PART IV

Sustainability and Enterprise: An Inside View of the Corporation

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INTRODUCTION

Several years ago, at a workshop on industrial ecology and the service industry, a representative of one of the largest retailing chains in the United States gave an impassioned presentation on his company's environmental program. He described a yearlong project he called "Dumpster diving," in which recyclable materials that were thrown into trash containers at the company's stores were carefully sorted and identified. With this information in hand, the company began a program to recover and recycle a substantial fraction of the trash. He was appropriately proud of its accomplishments.

During the discussion period that followed, one of the participants asked whether the company had ever thought about the environmental impacts of everything that went out the *front* door of its stores. After a long moment, the company representative said, "No, but perhaps that is where the greatest impact is" and maybe something could be done. In the next breath, however, he speculated that to do anything would entail "telling" customers that the products they were buying had an impact on the world, which would in essence mean giving them information that would constrain their choice. And this was very much against his company's basic marketing principles. He added that to give the customers such information was, in some sense, saying to them that they did not really know what they were buying.

What made this conversation even more telling was that it was preceded by a discussion of another major retailer's quite elaborate environmental management program, in which the environmental impact of many of its products, particularly

those with obvious resource and pollution implications, had been carefully examined. Based on these studies, the retailer changed the sources of many products and provided extensive information to customers to help them make informed choices about products with significant impacts. This initiative began in the early days of life-cycle assessment, and the firm's methods were pretty crude. Nonetheless, the program reflected both the company's understanding that products have an impact over their whole life cycle and its sense of responsibility to convey this understanding to customers.

It is clear that these two firms with very similar business strategies (although in different retailing sectors) saw environmental management and their roles in it very differently. The significance to the chapters that follow is that the activities a firm employs to take care of the environment — and in a larger sense to ensure that the world becomes sustainable — depend dramatically on its culture and the strategic implications of that culture. One must look inside a company to see what is really happening and to identify those activities that authentically represent the company's commitment to environmental excellence and sustainability. Jeffrey Pfeffer and Robert Sutton wrote recently of the emptiness of mission statements and the importance of examining actions, not words.[1]

The availability of tools and management systems is helpful but not sufficient to push companies to adopt sustainable strategies. Both firms mentioned above had ample resources to engage in proactive environmental management. No regulations required either one to do anything. Customer demands for environmentally preferable or superior products were (and generally still are) weak. Why, then, did one firm take an aggressive stance and the other a basically do-nothing attitude? The remainder of this chapter will explore this question, looking inside companies for clues to their behavior and examining pressures on them to become more responsible in the future.

Responsibility is central to the notion of extended producer responsibility (EPR).[2] The preceding parts of this report have explained how necessary it is to reduce demands on the world's material resources drastically, and how extended

producer responsibility is designed to move toward this goal. Part IV will focus on the firm, the major institutional actor in implementing this policy framework. Whether EPR is interpreted as *producer* responsibility or *product* responsibility — as is the tendency in the United States — the producing firm remains the primary actor.

The central role of the firm is highlighted in the following quotation from the Phase 1 report on the Organisation for Economic Cooperation and Development's (OECD's) examination of EPR.[3]

> EPR is an emerging strategy being used in the OECD (and other) counties to promote the integration of environmental costs associated with products *throughout their life cycles* into the market prices of the products. These programmes change the traditional balance of responsibilities among manufacturers and distributors of consumer goods, the consumer, and the government, particularly with regard to the post-consumer stage of the product's life. They *extend* the responsibilities assigned producers and distributors in the past (i.e., worker safety, prevention and treatment of environmental releases from production, financial and legal responsibility for sound management of production wastes) to include responsibilities (whether financial, physical, or both) for the management of the product at the post-consumer stage. By doing so, EPR encourages producers to re-evaluate decisions regarding materials selection, production processes, packaging and market strategies to reduce costs for which they have, for the first time, become responsible when the product reaches the post-consumer stage. This systems, or life cycle, approach to product design and production presents a unique incentive for the producer to act in ways that will promote goals shared by OECD governments: waste prevention and reduction, increased use of recycled materials in production, and internalization of environmental costs in product prices. [Emphasis in the original]

Responsibility in the policy world of EPR is understood as some form of legal duty, authorized by a legitimate government and enforced by the power of that authority. The debates over EPR since the idea emerged almost a decade ago have largely involved the allocation and extent of these duties and the mechanisms by which they are enforced. To some degree, the idea is based on the assessment that the firm is, institutionally, the most powerful agent available to achieve the emergent environmental goal of conserving resources, through strategies like

take-back and loop-closing. Thomas Lindhqvist and others argued that firms possess the technical knowledge and financial resources needed to find technologically sound and economically rational solutions to the new kinds of problems being sought at the societal level, and that they have a deep-seated interest in doing so.[4] The objectives of EPR from the firm perspective are to create product systems that conserve materials over their entire life cycle and to generate infrastructure that facilitates end-of-life recovery of products. Although EPR has in some instances become essentially synonymous with take-back, it is important to keep in mind that this is just one of the life-cycle stages targeted by this policy.

It is also important to look at another sense of the word "responsibility." Responsibility as an ethical concept held a central place in early cultures, even before there was a state to assign and enforce rules about what was explicitly permissible or not. Responsibility meant that one should avoid acting when one knew that one's actions could cause harm. Responsibility in this sense applies to all actions, not merely those that have been codified in laws and regulations.

If we recast the idea of sustainability in ethical terms, this second sense of responsibility becomes critical and challenges firms to see the world in very different ways. Many new strategic ideas (such as eco-efficiency), codes of practice, and tool kits (such as design for environment) embody some aspects of responsibility in this sense. In his Foreword to the book *Eco-efficiency, The Business Link to Sustainable Development*, Maurice Strong (a well-known business thinker on sustainability) suggests that eco-efficiency "can help individuals, governments and business to achieve responsible attitudes."[5] But it is critically important to determine whether those attitudes become aligned with the ethical dimension of sustainability or turn out to be merely an elaborate case of business-as-usual — with businesses doing basically what laws and regulations mandate and perhaps a bit more.

Part IV of this report begins with a discussion of sustainability, presenting a new definition that leads directly to extended producer responsibility as a critical policy theme. A model for a responsibly sustainable firm is developed that also is consistent with the ideas of EPR. Chapter 2 argues that sustainability is a culturally

radical concept that will find its way into a firm's marketing strategy and product offerings only when the structures that constitute its culture change. Recent and emerging environmental codes of practice and management systems have varying potential to contribute to sustainable cultural change. But sustainability will not happen unless firms overcome many barriers, discussed in Chapter 3, that now stand in the way. Chapter 4 presents case studies of firms that have recently made significant moves toward sustainability through product and strategic innovations. The final chapter presents recommendations about how to achieve a more rapid development of sustainable firms. EPR can play a major role in providing a set of norms and beliefs that are more aligned with sustainability than those embedded in traditional environmental policy. But other resources and other institutional changes are also necessary.

CHAPTER 1. SUSTAINABILITY AND THE FIRM

It is reasonable to ask whether the emergence of "green" practices in firms signals a meaningful sea change or is merely part of a familiar but meaningless pattern. Further, given the spate of books and articles suggesting that only firms with sustainable strategies will be tomorrow's winners, it also reasonable to ask whether the exhortations usually contained in these writings will really induce a critical mass of firms to move onto sustainable trajectories. There are reasons to be skeptical on both counts.

If sustainability is defined carefully, it can be argued that few, if any, of the many new practices being touted as green or eco-efficient are, in fact, sustainable. The basis for this argument is that sustainability is a radical concept that cannot be realized within the existing set of institutional and societal action-producing structures or, as some would say, within the current dominant social/cultural paradigm.[6] Thus, any assessment of emergent new practices needs to be made in the light of their consistency with a different concept of sustainability.

The Roots of Sustainability

The now familiar Brundtland definition of sustainable development – a form of development or progress that "meets the needs of the present without compromising the ability of future generations to meet their own needs"[7] – both simplifies and hinders attempts to determine what is and what is not a sustainable practice. On the one hand, it suggests that the current social/economic system only needs to be made more efficient through technological and institutional innovations. Further, many argue that such innovations will come naturally as a consequence of scarcity, environmental stresses, consumer demands, and other forms of economic forces that promote inventiveness and change.[8]

On the other hand, this definition clouds the fundamentally unsustainable character of the existing economic, industrial system, encouraging an uncritical

view of the current world situation and its trajectory. The Brundtland definition begs many questions and has led to criteria for judging new practices that are primarily means-oriented. One of these, created by the business community, is the notion of eco-efficiency, which basically promises more of a service or function while using less materials and energy. This idea parallels the call for improved technologies vastly more efficient than those they replace.[9] While such improvements are necessary to sustainability, they are not sufficient. Their failings spring from two sources: one is simply that these improvements in efficiency are insufficient to counter the absolute impacts of growth occurring at even faster rates. Such rates of growth are projected in virtually all models of near-term global development. A second shortcoming is that the Brundtland definition and its associated criteria fail to capture the inherent radicality of the very idea of sustainability.

Over 20 years ago, the eminent psychoanalyst Erich Fromm wrote in a remarkable, prescient book, *To Have or To Be*, that "the first crucial step toward [a healthy economy] is that production shall be directed for the sake of 'sane consumption.'"[10] Fromm arrived at this notion of sustainability by observing two fundamental modes of human existence — being and having. He suggests that the "having" paradigm, which has come to dominate modern industrial cultures, has turned pathological, and that only a shift to the "radical" alternative mode of "being" can save both the human species and the natural world.

The implications for sustainability should be obvious. It is important, however, not to read this critique of modernity as a simple argument against consumption. Fromm was cautioning against the dangers of a technological world in which individual and social experiences are so transformed by technology, and by the way we think about technology, that the fullness of our being as a unique species tends to get lost. In compensation for this loss, we tend to pick up more and more technological artifacts, hoping against hope to regain our sense of being. The challenge to industrial societies is not simply to reduce consumption, but to transform the nature of what we consume so that both human beings and natural systems can prosper.

Another problem with the Brundtland definition of sustainability is that there is no way to ascertain whether or not the world at a given point in time is sustainable – that is, whether current conditions, even if desirable, will exist in the future. Sustainability is essentially not assessable; all we can know is whether the present world is a flourishing place. Unsustainability, on the other hand, *can* be observed and is a characteristic of our modern mode of life. But we cannot determine whether current conditions can or will persist into the future. Thus, sustainability cannot be reduced to some deterministic set of characteristics and rules.

An alternative definition that avoids the determinism of the Brundtland and related concepts holds that sustainability is merely a possibility that human and other life will flourish on Earth forever. By "flourish" I mean not only biological survival but also the realization of whatever fundamental social norms humans have found to be essential to meaningful and authentic existence – justice, freedom, and dignity. Redefined as a possibility, sustainability can serve as a guide to actions that can achieve the central vision of flourishing day-by-day for time immemorial. Sustainability as possibility is not merely a technological characteristic of the global system, such as is embedded in the term "sustainable development," and yet it depends on the nature of that system. It is a vision of the future from which we can construct our present way of being. Although this concept of sustainability is a very powerful way of thinking and acting, it does not offer a direct route to practice. Creating a set of operational sustainable practices involves several steps.[11]

It is human action that will or will not produce an enduring world. The following incorporates the gist of many current definitions into a definition of sustainability as possibility with practical implications:

> Sustainability is a *possible* way of living or being in which individuals, firms, governments, and other institutions act *responsibly* in taking care of the future as if it belonged to them today, in equitably sharing the ecological resources on which the survival of human and other species depends, and in ensuring that all who live today and in the future will be able to satisfy their needs and aspirations.

A key word in the above definition is "responsibly," which lends a fundamentally ethical dimension to sustainability and ties it to the codified form of responsibility in EPR. It is directed at moral actors, not just utility maximizers, and not at some shapeless development process.[12] In contrast, the Brundtland and related concepts of sustainable development are all inextricably rooted in the present dominant social paradigm (at least in the industrial world) and cannot be radical in the paradigmatic sense that appears essential if societies are to break out of the current cultural reproduction of ecologically unsustainable patterns.

This discussion could easily be enriched with many more references to the literature of environmental and social policy that argue for radical change. Such sources would certainly include several on the idea of paradigm and its centrality in producing institutional or social patterns of culture and behavior. Thomas Kuhn's work is the seminal study that raised serious questions about the positivist model of knowledge and its handmaiden, science.[13] Anthony Giddens argues similarly that social action in general is rooted in a paradigmatic-like structure.[14] Both basically argue that institutions (the scientific establishment in Kuhn's work and society at large in Giddens') follow routine (or normal) patterns of activity until something happens that makes key actors aware that their efforts are not producing the results they intend. Only when they become aware of the futility of following the old, entrenched ways will they seek fundamentally new ways of seeing the world and acting accordingly.

The Responsibly Sustainable Firm

The nexus of production and consumption (sustainable or not) is the economist's abstraction, the marketplace. Under a set of ideal conditions, the market, regulated by the invisible hand, will produce equilibrium between consumers' demand and producers' supply. Standard economic models assume consumer sovereignty; that is, demand is created by preferences outside of the market and ancillary activities such as advertising. The correctness of this assumption is critical to any set of actions directed at making this "equilibrium" sustainable. The ideal conditions also assume the absence of spillovers or externalities, that is, positive and negative outcomes that arise from production and consumption outside of market transactions.

The standard models ignore distribution or equity, always assuming some a priori distribution of wealth that, in capitalist nations, has tended to shift from the poorer to the richer within and among nations. Finally, welfare economics has equated human well being with an arbitrary measure of aggregate national output, GDP, in such a way that more is always better.

Industry or business as a sector in the political economy of a nation is a primary target of environmental and other social policy because it is the key institutional actor in 1) creating growth in GDP through investment and innovation and 2) creating the tangible negative externalities that produce unwanted or unintended environmental damage and loss of human well being. Further, the cultural structures that establish the normal practices of business are, by themselves, incapable of leveling the distribution of wealth; such change is left to governments and extra-market instruments. Why is it important to pause and review this standard model before proceeding? Simply, because all of these hypotheses and standard policy frameworks must be changed if business is to lead a shift toward a more sustainable pattern of production and consumption. The good news is that some change is happening now; the bad news is that these small gains have been overwhelmed by the growth of the industrialized nations and by the aspirations of virtually everyone else to equal them in economic terms.

With this preface in place, it is fairly easy to imagine what an idealized firm operating on the basis of radical or responsible sustainability would look like. It would:

- Focus on the services, as opposed to the goods, it provides to customers and strive to design and deliver them in the least resource-intensive and ecologically damaging manner, taking account of life-cycle impacts over the entire value chain.[15]
- Market only services (and goods) that conform to a set of sustainability principles and performance measures based on the latest scientific understanding and on societal values defined by broad public participation.
- Use a set of sustainability tools to guide its actions.
- Operate with the same set of policies and standards in every location where it makes or markets its goods and services.

- Educate its customers and strategic partners along the entire life-cycle value chain about the implications of their actions on sustainability, and in this way contribute directly to the formation of sustainable consumer preferences.
- Maintain high levels of employment and flatten wage discrepancies between management and workers.[16]
- Publicly report on all of its activities that impinge on sustainability.[17]
- Do all the above routinely and responsibly, with its actions arising from a vision of sustainability and a set of normative values deeply embedded in its culture.

It is arguable (few would probably disagree) that this ideal firm does not exist today and could not survive within the paradigmatic structures that establish the institutional form of business virtually everywhere in the democratic, market-based world. Much of what needs to be done to produce such firms is deeply tied up with visions of self and society, with individual values and values that drive institutional action, and with a set of controlling or regulating tools, constraints, sanctions, rewards, and power relationships that, over time, have grown out of those visions and values. Giddens theorizes that such visions and values create the tools and power relationships that in turn reinforce and further embed those visions and values in the cultural underpinnings of routine actions.[18]

And so on, until something happens in the world, like the publication of Rachel Carson's *Silent Spring* or the disappearance of the ozone layer. Such public events, amplified by the media, penetrate the collective psyche and raise the public's anxiety to high levels. To ensure that such dramatic cases are few and far between, we need a set of early warning indicators that locate societal activities on some sort of sustainability map. Indicators such as "environmental utilization space" and "ecological footprint" are in the early stages of development and remain fuzzy and controversial, reflecting the complexity of the global economic/ecological system and the remoteness of many impacts from our consciousness in both time and space.[19] Without them, however, the reflexive process required for structural change toward sustainable patterns of production and consumption cannot happen. Change certainly occurs all the time, but perhaps the kind of change seen so far is only like rearranging the deck chairs on the *Titanic* when a change of course is what is really needed.

Industry does speak of "changing course," the title of Stephan Schmidheiny's important book that signaled industry's awareness of the need for a new paradigm and laid out some new principles for industry behavior — mainly the notion of eco-efficiency.[20] But this book was not the only sign of change within industry. New voluntary codes of practice and new forms of cooperative arrangement with governments and NGOs have been replacing or finding their place alongside regulatory mandates. Tools like life-cycle assessment, integrated chain management, full-cost accounting, and design for environment are slowly being diffused throughout industry. These tools are based on models of system behavior with names like steady-state economics and industrial ecology. Such paradigmatic frameworks — paradigmatic because they raise fundamental questions about current modes of thinking and acting — draw heavily on conditions found in nature. For example the following themes are important to many researchers' concepts of industrial ecology:[21]

- Connectedness
- Cooperation
- Community

All of these run counter to the basic notions of many industrial societies, which instead stress reductionist knowledge and administrative systems, competition, and individual autonomy.

The remaining chapters will examine the forces that are pushing companies toward this new paradigm. Perhaps the most significant barrier is the addiction to old ways of thinking that are often concealed in what appear to be pathways to sustainability. Sustainable development and eco-efficiency run this risk. Although they can be openings to a sustainable future, they are usually just improved instrumental means that lack the transformative power to move into the new paradigm. A related barrier is the continued reliance on technological fixes. Even when these could in theory reduce the immediate unsustainable consequences of economic behavior, they do not get picked up and put into play except in rare cases. The technologists that create the solutions frequently bemoan the fact

that their ideas go begging. But those that look at institutional behavior from a social sciences perspective are not so surprised that these "rational" solutions are ignored. They argue that "the failure to implement the 'solutions' is due to the fact that the changes [needed] are not primarily of a technical nature, and that major changes are also needed in our institutional systems and infrastructure."[22] The next section looks at culture and what it takes to change it.

CHAPTER 2. CREATING TRANSFORMATIVE CHANGE IN FIRMS

Sustainability is the latest in a sequence of themes related to environmental management that stretches over almost three decades. As already noted, sustainability requires new ways of thinking and acting that depart significantly from those that have become embedded in the present-day routines of firms. Increasingly, these need to take into consideration the whole life cycle of a firm's products and services. As a result, decision-making may involve actors outside the firm's traditional corporate environmental functions and perhaps even outside the company itself. Emerging public policies, such as EPR, stretch the traditional mission of firms, mandating new roles such as product take-back. It is hard to imagine a product designer, say 10 years ago, paying much (if any) attention to how a new product can be taken apart at the end of its useful life. But the new realities of sustainability and other environmental policies force such thinking on firms and their key personnel. Not to change is to risk loss of competitiveness and relevance in the future.[23]

If more effective behavior relative to the environmental and sustainable dimensions of business activities is to become routine in the future, firms must deepen and broaden the underlying resources and processes from which action springs. The most prevalent models for organizational behavior are predicated on some form of rationality, and assume that decisions arise from the application of a calculus of logical operations that maximize the firm's net benefits, given the resources and information available to it.[24]

But these models are not the only ones used to explain and design organizational behavior. The model of organizational behavior (action) invoked in this chapter largely follows Anthony Giddens' structuration theory.[25] Giddens, among other sociologists, argues that decisions are rooted in the culture of firms and follow routines that have become deeply embedded in that culture. Rationalists tend to posit that improved decisions rest primarily on more and higher-quality

resources, such as skills, tools, and information. Few would argue with the need for and value of such resources. Cultural theorists, however, add that changes in routines and decision-making come only after the underlying structures that give a culture its characteristic shape are themselves changed.

This chapter briefly examines this theory and discusses the key cultural characteristics of progressively proactive modes of environmental performance and the kinds of cultural structures demanded by sustainability. It then analyzes the potential of some new environmental management strategies and practices to bring about cultural change.

Sustainability and Structure

Giddens posits that a given action arises from the interplay of four categories of structure (and their attendant rules and resources) that are reinforced or modified in the course of action. Structure, according to Giddens, is both "the medium and the outcome of action." The most familiar categories of structure are 1) allocable tools used by the organization and 2) patterns of authority. These empower the members of an organization to produce the outcomes they intend (and some that they do not intend). Tools give people the wherewithal to get the job done; authoritative resources establish a network of commitments. The two other forms of structure exist only in the mind or memory of the individual or firm. They are 1) a set of filters that create a world for the members of the organization and 2) a set of norms that define appropriate action. Organizations create a world by means of beliefs, mind-sets, world view, and meanings; they articulate norms by means of values, priorities, policies, rules and regulations, standard operating procedures, and so on.

A key implication of Giddens' model is that changes in one category of structure cause changes in the others. If there are changes in the belief system or norms, new tools arise to bring actions into correspondence. Or if new tools and patterns of authority are introduced, the underlying beliefs and norms will shift. This process takes place over and over again, reinforcing the cognitive pieces and embedding practices.

Institutional theory suggests that the norms of the external society penetrate the organizational structure, becoming so strongly held that the organization's patterns of behavior arise from compliance with those norms. Institutionalist models are consistent with Giddens in that they connect long-term behavior with conformity to norms based on societal forces. For example, it could be argued that quality management was a highly valued norm in the US automobile industry for many years, but that automakers were nevertheless producing unsatisfactory results compared with their Japanese competitors. The total quality revolution — not merely a change in practices — resulted, at least in part, from the new meaning given to quality by Japanese automakers, who saw quality as an assessment by the customer, not a set of inherent technical characteristics. US industry still struggles to overcome its deeply entrenched belief that quality exists in the object, rather than in the customer's world.

Similarly, in the environmental arena, the disaster at Bhopal changed the image of the chemical industry and created a new reality in which member firms would have to live. The industry's image changed from helping to create the good life through chemistry to a destructive force in the world. Sometime after this new reality became embedded in the consciousness of chemical firms, the industry responded with Responsible Care — a code of practices and principles that has already changed the underlying cultural structures in many firms and made new practices routine, all in the name of taking better care of people and the environment.

The Corporate Road to Sustainability

Firms create their intention to act through the filters of their world view or belief system and their norms. Commitment follows through a network of requests and promises mediated by the authoritative structure, and action finally occurs through the application of allocative, tool-like resources. When designing for better environmental outcomes, the structures of authority, resources, and worldview must all be in place if the desired outcomes are to become routine. The history of corporate environmentalism exhibits a pattern of distinct behavior that reflects the underlying filters and norms that characterize today's firms. The following discussion follows the argument that sustainability is a structurally

distinct "environmental" issue with a new set of beliefs and norms. It shows how recent environmental codes and practices have the potential to change the structure by which firms act.

Early Corporate Environmentalism

Concern for the environment surfaced in the late 1960s and early '70s following a series of environmental problems involving air and river pollution. The initial response was basically to conduct business as usual, treating events such as massive fish kills as accidents to be dealt with by plant operating personnel. Anything problematic was viewed as an unfamiliar nuisance ancillary to conducting business. As a result, organizations did not have permanent staffs or budgets for dealing with environmental issues. Often, plant engineering staff were called upon to handle environmental issues on an ad hoc basis. In contrast, few firms in today's advanced industrial societies operate in this manner. Given the all-pervasive nature of environmental regulations, every company must have an understanding of environmental law in order to survive.

Managing for Compliance

Around 1970, the environment began to hit the front pages and the political arena in many countries simultaneously. The United States led the world, passing one strong environmental law after another, the first requiring firms to control emissions to air and water and subsequent laws regulating solid and hazardous waste management. Firms responded by establishing new functions to ensure compliance with the largely technical requirements of the many new regulations that flowed from these laws.

This response was a classic case of buffering behavior — that is, new routines arose without much change in the underlying structure. Following a pattern characteristic of the mass production model that was the hallmark of American industry, companies generally placed these new functions at the periphery of the firm, buffering the core of the organization involved more directly with manufacturing. Although a new consciousness of the "environment" did arise, the normative structure maintained the hegemony of the firm's core functions.

The underlying assumption was that environmental protection was of little or no concern to a firm's strategic decision-making. Although companies at this stage view laws and regulations as significant influences on business operations, they have no concern for the background environmental issues. Certain parts of the organization are altered, but the basic structure remains untouched. Dedicated compliance staffs, in departments labeled "government affairs" or "regulatory compliance," serve as buffers, limiting the collection of information and the impact that environmental regulations have on the inner workings of the firm. Such staff can function at the operating level in the form of an environmental engineering department, at the corporate level in the form of environmental counsel, and at the political level in the form of lobbyists who fight against environmental statutes and regulations.

Moving Beyond Compliance

The first signs of strategic environmental behavior began to emerge about 10 years into the environmental era, around the time of the passage of the US Superfund law. By making unlawful the standard disposal practices that companies had followed for decades and making them responsible overnight for the cost of cleaning up thousands of abandoned and inactive dumps, this law profoundly changed corporate attitudes. In addition, it caused the financial cost of complying with environmental regulations to rise sharply (it now amounts to 2 to 3 percent of the US gross domestic product). Accidents such as Bhopal in the mid-1980s were highly publicized, giving the entire chemical industry a black eye in the marketplace and in the political arena. Public disclosure requirements (such as community right-to-know provisions in the United States) forced companies to look more carefully at their relations with other stakeholders besides customers and stockholders.

In this costly and institutionally threatening context, firms began to envision a positive side to environmental management that went beyond mere compliance with government standards. They realized that taking care of the environment could provide them with strategic as well as significant bottom-line advantages, and that reducing emissions could have good public relations and political

value. At this stage in the history of corporate environmentalism, the voluntary establishment of stricter emission controls began to be seen as consistent with corporate values. The Pollution Prevention Pays (3P) program introduced by 3M in 1975 was one of the earliest examples of a US firm taking explicit action beyond mere compliance in environmental management. The reasons 3M cited for the program were strategic: pollution represented waste and an inefficient use of resources, so eliminating pollution should improve efficiency. The 3P program provided incentives for employees to seek innovative ways of eliminating waste at the source rather than falling back on end-of-pipe technologies like recycling or recovery. Between 1975 and 1992, the 3P initiative involved more than 3000 projects, prevented more than 1 billion pounds of emissions, and saved 3M more than $500 million.

Actions such as these often result in profit increases through lowered operating expenses. Organizationally, they are often accompanied by the establishment of an executive-level position responsible for matters concerning the environment. Also, responsibility for environmental protection begins to be diffused throughout the company. Environmental management staffs move away from their alignment with regulatory compliance and begin to associate with their colleagues in quality control and corporate strategy. Generally, such moves are accompanied by public statements of broad corporate commitment to protecting the environment.

The Emergence of Sustainability: New Cultural Structures

The evolutionary pressures that produced the responses characteristic of the first three phases of corporate environmentalism also created broad-based beliefs and norms that formed the basis for corporate strategies and practices. Table 1 shows the key beliefs and norms typical of companies during these transitional periods. Now, however, these beliefs and norms are being impacted by a new set of evolutionary pressures brought about by the emergence of sustainability as a driver of environmental management and, some might argue, of corporate strategy in general.[26]

Table 1. Three Stages of Corporate Environmentalism

Stage	Beliefs	Norms
Early (late '60s to early '70s)	No distinctive beliefs regarding the environment	Business as usual; problems dealt with on ad hoc basis by engineering staff
Compliance ('70s to mid-'80s)	Environmental responsibility means compliance with regulations; environmental management is always costly	Business as usual; obey the law; respond cost-effectively; rationalize the cost; fight against regulations
Prevention (mid-'80s to the present)	Environment responsibility is an opportunity; pollution and waste are avoidable inefficiencies	Business as usual; reduce pollution sources; pollution prevention pays

In countries with long histories of environmental protection such as the United States, Germany, and Japan, virtually all firms have by now moved into the compliance stage. Penalties exacted by the courts or the marketplace are much too high to ignore. Larger, more strategically oriented firms have moved into the proactive stage characterized by preventive approaches. And although many such strategies are anticipatory and seek to avoid future harm to both the firm and the environment, only a few firms have integrated the far-reaching implications of sustainability into their strategies.

To the extent that sustainability is explicit in a company's policies, strategies, and operational behavior, it almost always reflects some variant of the notion of sustainable development promoted by the United Nations Conference on Environmental Development (UNCED). The objectives of this form of sustainability are consistent with those of the more radical form, but the bases of action are assumed to be available within the existing paradigm (or structure, in Giddens' terms). In order to operate on the basis of radical or responsible sustainability (as described in Chapter 2, pp. 207 to 208), a company must shift its beliefs from those that are common today. The following are representative of the beliefs and values of a responsibly sustainable firm:

- Profit is a critical factor in the firm's short-term survival.
- Equity is a responsibility of the firm.
- Precaution is a virtue, not a vice.
- The firm exists within and is connected to the natural world. Understanding the firm's ties to the ecosystem and acting accordingly are central to sustainability.
- Resources are limited, are affected by the firm's activities over the whole product life cycle, and are of strategic importance.
- Diverse stakeholders hold legitimate interests in what the firm does. But nature itself is a critical stakeholder and must be represented by human surrogates.
- The firm's boundaries are transparent, porous, and extend beyond the traditional fenceline.
- Individual, independent organizations (organisms) are not sustainable.

With the exception of the first in the list, all of these beliefs and values are more or less in conflict with current strategic corporate thinking. The beliefs typical of today's firms, which mirror those of the larger society, include the following:

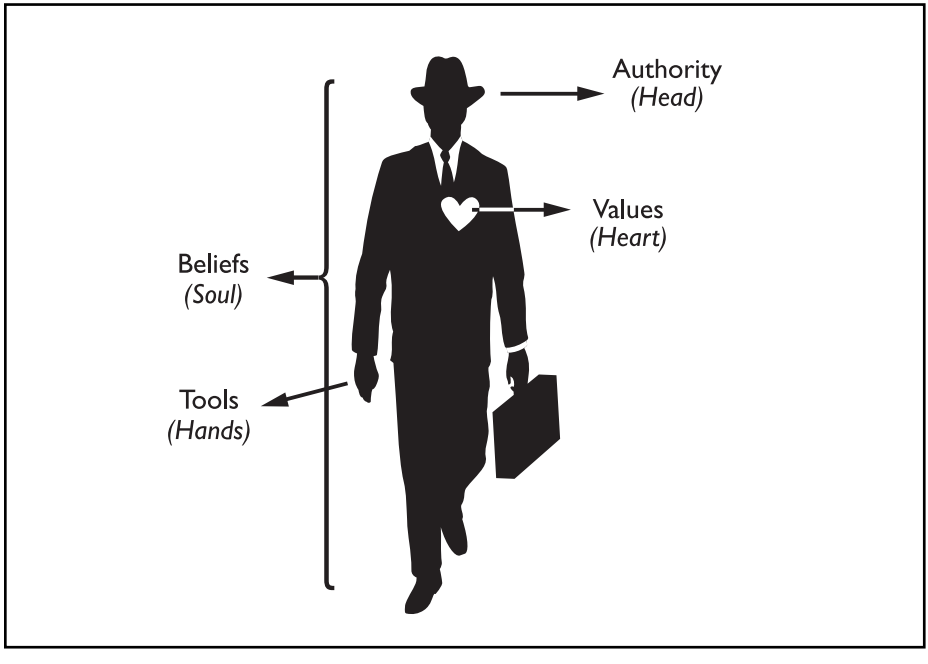
- Profit is a critical factor in the firm's survival.
- Life is focused on the here and now; the future will take care of itself.
- Nature is limitless and always available to serve humankind; the economy is separate from and independent of the ecosystem.
- Scarcity is an economic idea, not a physical reality.
- New, improved, and more economical technological substitutes will always emerge as the old ways become too costly.
- There is always a right answer to every question, provided one has enough factual information.
- Technology is good, progressive, and can solve any problem it creates.

Development of routine compliance and preventive activities requires a shift in a firm's authoritative and allocative resources but little change in its beliefs or

norms. Although a firm may make "green" claims, in most cases it will still be operating on the basis of beliefs and norms typical of current corporate culture.[27]

It is helpful to use a metaphor for the four categories of structure in Giddens' taxonomy. If the corporation is envisioned as a person, the four categories can be symbolized by the hands, head, heart, and soul of the organization (Figure 1).[28] The hands correspond to the allocative resources or tools available to the firm. The head refers to the authoritative structure — the source of power to create and command. The heart is the locus of the firm's values and norms, and the soul is its vision, mission, and other belief structures. Together they constitute the cultural foundation of a firm, that is, its corporate body.

Figure 1. The Four Categories of Structure in the Corporate Body



In the compliance stage, only the hands (or tools) are needed for the firm to respond to environmental concerns. A valve must be closed, a new control device added. The environment is mainly just another cost-producing problem;

new norms reflecting a sense of responsibility toward the environment are absent. In the move to prevention, a shift in the corporate head (authority) is required toward longer-range thinking and new organizational structures. Industrial processes must be carefully scrutinized to identify the sources of waste. Process managers must brainstorm strategies to find new opportunities for reduction. Firms begin to decide to invest in new technologies that will avoid or internally recycle wastes and dramatically reduce discharges. This domain represents an expanded rationality.

But these activities do not require significant changes in the firm's heart — its values. However, as the firm begins to interact with stakeholders whose worldviews are substantially different, its values may shift.[29] As it listens to the environmental concerns of customers and others, its environmental consciousness may begin to broaden, particularly if those concerns are considered important to the firm's competitive success. What the firm cares about, what it considers its "business" in a practical sense, begins to shift.

Finally, the very soul of the firm — its vision of the world and its place in it — may begin to metamorphose. As a company begins to embody the very long-range view called for in manifestos like the Brundtland Commission report and the Rio Summit's Agenda 21, its essence may crumble and recompose into something altogether different. A new species of corporation emerges. Robert Shapiro, the CEO of Monsanto, said in an interview published in the Harvard Business Review: "We're entering a time of perhaps unprecedented discontinuity. Businesses grounded in the old model will become obsolete and die. At Monsanto, we're trying to invent some new businesses around the concept of environmental sustainability. We may not know exactly what those businesses will look like, but we're willing to place some bets because the world cannot avoid needing sustainability in the long run."[30] John Browne, Chief Group Executive of BP America, put the challenge somewhat differently in a speech at Stanford University: "It is a moment for change and for a rethinking of corporate responsibility."[31] It is too soon to know the extent to which these structural changes will actually occur. But it is noteworthy that the language of these

industry leaders speaks to the need for some kind of deep-seated structural or cultural change.[32]

Seeking Sustainability in New Environmental Practices

To achieve sustainability, firms have no choice but to take the kind of bold steps suggested by Monsanto's Shapiro. Although this is an unknown and often frightening area, roadmaps can be found. New ideas and systems have been emerging as guides for firms ready to step off the secure platforms of compliance and pollution prevention. Companies committed to moving toward sustainable structures can speed the process by adopting a thematic or programmatic package that provides vision, policies, priorities, and performance goals incorporating some of the sustainable beliefs and norms outlined above. Once such a program is created, a firm can build its core competence around sustainability and the learning gained from new practices.

The programs described below are examples of drivers for structural change. They have the capability to alter a firm's values and beliefs and open it up to a learning process that can ultimately produce increasingly sustainable everyday behavior. Even the names of the programs are important, conveying the connectedness of the firm to the larger world and its impact on the world over the product life cycle. A firm's policies must be changed to make the new visions and values explicit. New tools and information systems, such as life-cycle analysis and full-cost accounting, are essential to remove the firm from its attachment to the old culture and bring it to new opportunities.

Total Quality Environmental Management

Total quality environmental management (TQEM) is a movement to introduce quality management themes and practices into environmental systems.[33] TQEM is the main program of the Global Environmental Management Initiative (GEMI), an association of about 30 large US corporations. Unlike several of the other organizations promulgating standard-like codes of practice, GEMI views itself as an educational association only. TQEM seeks to bring environmental management closer to the same kinds of formalized systems and procedures that

typically are used to ensure quality in a firm's products. It promotes continuous learning, assessment and feedback, data-driven decision tools, training, and other standard practices. It has the capacity to elevate the status of environmental management within a firm's existing values. It is primarily an internal analytic system with a larger awareness of the environmental aspects of product quality. TQEM most directly affects the hands (tools) and head (authority) of the corporate body, and requires complementary means to bring change to its heart (values) and soul (beliefs).

Eco-efficiency

Through the World Business Council on Sustainable Development (WBCSD), some 120 of the world's largest firms have lined up behind the idea of "eco-efficiency," which focuses on the inefficiency of material and energy consumption prevalent in current practices.[34] These companies promote eco-efficiency as "the primary way in which business can contribute to the concept of sustainable development."[35] They note further that:

> Eco-efficiency is a management philosophy. It encourages business to become more competitive, more innovative and more environmentally responsible. The pursuit of eco-efficiency does not require companies to abandon all their current practices and systems. It calls for them to adapt these in order to achieve higher levels of economic and environmental performance through continuous improvement. This means a significant change from 'business as usual'... Although it is a new and unfolding concept, the vision of eco-efficiency is simply to 'produce more from less.'

Eco-efficiency has five core themes: (1) an emphasis on service, (2) a focus on needs and quality of life, (3) consideration of the entire product life cycle, (4) a recognition of limits to eco-capacity, and (5) a process view.[36]

The WBCSD web site presents some 10 cases of eco-efficiency among its members.[37] For example, Millar Western now uses a chlorine-free closed-loop paper manufacturing process in several of its mills. Danfoss introduced a water use program for a facility in the Baltic Sea that reduced demands on a failing aquifer that was threatening the viability of the plant's operations and the well-being of the entire island

population. STMicroelectronics found a productive use for wastewater treatment sludge by recycling rather than landfilling.

The value of these eco-efficient solutions was characterized by the WBCSD as falling into the category of cost savings, market expansion, or risk management. They exemplify the ability to obtain both environmental and business benefits by providing more for less. However, these cases show little or no evidence of responsible sustainability that can be directly attributed to eco-efficiency. The Danfoss case, for example, seems to have been driven primarily by regulatory pressures, not by any independent sense of environmental responsibility. Though still at an early stage, eco-efficiency seems to be largely a sophisticated form of business as usual.

Two other cases from the WBCSD web site were somewhat different in nature, hinting at a new sense of responsibility. Bristol-Myers Squibb has developed a product life-cycle review process and in-house database of some 240 best practices for dealing with environmental problems. While the specific examples described are fairly mundane and do not embody sustainability in the radical sense, the company does appear to be taking a more responsible stance toward its products. Similarly, SC Johnson established a self-imposed set of pollution reduction requirements and a process for continually tightening its targets. Again, while not remarkable technically, this project has involved SC Johnson in a dialogue with community and national interests and exemplifies a long-standing commitment to good corporate citizenship.

While more efficient use of resources is undeniably critical, eco-efficiency is an insufficient means to achieve sustainability in the fullest sense. The very term "eco-efficiency" seems to send a message that a completely technocratic solution is available and that little needs to be done in reshaping corporate responsibilities and values.

Product Stewardship/EPR

Product stewardship is a general term signaling a shift in a firm's responsibility from the mere delivery of a product or service to the entire product life cycle.[38]

Product stewardship is closely related to extended producer responsibility. One essential difference is that product stewardship generally arises from industry initiatives, whereas EPR comes largely through public policy.[39] Product stewardship is largely voluntary, although in cases such as the chemical industry's Responsible Care program (described below) it may be undertaken by an entire product sector, with sanctions created by peer pressure.

The focus on product take-back that characterizes EPR is not explicit in product stewardship codes such as Responsible Care. The language of product stewardship is more general, but it does make explicit a company's responsibility for its products and services over their entire life cycle. For example, Responsible Care's distribution code of practice requires chemical companies to stop selling to firms they deem unable to safely handle their products. This has resulted in chemical companies providing technical assistance to customers to ensure their competence (sales to a small number of customers have been discontinued).

It is the explicit acceptance of stewardship (in the sense of taking care of the environment beyond what is mandated by law) that gives this concept the power to alter corporate structures. The difference between stewardship and EPR is largely semantic. Both rest on an ethical base, whether codified in law and policy or simply embedded in a firm's normative cultural structures. Both challenge not only a firm's tools and authority, but also its values and beliefs. They force designers and planners to consider issues left out of the customary focus on cost and performance. And they open the firm up to new relationships with its suppliers, distributors, customers, and waste managers.

Responsible Care

Responsible Care is the example par excellence of a class of voluntary codes that have policy or regulatory-like characteristics.[40] Such codes are voluntary only in the sense that they are not mandated by public authorities, but failure to comply may carry strong sanctions from the institutional source that created them and from other groups as well. Responsible Care emerged from concerns over the public image of the chemical industry, especially following Bhopal and other

incidents, and from the realization that institutional, industrywide action was needed to restore and maintain legitimacy among stakeholders.

In the late 1970s, Canadian chemical firms developed an informal statement of principles regarding the management of chemicals. These principles failed to receive broad support until 1983, when the Canadian Chemical Producers Association (CCPA) adopted a formal statement of environmental principles that it called Responsible Care. Endorsement of the principles by member companies was voluntary. In the aftermath of Bhopal, in December 1984, the CCPA board of directors voted to make signing on to Responsible Care a condition of membership in the association. In addition to abiding by the Responsible Care principles, member firms were to enact a program of Community Awareness and Emergency Response (CAER) at each facility to help communities develop plans in the event of a chemical accident.

The US chemical industry responded to the Bhopal disaster with its own CAER program in 1984. In 1987, the Chemical Manufacturers Association (CMA) formally took action to implement a comprehensive program like Canada's. The stated objectives of Responsible Care are to "promote continuous improvement in member company environmental, health, and safety performance in response to public concerns, and assist members' demonstration of their improvements in performance to critical public audiences." Participating firms must "make environmental considerations a priority" in planning products and processes, operate plants "in a manner that protects the environment," and recognize "community concerns about chemicals."

From 1988 to 1994, CMA developed codes of management practice governing how firms were to operate their manufacturing processes, distribute their products, and interact with community members, suppliers, and customers. Six Responsible Care codes have been instituted, encompassing over 100 practices that chemical companies must implement and continually improve.

Responsible Care has been adopted by the chemical industry worldwide. It has a strong emphasis on elevating environmental values and other beliefs. The name itself is significant; responsibility and caring both reflect a concern for factors closer to the heart and soul of a company.

Business Charter for Sustainable Development

The Business Charter for Sustainable Development of the International Chamber of Commerce (ICC) was unveiled in early 1991.[41] To date, it has been endorsed by thousands of firms, more than any other code. The charter comprises 16 principles, including corporate priority, integrated management, prior assessment, openness to concerns, and a precautionary approach. Many of these make strong normative statements. The Business Charter for Sustainable Development was developed by a group of industry leaders in preparation for the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992. It calls on firms to recognize environmental management "as among the highest corporate priorities and as a key determinant to sustainable development," and is explicit in its discussion of the use of life-cycle assessment. Companies' products should be "safe in their intended use." The strong normative and world-changing sense of the ICC's charter makes it a potentially powerful agent for cultural change at the heart and soul of the corporate structure.

ISO 14000

ISO 14000 is a comprehensive set of management system requirements that a firm must implement if it is to become certified under procedures established by the International Standardization Organization (ISO).[42] The ISO 14000 standards and supporting documents grew directly out of the ISO 9000 quality management standards and borrow from them extensively. US firms have been much slower to become ISO 14001-certified (ISO 14001 is the actual certification standard) than companies in the rest of the industrialized world. At the end of 1998, only about 200 sites had been certified, compared to around 1400 in Japan, 950 in both the UK and Germany, and 460 in Korea.[43]

ISO 14001 has a strong training component and aims for direct improvement in a firm's environmental management systems. The standard is only indirectly connected to tangible environmental outputs. Like TQEM, it has much potential to improve practice in a firm (its hands and head), particularly in relation to compliance, but it lacks visionary and normative power (heart and soul). Change in these two aspects of a firm's structure must be created by the company in its policy statement, as required under ISO 14001. The standards grew out of a consensus process that caused normative content to be excluded from the final code. Combined with TQEM (which involves complementary strongly normative and consciousness-producing programs) or another of the more normative codes, ISO 14001 can become part of a system that moves a firm toward the realm of sustainability.

CERES

In the wake of the Valdez oil spill in 1989, a coalition of socially responsible investors, environmental advocates, labor unions, and religious groups joined forces to create an organization dedicated to forging a new type of relationship between industry and outside stakeholders. This group, called the Coalition for Environmentally Responsible Economies (CERES), sought to encourage firms to act responsibly toward the environment and to disclose relevant information about their behavior.[44] The vision of CERES organizers was that firms would release to the public "consistent and comparable" environmental data similar to what is used by investors to analyze corporate financial performance. Armed with this data, investors with environmental interests would be able to select high performers for investment. CERES ambitiously aspired to play a role not unlike that of the Financial Accounting Standards Board, and eventually to formulate "generally accepted principles" for environmental reporting.

The group's first order of business was to develop a common set of environmental principles that would constitute responsible corporate behavior toward the environment. After many debates, the coalition released the Valdez Principles, 10 recommendations intended to guide corporate behavior on important environmental issues, including sustainability. The Valdez Principles addressed corporate conduct regarding the protection of the biosphere, use of natural resources, waste reduction

and disposal, energy use, risk reduction, marketing of products, damage compensation, environmental commitment in the selection of board members, auditing, and public disclosure of audit results. Firms that wanted to claim adherence to the principles had to sign on and agree to implement them. This process was softened after CERES found it virtually impossible to involve any companies other than a set of small firms that already called themselves "green." The principles were subsequently modified and renamed the CERES principles. The commitment process was changed to one in which CERES and company participants endorse each other's principles or other formal code of environmental practice.

Some 50 companies and organizations have endorsed the new CERES principles.[45] The list includes around 15 large firms, including some Fortune 500 companies. The requirement to report publicly on progress and performance strongly activates the structuration process. CERES launched a Global Reporting Initiative in late 1997 to establish a consensus standard for environmental reporting and continues to act as convener for the participants. A draft set of reporting guidelines was discussed at a meeting in London convened by CERES in March 1999. Although most attendees applauded the progress and the broad participation in the drafting process, there were significant differences about the content.[46]

The CERES organization has moved to a consultative process working with endorsers that appears to accelerate organizational learning and the realization of better environmental decisions. The normative content of the CERES principles has the potential to alter the heart and soul, but it leaves the choice of resources (head and hands) largely to the firm. Moreover, the potential for change embedded in the CERES principles may not be fully reflected in a firm's own code.

Industrial Ecology

Unlike specific programs such as Responsible Care and ISO 14000, industrial ecology is a broad framework for thinking and acting in the realm of sustainability.[47] The name suggests the blending of ecological systems and industrial economies. The ecological side offers the possibility of learning from resilient, robust, long-lived ecological communities as examples of sustainable systems. The industrial

side suggests that society can move toward sustainable economies by embedding the underlying principles of these ecological systems in the design of firms and other social institutions. For many, industrial ecology is paradigmatic in that it provides a new vocabulary for talking about and understanding sustainability.

The relevance of industrial ecology to environmental decision-making is that it emphasizes (1) interdependence, cooperation, and symbiosis; (2) limits to carrying capacity and the inherent parsimony of stable living systems; and (3) cyclic patterns of material and energy use in nature. These notions are congruent with the list of sustainability beliefs noted earlier and can influence the soul of the firm at a very deep level. The design principles that arise from industrial ecology, such as closing materials loops, can provide those engaged in the process of technological problem-solving and innovation with a more powerful methodology for change. Thus, industrial ecology also bears on the hands and head of a company, offering the means to new tools and organizational arrangements.

The Natural Step

Dr. Karl-Henrik Robèrt, a Swedish research oncologist, founded The Natural Step (TNS), in 1989. The purpose of TNS is to disseminate a framework of easily understood, scientifically based principles that can guide society toward a sustainable future. These principles, called "the system conditions," are:

1. Substances extracted from the earth must not systematically accumulate in the ecosphere.
2. Society-produced substances must not systematically accumulate in the ecosphere.
3. The physical conditions for production and diversity within the ecosphere must not be systematically deteriorated.
4. The use of resources must be efficient and fair with respect to meeting human needs.

TNS spread quickly throughout Sweden and has recently taken root in Europe, the United States, Canada, and Australia. The normative character of the system conditions is explicit. The Natural Step offers training and consultative support for

companies and other organizations. It portrays the system conditions as a "compass" with which a firm can find its way to a sustainable existence with products, services, and strategies that are consistent with the principles. Like the CERES principles, TNS has the potential to change the heart and soul of a firm. It provides a strong new vision of the connectedness of a firm to the natural world.[48]

Design for Environment

Design for environment (DfE) is emerging as a systematic approach to addressing the entire system of environmental impacts.[49] It is a process by which firms design products and processes in an environmentally conscious way across the entire product life cycle. Decision-making is guided by a set of principles based on industrial ecology or some other set of system-configured, integrative principles. DfE has great potential to effect change in both the heart and soul of a firm. It impacts the core processes by which a firm renews itself — product development and marketing. The capability of the resultant goods and services to achieve sustainability depends on the depth of the firm's vision and values.

Table 2 estimates the relative power of the environmental practices discussed in the preceding pages to alter the hands, head, heart, and soul of the corporate body. No single program is strong in all categories, suggesting that companies committed to moving quickly toward sustainability may wish to implement a combination of these and other practices.

These and other culture- and behavior-changing programs are being implemented by many companies. The pressure to incorporate some version of them comes, in part, from these companies' ultimate customers as they seek more "sustainable" or "green" products. However, demand from the consumer market has been slow to develop, particularly in the United States. In contrast, industrial buyers have been more demanding, and they are the major force behind such codes of practice as ISO 14000.[50] Regulators are also considering participation in these programs as signs of leadership or good citizenship, and may relax some requirements for the companies involved. Peer pressure and concerns over the image of particular sectors are forces behind Responsible Care and other industry-driven programs.

Corporations exist primarily to produce the goods and services demanded by society. Ultimately, sustainable corporate cultures will be reflected in products and services that, in comparison with today's output, recognize the connectedness of the economy to the natural world and respect the need to maintain its health into

Table 2. Structural Change Potential of Various Environmental Practices

Practice	Head	Hands	Heart	Soul
Total Quality Environmental Management (TQEM)	Absent	Weakly explicit	Reinforces business as usual	Reinforces business as usual
Eco-efficiency	Absent	Implicit	Implicit	Not known
Product Stewardship/EPR	Absent	Implicit	Implicit	Implicit
Responsible Care	Weakly explicit	Strongly explicit	Weakly explicit	Weakly explicit
Business Charter for Sustainable Development	Implicit	Implicit	Strongly explicit	Weakly explicit
ISO 14000	Weakly explicit	Weakly explicit	Absent	Absent
CERES	Weakly explicit	Weakly explicit	Strongly explicit	Strongly explicit
Industrial Ecology	Absent	Strongly explicit	Implicit	Strongly explicit
The Natural Step (TNS)	Absent	Weakly explicit	Strongly explicit	Strongly explicit
Design for Environment (DfE)	Absent	Strongly explicit	Implicit	Strongly explicit

the far distant future. Taking care of a world in which humans are completely interconnected means that in caring for the world we take care of ourselves.

The codes, principles, and specific practices briefly described in this chapter contain embedded norms and beliefs, as well as explicit designs for resource use that can hasten the formation of sustainable cultural structures. Structuration – the evolutionary process by which the a firm's head, hands, heart, and soul are changed in the course of action – is usually a slow process, responding only to an emergent awareness of unintended consequences or of new possibilities. It might be said that the Montreal Protocol, which contains a broad set of structures on a global scale, is the result of one such event – the acceptance that the ozone layer has collapsed due to human activities. On the other hand, structuration and the development of new routines can be deliberately speeded up by adopting new codes and practices that embed the vision of sustainability and other environmental states of being. To take care of the environment permanently and routinely, firms need to build the appropriate structure. Applying good analytic tools can be helpful in sorting out options, but without vision and a strong normative sense of what is important, the options that get evaluated are unlikely to produce the hoped for results. Only when the heart and soul are in the right place will the head and hands produce better outcomes.

CHAPTER 3. BARRIERS TO SUSTAINABLE PRACTICES

Barriers to a smooth shift toward the sustainable firm as the norm are plentiful. The major obstacles at the paradigmatic level are ideas, concepts, norms, and practices that are firmly rooted in the way business is done. But there are also many barriers of a more practical nature, such as regulations established to promote good environmental behavior under the old system that now hinder new kinds of sustainable behavior. Barriers can be found in the larger context in which a firm operates and within the firm itself. The following discussion will examine regulatory, organizational, and economic barriers to sustainable practices.

Regulatory Barriers

In the United States and to some extent in other highly industrialized countries, environmental policy has grown out of an awareness of problems that arose at different times and in different domains of environmental concern. In the United States, environmental regulations have focused on controlling sources of pollution in specific media, such as air or water, and on the generation of hazardous waste. By far the preponderance of laws and regulations are tied to emissions from production processes. Each one of these laws tends to create an independent regulatory function and permitting process. The primary technical underpinning of the system is end-of-pipe controls, which convert pollutants and wastes to other substances that can be disposed of in the environment more safely than the process effluents themselves. Over the years, such regulations have become very specific, often designating only one or a few allowable technologies as permissible for treating a certain waste stream.

As already noted, the concept of loop closing is central to EPR and to sustainability in general. Loops can be closed at many stages in the product chain — by reusing production by-products in the same process, by sending them to another process as feedstocks, or by recovering and breaking down end-of-life products to generate

parts and materials for reuse. But in many cases, the potential feedstocks are classified as hazardous wastes and must be treated according to restrictive regulations that were designed to accomplish exactly the opposite of recycling, that is, the destruction or permanent isolation of these potentially recoverable materials.

A case in point is the cathode-ray tube (CRT) monitors found in television sets and computers. To protect users from dangerous emissions inherent in the technology of CRTs, part of the glass envelope is made of lead-containing glass. In many types of tubes, lead is present in sufficiently large quantities that these products would fail the tests used by the US Environmental Protection Agency to characterize hazardous wastes. In the absence of some exemption from the general provisions of the Resource Conservation and Recovery Act, used CRTs have to be managed as hazardous wastes, effectively precluding recovery and recycling.

CRTs are one of the many consumer products or product components whose recovery has been impeded by regulations. Other examples include nickel-cadmium (Ni-Cd) rechargeable batteries, mercury-containing thermostats and fluorescent lights, and many pesticide containers. Although it is permissible under federal law for individual homeowners in the United States to discard these items, many states have banned their disposal because they pose significant hazards in landfills or incinerators. Efforts to establish consumer recovery systems have been hindered because the discarded items are classified as hazardous wastes once they are collected and accumulated by industrial firms. The efforts of a large coalition of state regulators, environmental groups, and manufacturers to create a recovery program for Ni-Cds required regulatory relief from the federal government before the successful national recovery program could get off the ground (see Part II, Chapter 3, for a discussion of the US battery take-back program). It took the establishment of a special form of regulation, the Universal Waste Rule, which, in effect, exempts those who collect and manage end-of-life products like batteries from the most onerous regulations.

Organizational Inertia

According to economic models of corporate behavior, firms with a perfect understanding of the costs and benefits of innovative practices will implement those that bring a net positive result. Experience shows otherwise. If one examines the behavior of many similar firms in a reasonably well-bounded sector, one finds that in most cases there are wide variations in the speed at which new practices are adopted and in the degree to which they become routine.

Design for environment (DfE) is the process by which firms introduce "green" or sustainable attributes into their products and services.[51] It has been defined as "the systematic process by which firms design products and processes in an environmentally conscious way."[52] DfE differs from traditional design activities in that environmental issues are *consciously* addressed during the product development process. Design for environment provides competitive advantages through the reduction of manufacturing costs, the satisfaction of consumer demands, and the lightening of regulatory burdens.

Success stories from pioneering firms tout the benefits of DfE to both the bottom line and the environment.[53] Consequently, interest in DfE has grown dramatically over the past decade.[54] Yet despite the push for the adoption for environmental design practices, it appears that only a handful of firms perform DfE consistently and effectively on the product development level. DfE programs have often been characterized by a disconnect between activities on the corporate level and those on the product development level.[55]

Numerous barriers to the widespread adoption of design for environment have been identified.[56] These include a failure to recognize the benefits of DfE and to perform DfE consistently and effectively. These problems derive from the complex, uncertain nature of environmental design. The benefits of adopting DfE may have a long payoff period, and the payoff may depend on future regulations or consumer demands. Barriers are often compounded by the unfamiliarity of product development personnel with environmental issues. Environmental design typically does not fit into the prevailing mind-set of engineers, designers, and managers, to whom the

"environment" falls within the domain of regulation and compliance. There is a failure to perceive the strategic benefits of DfE, which manifests itself in the resistance of business unit managers to DfE practices.

One response to the difficulties of diffusing DfE practice and performing DfE consistently and effectively has been a concerted effort to develop better tools. By "tools" we mean those artifacts, typically embodied in software packages or written design guidelines, that aid in the *detailed* design of products. We define tools narrowly to contrast with organizational issues, i.e., the arrangement of individuals and groups and the patterns of authority, activity, and information exchange that characterize them. Current DfE tools are as diverse as they are numerous. They are applicable to a variety of product development and life-cycle phases.[57] They provide a wide range of decision support, from inventories of environmental impacts to impact analyses to improvement opportunities. They have been developed to be broadly applicable as well as useful in narrowly defined product clusters.

The rush to develop better tools is predicated on the belief that these will lower the costs of DfE, thus making adoption more likely and environmental design more effective. Unfortunately, many tool developers fail to consider the organizational context in which their tools are used.[58] Tools are frequently created as stand-alone packages that are merely handed to designers; not surprisingly, they never leave the hands of corporate-level DfE program staff. Such tools fail to reflect the institutional reality of product development. Many are built on a simple model of product development in which the detailed design phase is the primary activity in technology management. Many assume that there is a single objective (for example, to minimize environmental impact), violating the multi-objective nature of product development. Others, while facilitating comparisons, assume that trade-offs are weighed only during the detailed design phase. Most tools require worker input far exceeding what is realistically available in short product development cycles.

A more interpretative model of the product development process would highlight the importance of product conceptualization, the establishment of requirements, and product review.[59] It would also recognize that these activities are not disconnected but are embedded in a network of relations. Hence, product development resembles a series of conversations among a variety of players including not only design engineers, but also business unit managers, corporate researchers, manufacturing engineers, and marketing personnel. It is this conceptualization of product development that has led to such recent innovations as integrated product teams and concurrent engineering. This model of product development is a fractal of the institutional models developed earlier to describe the more general problem of getting a firm to change the fundamental way it does business.

The interpretative model of product development suggests a more prominent role for the *organization* of environmental design activities.[60] The challenge is to overcome the failure to perceive the benefits of DfE while developing structures that facilitate consistent, effective environmental design. Those firms that have had success in environmental design have been able to do so through (1) the execution of an effective implementation strategy to overcome perception problems and (2) the building of inter-firm information linkages to facilitate consistent, effective environmental design. Typically, these firms have been able to practice design for environment without relying heavily on tools.

Economic Obstacles

According to the paradigm of economic rationality, a firm always acts to maximize its economic efficiency, given the resources at hand and the information it possesses. If information is considered merely as a resource, the firm's best rational strategy may depend on the cost of acquiring adequate information about the opportunities it should consider. Some argue that producing any form of waste and pollution is inherently inefficient economically and that companies can generally find some innovative strategy that is an improvement.[61] Others argue that firms must adopt sustainable strategies if they are to compete successfully in the next century.[62] The publications of the World Business Council on Sustainable Development echo this call. Eco-efficiency reflects the assumption that the so-called double

bottom line or win-win case is just around the corner, if firms will only rethink their strategies and technological options.[63]

There are many cases that give credence to the possibility that such sustainably preferable strategies can be found. However, it is arguable that green is always the rational choice under the typical conditions of competition. As noted in a recent paper, "If environmental externalities were the only departure from the economic assumptions of perfect competition, and if no firms had preferential access to superior (low-cost) stocks of natural resources, then firms that volunteered to internalize [the environmental public] costs could not survive."[64] The basic question is, Under what circumstances are consumers willing to pay for attributes that incorporate some public good, such as preserving biodiversity? According to the theory of economic rationality, there are only a few situations that would allow a firm to maintain a competitive edge while delivering sustainability.

One would be a situation in which the costs to the firm of internalizing public (or external) costs are on average less than the costs to its competitors. If that firm and its competitors can establish some sort of requirement that forces all of them to internalize these costs, it may successfully compete with products and services that incorporate some attribute of sustainability. An example of such collective action is the establishment of a private sectoral code of practice, such as the chemical industry's Responsible Care code (described in Chapter 2). Alternatively, firms can lobby for government intervention.

Another way in which a firm can remain competitive while delivering sustainability is through product differentiation — the production of goods and services that appeal to consumers willing to pay for the public good they contain, even if they are generally more expensive than the functionally equivalent alternatives. For this strategy to succeed, the customer must have credible information about the product's green attributes and be willing to pay the premium, while the firm must be able to protect its product line against imitators. Although there are many examples of this strategy succeeding, it remains a rarity.[65] Supermarkets and discount stores like Target and Wal-Mart have few such products on the

shelves, and they seldom provide information to help customers find the green products that are available.

Lack of Market Demand

One of the primary reasons for the sparseness of green products in the United States is weak demand. While polls consistently show that over half of US adults value the environment, only about 15 percent are willing to translate this value into market choices. A very small fraction, about 5 percent, have been called "greenbacks" because they are willing to spend up to about 20 percent more for environmentally preferable goods and services.[66]

A third situation in which a firm can make an economic success of environmental offerings is when circumstances allow it to improve environmental performance and reduce costs simultaneously. This occurs only when imperfections in the market permit firms to operate in an inefficient manner. If a firm can identify such opportunities, it can gain an advantage (at least in the short term) by finding ways to avoid or reduce these inefficiencies. Many well-known pollution prevention programs, such as the Pollution Prevention Pays (3P) program at 3M, fit this model. Operating personnel often discover opportunities for such win-win strategies when they are encouraged to look for them through cash rewards and other incentives. Many are found on the production line, where it is more likely that inefficiencies can be concealed from competitors.

The bottom line is that sustainability does not come for free in a market economy. In the absence of any of the conditions described above, a firm that attempts to be sustainable voluntarily is likely to fail. Philips Electronics recently introduced a "green" television, following an extensive effort to reduce the product's toxic content, increase its energy efficiency, improve its recyclability, and reduce its packaging. All this came at a cost, however. The model was more expensive than its competitors, and after several months Philips withdrew it from the market for lack of sufficient demand.

CHAPTER 4. CASE STUDIES OF TRANSFORMATIVE CHANGE

For anyone looking for evidence of deep-seated change in an organization, the proof is in the pudding. Radically new behavior patterns become routine only after a firm's underlying beliefs and values have changed, but it is never possible to completely explicate these components of cultural structure. They are buried deep in the firm's consciousness. On the other hand, it is quite easy to look for evidence of such change in a firm's actions, and in the products and services that it brings to the market.

The first two case studies in this chapter (Xerox and Interface) exemplify some of the greener products and services now becoming available. Each demonstrates some characteristic related to extended producer responsibility, involving some sort of take-back system or reflecting special attention to reducing end-of-life environmental impacts. The remaining case studies illustrate how AT&T and IBM brought about transformative change in another dimension, that of product design.

Xerox Corporation: Existing Practices Lead to Change

Environmental design activities formally began at Xerox in 1990 with the inception of a corporate environmental management initiative called the Environmental Leadership Program.[67] By 1992, Xerox was requiring the incorporation of end-of-life considerations into the product development process for all business units. This involved an initiative to diffuse design for environment (DfE) throughout the design teams housed within the various business units. The strategy was to support DfE activities at the corporate level while capitalizing on Xerox's already established use of integrated design teams to create environmental liaisons at the design level.

Xerox's strong product-oriented environmental program emerged in the context of the company's experience in leasing its products and taking them back at end of life (see Part II, Chapter 4). Management eventually realized the economic value of using old equipment that was piling up in warehouses as feedstock in the manufacture of new products. Recovering and reconditioning parts as much as possible represented potential savings in both parts and disposal, the cost of which rose rapidly after 1980 because of new regulations covering both conventional and hazardous wastes.

Xerox created the position of Corporate Manager for Environmental Design and Resource Conservation (within the Environmental Health and Safety department) to provide primary support for the company's environmental initiative. The role of this manager was to advocate DfE-related activities throughout Xerox. Seven technical staff members now known as the Environmental Products and Technology group were hired to promote the design for environment activities of product teams. To accomplish this, the group has performed environmental market analyses that demonstrate the drivers of DfE and developed life-cycle assessment tools and environmental standards and guidelines that demonstrate how to conduct DfE. Finally, the Environmental Products and Technology group tries to establish personal contacts with business unit managers and designers.

In the area of asset recovery — the take-back, disassembly, reuse, and recycling of a product to capture its value at the end of its useful life — the Environmental Products and Technology group established the Asset Recycling Management (ARM) group to facilitate contact between product design and engineering staff (see Part II, Chapter 4, for a discussion of Xerox's ARM program). Rather than entering product design as outsiders, trained ARM engineers are assigned to product design teams in the same fashion as other design engineers. The ARM champion is a full participant throughout the product development process, working with the design team to consider environmental issues. The champion coordinates his or her efforts with the central program administration as well as with the recovery issues group.

Xerox has had much success with its DfE-related programs. In 1991, it started the Print and Copy Cartridge Return Program, which allows customers to send back used toner cartridges for refurbishment. By 1997, the printer and copier cartridge return rate reached 65 percent. In part because of favorable consumer response, the take-back idea was expanded in 1995 when Xerox initiated its Toner Container Return Program. Begun as a special service for Kinko copy shops, this program has since been expanded to include many other customers. Over 4.4 million toner containers have been returned for reuse or recycling since the program began, representing over 2 million pounds of plastic diverted from landfills. Finally, in 1997, Xerox initiated its Waste Toner Return Program. The first of its kind in the industry, this program involves special services for users of certain types of toner.

The Lakes Project

In 1990, a special team embarked on a project that succeeded in creating a nearly 100 percent recyclable digital copier. The Lakes project began with a clean slate and involved the development of many new technologies and designs (over 400 patents were awarded). The driving concept was for the next generation of copiers to be a set of integrated facilities and services that would change the way copying was performed.

The Lakes project was not just a product development exercise. A whole new social milieu was created for the integrated product team, which involved people working on the project continuously for several years. New management techniques focused on nurturing project participants. A concept called the "values pyramid" was developed that outlined principles of project management as well as appropriate treatment of staff. The expertise of Living Systems, a consulting firm, was brought in to motivate engineers to design for the environment. A new "cultural ecology" was born that thrived on communication, team building, and personal reflection, and that permitted coalescence of personal and corporate values.

Innovative technology, trend-setting management techniques, and a values-oriented culture all contributed to the development of what has quickly become a leading product in its class. The new copier is a flagship environmental product designed to be modular, scaleable, and able to be upgraded in the field. It is energy efficient, 90 percent remanufacturable, and 97 percent recyclable. All replaced parts are either remanufactured or recycled, noise and emissions are minimized, and the digital technology contributes to improvements in energy and paper efficiency. To facilitate the recovery and recycling process, all plastic parts are labeled. When the product reaches the end of its useful life, Xerox will take it back if it was leased or pay to take it back if it was purchased. It is then remanufactured and sold as new, with a guarantee that the quality matches that of a brand-new copier. Thus, Xerox retains responsibility for both leased and sold products throughout their life cycle. It has adopted the notion of closing material loops as a central part of its overall corporate strategy.

Interface: Change Through Leadership

Interface, Inc., the world's largest producer of commercial floor coverings, is an environmental leader in the carpeting industry and in industry generally. Its Evergreen leasing program, carpet maintenance service programs, and 100 percent recyclable Solenium floor covering are all examples of how the company has incorporated extended producer responsibility into the way its does business (see Part II, Chapter 4).[68] Interface CEO Ray Anderson has become a leading spokesperson for sustainable development and is currently co-chair of the (US) President's Council on Sustainable Development.

Interface's strategy of waste reduction and sustainable development has been implemented through the Quality Utilizing Employee Suggestions and Teamwork (QUEST) program and the EcoSense program. Established in 1995, QUEST aims to eliminate not only waste but the very concept of waste. So far, the QUEST program has saved Interface over $50 million. EcoSense aims at sustainability and has resulted in the development of the EcoMetrics system to describe the use of resources. A subsidiary company, Interface Research Corporation, is responsible for the major sustainability initiatives of EcoSense, including the development

of EcoMetrics, research and development in general, and the production of the company's annual "Sustainability Report."

Interface's commitment to sustainability stems from its core environmental values. According to Ray Anderson, it was reading Paul Hawken's *The Ecology of Commerce* in 1994 that first gave him the idea of transforming his company into an environmental leader.[69] Anderson dedicated himself to building a sustainable business while recognizing that the firm knew very little about how to be sustainable. During the course of the next year, he assembled an "Eco Dream Team"comprising experts and leaders in environmental management who were willing to work with Interface to create a uniquely environmental business.[70]

The Evergreen Lease

With the help of the Eco Dream Team, Interface management concluded that the company's conception of its own business was flawed. What its customers wanted was the service provided by carpeting, not ownership of the carpet itself. The company's business was to provide that service. Interface also recognized that traditional marketing did not incorporate the environmental costs of carpeting over its entire life cycle. During this period, Interface was already exploring the strategy of providing services such as cutting and installing carpet. The pieces were therefore in place to develop a revolutionary new product/service combination.

John Picard, the first member of the Eco Dream Team, worked for Southern California Gas Company, which was building an environmental demonstration building. The Energy Resource Center seemed an excellent place to try out what would become the Evergreen lease. The idea was that the customer, instead of paying a one-time carpet purchase and installation fee, would pay a monthly fee reflecting the cost of installation, maintenance, and reclamation. By signing a lease, the customer would acquire the functionality of carpeting, whose quality Interface would maintain over the course of the lease (see Part II, Chapter 4, for a discussion of the Evergreen leasing program). As a result of Picard's involvement with high-level executives at both companies, Southern California Gas Company became the first firm to participate in Interface's leasing program.

Integrated Service

In spite of the company's enthusiasm, the original Evergreen leasing program was not a success. However, Interface remains dedicated to the concept and believes it to be the wave of the future. In the meantime, Interface continues to offer a strong service plan that runs from installation to maintenance to reclamation. This "sale with connected service plan" has found much more acceptance in the market and is now an integral part of Interface's business activity.

To further this strategy, Interface is diversifying into new market segments. For example, acquisition of Renovisions in 1996 and Facilities Resource Group in 1997 has allowed the company to offer a complete carpet installation service, including furniture lifting and moving. Interface's integrated service network is known as Re:Source Americas.

Solenium

Like all environmental product innovators, Interface invests heavily in research and development. The latest product born of these development efforts is Solenium carpet, launched in April 1999. Solenium is 100 percent recyclable and uses less material compared with traditional nylon and PVC carpets.

In developing this product, Interface conducted consumer surveys, convened focus groups, and introduced the product in test markets. The primary attributes desired by customers were aesthetics, acoustics, comfort under foot, slipfall, and cleanliness. Interface's goal was to provide these characteristics rather than simply providing carpet material. This new perspective freed the company to explore new materials that could provide important services more effectively.

Successful Environmental Products Must Be Good Business Ideas

At Xerox, existing practices pushed the company to start thinking about environmental design. The idea of asset recovery was at least as much a business idea as an environmental one. Leasing and the notion of delivering services rather than products were already a part of the company's marketing culture. So when John

Elter, the Vice President for Strategic Programs, made a commitment to produce a new system that would embody innovative technical *and* environmental attributes, he was able to create an organizational unit that could roam freely in new organizational and technical spaces. The result was a system representing a departure from the old in virtually every way. It was technologically distinct and operationally innovative, and it extended the idea of loop-closing almost to its limits.

In contrast, change at Interface was initially driven internally by the CEO. Ray Anderson controlled the company and could exercise leadership with little internal or external interference. But he was perceptive enough to recognize that he needed input from people with special expertise. He and his Eco Dream Team (as well as a new CEO with long and successful experience in the carpet industry) paid close attention to what they heard and were willing to experiment with very new ways of thinking and operating. Although the original Evergreen lease program was not a success, Interface has not abandoned its environmental quest. With Anderson's continuing leadership and dynamism, the company is continuing to find other environmental solutions to meet its strategic goals.

AT&T: Spreading DfE by Developing Tools

Environmental management at AT&T began in 1973 when its manufacturing subsidiary, Western Electric, introduced the corporation's first environmental policy. Over the next decade or so, the entire corporation committed itself to "the protection of human health and environment in all areas where it conducts operations."[71] AT&T is one of the pioneers of design for environment, having begun to develop environmental design concepts and practices in the late '80s. It did so by dedicating a number of professionals in corporate R&D through reassignments and new hires.

Much of the early effort was spent developing and clarifying the practice of DfE and lobbying for support. One result was an environmental design tool intended for designers in AT&T's business units. Other activities included the development of quick assessment methodologies to analyze the impact of products over their life cycle. As a result, one group at Bell Labs conducted over 15 assessments by

1995. The DfE group also conducted a demonstration project to design a "green phone" in collaboration with the National Pollution Prevention Center at the University of Michigan. These projects were useful in developing knowledge about environmental design pitfalls as well as supporting efforts by R&D staff to gain support for environmental design. An effort by Bell Labs resulted in data on the internal firm network, giving designers quick access to information on environmental design. It allowed Bell Labs to offer its services on a consultancy basis to the corporation's business units.

As the DfE group within Bell Labs gained proficiency in applying DfE, a separate group was formed within the Global Manufacturing & Engineering (GME) Division at corporate headquarters to help promote the use of DfE throughout the corporation. This group chose to try to "piggyback" DfE activities on top of other design programs. AT&T had already made substantial inroads with similar product design practices, generally referred to as DfX (X standing for concerns such as manufacturability, safety, and assembly). The use of the term "DfE" reflected the strategic choice of AT&T management to emphasize the new program's link to DfX.

Despite the extensive development of resources and an occasional success, AT&T's DfE training and product impact assessments rarely resulted in action.[72] This was because the business units were under no obligation to respond to environmental concerns. Environmental requirements were not usually written into design specifications and DfE was therefore the first thing to go. By 1996, when plans to restructure AT&T were made public, there was no evidence of the routine use of DfE by product development teams within the company's business units. After restructuring, the firm's DfE efforts were significantly reduced. Many DfE resources remained with Bell Labs and became part of Lucent Technologies.

IBM: Corporate Support Initiates Environmental Leadership

In 1989, IBM commissioned an international task force to recommend future environmental activities. The commission established the Environmentally Conscious Products initiative to "develop, manufacture, and market products that are safe for their intended use, efficient in their use of energy, protective of

the environment, and that can be recycled or disposed of safely."[73] From 1991 to 1996, environmental design activities in individual business units were voluntary; thereafter, participation became mandatory.

Each business unit product development team is required to appoint an engineer and/or designer as a champion of environmental design. During the voluntary phase of the program, these champions were often given little responsibility or had other responsibilities besides those connected with environmental design. In contrast, one business unit appointed an entire champion team, including a manager, a leader, and three specialists in end-of-life issues, energy efficiency, and recyclability/materials selection. This team developed a two-year strategic plan, which included a list of desired product attributes and a schedule for designs that included them. Each team member was assigned one attribute and the responsibility to incorporate it into the final product.

On the corporate level, firmwide environmental design activities are coordinated by a central program administration. These coordinators provide training in environmental design for all business unit champions and organize a yearly conference at which champions learn about the latest advances in environmental design practice, share experiences with their counterparts in other business units, and receive additional training.

In 1991, IBM created the Engineering Center for Environmentally Conscious Products (ECECP), situated within the corporate R&D lab and staffed by 10 engineers with a variety of technical backgrounds. The center helps the central program administration by auditing environmental design activities in the business units. In addition, ECECP conducts research in response to environmental issues deemed strategically important to the corporation.

The environmental design center acts as a consultant for the environmental design champions on matters ranging from informal design questions to formal research projects. It also performs periodic product assessments, often at the request of the business units, which are extremely valuable for prioritization at

the business unit level. Finally, the ECECP acts as a conduit for information from IBM's 14 product recovery facilities around the world. These facilities, which take back end-of-life products for disassembly, remanufacture, recycling, and disposal, often have valuable information about how a product's design can reduce the costs of recovery. The ECECP collects, filters, and transfers information from the recovery facilities to individual business unit champions.

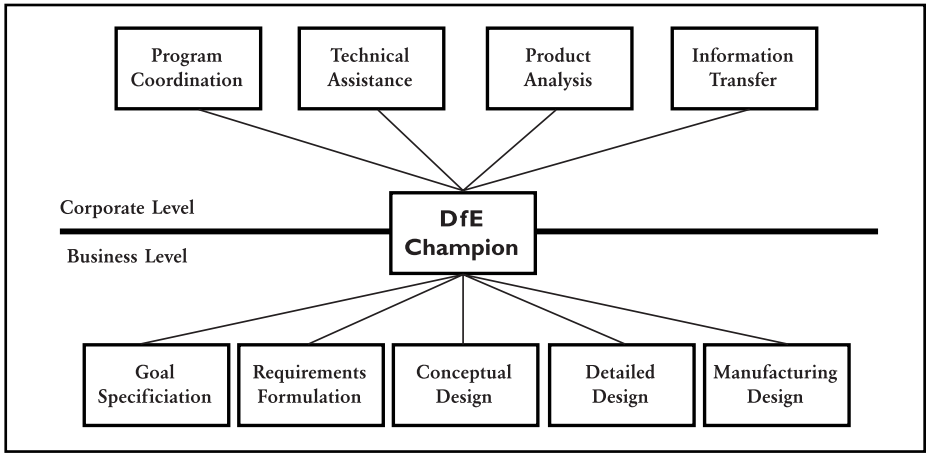
Over time, and largely through the efforts of the central program administration and the Engineering Center for Environmentally Conscious Products, more than 75 percent of IBM's design teams came to adopt DfE practices. Since May 1996, when the company formalized the program, all business units have been required to set up specific infrastructures for DfE and to provide reports on their progress in improving the environmental design of their products.

Organizational Structures that Promote Environmental Design

The key to effective environmental design practice within a firm's business units (which is where it really counts) is the exchange of information between diverse organizational groups. Tools are merely a piece of what is required to routinize DfE or any other environmental design practice. In the preceding case studies, Xerox, AT&T, and IBM all adopted a variant of an "hourglass" organizational structure, in which an individual or team serves as a filter between support functions on the corporate level and design efforts within individual product development groups (typically at the business unit level). This individual or team, referred to as the DfE champion, is assigned primary responsibility for DfE efforts within the product development groups. As shown in Figure 2, they link a number of support functions, typically housed at the corporate level, with each of the phases of product development.

This hourglass structure allows the organization to create specialized environmental support units that serve as sources of expertise while maintaining communication linkages that facilitate knowledge transfer to the product development teams. In multidivisional firms, this can reduce duplication of effort by enabling specialized

Figure 2. Organizational Structure for Effective Environmental Design



knowledge to be shared on the corporate level among the various product development teams. More important, the relative isolation of these corporate support units allows them to engage in exploratory efforts outside the bounds of the firm and among the organization's subunits. In this way, they facilitate continual learning about environmental design within the organization.

By themselves, however, such environmental support units are insufficient to ensure effective environmental design practices. Organizations must find ways to transfer knowledge from these specialized units to product development personnel. Environmental design champions provide a robust mechanism not only for communication but also for bridging disparate cultural structures between designers and environmental staff. In this way, an organization can effectively generate and transfer knowledge as product development teams confront problem-solving scenarios through the course of their environmental design efforts.

In multidivisional firms, the coordination of DfE efforts throughout the organization is typically managed by a corporate-level group, often housed within the traditional environmental, health, and safety function. Program coordination serves a variety of functions. First, it is critical to the implementation of DfE activities on the

business unit level. Beyond the diffusion of DfE activities, program coordination is necessary to the dissemination of general information about DfE, to the coordination of DfE activities across business units, and to the review of DfE activities within business units. At IBM, program coordinators hold a yearly conference that provides a forum for open exchange of information and experiences among DfE practitioners in the various business units. Further, it provides an opportunity for corporate R&D to present recent innovations in practice. At Xerox, yearly reviews of DfE activities within business units help in tracking and ranking the progress of each unit. Such reviews often provide incentives to business unit managers, who do not want to see their name at the bottom of the list.

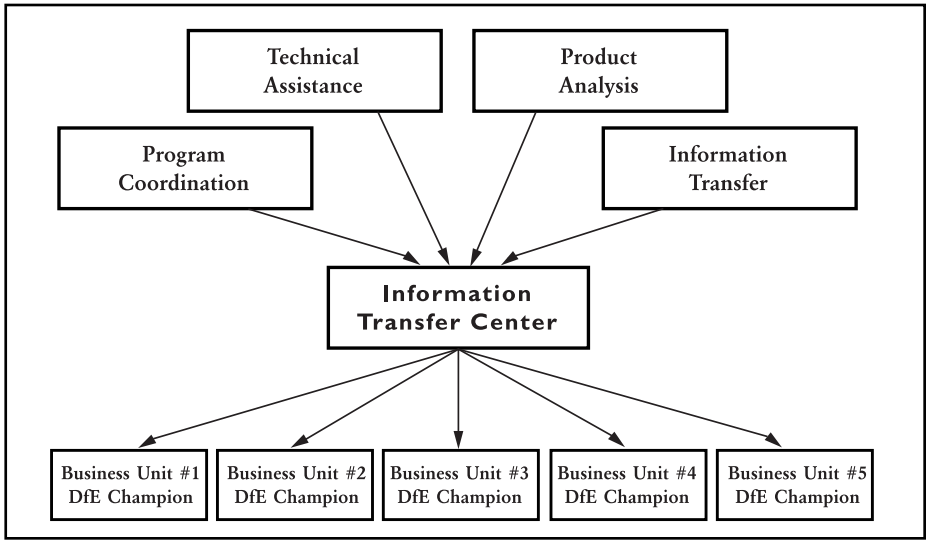
Another critical function is technical assistance, which helps product development in addressing specific design issues. Technical assistance is often housed within the corporate research center. At IBM, the Engineering Center for Environmentally Conscious Products (ECECP) is dedicated to finding solutions to environmental problems. At Xerox, technical support was incorporated into the corporate product stewardship group through the hiring of new technical personnel. Xerox has combined technical assistance and program coordination functions into one centralized corporate unit.

Closely related to technical support is product assessment, the systematic analysis of a product's environmental impact. Product assessments can be critical in determining future design changes. Analysis methods range from quick matrix methods to full life-cycle assessments.[74] Life-cycle assessment and other in-depth analysis methods provide a total picture of environmental impacts. They are rarely used in the actual design process because of the time and resources they require.[75] Matrix methods provide a quick, easy assessment mechanism but lack detail. At IBM, product assessment is conducted by the ECECP on an ad hoc basis. Before AT&T underwent restructuring, over 15 products were assessed using the company's own matrix method. In general, the product assessment function is housed on the corporate level within R&D or the program coordination function. In some cases, it may be integrated at the business unit level.

Information transfer is one of the most important aspects of DfE. It is typically coordinated by a centralized corporate body that collects and disseminates information. For example, the information transfer unit may coordinate information exchange among numerous take-back facilities, manufacturing facilities, and business units. Once again, this function is often characterized by an hourglass structure (Figure 3). Information may be transferred from a number of organizational sources — for example, information on compliance issues from environment, health, and safety; on pollution prevention from manufacturing; on product take-back from a company's take-back facilities; and on procurement issues from supply-chain management. At IBM, the ECECP communicates with the company's manufacturing recovery facilities to assess their needs and may transfer that information back to the business unit champions. At Xerox, elaborate feedback mechanisms between product design and take-back are coordinated through the asset recovery management group.

The interconnection of various support functions with a DfE champion is only helpful if further integrated with the various phases of product development. Product development involves a number of stages: goal specification, requirements

Figure 3. The Information Transfer Function



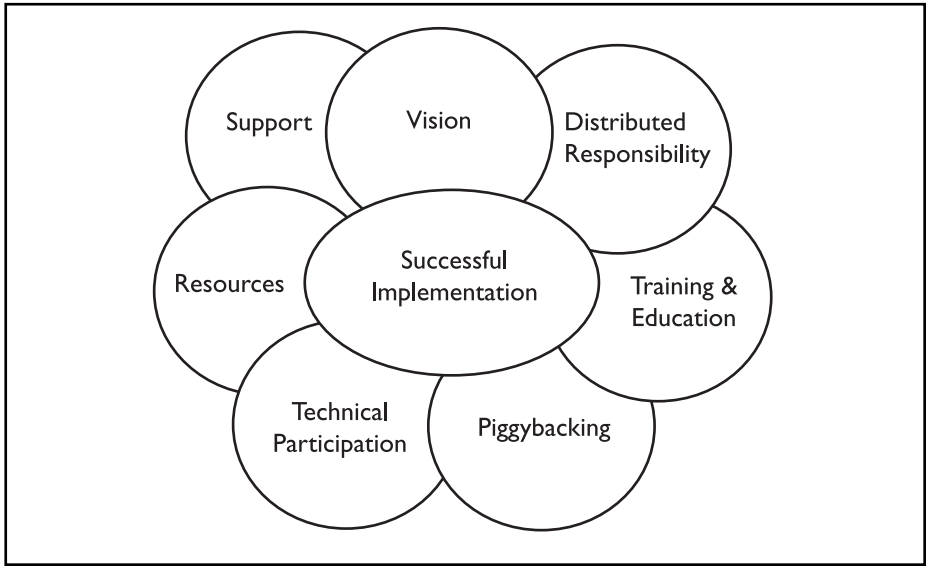
specification, conceptual design, detailed design, and manufacturing design. While product development is often depicted as a neat linear process, in reality it is much more complex. The various stages of product development interact in a variety of ways. Consequently, DfE champions often function as mediators, advocating and providing expertise on environmental design efforts. The challenge to the DfE champion is to utilize information from corporate-level support functions so as to participate effectively in the product development process.

The goal of implementation is the routinized consideration of environmental issues. Since it is at the product development level that routinized design occurs, it is here that environmental design must take place.[76] Common among firms with successful environmental design programs is an ability to move DfE from the corporate level to product development groups typically housed in the individual business units. In these firms, implementation has a number of defining characteristics: vision, support, resources, technical participation, piggybacking, distributed responsibility, and training and education. These facilitate the transfer of design for environment practice from the corporate to the product development level (Figure 4).

The Future of DfE

DfE is a critical practice for any sustainable firm. It represents conscious, routine considerations that must be integrated into product or service development and into the firm's strategies. As the preceding case studies suggest, initiating DfE within the groups that have traditionally been responsible for design and strategy formation is not easy, and making it stick is even more difficult. One key to success is the establishment of organizational structures that facilitate the transfer of information from various knowledge centers to the product development level. DfE champions play a critical role, as do such corporate support functions as program coordination, technical support, and product assessment. Many successful firms have pursued implementation incrementally, building success in individual business units through pilot projects.

Figure 4. Contributors to an Effective Implementation Strategy



As environmental design practices become more established, tools will become a critical component of DfE systems. Over time, interpersonal linkages may be replaced by stand-alone tools or interlocking information systems. But even in advanced systems, interpersonal linkages are likely to provide a robust solution to the complicated problem of information transfer and processing. The ability to develop a comprehensive database that easily interfaces with designers and is routinely updated with new information is a large undertaking. The establishment of linkages allows for knowledge to reside in multiple experts and economizes on resources.

In the future, DfE may become more fully integrated with both alternative environmental management systems and traditional design systems. In this way, it will provide a bridge for the integration of environmental concerns into the mainstream strategic decision-making processes of firms. Increasingly, DfE will become a critical component of an integrated strategic environmental management system.

CHAPTER 5. THE BOTTOM LINE: BECOMING RESPONSIBLE

Sustainability has emerged as the expression of concerns about environmental and social problems on a global scale. In the past decade or so, the call to move to a sustainable world has been answered by many institutional voices. Public policy has responded through follow-up programs arising from the Rio Summit of 1992, primarily through treaties such as the Kyoto Protocol on global warming. Extended producer responsibility, with its roots in Europe, has a quite different policy thrust, aiming at the creation of innovative products and services and new forms of infrastructure to close material and product loops. In particular, EPR is directed at business enterprises as the primary actors with the power to change the nature of both production and consumption. Unlike almost all policy frameworks that preceded it, EPR addresses products, not processes.

The word "responsibility" in the context of EPR is usually interpreted in the policy sense of assigning duties to some actor or actors — companies in this case — through the state's authority. Specific duties are set forth quite explicitly in the policy and attached regulatory instruments. The concept of sustainability presented in Chapter 1 springs from a different understanding of responsibility — that of acting responsibly in an ethical, rather than a legal, sense. EPR can be understood in both senses. This dual meaning gives the idea great potential to bring about a transformation in the way firms behave.

Over time, the private sector has developed standard routines — business as usual — as it gains experience and learns to respond to the prevailing norms that shape society's institutions and economy. In a market democracy, the institutions that most directly affect corporate practice are the consumer and the government. In the United States today, there is little on the horizon that is likely to lead to any change in the basic strategies that drive firms: absolute growth, strengthening competitive position, and continuing efficiency or productivity. Increased

reliance on market forces and shrinking governmental programs only reinforce this way of thinking.

The responsibly sustainable firm would be alien in this context and with few exceptions could not prosper. Many of the most cited examples of successful sustainable firms have private owners who can overwhelm the dominant norm with their personal values and vision. Yvan Chouinard, founder, sole owner, and CEO of Patagonia — and one of the early leaders in strategic environmental innovation — personally decided to limit the growth of his company because he saw continued growth as fundamentally unsustainable. Similarly, the founder of IKEA, one of Europe's environmental leaders, believed that "waste is a mortal sin."

Despite prevailing norms, many scholars and social critics argue that firms must become sustainable or die. They believe that economic success is tied to the natural resource factors that form a firm's technological context.[77] Firms that do not heed stresses on these factors risk serious erosion or even destruction of their underpinnings. Stephan Schmidheiny, who was the driving force behind the formation of the World Business Council for Sustainable Development, was an early promoter of the idea of eco-efficiency, which holds that to ensure their competitive success in the coming years, firms must learn to provide more satisfaction using fewer resources.[78]

Others argue a bit differently that firms must provide sustainable goods and services in order to satisfy their responsibility to society.[79] Environmental and social demands, they believe, will eventually become dominant factors in the formulation of strategy. However, there is little sign of such social pressures in the United States today. Consumer demand for sustainable goods and services remains very low and shows signs of weakening.

A recently concluded dialogue on EPR, conducted under the aegis of the Organisation for Economic Cooperation and Development (OECD), reflected a deep schism between the United States and most European participants. The language used by the two sides tells an interesting story about cultural norms.

Extended *producer* responsibility, as the policy is called in Europe, conveys the idea that firms, acting as socially responsible entities, have an obligation to ensure that the goods and services they bring to the market are consistent with sustainability (or, at least, with the environmental impacts about which they possess knowledge). As noted earlier, EPR has focused primarily on the end-of-life stage of products, but it is equally applicable to their entire life cycle.

In the United States, the concept is generally referred to as extended *product* responsibility (see Part II, Chapter 1, for a discussion of this distinction). This does not imply any kind of broad duty, and indeed there cannot be one, since products are inanimate and cannot be assigned any form of responsibility in the ethical or normative sense. Duties can be codified in regulations (such as those governing product safety) and in prohibitions against specific materials (such as ozone depleters), but it is the producer that is generally responsible for damages should the product fail to meet these mandates. Reflecting the free market ideology that has become stronger in the United States in the past several decades and remains more deeply rooted than in Europe, some of the participants in the OECD process are now calling for "shared product responsibility," which basically means that whoever "owns" the product or its component parts during the various phases of a product's lifetime is the party that should be responsible for handling it in an environmentally or sustainably appropriate manner.

This school of policy reflects Milton Friedman's market philosophy. Friedman wrote in the early 1960s that "there is one and only one social responsibility of business — to use its resources and engage in activities designed to increase profits."[80] More recently, a group of scholars of business and the environment has echoed the themes of Friedman and others. These writers present a model of competitive strategy based on economic rationality and argue that managers should make decisions and subsequent investments in order to bring positive results to the bottom line.[81] Other goals, such as acting in the manner of the responsibly sustainable firm, would mean ignoring the realities of the competitive marketplace and courting disaster. This does not mean that firms should rule out environmental factors as an opportunity to capture a competitive advantage and gain profits.

But they should only do so when they enjoy some differentially favorable position relative to their competitors, such as having access to "green" customers who are willing to purchase more expensive goods. Reinhardt sums up this argument neatly, noting, "Managers need to go beyond the question 'Does it pay to be green?' and ask instead, 'Under what circumstances do particular kinds of environmental investments deliver benefits to shareholders?'"[82]

Firms that make a decision to take on the challenges of sustainability for ethical, normative, or profit-seeking reasons face significant barriers when they start to put their decision into action. Some of these arise from the failure of the market to price precious natural and human resources appropriately. Firms that voluntarily introduce some form of public good – that attempt to internalize the externalities – run the risk of failure, as Interface discovered with its Evergreen lease. Opportunities do exist, but may come only in very special circumstances. Only when a firm already enjoys some sort of competitive advantage can it expect to succeed with products that are more expensive than those of competing firms.

Without radical changes in the rules that shape their cultures and strategies, firms will continue to behave in more or less the same fashion as they do today. How could they do otherwise? Firms are collections of people, with very strict responsibilities to their many stakeholders. They would not survive for long if they operated under their own rules or under rules set by other stakeholders, such as environmentalists. Public policy is only one component of the rules that govern firm behavior, but transformative rules like EPR have the potential to change firms' understanding of themselves and of the life-cycle impacts of their goods and services.

New metrics like full-cost accounting and eco-efficiency may or may not bring sustainability and profitability closer together. New design tools and strategies built around life-cycle assessment are emerging, but good results are still few and far between. As shown in Chapter 4, Interface has developed a fundamentally new strategy that aims to convert a business that sells carpet into one that provides services by retaining ownership of the products it provides. Xerox, too, has

embarked on a bold corporate strategy called asset recovery management in which the company's mandate is to provide services rather than deliver products. Its goal is to completely close material loops by reusing, recycling, and remanufacturing the products its owns and controls, leasing them to customers but retaining all maintenance and disposal responsibilities over their lifetime.

Many of the new greener products and services are directed at industrial and commercial buyers, not at the public at large. ISO 14000 is thought to have the potential for greening the supply chain much as its predecessor, ISO 9000, did in the quality arena. But the theory that better environmental management systems will lead to better environmental performance is still unproven. And ISO 14000 is devoid of normative content and thus is an ineffective agent of structural cultural change.

As a final note, we return to EPR as an important new framework with the potential to:

- Initiate cultural change in both consumers and producers.
- Re-equilibrate the intersection between producer and consumer at a sustainable point.
- Promote sustainable technological innovation.
- Lead to new forms of cooperative institutions and organizations.
- Create new policy frameworks.

EPR's potential to initiate cultural change stems from its focus on responsibility in the normative or ethical sense. Almost all culture-based models of organizational learning and change stress the importance of norms as a powerful driver of action. When new norms make a firm responsible for its outputs over the whole product life cycle, a new consciousness starts to inform fundamental strategic decisions. These include what the company's business should be, what products and services it should provide to consumers, and how they should be designed.

Standard economic models separate producers and consumers into two distinct groups linked primarily through price signals. Neither has any responsibility to the other. Producers that respond fortuitously to the demands of consumers emerge as winners; others die off. EPR would change this model, forcing producers to look beyond the market transaction to the impact of their products when used by consumers and even after their useful life. This distorts the simple, symmetrical model of supply and demand, and even turns the idea of consumer sovereignty on its head. But firms that know something about the impacts of their actions and offerings have a better basis on which to design sustainably. Free market purists may cry foul, but acceptance of EPR could — ironically — deter more aggressive intervention if the market began moving toward a truly sustainable equilibrium.

Promotion of innovation follows directly from EPR's potential to change company cultures and the relationship between producers and consumers. In Europe, the immediate impact of EPR was to induce firms to experiment with new forms of packaging and new ways to make it easier (and more economical) to disassemble and recover their products at end of life. Design for disassembly and design for recycling are now common practices in industries producing complex products like automobiles and electronic goods. Such innovation is not limited to product technology, but extends to the institutional shape of the market, as innovative cooperative mechanisms (such as the Green Dot System in Germany) have arisen to make EPR a reality.

If the adoption of EPR policy frameworks is to spread throughout the world, much more emphasis will have to be placed on the words "producer" and "responsibility." In the United States, the social responsibility of the private sector has traditionally been to produce profits that in theory are reinvested in growth and innovation, and that contribute to an ever-growing gross domestic product. That this simplistic objective fails to achieve many of society's important goals has been known for a long time. EPR and other ventures into more sustainable forms of technology and institutional arrangements hold out the hope that in many sectors the right questions are beginning to be raised about old notions.

The signs of change are very promising, but few in number. Cultural change reflecting the evolving notions of sustainability will come slowly and must overcome deeply entrenched resistance. A combination of patience and persistence is clearly called for.

Notes

INTRODUCTION

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