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# Sustainability and business-to-business marketing: A framework and implications

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ABSTRACT

Researchers in several business disciplines have convincingly argued that environmentally responsible strategies can contribute to competitive advantage and superior financial performance. While debates on ecological conservation and environmental practices within marketing have raged for over three decades, much of the focus has been on identifying and targeting the environmentally-conscious consumer. Less attention has been given to marketing's role in a green supply chain and its interface with environmentally-friendly manufacturing and operations. We integrate disparate streams of research and develop a broader framework to understand the appropriate role and focus of business-to-business marketing in the supply chain for achieving environmental sustainability objectives. We identify three major strategies – the reduction of surplus supply of products, reduction of reverse supply, and internal marketing – where marketing's role in environmental sustainability is crucial for achieving superior competitive advantage and financial performance.



## 1. Introduction

The idea of a sustainable link between business and environment, initially proposed about two decades ago, revolves around the central thesis that the goals of environmental conservation and the goals of business need not be disparate and conflicting (Barbier, 1987; Hawken, Lovins, & Lovins, 1999; Holliday, Schmidheiny, & Watts, 2002; World Commission on Environment and Development, 1987). Proponents of environmental sustainability have now taken this thesis one step further with the argument that environmentally-conscious and ecologically-friendly strategies could, in fact, lead to competitive advantages and superior financial performance (Engardio, 2007; Esty & Winston, 2006; Hart, 2005). While earlier views were dominated by notions that environmental objectives were a constraint to the economic goals of a business or that the economic objectives of a business were a direct threat to environmental conservation, the recent approach treats both economics and ecology as two sides of the same coin. It has been argued by Hart (2005) that when properly focused, the profit motive of business can accelerate the transformation toward global sustainability, with nonprofits, governments, and multilateral agencies, all playing crucial roles as collaborators. Savitz and Weber (2006) suggest that a sustainable corporation is one that creates profit for its shareholders while protecting the environment and improving the lives of those with whom it interacts. Recently, Lash and Wellington (2007) suggest that firms will be at a competitive disadvantage if they do not pay attention to sustainability issues.

Marketing has been long concerned with understanding environmentally-conscious consumers and devising appropriate strategies to target such consumers (Antil, 1984; Ellen, Wiener, & Cobb-Walgren, 1991, Kinnear, Taylor, & Ahmed, 1974). In both marketing as well as management strategy, it has been argued that managerial decision making must incorporate environmental issues, including ideas on resource conservation and environmental sustainability (Drumwright, 1994; Hart, 1995; Shrivastava, 1995a). Incorporating consumers' and managerial concerns on the natural and physical environment contributes not only to superior business performance, especially in terms of competitive advantage, but also to enhanced corporate reputation (Menon & Menon, 1997; Shrivastava, 1995b; Sisodia, Wolfe, & Sheth, 2007).

While the importance of environmental sustainability for business performance and competitive advantage are now better accepted, research on appropriate strategies to implement environmentally sustainable corporate programs are still in their infancy within business-to-business marketing. There has been considerable interest in the issue of environmental sustainability in business practices, but discussions so far have been confined to disciplinary silos of management, marketing, and production and operations management. For example, while environmentally-conscious product design has been a focus of attention within production and operations management, marketing's role in managing demand for such products has rarely been taken into account.

While research within marketing has focused on the competitive benefits of green marketing, there has been less attention given to

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the examination of the marketing–manufacturing interface and the impacts of a green supply chain (Ottman & Terry, 1998). The demand-focused outlook of marketing, with its knowledge of buyer behaviors, both in consumer and industrial markets, finds complements in the environmentally-conscious policies of firms. Environmental concerns call for an approach that focuses both on supply management and demand management in the context of the entire value chain. Environmentally-conscious supply management would enable better waste management and inventory control through lean manufacturing, reuse, remanufacture, and recycling, as well as a focus on product design for disassembly. On the other hand, environmentally-conscious demand management would require strategies that would reduce reverse supply, including better product design, precision in demand forecasting, and customized development and delivery.

We focus on the domain of business-to-business marketing and develop a framework that highlights the role of marketing in environmentally sustainable supply chain strategies. In developing this framework, we integrate prior research from several business disciplines, highlight ignored areas of study and provide justifications for additional theoretical and empirical research in this area. In addition, we develop propositions that will hopefully guide future research.

The paper begins with a review of the extant literature. This is followed by the development and explanation of the sustainable market framework. Specific characteristics of three possible strategies – build-to-order manufacturing, recycling, and remanufacturing – are then discussed. This is followed by a discussion of the role of internal and external marketing in the successful implementation of sustainable market policies. Several propositions are derived from the discussion. The final section discusses managerial implications and directions for future research.

## 2. Literature review

### 2.1. Environmental sustainability

The World Commission on Environment and Development Report (1987), also known as the Brundtland Report, defined *sustainable development* as development that "meets the needs of the present generation without compromising the ability of future generations to meet their own needs." More recently Savitz and Weber (2006) suggest that business interests and the interests of the environment and society intersect in every firm's operations. They term the overlap between corporate goals of increasing market share and profits and the environmental goals of addressing climate change and public health as the "sustainability sweet spot." The starting point for environmental sustainability is surprisingly simple: if everyone recognizes that ecosystems and natural resources are limited, economic decisions can be so oriented that the end products of economic actions are environmentally sustainable as well.

The relationship between commerce and ecological concerns became less adversarial with the prescient view of environmental sustainability; in other words, the idea that environmental priorities make sound business sense as well (Costanza, Daly, & Bartholomew, 1991; Gladwin, Kennelly, & Kraus, 1995; Hawken, 1993; Schmidheiny, 1992; World Commission on Environment and Development, 1987). Many approaches emerged from this basic precept of sustainability (Goodland, Daly, El Seafy, & von Droste, 1991; Shiva, 1989; World Commission on Environment and Development, 1987; Eckersley, 1992; Gladwin et al., 1995; Hawken et al., 1999; Iyer, 1999; Shrivastava, 1995a). One of the popular approaches focused on business fundamentals and is practical in its argument that environmental sustainability could contribute to economic profitability as well as to competitive advantages (Porter and van der Linde, 1995; Schmidheiny, 1992; Wald, 2006; Lash & Wellington, 2007). But, the issue remained unresolved as to who should take the lead in the drive towards sustainability, with some suggesting that unless the consumer is more involved in environmental conservation, there will be less incentives for transformation (Iyer, 1999). However, recently Hart (2005) has convincingly argued that environmental sustainability fits well within the profit motive of business. And, since it leads to superior financial performance, environmental sustainability may best be guided by businesses.

Within marketing, there are two streams of research that could be used to support the link between sustainability and superior financial performance. First, resource-based theory suggests that better access and utilization of resources will lead to competitive advantage and therefore better performance in terms of profitability (Hunt & Morgan, 1995). Second, empirical evidence suggests that ecologically-conscious policies lead to better customer retention which again leads to better performance (Sisodia et al., 2007). The means to achieve such environmental sustainability is through the maximization of value-addition with the least use of resources, least amount of waste, and least pollution (Schmidheiny, 1992; Lovins, Lovins, & Hawken, 1999).

The latter approach, with its sights focused clearly on profits and competition as well as on environmental sustainability, has had the greatest appeal for scholars within various business disciplines. The contribution of marketing, reviewed briefly below, has been on the impacts of boundary-spanning activities and environmentally sustainable strategies (Sinding, 2001).

### 2.2. Marketing and environmental sustainability

Early research agenda within marketing focused on the end-customers' ecological consciousness or, in other words, the problems and issues of understanding the "green customer" and marketing effectively to such customers (Antil, 1984; Ellen et al., 1991; Kinnear et al., 1974). It was argued that consumer power would lead businesses to focus more on the environment since customers have the power to endorse (vote favorably) or reject (boycott) firms or criticize them for failing to maintain a balance with the environment. Firms such as BMW, Honda, IDEO, Patagonia, and Timberland follow these practices in part due to end-consumer demand (Sisodia et al., 2007). Since increasing numbers of business customers as well seek environmentally responsible products and favor environmentally conscious business behaviors, recent approaches suggest that such customers cannot be overlooked (c.f., Sisodia et al., 2007).

Large business customers can be more credible in emphasizing environmentally-friendly policies in their transactions with other firms (Drumwright, 1994). Business customer buying power is more effective in placing pressures on organizations to be environmentally-conscious and market only environmentally-friendly products. Such a focus on environmental consciousness manifests itself within the organization, especially in purchasing. For example, it has been argued that several firms favor ecological purchasing strategies and include non-economic criteria in their buying decisions (Drumwright, 1994). Office supply retailer Staples offers more than 2800 stock-keeping units (SKUs) that contain at least some post-consumer recycled content and is developing additional private-label eco-friendly products (Wilson, 2006). Thus, a large retailer can exert its power and influence the supply chain to become more eco-friendly.

There is now a growing recognition that environmentally-friendly product strategies gain better customer endorsements and therefore, contribute to long-term profits. Companies with clear environmental positioning in the market, such as Ben & Jerry, Body Shop, and Patagonia, are often cited as successful societal marketing examples (Kotler, 2003). Since these firms enjoy an ecological reputation, they seek business suppliers that also are ecologically-conscious. Thus, environmentally-responsible actions not only target an otherwise ignored subset of environmentally-conscious customers, but also by building a green supply chain, they also enable the firm to develop distinct advantages over their competitors (Winsemius & Guntram, 1992).

### 2.3. Environmental sustainability and other functional areas

Researchers in other functional areas have argued that the focus on environmental sustainability stems from the pressures of global competition, governmental regulations, and resource constraints (Jiménez and Céspedes, 2001; Sarkis, 2001; Sharma & Ruud, 2003). Government pressures as in the case of Germany had led to firms changing their packaging requirements. Similarly, resource constraints, especially the rising costs of traditional energy have put more pressures on firms to seek alternative sources of energy, including solar power.

Firms that have control over their manufacturing function have focused on various approaches to environmental sustainability. At the minimum, firms have initiated elaborate programs of recycling. Most companies have recycling programs that range from simple sorting of recyclable materials to more complex behaviors like reusing products and materials (such as packaging cartons). Hewlett-Packard's recycling plants process about 1.5 million tons of electronics/month and recover materials that are reused in some form (Moran, 2006). Some companies require the seller to take charge of the old products as a condition for buying new products. Thus, the job of disposing or retrofitting the old product and recovering the usable parts is shifted to the seller. Many businesses are thriving in this retrofitting business (Schoenberger, 2004; Wagstaff, 2003; Prizinsky, 2000).

Some firms engage in remanufacturing of previously used products (Thierry, Salomon, Van Nune, & Van Wassenhove, 1995). Specifically within production and operations management, there is now an invigorated focus on the development of optimization models in which environmental sustainability is included as an additional consideration. Remanufacturing requires reverse logistics, disassembly, sorting, and reassembling. Remanufactured products typically cost less and extend the life of the original parts and components (Ferrer & Whybark, 2000).

In summary, current literature advocates paying attention to environmental constraints in production and operations planning (e.g., Dobos, 1999), recycling and reuse in manufacturing (e.g., Sarkis, 2001), and remanufacturing (e.g., Guide & Van Wassenhove, 2001). Table 1 provides exemplars of research that address these environmental concerns. Also, closed-loop processes within production and operations management have highlighted the need to integrate the forward supply chain with the reverse supply chain (Guide et al., 2003).

## 3. The sustainable market framework

We develop a framework (Fig. 1) that is based on two major objectives in sustaining environments. First, when firms do not manufacture more units than are required (over-produce), a reduction in over-supply occurs that leads to lower levels of product needing to be disposed (that may need recycling or remanufacturing), leading to a more sustainable environment. We label this strategy as *reducing surplus supply*. Second, firms can reduce the number of products that need recycling. We label this strategy *reducing reverse supply* and suggest that firms need to develop repairable products as well as more complete recycling and remanufacturing strategies. We discuss these strategies in detail next and suggest that both these strategies are not only good for environmental sustainability, but also for business. Our position is similar to Esty and Winston (2006), Hawken et al. (1999), and Savitz and Weber (2006), who have suggested that sustainability strategies are compatible with good business strategies.

Our focus in this paper is on identifying the important role of marketing in environmentally sustainable strategies. Fig. 1 highlights the critical role of internal and external marketing in the successful implementation of environmental strategies. As will be observed in subsequent sections, both internal marketing and external marketing are important for a successful approach to sustainability.

Recent literature within marketing makes a distinction between external marketing and internal marketing. External marketing refers to marketing strategies and activities outside the firm, i.e., those employed to attract or retain customers or build market share. Internal marketing refers to the marketing of process changes within firms, especially the communications necessary to successfully deploy new organizational strategies. While this distinction has been advanced in the area of services marketing (Gronroos, 1990), internal marketing is necessary to achieve a greater interdepartmental consensus and coordination for all firms (Narver & Slater, 1990). In the context of environmental sustainability as well, internal marketing efforts are especially important, since a coordinated effort is required across all functional departments. In discussing our framework, we provide the implications on both internal and external marketing efforts of the firm. The three major strategies discussed in our framework are also elaborated in Table 2.

### 3.1. Reducing surplus supply

Current discussions of environmental sustainability emphasize only external marketing efforts, i.e., the firm's relations to its customers. In most competitive environments, a focus solely on external consumer demand contributes to surplus supply, especially due to lack of precision in forecasting demand or lack of attention to supply management.

Surplus supply (over-production) typically has two implications for firms — discounting or non-consumption of the product. First, discounting results in business customers purchasing features that they will not utilize during the life of the product. Therefore, the materials that were utilized in providing unnecessary functionality will result in an unnecessary need for recycling. Examples of such features are DVD players in laptops that business customers may not use but are bundled with the system. Second, due to over-supply, some products may never be sold and may go to recycling without reaching the consumer. Such recycling may result in materials going back to the same cycle of non-use or may result in harvesting for spare parts. Over-supply thus increases the burden on costly recycling efforts.

One key strategy to reduce surplus supply is to produce only after an order has been placed or build-to-order (BTO). This strategy has also been labeled as demand-driven manufacturing and is also discussed under the rubric of lean manufacturing (Sharma & LaPlaca, 2005). Build-to-order (BTO) and lean manufacturing have been revolutionary in the last decade and are increasingly being adopted in a large variety of industries (Bylinsky, 2001). Firms such as Dell, Agilent Technologies, and Batesville have adopted BTO technologies to create enhanced competitive positions through associated cost reductions. The primary impetus for the move toward BTO and lean manufacturing is the value that can be generated for both the firm and the customer (Sharma & LaPlaca, 2005). Adopting BTO processes allows firms to effectively and efficiently customize their products. Customization in turn provides for a more precise matching of product to customer needs, leading to enhanced satisfaction and loyalty (Berman, 2002; Holweg & Pil, 2001; Salvador, Forza, & Rungtusanatham, 2002; Sharma & LaPlaca, 2005). More importantly, BTO processes create tremendous savings in the areas of reduced raw material inventories, reduced finished goods inventories, and reduced space requirements (Sharma & LaPlaca, 2005). For example, it is estimated that by manufacturing non-demand inventory, auto makers spend 80 billion dollars more annually than they would with BTO processes (Agarwal, Kumaresh, & Mercer, 2001). Similarly, Pella, a windows manufacturer in the U.S., worked on reducing surplus demand between 1991 and 2000, with the results that:

- The production line occupies about one-fourth the original space
- The company's inventory turns doubled between 1990 and 1999, in spite of a tripling in sales
- The value of work-in-process inventory was reduced by nearly one-fourth
- The cut-lumber inventory– which once ran as high as 6.9 million board feet–is down to less than 2 million with a reduction in the number of lumber suppliers (Siekman, 2000).

**Table 1**
Exemplars of research on sustainable environments.

| Reference | Focus | Key findings | Addressed | | | |
|---|---|---|---|---|---|---|
| | | | Marketing | Reduce reverse demand | Recycling | Re-manufacturing |
| Thierry et al. (1995) | Product recovery management | Identify multiple product recovery options | No | No | Yes | Yes |
| Royal (1995) | Green marketing | Baxter International's marketing initiatives | Yes | No | No | No |
| Hormozi (1999) | Remanufacturing | Standards for environmentally conscious remanufacturing are essential | No | No | No | Yes |
| Van der Laan, Salomon, Dekker, and Van Wassenhove (1999) | Production planning and inventory control | The effects of remanufacturing in push and pull controlled production/inventory systems are analyzed | No | No | No | Yes |
| Ferrer and Whybark (2000) | Remanufacturing | Reverse logistics and marketing remanufactured products are important | Yes | No | No | Yes |
| Guide et al. (2000) | Supply chain for recoverable manufacturing | Identifies seven complicating characteristics | No | No | Yes | Yes |
| Linton and Johnston (2000) | DSS for remanufacturing planning | Reverse logistics system for Nortel networks is discussed | No | Yes | Yes | Yes |
| Toktay, Wein, and Zenios (2000) | Inventory management of remanufacturable products | Procurement of new components for recyclable products in the context of Kodak's single-use camera | No | Yes | Yes | Yes |
| Guide and Van Wassenhove (2001) | Product returns for remanufacturing | Acquisition of used products may be used as the control lever for re-use activities | No | No | No | Yes |
| Ferrer and Whybark (2001) | Material planning | Integrated approach to manage demand and supply of material in remanufacturing is presented. | No | No | No | Yes |
| Linton, Yeomans, and Yoogalingam (2002) | Supply planning under uncertainty | Quantifies when and how many obsolete televisions will be placed in the waste stream | No | No | Yes | Yes |
| Majumder and Groenevelt (2001) | Competition in remanufacturing, reverse-logistics | Presents a model of competition in remanufacturing | No | No | No | Yes |
| Pan and Zeid (2001) | Planning for disassembly | A knowledge base for indexing and retrieving disassembly plans is implemented | No | No | Yes | Yes |
| Mangun and Thurston (2002) | Product portfolio design | Different products and service plans overall superior for customer satisfaction | No | Yes | Yes | Yes |
| Souza et al. (2002) | Capacitated remanufacturing, reverse logistics | Production decisions to maximize profit not intuitive — must consider product mix | No | No | No | Yes |
| Thorn and Rogerson (2002) | Design for remanufacturing | Remanufacturing approach to product retirement requires broad systems | No | No | No | Yes |
| Tang, Zhou, Zussman, and Caudill (2002) | Disassembly | Important to develop automated disassembly systems to eliminate lengthy disassembly times | No | Yes | Yes | Yes |
| Abukhader and Jonson (2003) | Environmental implications of e-commerce | Unclear if the damaging effects of e-commerce outweigh the advantageous effects | No | No | No | No |
| Bayindir, Erkip, and Güllü (2003) | Inventory costs in remanufacturing | Separate operations for manufacturing and remanufacturing not attractive if it requires high value added or if expected lifetime of product is high | No | No | No | Yes |
| Giuntini and Gaudette (2003) | Remanufacturing | Discusses importance of modular designs and multidisciplinary focus | Yes | Yes | Yes | Yes |
| Guide, Jayaraman and Linton (2003) | Contingency planning for closed-loop supply chains | Framework showing common activities required for all remanufacturing operations is developed and cases on remanufacturing and reassembling are studied | No | No | Yes | Yes |
| Guide et al. (2003) | Remanufacturing | Matching demand and supply to maximize profit | No | Yes | Yes | Yes |
| Kekre, Rao, Swaminathan, and Zhang (2003) | Reconfiguring remanufacturing lines | A model that considers line balancing and line length simultaneously is maximize throughput is presented | No | No | No | Yes |
| Ketzenberg et al. (2003) | Remanufacturing line design | Advanced yield information generally decreases flow times | No | No | No | Yes |
| Mahadevan, Pyke, and Fleischmann (2003) | Product recovery | Studies remanufacturing that receives a steady stream of returned products | No | No | No | Yes |
| Andel (2004) | Product returns — reverse logistics | Secondary markets can help maximize investment in reverse logistics | Yes | Yes | Yes | Yes |
| Aras and Vedat (2004) | Categorizing returned products | Incorporating returned product quality and disposal decisions lead to significant cost savings | No | No | Yes | Yes |
| Ferrer and Ketzenberg (2004) | Information value in remanufacturing complex products | Yield information is valuable. Lead times important only for complex products requiring several parts. | No | No | No | Yes |
| Flapper and Teunter (2004) | Disposal and rework strategies | Numerically compares strategies for disposal and rework of production rejects | No | No | No | Yes |
| Shu (2004) | Design for remanufacturing | Application of Biometric design methods | No | No | No | Yes |
| Toffel (2004) | Strategic management of product recovery | Research on product recovery from other than OM focus is scarce. Surveys current status of research on product recovery | Yes | Yes | Yes | Yes |
| Heese, Cattani, Ferrer, Gillard, and Roth (2005) | Product take backs | Models the process and identifies when take backs should occur | Yes | No | No | Yes |
| Robotis, Bhattacharya and Van Wassenhove (2005) | Remanufacturing strategy | Remanufacturing is a competitive strategy | Yes | No | No | Yes |

BTO processes are relevant as well for firms producing non-standard and low volume products. Such firms can also manufacture to demand and have lean raw materials inventory. Moreover, these firms can take advantage of BTO processes to a higher degree because the cost per unit sold of finished inventory or raw materials is much higher (due to lower volumes). With the advent of BTO, the role of

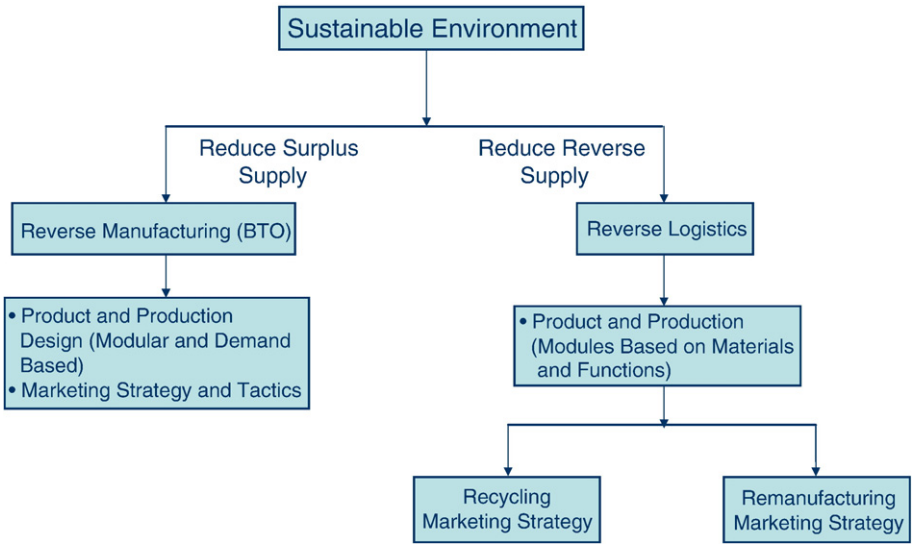


**Fig. 1.** The sustainable market framework.

marketing will be more of customer management rather than demand management (c.f., Kotler, 1973), i.e., to assure an adequate supply of customers who value the customized products and services offered by the firm (Sharma & LaPlaca, 2005).

*3.1.1. Internal process changes*

BTO processes require substantial changes in the product design and supply chain and therefore, internal process changes are expected to be high (Sharma & LaPlaca, 2005). First, product design has to be modular so that efficient customization and BTO can take place. This is a significant hurdle, as a majority of products are not designed for modularity. Second, BTO processes require rapid customizable manufacturing. This process is difficult, as is evident by the fact that Dell remains the only successful implementer of BTO in the personal computer industry. Third, modular manufacturing requires closer cooperation between buyers and suppliers, and firms will have to share information with supply chain partners such as suppliers and logistics firms. For example, Dell takes PC orders from business customers that are instantaneously accessed by its manufacturing function and suppliers, and even by FedEx, which delivers the computers (Sharma & LaPlaca, 2005). Each member of the supply chain needs to provide error-free service. BTO also requires geographical proximity between buyers and suppliers. For example, Dell now relies on vendor-managed inventory warehouses and in many cases, it is staging inventory inside its plant itself. This has enabled savings in inbound logistics, but more importantly, enable effective BTO manufacturing (Hoffman, 2005).

*3.1.2. Marketing*

Due to changes in the internal processes, BTO renders internal marketing quite difficult. Moreover, the focus of the entire marketing function also changes. BTO and lean manufacturing will increasingly make the marketing function responsible for "supply management" (Sharma & LaPlaca, 2005). The customer will be the starting point for marketing activities for multiple reasons. The increasing diversity in needs, wants, and resources of businesses and households will make customer behavior inherently less predictable and forecasting less accurate (Sheth et al., 2000). This may lead to a shift to qualitative techniques of forecasting from traditional quantitative techniques. In such an environment, companies that succeed will be those that can rapidly adjust their supply to meet demand; in other words, those that practice demand-driven supply management. For example, airlines use yield management to optimally allocate available capacity across fare classes, and to manage demand to match capacity. Many airlines such as Continental Airlines are now able to dynamically manage capacity by exchanging crew-compatible fleets.

External marketing will focus on the benefits of customization and the associated lower costs (Sharma & LaPlaca, 2005). Advertising will focus on the ability of the firm to provide unique solutions at lower costs. For example, the marketing advantages of BTO are evident at John Deere, which is able to provide better customization and

**Table 2**
Three paths to sustainable environments.

| Strategy | Reduce surplus supply — produce to demand | Reduce reverse supply | |
|---|---|---|---|
| | | Recycle products | Remanufacture products |
| Key benefit to sustainable environments | Reduce demand of unneeded functions<br>Reduce recycling of new products | Recycling resources<br>Meet emerging government regulations | Reduce demand for recycling<br>Reduce demand for new parts |
| Internal process changes/ internal marketing requirements | High<br>Product design changes for minimizing inputs and maximizing output configurations<br>Manufacturing changes<br>Supply chain changes<br>Marketing changes | Moderate<br>Product design change for recycling. | Low in the short-term<br>Moderate in the long-term<br>Outsource initially<br>Product design changes for remanufacturing<br>Marketing changes |
| Key customer groups | Current customers<br>Customers who seek customization | Recycling firms | Emerging markets (cannot afford new products now but may in the future)<br>Non-locational developing markets |
| External marketing focus | Customization/costs | Easy for recycling | Remanufactured products provide similar benefits |
| Firm's ability to implement | Low | Moderate | High |
| Set-up cost | High | Low | Low to moderate |
| Expected ROI | High | Low | Moderate |
| Ability to match regulations | Low | High | Moderate |
| Current research | High in manufacturing/ supply chain<br>None in marketing | Moderate in manufacturing/ supply chain<br>Dated in marketing | Very high in manufacturing/ supply chain<br>None in marketing |

customer satisfaction and at the same time reduce costs associated with over supply.

#### 3.1.3. Implementation issues

Any firm's ability to rapidly change to BTO processes will be challenging. Adoption of BTO requires fundamental changes in product design and manufacturing processes (Sharma & LaPlaca, 2005). This may be the reason that Dell's success in BTO has not been duplicated. The set up costs are expected to be high, but successful implementation will also lead to higher returns on the investments. Set up costs may include setting up non-traditional manufacturing facilities, designing products for BTO and developing closer supply-chain links for BTO processes.

While there is substantial research on BTO in management science and operations management, there is a need for more research in the area of marketing. One of the major issues with the BTO strategy is that it may be good for sustainable environments, but key stakeholders in the arena of sustainable environments may not regard this as an effective environmental strategy. Therefore, one of the tasks of marketing will be to translate the benefits of this strategy to direct environmental benefits.

Based on the discussion in the section, we offer the following propositions:

P1 Reducing surplus supply will increase sustainability efforts.
P2 Reducing surplus supply will require changes in design, manufacturing and cooperation between buyers and sellers.
P3 Reducing surplus supply will require enhanced internal marketing, increase in reverse marketing, and an external marketing emphasis on the benefits of customization.

### 3.2. Reduce reverse supply — recycle products

Recycling has been discussed extensively in the marketing context. Recycling enables firms to meet regulations and aids in the creation of sustainable environments. While recycling is costly, it is easy to implement, as third party vendors undertake the actual recycling efforts. For example, Wal-Mart is currently investing about $500 million to develop a system that would reduce the firm's energy consumption, greenhouse gas emissions and production of solid waste (Zimmerman, 2006). One program it is encouraging is that of closed-loop recycling, whereby the firm's waste would be sold to recycling centers for use as raw material. It is selling waste paper to Georgia-Pacific Corp. which converts such waste into paper towels and tissues that can be sold in Wal-Mart stores under its own private label (Zimmerman, 2006). This reduces the supply of waste paper that needs to be recycled.

In the context of environmental conservation, a key contribution of firms is to engage in modular product designs that allow customers to readily change one part of the product without discarding the entire product. This leads to a reduction in recycling commitments. For example, the average cost of a television or a PC is today less than $1000. However, when a TV stops working, customers cannot diagnose the problems with the television. Customers need to decide if they want to pay service personnel to diagnose the problem, and then pay additional repair costs. A large proportion of customers do not like the uncertainty of repair costs and throw the television away rather than have it repaired (Lewis, 2008).

On the other hand, when a PC breaks down, there are many diagnostic tools that quickly pinpoint the area of trouble. Firms in these industries also recognize the need for better design and build repair utilities into the product. For example, in the case of a hard drive error, the Windows operating system could repair the error. Business customers can fix several problems themselves or can easily compare the costs of repair versus replacement. Thus, in the case of computers, better product design could allow customers to use the product for longer periods of time, thereby reducing the total amount of recycling required.

Some of the product design changes are motivated by government policy as well. For example, the European Union has banned electronic waste (e-waste) from land-fills and holds manufacturers responsible for the disposal of e-waste at the end of the product life cycle (European Union Directive, 2003). This has prompted manufacturers to seek product design solutions that would extend the life cycle and/or lead to greater reuse of components.

Moreover, product design will have to be such that it is easier to recycle the product at the end of its life cycle. This may call for increasing use of modular product designs and design for disassembly. In Europe, the burden of recycling has already shifted toward the manufacturer. Firms whose products are harder to recycle are implicitly penalized unless product design incorporates similar materials in modules that can be easily recycled. If not, firms will face higher recycling costs.

Finally, products should be designed so that a change in the operating conditions should not lead to customers discarding their product. Product scalability is important for conservation of scarce materials. For example, with the advent of high-definition (HD) television, most traditional television cameras in studios will be obsolete unless they can be used with HD systems. In contrast, in some cases, computers are designed to handle operating system and software upgrades easily.

#### 3.2.1. Internal process changes

The internal process changes for reducing reverse supply may be moderate or extensive, based on the legacy systems in use. Legacy systems reduce the degree of product design flexibility. Moreover, firms would face internal resistance when trying to replace successful designs of the past with newer, more environmentally-friendly designs. Internal process changes would be successful only when the firm realizes that these changes are warranted due to shifts in the competitive environment and consumer preferences for sustainable product designs.

#### 3.2.2. Marketing

Reductions in reverse supply also call for changes in the marketing function. Internal marketing may be difficult since the changes will impact the processes and outcomes. Each function of the firm will be impacted and the anticipated changes have to be conveyed across the firm. Acceptance of these changes will be aided by internal marketing efforts. The external marketing function also changes. Rather than promoting the purchase of new products, some firms will promote the longer life and durability of their products, similar to what Maytag does with its washers and dryers in the consumer market.

#### 3.2.3. Implementation issues

A firm's ability to recycle its products is limited by product design. Capital investments for product design and process changes would be high initially, but the returns to scale would also be higher once a critical mass of customers has adopted the new designs. More research, however, is needed on the ROI and performance impacts of sustainable product designs.

Based on the discussion in this section, we propose that:

P4 Reducing reverse supply through recycling will increase sustainability efforts.
P5 Reducing reverse supply through recycling will require enhanced internal marketing and an external marketing emphasis on the life of products.

### 3.3. Reduce reverse supply — remanufacturing products

One of the more attractive strategies for sustainable environments is remanufacturing of products. Typically, in remanufacturing products, a used product is examined and repaired so as to make the

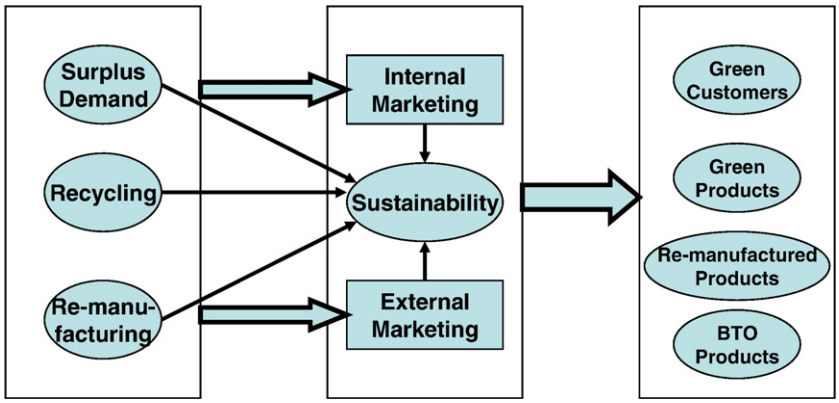


**Fig. 2.** Sustainability model — propositions.

product functional and to extend the life of the product. This strategy is becoming more prevalent for several reasons. First, firms are under pressure to contribute to environmental sustainability. This pressure is largely from the government through rules and regulations and to a smaller degree from customers. This focus is more critical in the electronics industry where components are harder to recycle and contain materials that harm the environment. Second, there is a growing segment of marginal customers who cannot afford new products now (but may in the future) but are interested in acquiring the product (c.f., Robotis, Bhattacharya, & Van Wassenhove, 2005). A remanufactured product may satisfy their needs. In addition, if properly remanufactured, there may be no observable differences in the aesthetics or performance of the remanufactured product. Finally, there is certainly a market segment that prefers remanufactured products, since new capital expenditure items can lose more than 30% of their value in the very first year.

The most persuasive strategy for remanufacturing comes from cost savings. It is argued that material costs are only 40% of the total costs of remanufactured products as compared to 70% of the total cost for new products (Hindo, 2006). Moreover, remanufactured products could on average cost only half of the cost of new products (Hindo, 2006). Caterpillar Inc.'s plant in Corinth, Mississippi, takes apart salvageable materials from used diesel engines to assemble refurbished products. Sales of remanufactured products exceeded $1 billion in 2005 at Caterpillar and are expected to grow at the rate of 15% annually for several years (Hindo, 2006).

Remanufacturing strategy requires extensive changes to product design. Some products that have been designed for BTO, due to their modular design, are also easy to remanufacture. For example, some models of Dell computers have no screws and each module can be clicked out. Interestingly, products that cannot be easily repaired cannot also be easily remanufactured.

Finally, products should be designed so that several obsolete parts can be replaced with newer parts, i.e., they must be forward-compatible. A change in the model design should not make previous models obsolete. For example, as discussed earlier, computers are designed to handle operating system and software changes easily.

*3.3.1. Internal process changes*

Internal process changes for remanufacturing strategies will be less in the short-term but moderate when product design changes take hold. It is suggested that firms outsource remanufacturing initially, until the product design changes allow firms to easily remanufacture internally. Such remanufacturing allows firms to reuse most of the product elements that may have needed to be recycled. As in the case of recycling, due to the costs associated with changing the product design processes, there will be some initial resistance within organizations. However, when remanufacturing becomes a source of sales and profits, firms will need to adopt it or they will be at a disadvantage. For example, most firms that manufacture earth moving equipment, such as Caterpillar, have certified pre-owned vehicles. These remanufactured products help in maintaining the competitive price of their brand. An increase in used vehicle prices lowers the lease prices of a firm's products, as lower lease rates are associated with higher resale value. If earth moving firms cannot maintain their used vehicle prices, their lease rates are higher, leading to a competitive disadvantage.

*3.3.2. Marketing*

Internal marketing may be less difficult, as firms need not initially change their internal processes. However, as stated earlier, internal marketing is more difficult when product design changes are proposed. Marketing's focus on the customer also changes since there are now two key customer groups — one that buys only new products and another that is content with remanufactured products. Adverse impacts on the firm's image can be avoided by marketing remanufactured products to markets where the firm currently has no presence. Such a strategy is used by Caterpillar to sell its remanufactured products in developing countries.

Rather than promoting the purchase of new products, firms will promote the fact that business customers can obtain the product that they want (albeit used), with the warranty of a new product, but at reduced prices. In essence, marketing will focus on ownership and the associated lower lifetime costs.

*3.3.3. Other issues*

Investments in remanufacturing are expected to be moderate with associated moderate returns. This area has been extensively researched in management science and operations management but is scarcely discussed in marketing (Table 1). Remanufacturing will only have a moderate impact on a firm's ability to meet existing and emerging sustainable environment regulations. The reason is that key stakeholders may need more information before they understand the value of this strategy.

Based on the above discussion, we propose that:

P6 Reducing reverse supply through remanufacturing will increase sustainability efforts.

P7 Reducing surplus supply through remanufacturing will require enhanced internal marketing and external marketing.

Fig. 2 provides a summary of our propositions.

## 4. Marketing's expanded role in achieving environmental sustainability

The sustainable market framework discussed in the prior section has significant implications for marketing. While marketing's primary focus currently has been on demand management, i.e., the problems of identifying and targeting “green business customers,” sustainability


**Fig. 3.** Marketing's expanded role given operations management priorities for environmental sustainability. A. Current focus of marketing. B. Expanded focus of marketing.

requires a greater role for marketing. The focus is on a greater integration between marketing and other corporate functions (see Webster & Montgomery, 1997; Malhotra & Sharma, 2002) to achieve sustainable environmental goals. Marketing's current focus and its expanded role are highlighted in Fig. 3 and discussed in depth below.

As shown in Panel A of Fig. 3, marketing's current focus is low on achieving the goals of sustainability since its efforts are geared primarily to those outside the firm. These priorities stem from marketing's traditional functions of demand stimulation and demand management (Kotler, 1973). However, in order to achieve the goals of environmental sustainability, both marketing and the supply chain must have greater inter-functional coordination, with marketing's expanded role focusing on both demand management and supply management. These objectives and activities are discussed briefly below.

### 4.1. Demand management

#### 4.1.1. Targeting "green" business customers

Marketing's traditional focus on identifying customers concerned with the natural environment has been quite successful, with several firms devising environmentally-friendly products in response to customer demands and market changes (Ottman, 1994; Menon & Menon, 1997). For example, medical equipment firms began using recyclable materials and the automobile industry is now consciously targeting business customers who are willing to pay higher prices for more fuel efficient hybrid buses and automobiles (Armstrong, 2005; Kotler, 2003).

#### 4.1.2. Predicting demand for environmentally-friendly products

Demand estimation and market forecasting within marketing is now quite sophisticated, with multivariate models able to capture not only the demand for environmentally-friendly products but also the specific preference combinations in which such products would be most desired (Lilien, Kotler, & Moorthy, 1992; Shaw & Shiu, 2003).

#### 4.1.3. Promoting environmentally-friendly products

Several firms, such as 3 M and Patagonia, have been successful in positioning their environmentally-friendly products to target markets and promoting them effectively. Environmentally-friendly product positioning and promotions have been particularly successful, given the increased number of such products made by firms in response to business customer demands (Osterhus, 1997). It is estimated that as much as 42% of customers in the U.S. are willing to pay more for "green" products (Kotler, 2003). However, many eco-friendly products fail due to a heavy focus only on the ecological aspects of the product (Semon, 2006). Instead, promotion efforts should focus on how ecological aspects complement with other needed functionality to provide better overall value-added benefits.

#### 4.1.4. Building competitive advantages from a focus on environmental priorities

There is some direct evidence that a focus on the environment in the firm's corporate and marketing strategies contributes to superior business performance (Jaffe, Peterson, Portney, & Stavins, 1995; Porter & van der Linde, 1995). It has been argued that firms can build distinctive competitive advantages through a focus on environmental priorities (Menon & Menon, 1997). Marketing environmentally-friendly products and positioning the firm as an environmentally-conscious business builds corporate reputation, which has the impact of strengthening the competitive market position of the firm (Menon & Menon, 1997).

#### 4.1.5. Positioning and demand stimulation for recycled and remanufactured products

Marketing thought or strategy on positioning recycled and remanufacturing products and creating demand for them appears to be a missed opportunity (Biddle, 1993). However, within specific industries, such as the automobile and electronics industry, firms do

market refurbished products from prior product returns. But there is little by way of marketing research to predict demand for such products or business customer attitudes towards such products. Moreover, the positioning of such products often suffers from a lack of formal strategic planning, possibly due to perceptions of the market being small in size and costly to reach. Marketing's expanded role here calls for a more concerted effort in identifying target markets for recycled and remanufactured products and for conscious attempts at positioning to overcome any negative images that customers may have of such products. One successful example in this area is that of Caterpillar certified vehicles, where the firm has made clear attempts to overcome any negative "used vehicle" image by assuring quality control through inspections and warranties.

#### 4.1.6. Generating demand for build-to-order products

While build-to-order products result in substantial cost savings and aids environmental sustainability objectives, marketing has yet to capitalize upon the customization possibilities of build-to-order manufacture. Notable exceptions are Dell and Miller SQA, which have, through their direct marketing approach, positioned themselves as firms that market products that can be customized to individual preferences. However, generating demand for build-to-order products requires an expanded role for marketing, one that is geared explicitly to changing current business customer preferences from one of instant gratification to that of delayed gratification of customized products.

Based on the previous discussion, we propose that:

P8 Increased emphasis on "greenness" by marketing will lead to increased focus on "green" customers, "green" products, and build-to-order products.

### 4.2. Supply management

It is in the area of supply management that marketing's expanded role in aiding the goals of environmental sustainability becomes more apparent. In its boundary-spanning role, marketing is ideally situated to "close the loop" in the supply chain and to ensure that the goals of environmental sustainability are not only effectively realized, but also are economically viable as well. Top management involvement, channel member persuasion and appropriate financial incentives to the channel may be needed for bringing about the desired changes. Here, we foresee the following expanded roles for marketing.

#### 4.2.1. Reducing supply through increases in demand for build-to-order products

Marketing's demand management role is critical in stimulating demand for build-to-order products and increasing the market size for such products so that the corresponding changes in manufacturing are economically viable for the firm. The market for build-to-order products requires concerted attempts by the firm in changing customer preferences for consumption timing. This calls for a fundamental shift not only in customer buying behaviors and in the forward supply chains for the product. For example, in order to shift business customers to a build-to-order system, closer cooperation is needed for sharing critical information on preferences, consumption timing and order sizes.

#### 4.2.2. Enabling reverse logistics for recycling and remanufactured products

Models of recycling and remanufacturing currently ignore the critical role of the end customer. It has been suggested that for effective customer participation in the reverse supply chain, there must be relationship orientation and commitment with customers (Daugherty, Richey, Hudgens, & Autry, 2003). Moreover, in reverse supply chains, the business customer's role is quite different — it is that of a supplier (Anderson & Brodin, 2005). To ensure customer participation, the economic incentives for business customers must be aligned to those of manufacturing. In its expanded role, marketing becomes the key player not only in incentives alignments, but also in building the critical relationships needed to effectively implement reverse logistics.

#### 4.2.3. Designing for modularity and disassembly

There has been some research on designing for modularity and designing for disassembly (Baumgarten, Klinkner, & Sommer-Dittrich, 2004) as well as on eco-design or designing for environmental sustainability (Johanssen, 2002; Sroufe, Curvokic, Motabon, & Melnyk, 2000). However, such ecological design principles also call for greater customer participation and closer customer relationships (Johanssen, 2002). Once again, marketing not only provides the window into customer preferences, but also provides the necessary guidance for design development that is commercially successful as well.

#### 4.2.4. Demand forecasting for inventory control

In marketing's current role, demand forecasting is primarily done through aggregating salespeople's individual sales forecasts. However, environmentally-sustainable objectives call for greater emphasis on waste management, and thus, overall inventory control and control over material flows (Ling, 1998). Thus, the expanded role of marketing calls attention to forecasting demand that would aid also in inventory control and materials flows, rather than simply achieve sales. This involves an explicit focus on the timing and patterns of demand as well as on enabling and encouraging changes to customer preferences such that the demand and supply of products are better aligned.

#### 4.2.5. Enabling materials recovery from end-customers

While materials recovery in industries such as automobiles and electronics products is currently achieved primarily through regulations, there needs to be greater end-customer participation in recycling and recovery efforts. Moreover, materials recovery calls for greater incentives for customer participation than those currently offered. For example, in both business and consumer markets, Hewlett-Packard has implemented a system for recovering spent printer toners from customers. Office Depot provides some incentives for its retail customers, which include home and small business customers, to bring back their spent printer toners to the store. Marketing's expanded role would be to get more and different segments of customers to participate in the production materials recovery effort as well as designing and implementing suitable channel incentives that would be more effective in the success of such programs.

### 4.3. Implications

Our framework for sustainability attests that achieving a sustainable environment will require emphasis in two major areas — reducing surplus supply (both products and functionality) and reducing reverse supply of products. In addition, the framework highlights the critical role of internal and external marketing in the successful implementation of sustainable environment strategies.

For marketing to play an important role in the organization's sustainability efforts, several skills would be required. Such skill sets are similar to ones suggested by others in enhancing the marketing's role in the corporation, viz., information acquisition, knowledge development, interactivity, connectivity and ongoing relationship management (Vargo & Lusch, 2004). The role of marketing will be similar to the suggestions of Kotler, Jain, and Maesincee (2003) in their amplification of holistic marketing. They suggest that marketing will need to play a more central role and will be the glue that will drive successful firms. Therefore, each function will become more marketing-oriented and marketing will

be the key information provider on both demand and supply. While inter-organizational relationships in business-to-business markets will remain critical, we contend that intra-organizational skills are more important for the marketing function to take the lead in sustainability efforts.

We reiterate the emerging view that strategies that aid in sustainable environments are also good for the firm. Specifically, effective implementation of BTO and remanufacturing leads to both enhanced sustainability as well as enhanced competitive position. In order to better design products, managers need to pay attention to the design of products as well as manufacturing.

With the input of marketing, the emphasis of product design will be on modular design that aids in BTO processes, recycling, and remanufacturing. Traditional product design processes are integrated in developing the entire product from scratch. In the emerging era of environmental sustainability, firms will seek modular manufacturing so as to be able to customize, recycle, or remanufacture products.

The marketing function will also be instrumental in enabling recycling efforts as part of the firm's sustainability program. Whereas some regions in Western Europe already have clear manifest preferences for recycling, such preference changes are also occurring in the U.S. In many instances, given a choice between two options with similar performance benefits, customers will prefer a product that can be recycled versus one that cannot. Similarly, there is an increase in preferences for products made from recycled materials, especially paper and plastic products. Volume buying by business customers would enable this recycled market to grow tremendously in the coming years. Finally, remanufacturing as an environmentally-friendly strategy enables firms to target marginal customers that cannot afford a new product, or markets that they are not currently serving.

In their shift to BTO processes, manufacturers will need to overhaul their internal processes and marketing's role will become more critical in demand creation and supply management. In the typical execution of the BTO strategy, the firm produces sufficient samples for customer evaluation and only manufactures the product after they are ordered. As a variation of this approach, the firm may produce sample products and then let customers "customize" the product through a variety of options. For example, Pratt and Whitney permits customers who order a large number of jet engines (in excess of 30 at a time) to add several optional features to the engine that make its operating characteristics more closely match the specific needs of the customer, depending on type of plane (passenger or cargo), route characteristics (short or long haul), noise abatement requirements, and other criteria.

## 5. Conclusion

From our review of the current literature on environmental sustainability across various business disciplines, we found that marketing's concern has mainly been only the demand side, while ignoring important contributions that marketing can make to manufacturing, operations and the supply chain. We have also explicated the critical role of marketing in aiding firm's objectives for environmental sustainability. We integrated disparate research streams and provided propositions for future research.

While we have focused currently on three major strategic thrusts – reverse manufacturing, recycling, and remanufacturing – marketing can well encompass other sustainability strategies as well. One primary limitation of our approach is that, apart from anecdotal evidence, we do not offer a rigorous examination of the propositions put forth in this paper. Clearly, there is need for empirical research not only on marketing's contribution to the environmentally sustainable strategies of firms but also on the links between sustainability and firm performance. Also, our review of prior research focused on several research streams and contributions from other disciplines. While we have presumed the importance of marketing's links to other disciplines, future research could examine the specific areas of inter-functional collaboration and conflict between marketing and other business functions. Similar to the "closed-loop systems" noted in the sustainability literature to close the gaps between demand and supply, future research could focus on closing the conceptual and disciplinary gaps between marketing and other functional areas in the organizational objectives of environmental sustainability.

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