colleagues in other functions and to their superiors – that the environment is indeed an integral part of their professional role.

Given the traditionally lower status of supply chain management in comparison with other corporate functions, another – and perhaps the most efficient – opportunity for strengthening its role in environmental protection is to allow the function to participate in the corporate strategic planning process and to offer it a seat on the Board of Management. Supply chain management can ensure that the organisation adopts a comprehensive environmental strategy which includes the supply chain perspective. Such a comprehensive approach is all the more important since external pressure, in particular consumer pressure, is unlikely to distinguish between the legally separate entities in the supply chain. If a production process is leading to environmental degradation, the branded manufacturer of the product could face the wrath of consumer activists, independently of whether the company itself or one of its suppliers created the environmental damage.

The integration of greener supply into corporate strategic planning should thus lead to improved statutory compliance and to more secure financial and insurance planning, as environmental risks are better understood. It could also bring about an improved organisational image, more customers and a better motivated workforce (McCloskey and Smith 1995).

Access to corporate strategy making may create new problems for the purchasing function (see also Legge, 1995, who makes a parallel claim for the human resource manager to become a member of the Board), as any new function that has gained access to the decision-making forum would need to prove its value by making reference to the established group values and terms. Hence the struggle for legitimisation in the new forum might interfere with the environmental contribution which supply chain management was originally planning to make.

While this might turn out to be a transitional problem, a more formidable challenge lies in the alleged ‘strategic irrelevance’ (Ramsay 2001) of supply chain management. A contribution to profits and cost savings, it is argued, does not yet constitute a strategic contribution, as bought-in knowledge that is readily available in the market place is available to all potential customers.

Building on their notion of core competence as products and processes that competitors find difficult to imitate, Prahalad and Hamel (1990) suggest that if a product, process or service can be produced better by the supply chain than it can
in-house, it is no longer part of the core competence and loses its strategic importance as it is now equally available to competitors (Porter 1985, Venkatesan 1992, Ramsay 2001). In other words, anything supply chain management deals with is from this perspective seen as intrinsically operational and non-strategic.

These arguments, however, are based on too narrow a view of supply chain management. With a shift from traditional arm’s length or adversarial relationships to collaboration a new quality in supply chain relationships has been reached and the more complex relationships can, in effect, establish a barrier to imitation. Rather than merely selecting between the current offers of the market, supply chain managers use inimitable and innovative approaches to develop new supply solutions. They may find that the most capable supplier for a solution does not offer the required product or service and persuade it to change its product portfolio (reverse marketing in the terminology of Blenkhorn and Leenders 1988). Applying such differentiation in the input markets, supply chain management can become a ‘competence release agent’ (White and Hanmer-Lloyd 1999) and make a real strategic contribution that is difficult to imitate.

However, such a supply strategy carries a considerable risk. If a supplier is perceived as being sufficiently different to provide a competitive advantage, it is also likely to be rejected by the market as being too experimental (Lamming 1993). Procurement and supply carry a sense of vulnerability anyway and this is heightened if the
company buys differently to other participants in the market. Thus, the crux of the matters lies less in a necessarily opportunistic behaviour of suppliers who have been ‘reverse marketed’ rather than in the Catch 22, where the supply chain management function is unlikely to rise to such a strategic challenge without top management support, while top management, in turn, is unlikely to support strategic supply initiatives as long as supply chain management is perceived to be of routine operational character (White and Hanmer-Lloyd 1999).

The same scenario applies to greener supply, where supply chain management is unwilling to take on the risks of a more strategic environmental orientation without top management support, and top management is unwilling to encourage a more strategic approach to the environment in a function which is seen as non-strategic in nature. It is argued, then, that greener supply requires the inclusion of ‘softer’ factors, such as the environment, into the performance evaluation criteria for supply chain managers and above all, a greater role in corporate strategy making. Once supply chain management can demonstrate its strategic contribution to the company, it will also be trusted to accept the risks of environmental initiatives. Failing this, the greening potential in the supply chain will be put to sub-optimal use at best.

**New modes of supply chain management**

Further avenues for greener supply can be found by rethinking the ways in which manufacturing supply chains operate. This encompasses three related aspects: first, the collection, analysis and dissemination of environmental information along the chain, second by the decision-making process and support tools for environmental challenges, and third, the changes that can be made to the way in which supply chains operate.

An improved information flow can address some of the shortfalls referred to by the empirical studies. Having established its own values in an environmental policy, the company must communicate these to both its own employees and the supply chain. To check the environmental stand-

ing of the supply chain, pre-qualification criteria and environment-related specifications in the tendering can be used, while a consistent inclusion of the environment into supplier selection and evaluation criteria is of utmost importance. The environment can also be addressed by post-tender contractual obligations (Young and Kielkiewicz-Young 2001). More collaboration with other supply chain members can also be encouraged by measures like training and mentoring for suppliers as well as environmental supplier rewards.

British DIY superstore chain B&Q is a good example here. After it had been criticised by environmental pressure groups for irresponsible sourcing of timber in the third world, it launched a Supplier Environmental Audit. Two main obstacles to better supplier performance were identified. There was a lack of awareness and understanding of environmental issues on the part of suppliers, to which B&Q responded by improving environmental communication, and by organising seminars, conferences and site visits. Suppliers also lacked incentives for tackling environmental issues, to which B&Q responded by making the environment part of the supplier appraisal: since 1994 it has also been giving awards to suppliers of outstanding environmental performance. Such improvements to the information flow can work both upstream and downstream as is illustrated by the Responsible Care initiative of the chemical industry. This requires member companies to “assess the risks associated with our products, and seek to ensure these risks are properly managed throughout the supply chain through stewardship programmes involving our customers, suppliers and distributors.”

Environmental questions are more complex than traditional sourcing issues in that their time scale is longer and the interaction between individual variables more complex. Consequently, addressing environmental issues in the manufacturing supply chain can be hampered by problems inherent in the decision-making process. A number of environmental management programmes have been developed over the years, which include design for environment, life cycle analysis, total quality environmental management and environmental management standards ISO 14001 and
EMAS (cf. Welford 1998). Organisations lack the resources to implement all of these environmental management programmes effectively, and there is also the question of strategic fit, as some alternatives are better suited to a specific competitive and regulatory context.

Management must thus select among environmental management alternatives. To aid such decision-making, tools are needed to structure strategic environmental decisions in a dynamic competitive and regulatory context. Sarkis (1998) developed an analytical network process, which correlates the above environmental management programmes with external factors, in particular with the mode of environmental regulation. The decision-making matrix can evaluate alternative environmental projects, for example, regarding their compatibility with the current regulatory regime. Where environmental regulation operates in compliance mode, ISO 14001 might be best suited, as the major focus of the standard is on compliance, while under a cooperative regulatory approach total environmental quality management might be more fitting, as it is relatively proactive.

In addition to promoting organisational learning and improving decision-making tools, greener supply can also be improved by changes to the current operation of supply chains. Such improvements could follow Shrivastava’s (1995) suggestion that a corporation can contribute to environmental protection by combining a total quality environmental management with ecologically sustainable competitive strategies. A total quality environmental management approach applies a systems perspective and, just like total quality management itself, requires improvements in each stage of the design and production process. On the input side, energy and raw material conservation are encouraged, as well as greater use of renewable materials. This is supplemented by ecologically sensitive purchasing policies and inventory management systems. The production stage focuses on the improvement of production efficiency, thereby minimising waste and reducing cost; the ‘zero defect’ goal in TQM turns into a ‘zero discharges’ or ‘zero risk’ goal. In terms of output, products can be redesigned so that their durability and recyclability improves, which would reduce their cost over the whole life cycle.

One example of a move towards an ecologically sustainable competitive strategy is provided by Interface Floorings Systems, a leading US manufacturer of commercial carpets (Frankel 1998). The company is committed to sustainability; it aims to eliminate waste, reduce emissions and to replace non-renewable sources of energy with sustainable ones. In terms of the supply chain, its “aim is to redesign our processes and products to create cyclical material flows.” On one product range it leases office flooring to the customer instead of selling it. This forces the company to adopt a life-cycle perspective as the repercussions of take-back and disposal need to be considered when the contract is entered into. Hence a much greater supply chain management contribution to environmental initiatives is needed much earlier. Supply chain management is also given further ecological weight in activities such as disposal and value recovery from excess products and reverse logistics.

Another model for sustainable management is offered by the notion of an industrial ecosystem. In analogy to a natural ecosystem, an industrial ecosystem consists of a network of organisations which use each others’ waste and by-products and share and minimise the use of natural resources, thus jointly aiming to reduce environmental destruction. Since all these activities concern upstream and downstream links between organisational supply chains, the industrial ecosystem can, at the macro-level of the regional economy, be perceived as a model for greener supply.

An example is provided by a number of companies in Kalundborg, Denmark, a power plant, an enzyme plant, a refinery, a chemical plant, a cement plant, a wallboard plant and some farms (Tibbs 1993). The companies coordinate the use of raw materials, energy and water as well as their waste management. They also use each others’ waste and by-products as resources. For example, the power plant sells used steam to the enzyme plant and the refinery, fly ash to the cement plant and surplus heat to the city for heating purposes. The refinery supplies the power plant with treated waste water for cooling and sells desulphurised gas
to burn, which saves some 30,000 tons of coal per year. Overall, the coordinated use of materials and energy drastically reduces fresh water consumption, the amount of landfilled waste is minimised, air and water pollution are reduced and energy is conserved. Clearly such an arrangement impacts on many of the tasks the supply chain management function is usually charged with and hence is an encouraging model for greener supply.

Industrial ecosystems and take-back of consumer durables are at the moment not realistic on a large scale, but these examples illustrate both that environmental protection requires novel ways of supply chain management and that the supply chain management function, due to its boundary-spanning role, is set to play a larger role in protecting the environment. The suggestions in this paper have been developed on the basis of a literature review and a study of manufacturing companies within the regional economy of Scotland. This contribution is thus a ‘thought paper’ and further research is needed to empirically verify the above suggestions. We need to study, for example, what impact take-back of office flooring has on the supply chain function of major carpet manufacturers, whether the setting up and running of the industrial ecosystem in Kalundborg, Denmark, did involve the supply chain managers of the respective companies, and whether companies which involve their supply chain management in strategic decision-making indeed show more or more consistent signs of greener supply than companies which do not.

Conclusions

The supply chain management function in manufacturing companies is currently undergoing a tremendous transformation. From a largely clerical role it is mutating into a corporate function of increasingly strategic importance. However, this evolution is not matched by an equally large and consistent contribution to environmental protection, as examples where companies do address the environmental performance of the supply chains predominantly come from large corporations in selected industries which are under public scrutiny, such as chemicals. Yet due to the boundary-spanning role of the supply function, corporate greening efforts are unlikely to reach their full potential without involvement of supply chain management.

This paper has offered some suggestions for increasing the supply chain management contribution to environmental protection, beginning with changes to personal values of managers. This is all the more important as managerial values regarding the environment are already lagging behind those of society in general. Business school education and support from professional bodies could play a role in changing managers’ values, yet currently their potential for environmental initiatives is far from being used. Conversely the influence of business school education, with an emphasis on short-term projects of quantifiable contribution, may be one of the reasons for the marginal involvement of supply chain management in environmental initiatives.

Greener supply furthermore requires changes to organisational structure and hierarchy. Performance measurement for supply chain management needs to move away from exclusively using ‘hard’ financial data and should include ‘softer’ criteria, such as concern for the environment. Supply chain managers should be allowed to play a greater role in the corporate strategic planning process and be given a seat on the Board of Management, otherwise the important contribution supply chain management could make to environmental protection will be utilised sub-optimally at best.

Improvements to the actual supply chain interaction can aid greener supply too. A first aspect here concerns improved information dissemination in the supply chain. Managerial decision-making criteria in the face of the complex nature of environmental challenges need further research to assure an optimal approach. The environment also needs to be addressed by a consistent inclusion of green issues in the supplier assessment and evaluation criteria. Finally, new modes of supply chain management should be explored, which could include product take-back at the level of an individual company and, at a regional level, an industrial ecosystem as a model for green supply.
Notes

2. See the B&Q website http://www.diy.com
3. The initiative was launched by the Canadian Chemical Producers Association and has since been adopted by chemical industry associations in most industrialised countries, including the Chemical Industries Association in the UK and the European Chemical Industry Council, CEFIC. http://www.cia.org.uk/industry/care.htm http://www.cefic.be/activities/hse/rc/
4. Shrivastava’s model contains two further elements: technology-for-nature swaps, where Western corporations could offer advanced know-how on environmentally friendly technology in return for increased efforts to conserve the natural environment in developing countries; and corporate population impact control, where Western corporations are encouraged to contribute to population control by, for example, using their extensive distribution channels in developing countries to propagate lower birth rates. These two suggestions are more idealistic and more difficult to defend than the first two, hence the discussion is limited to the first two suggestions.

Bibliography


