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**INTEGRATING ENVIRONMENTAL ISSUES
INTO CORPORATE STRATEGY: A
CATALYST FOR RADICAL
ORGANIZATIONAL INNOVATION**

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Integrating Environmental Issues Into Corporate Strategy: A Catalyst for Radical Organizational Innovation

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Abstract / Résumé

This paper presents the results of a study conducted in manufacturing firms operating in the electrical and electronic sectors in Quebec. It investigates the extent to which environmental concerns are integrated into corporate strategy and the entire product development stages. Special attention is paid to the underlying decision process and the benefits derived from being “green”.

Un étude conduite auprès des entreprises québécoises œuvrant dans les secteur électrique et électronique permet d'évaluer le niveau d'intégration des préoccupations environnementales dans la stratégie corporative et dans les différentes phases du cycle de développement des produits. Les résultats de l'étude analysent les processus décisionnels sous-jacents ainsi que les bénéfices encourus par les entreprises qui ont privilégié une stratégie environnementale plus intense.

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1. Background

One important issue facing managers today is the integration of environmental issues into the overall corporate strategy. This constitutes a drastic departure from traditional management practices where the environment was considered by some as a free and unlimited resource and where existing environmental standards and external pressures were viewed by most as just one more constraint to comply with. Such a reactive strategy is a losing one in the long run since a negative record with the environment is now definitely a competitive handicap¹.

Two basic premises will guide our discussion. First, being environmentally responsible is a major strategic issue facing all firms whose importance will steadily increase as we enter the twenty-first century. Second, environmental concerns cannot be properly addressed by pursuing separate isolated activities but must be tackled in a systemic and comprehensive manner, requiring not only interfunctional integration within the firm but also upstream and downstream integration with suppliers and customers. This implies tremendous changes and, as such, can be considered a radical organizational innovation.

1.1 The environmental challenge as a major strategic issue for manufacturing firms

Mounting pressures from outside are certainly the main forces driving companies to increase the environmental friendliness of their products. Strict environmental regulations, norms and standards are already in place in most industrialized countries. Some regulatory approaches are narrow and stringent: for example, in Germany, all packaging in which goods are transported and sold must be returned to the responsible actors in the distribution chain, namely retailers and manufacturers, to be recycled or put to new use. The German packaging law, passed in early 1993, requires a two-way distribution network² costing some 10 billion dollars to set up and another 1 billion to operate annually³.

¹ This point of view is strongly advocated by many (see for example, Dechant and Altman, 1994 or Newman and Breeden, 1992).

² This parallel waste collection network is called DSD (Duales System Deutschland).

³ As reported by Corbott and Wassenhove, 1993.

A more comprehensive but somewhat less stringent approach⁴ is favoured by the BS7750 standard. As reported in the official documentation, the “BS7750 is aimed at encouraging business to establish a structured system for measuring, managing and improving their environment performance”. If as many organizations adopt the BS7750 as did the BS5750 (standard for quality management systems), environmental concerns will indeed be key issues in the corporate agenda in the coming years.

Expected new environmental regulations and standards are also aimed specifically at manufacturers. Compulsory take-back program requirements in Germany will require that leading car manufacturers design recyclable vehicles and that electronics firms investigate ways to re-use components⁵. In the very short term, the European Community is proposing a management and audit system termed EC-ECO-Audit for mid-1995⁶. The system was devised by a joint industry-government task force and should apply to all members of the European Community. The ISO group is also working on a new standard known as the Committee Draft 14000 which is expected to be tabled by the end of 1995⁷. Obviously, the proliferation of environmental norms and standards poses the problem for companies of not only having to adopt a standard as was recently the case for quality standards (for example, the ISO 9000), but also of which one to choose. Furthermore, corporate management must also foresee future potential changes in environmental legislation, norms and standards and the corresponding implications for their firms. Beyond any doubt, this is a complex and strategic issue for all manufacturers.

Yet this is but one of the challenges awaiting the majority of these firms. According to a rather recent survey⁸, only 7% of the 220 participating senior executives felt that environmental issues were well understood in their respective firms. This is a

⁴ The BS7750 is considered less stringent because it does not go any further than adherence to current legislative and regulatory requirements (see McClosky and Maddock, 1994). Yet, the BS7750 proposes a comprehensive Environmental Management System. For further discussion on the BS7750 (UK) and the Eco-Management and Audit Scheme (European Commission) as well as potential overlap between the two, see Ryall and Pinder, 1994.

⁵ According to the Economist (1993), the threat made by Klaus Töpfer, the federal environment minister in Germany, to legally force firms to take back and recycle their products at the end of their useful life is taken seriously by many European manufacturers. Because of the recession, the time frame of such environmental legislation has however been delayed.

⁶ Council of European Communities, 1993, Brussels.

⁷ “Companies that meet these standards will be able to label their products environmentally sound, a powerful marketing tool” (Denton, 1994, p. 48). See also Ryall and Pinder (1994).

⁸ This survey was conducted in 1991 by Booz, Allen and Hamilton.

somewhat disturbing proportion when one considers the important agenda to be met in that area in the years to come. In fact, environmental expenses in major American companies are expected to rise from the current 2.4% of sales to a projected 4.3% by the year 2000⁹. Some companies such as the German chemical group Bayer, are spending 20% of their manufacturing costs on environmental protection which corresponds to about the same amount as they spend on energy and labour¹⁰. Chevron sees environmental spending, which it expects to grow at the rate of 10% a year, as the only growth area in the oil industry in the coming years¹¹. The CEO of Dow Chemical sums it up this way: “No matter how competitive you are and how globally you trade, if you are environmentally irresponsible, someone can and will – and should padlock your door”¹². This has led management theorists to consider environmental management and crisis management as two of the “new key functions of business”¹³ to be incorporated into the corporate agenda.

Could environmental concerns be merely a fashionable and short-lived trend? Many people do not believe so and in fact favour tighter environmental standards, norms and legislation. Consumer pressures are also mounting to the extent that, in a recent survey conducted in the U.S.A., 84% of the respondents felt that industrial pollution constituted the worst corporate offense¹⁴. One significant trend in that respect is the astonishing progress in the field of environmental law where, in the U.S.A. alone, the number of lawyers is estimated to be 20,000 compared to 2,000 just ten years ago; in fact, it is reported to be the fastest growing field of specialization in law schools in that country¹⁵. Business schools around the world are also responding to this new reality with the creation of schools in Environmental Management, as is the case at the Farnborough College of Technology in the U.K., or industrial chairs in management and the environment (the Sandoz Chair at INSEAD being an example). A recent survey of American business schools identified more than one hundred offering

⁹ The estimated increase of overall environmental expenditure is given in the McKinsey & Company’s summary report (1991).

¹⁰ As reported by F. Cairncross in “Costing the Earth”, 1993, p. 259.

¹¹ *Ibid.*, p. 259.

¹² Comment made by Frank P. Popoff, Dow Chemical CEO and Chairman during an interview conducted by Avila and Whitehead in 1993.

¹³ See Mitroff, 1994.

¹⁴ As reported by Gagné (1994).

¹⁵ See Denton, 1994, p. 24.

courses or modules in environmental management in the 1993-1994 academic year, compared to none prior to 1990¹⁶.

1.2 Integrating environmental concerns: the need for a systemic approach

At the heart of all environmental concerns lies the product since as reported by *The Economist*: “After all, the problem is the product”¹⁷. This is demonstrated in Figure 1 where all major phases of a product’s development cycle are represented. The development stage which precedes production, consumption and disposal, is considered differently from the other stages since during this first stage a product cannot create a negative environmental impact given that it only exists on a drawing board, as a prototype or even as an idea. Obviously, though, the next three stages can create a broad range of environmental problems.

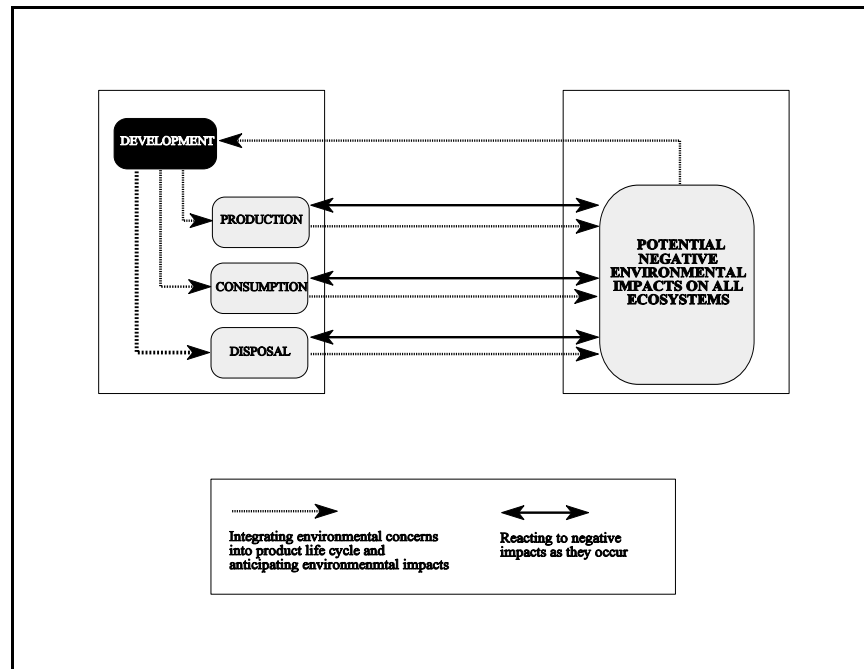


Figure 1: Product Life Cycle and Environmental Impacts

¹⁶ See Dechant and Altman, 1994.

¹⁷ This is a direct quote from *The Economist*, 1990.

Traditionally, efforts have been made in a piecemeal fashion (usually in the form of an “end of the pipe” solution) to respond to specific environmental problems whose focus is different from industry to industry¹⁸. For example, efforts have been aimed at engaging recycling procedures at the disposal stage, as is the case with glass, plastic or aluminium containers; or minimizing polluting substances or rejects, as is the case in the pulp and paper and chemical industries. Again there is a trend to reducing the amount of packaging materials in consumer products. Very rarely have we seen an integrated approach covering all of a product’s development stages, such as 3M’s innovative program¹⁹.

When a manufacturing firm acts on environmental problems as they occur and in response to internal and, more likely, external pressures, it has a reactive and piecemeal strategy (left hand side of Figure 1). On the other hand, a firm may decide that it will integrate environmental concerns at the very beginning of the product’s life cycle, namely at the development phase, thus trying to anticipate and correct any negative environmental impacts which could occur over the entire life cycle. With a such proactive strategy, a firm will have to rethink during the development stage the whole industrial process from R&D to design, manufacturing, marketing and to ultimately, recycling activities. Such questioning at the development stage would affect all the other phases of the product’s development cycle and ultimately the environment, as represented by the striped arrows. This notion of “product stewardship” whereby a company takes full responsibility for its products from the design stage right through to recycling is gradually taking hold and may become a dominant way of doing business in the years to come²⁰. This is where a systemic approach rather than a piecemeal approach is needed to proactively tackle environmental problems. It is an important direction for firms to take and one which at present has only been adopted by the more innovative ones.

But what is actually happening in today’s companies in terms of environmental efforts and the benefits derived from these efforts? Where do these efforts take place in the product development cycle? Are there significant differences in terms of benefits for companies that demonstrate higher levels of preoccupation with environmental concerns? Who actually initiates and supports these issues in the company? Can we observe a cumulative learning pattern within firms? This empirical study attempts to address these questions.

¹⁸ This is clearly demonstrated in the McKinsey & Company’s Report (1991).

¹⁹ 3M’s “Pollution Prevention Pays” program is probably the most well known case.

²⁰ Cairncross, 1993.

2. Methodology

The sample corresponds to manufacturing firms operating in the electric and electronic sector in Canada and belonging to the same two-digit standard industrial code (SIC 33). This sector was chosen because it exemplifies well the type of consumer and industrial products of high consumption such as computers, televisions, refrigerators where the disposal rate is significant. A carefully pre-tested questionnaire was sent directly to the chief executive officer of each firm. The objective of the survey was clearly and deliberately identified as a survey on “green management practices” in order to avoid responses from firms with no particular environmental concern. The response rate was 17.73% (103 valid questionnaires out of 581) and no follow-up was done. After a first analysis of the results, 21 firms were found to make very minimal efforts in terms of integrating environmental concerns into their product development cycle and therefore were eliminated. All of the results presented here are based on the remaining 82 firms.

3. Environmental efforts in the product development stages

The results presented in Figure 2 show modest efforts with respect to the environment in the different product development stages. Given that the firms that responded to our sample are those that are sensitive to environmental preoccupations, the overall sectorial picture is rather blim. On a scale of 7, our responding firms are close to or below average on three of the five stages, namely manufacturing, commercialization and recycling. This is somewhat worrying given the overall importance of this particular industry with respect to consumer and industrial products. For example, in the U.S. alone, more that 12 million computers and 350 million appliances²¹ end up in dumping sites each year and yet, according to our results, little concern is devoted to the recycling stage. An encouraging sign is the relatively important efforts reported in design stage activities.

²¹ Statistics reported in *Computer World* (1993) and Parker (1993) respectively.

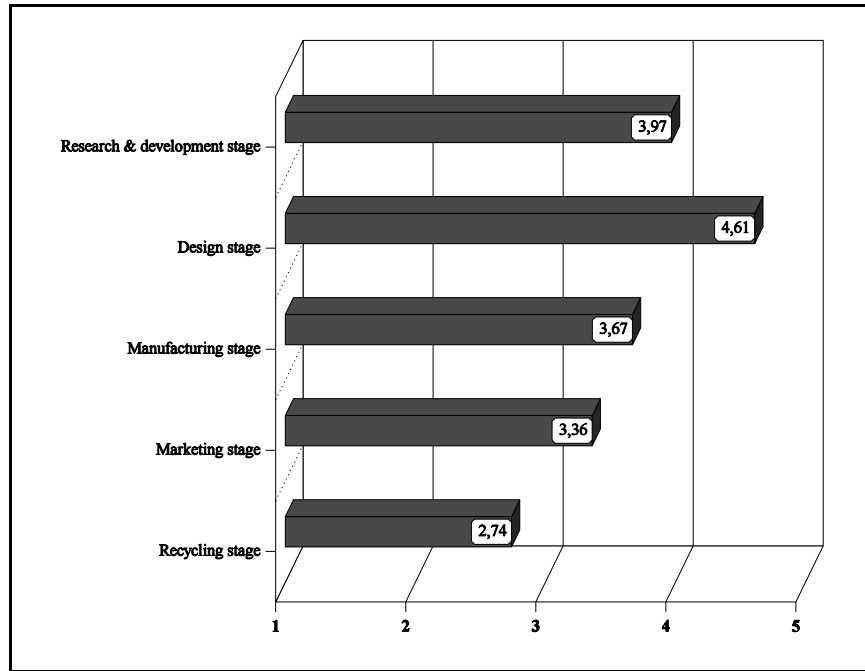


Figure 2: Level of Integration of Environmental Concerns in the Product Development Stages'
 1. Measured on 7-point Likert scale where 1=no effort and 7=considerable effort.

Taking a closer look at the specific activities²² undertaken during each of the stages (Table 1), it becomes clear that the strongest efforts are aimed at activities which also translate into cost-cutting activities: making the product easier to repair or minimizing waste may both translate into additional savings to the manufacturing firm. Similarly, reducing the amount of energy required for the manufacturing and assembly of the product implies savings. On the other hand, recycling or marketing activities that would normally require additional costs score very low. As a general remark, it seems that environmental efforts seem to be justified as long as they do not result in additional costs for the firm.

²² The list of activities was established based on an extensive literature review and was thoroughly pre-tested with five experts and five CEOs.

TABLE 1
Environmental concerns in the product development stages

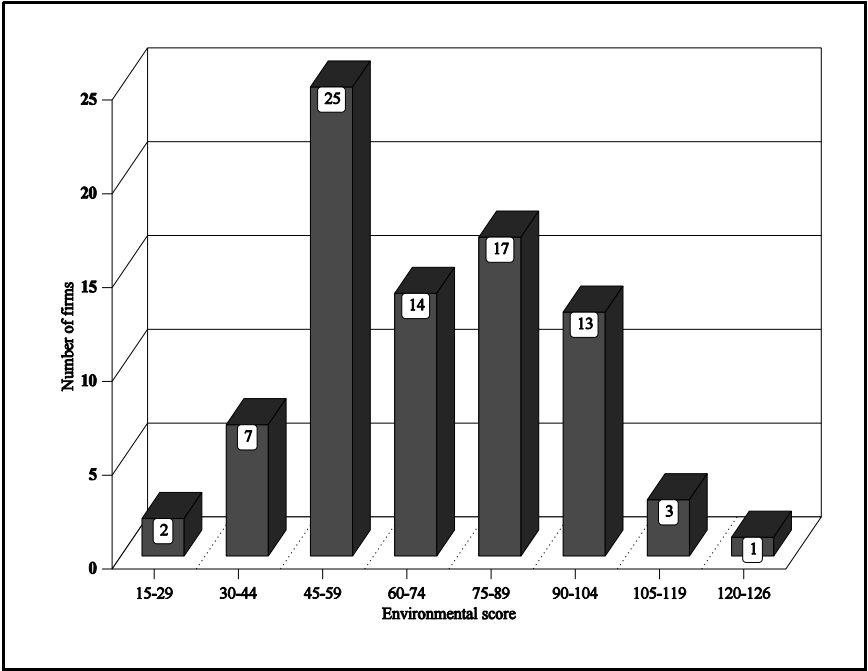
ACTIVITIES	Mean value ¹
Research and development stage	
Use more recycled materials	2.23
Reduce the amount of raw materials involved	3.69
Choose raw materials that are less harmful for the environment	3.64
Reduce the amount of energy necessary to use the product	4.13
Increase the product's useful life	4.87
Design stage	
Design the product to accommodate multiple future uses	4.64
Design the product to be easy to repair	5.13
Design the product to be easy to disassemble	4.73
Design the product to be easy to recycle	3.00
Manufacturing stage	
Choose suppliers whose operations pollute less	2.71
Eliminate discharge of pollutants	3.44
Minimize waste	3.98
Reduce the amount of energy required for the manufacturing and assembly of the product	3.94
Find outlets for hazardous waste	2.88
Marketing stage	
Publicize the environmental aspects of the products	2.54
Inform customers of the environmental aspects of the product	2.57
Minimize product packaging	3.91
Make packaging easily recyclable	3.52
Recycling stage	
Establish recycling procedures	2.37
Ensure that recuperation infrastructure exists	2.42

¹ Based on 7-point Likert scales where 1 = no effort and 7 = considerable effort

In fact, firms in general display a tendency to focus on the less complex problems while spending no more than necessary (if anything) on environmental protection. However, this is not the case for everyone and some firms do respond more positively to the environmental challenge.

4. Assessing the level of environmental responsibility of manufacturing firms

From the activities listed in Table 1, a score can be simply established by summing the relative importance of the efforts devoted to each of the 20 activities. This score, which varies from 0 (20 x 0) to 140 (20 x 7), gives a good indication of the level of green management practices within a particular firm.



The bell-shaped curve reflecting the distribution of firms shown in Figure 3 indicates that our sample is not homogeneous in terms of the actual level of environmental efforts firms are making. Some of them have obviously integrated environmental

concerns into all stages of the product development cycle to a significant extent whereas others are only beginning to do so. This raises the question of the differences which may exist between the more environmentally committed firms and those that are at a less advanced stage. The next three sections address this question by looking successfully at the distinctive profiles of the firms, their organizational decision-making process with respect to environmental issues, and finally the opportunities and advantages derived from being green.

5. Distinctive profile of the more environmentally responsible manufacturing firms

The characteristics²³ that discriminate most between less and more environmentally responsible firms are, in decreasing order of importance: the fact that the product is exported (Table 2), the existence of a total quality program within the firm (Table 3), the type of consumers to whom the product is addressed (final consumers versus corporate customers) and the size of the firm.

The larger the firm, the more resources (financial and non-financial) it can invest in the protection of the environment. One should also recognize that larger firms are more visible and therefore subject to greater environmental pressures than smaller ones. Surprisingly, though, size is only the fourth discriminating factor and not the first, as one might have expected.

The most discriminating characteristic is the fact that the product is exported, suggesting that firms operating in external markets must be more environmentally conscious or that environmental standards are a trade obligation. Table 2 gives a more detailed view of the level of efforts made by firms whose products are exported. All the 20 activities presented in Table 1 score higher when the product is exported and, for 10 out of 20 of these activities, the differences are significant.

²³ A stepwise discriminant analysis was performed on the two groups of firms based on the median value of the score representing their level of environmental responsibility. This multivariate analysis retained discriminating characteristics which allow an overall classification rate of 72.6%. The discriminant function is highly significant ($p = 0.0001$).

TABLE 2
Relationship between export behaviour and environmental concerns
(n = 82)

Activities ²	Product Exported ¹		p ³
	YES	NO	
R&D			
Reduce the amount of raw materials involved	4.38	3.47	0.0392**
Choose raw materials that are less harmful	4.23	3.48	0.0804*
Reduce the amount of energy to use the product	4.81	3.84	0.0182**
Increase the product's useful life	5.69	4.50	0.0048***
DESIGN			
To be easy to repair	5.68	5.03	0.0201**
PRODUCTION			
Eliminate discharge of pollutants	4.07	3.30	0.0675*
Minimize waste	4.60	3.82	0.0629*
Reduce the amount of energy required for the manufacturing and assembly of the product	4.63	3.42	0.0061***
MARKETING			
Minimize product packaging	4.42	3.85	0.0872*
Make packaging easily recyclable	4.19	3.18	0.0171**

¹ Export outside Canada

² Measured on 7-point Likert scales where 1 = no effort and 7 = considerable effort

³ Level of significance for t-test

The second most discriminating characteristic is the existence of a total quality program. As the parallels between total quality (or zero defects) and protection of the environment (or zero pollution) seem almost natural²⁴, this appears reasonable. Moreover, the objectives of a total quality program (for example, minimizing waste) overlap with some of the objectives pursued by environmentally responsible firms. Table 3 demonstrates the significantly higher efforts directed at environmental protection made by firms which have introduced a total quality program. In fact, it is probably fair to argue that the existence of a total quality program is, to some extent, an important precondition to engaging in environmental management. Furthermore, those firms that do have a quality program pursue some of the environmental efforts which could be classified as cost-generating as opposed to cost-saving activities, namely marketing activities and supplier selection. This is an important distinction as it demonstrates a very different type of innovative behaviour on the part of the more

²⁴ This point has been raised by many (for instance, Cairncross, 1993; Kleiner, 1991 or Denton, 1994).

environmentally committed firms, which may try to turn environmental costs into competitive opportunities.

TABLE 3
Relationship between the existence of a total quality program
and environmental concerns
(n = 82)

Activities ¹	TQ Program		p ²
	YES	NO	
R&D			
Reduce the amount of raw materials	4.38	3.35	0.0188**
Reduce the amount of energy to use the product	4.80	3.82	0.0130**
Increase the product's useful life	5.35	4.97	0.0837*
PRODUCTION			
Choose suppliers whose operations pollute less	3.14	2.58	0.0984*
Eliminate discharge of pollutants	4.00	3.27	0.0793*
Minimize waste	4.58	3.74	0.0640*
Reduce the amount of energy required for manufacturing	4.37	3.74	0.0935*
MARKETING			
Environmental claims to customers	2.88	2.10	0.0226**
Environmental informations to customers	3.02	2.20	0.0226**

¹ Measured on 7-point Likert scales where 1 = no effort and 7 = considerable effort

² Level of significance for t-test

As for the third discriminating factor, the consumers of the product also allow one to differentiate between the two groups of firms: the more environmentally committed firms are those that deal with individual or final consumers. It may be that corporate consumers are less sensitive or demanding than individual or final customers with respect to the environmental aspects of a particular product. This is indirectly linked with one of the results presented in Table 1: "selecting suppliers whose activities are less polluting" is not a very highly ranked activity (it received a score of 2.71).

6. Important dimensions of the decision-making process required to respond to the environmental challenge

Integrating environmental concerns into the different stages of a product's life cycle has far-reaching implications. First, interfunctional integration is required, since R&D, production, marketing, distribution and after-sales service all have to work together in order to minimize the environmental impacts of a given product or product line. In fact, the list of activities given in Table 1 suggests a dramatic new way of conducting business where product designers, suppliers, manufacturers and distributors must work hand in hand. This is rather difficult to achieve since it requires external integration (upstream and downstream). This was shown previously with the more environmentally conscious firms, which chose suppliers whose operations pollute less. For example, it may modify not only the procedures for selecting suppliers but also the nature and type of relationships between suppliers and manufacturers or prime contractors. Furthermore, the notion of product stewardship requires tremendous efforts to ensure that appropriate recycling procedures and the corresponding infrastructure exist.

Because of these considerations, it is particularly interesting to analyze the relative importance of the influence of internal and external proponents (Figures 4A and 4B) on the decision-making process and of the underlying motives (Figure 5).

Who actually initiates the idea of taking environmental concerns into account in a firm's product life cycle? The answer to the question varies considerably with the firm's level of environmental awareness (Figure 4A). In the more environmentally concerned firms, a top-down approach is favoured with top management giving direction and leadership and stakeholders demonstrating a positive recognition of the environmental challenge. Since spending on environmental R&D leads to long-term competitive advantages, it is reassuring to observe the strong influence of the head of R&D. In the less advanced firms, influences are all extremely low and the decision-making process is internal and follows a bottom-up approach: senior management is barely involved and as such would not be able to create the appropriate organizational culture to foster environmental conviction in all employees; the R&D director seems to be the principal instigator, followed by the director of operations, which could explain, to some extent, why these firms seek out cost-cutting activities. No loud and clear signal from any group is given for the less environmentally responsible firms.

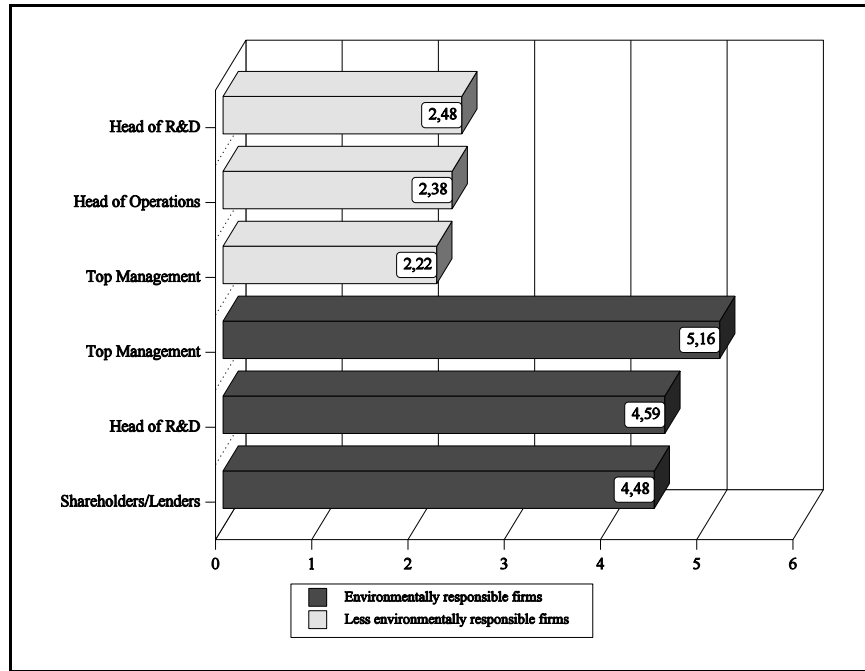


Figure 4A: Who initiated the idea of taking the environment into account in the development of the product? (3 greatest influences)

In order for the idea to become reality, it must also be supported by senior management, irrespective of the firms considered. What is most striking here again is the level of commitment expressed by the different parties in both groups (figure 4B). It is obvious that the level of support grows significantly with the degree to which a firm has integrated environmental concerns into the different stages of its product life cycle.

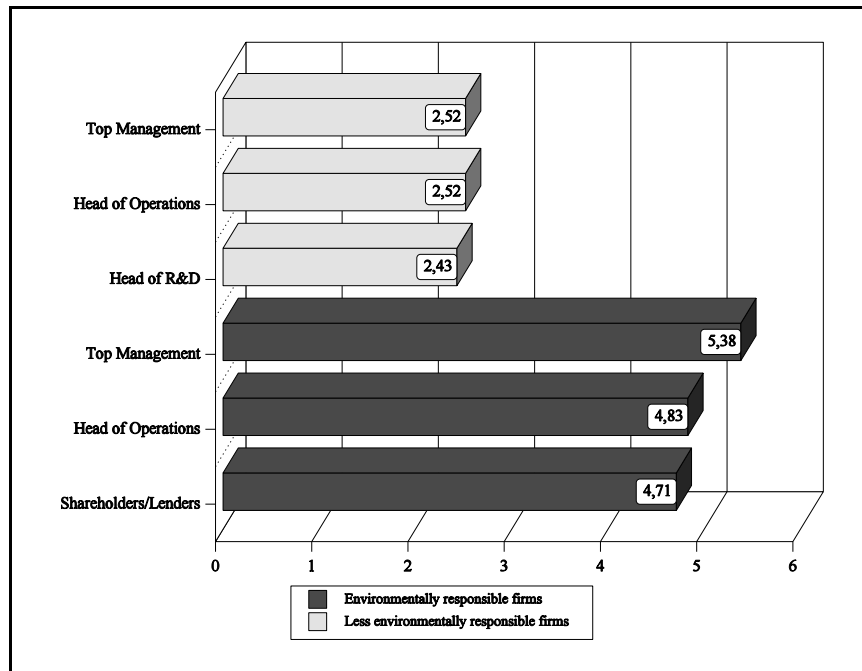


Figure 4B: Who supported the idea of taking the environment into account in the development of the product? (3 greatest influences)

Could this suggest that there is a cumulative learning pattern especially on the part of top management and the R&D director who, by the way, always appears to be equally involved in the initiating and support stages? In fact, if there is anything surprising, it is not the presence of top management, which is obviously essential to all strategic orientations, but rather the continued dominant role of the R&D manager as opposed to the marketing director, the head of operations, other employees, suppliers, customers, governments, or consultants. This suggests that environmental concerns are becoming a strategic issue that R&D managers must deal with in manufacturing firms and one which will undoubtedly make their role even more demanding in the years to come²⁵.

²⁵ Based on interviews made with R&D managers, Rich (1993, p. 19) made the following observation: "What R&D executives describe as new is that over the past three to five years, environmental and health issues have become ubiquitous within their departments". The results presented in figures 4A and 4B point to the leading role of R&D managers with regard to environmental concerns.

What are the underlying motives for adopting environmentally sound corporate practice? The CEOs of our responding firms identify customer requirements as the most important influence, followed by the laws and regulations of local governments and market opportunities. The least important factor or influence is pressures from ecological groups.

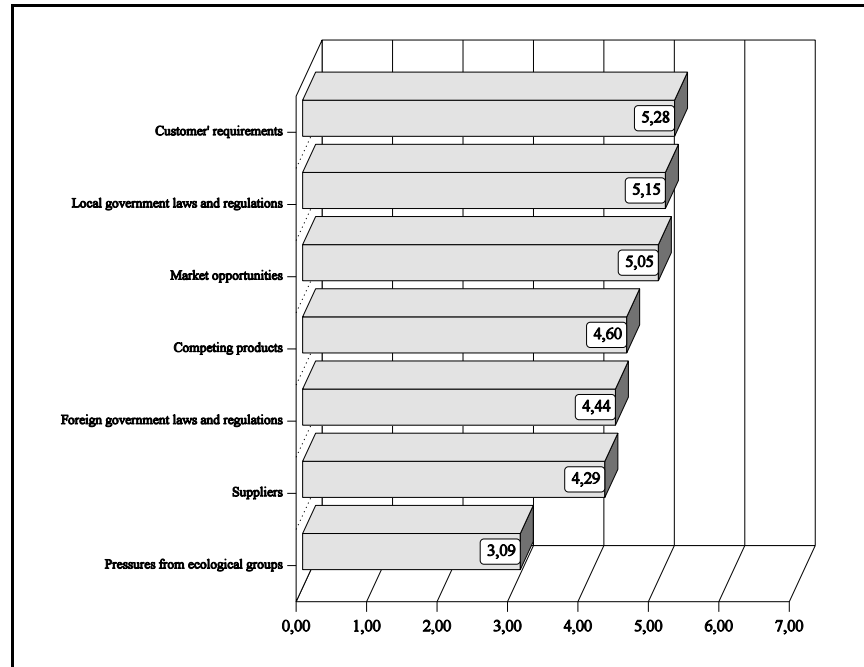


Figure 5: Underlying motives for integrating environmental concerns into product development

This indicates quite clearly that firms respond first and foremost to market pressures as expressed by customer requirements. Secondly, governments can and do have an impact. In fact it has been shown that firms operating in countries that have strict environmental policies and regulations, like Germany, have developed some form of competitive advantage with respect to environmental management issues²⁶.

²⁶ Do strict environmental policies and regulations enhance the competitive position of domestic industry? This question has raised a heated debate: Porter (1991) strongly argues that stringent regulations can be a competitive advantage whereas others raise many doubts against Porter's argument (see for instance, Oates, Palmer and Portney, 1993). In Germany, the "self-inflicted costs" created by probably the toughest environmental laws are considered

7. Opportunities and competitive advantages derived from being green

It was shown earlier that firms undertaking environmental activities mostly do so to respond to customer requirements and legal and regulatory constraints. What we have not yet discussed is the benefits CEOs feel they have derived as a result of these efforts. Figure 6 presents the CEOs' perceptions for both groups of firms.

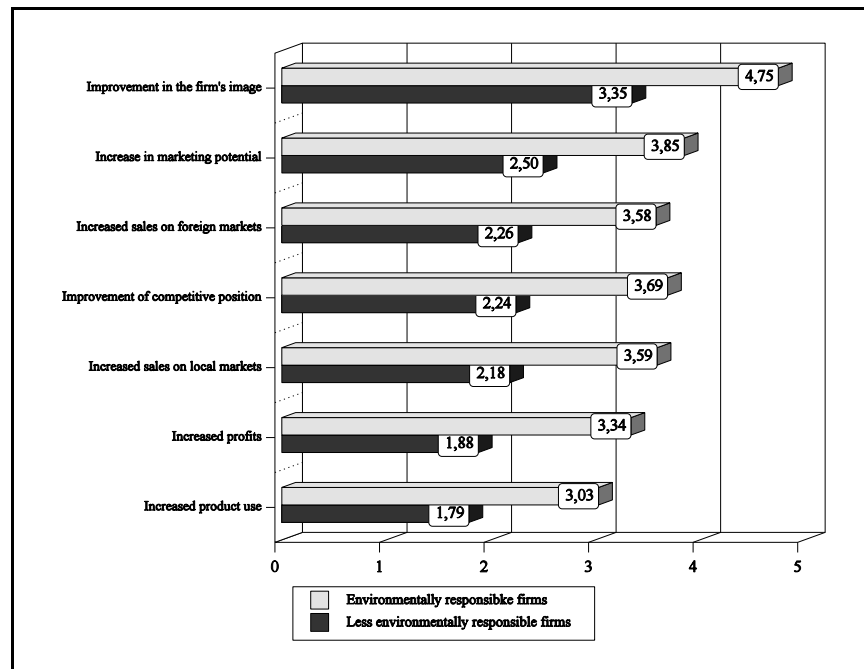


Figure 6: Benefits derived from the environment-friendliness of the product

The first striking result is that the more environmentally concerned firms also seem to derive more benefits from their activities in this area. The second finding is that being green is no panacea²⁷: the only substantial benefit is the improvement in the company's

by some firms as an unfair burden. However, Germany is "the world's leading exporter of environmental technology with sales of DM 35 billion in 1992" (*The Economist*, 1993, p. 81).

²⁷ Being green is indeed difficult and informed decisions have to be made (see for instance Walley and Whitehead, 1994 and Parker, 1993).

environmental image. This is an intangible benefit which does not necessarily translate into hard financial results. In fact, CEOs believe that being green has slightly improved their sales performance, their competitive position, their profits and to a greater extent, their marketing potential. The real message of Figure 6 is that turning environmental issues into profits is certainly difficult but it is another major factor to take into account in the new competitive game. This may sound familiar to all those who have heard a similar plea with respect to the new process technologies over the last decade. However, the message is still positive as the most environmentally sound firms do perform significantly better on all dimensions.

8. Environment: a new item on the strategic agenda

The last question addressed to the CEOs was to evaluate the environmental efforts they planned on intensifying with respect to the different product life development stages in their firms over the next five years (Figure 7).

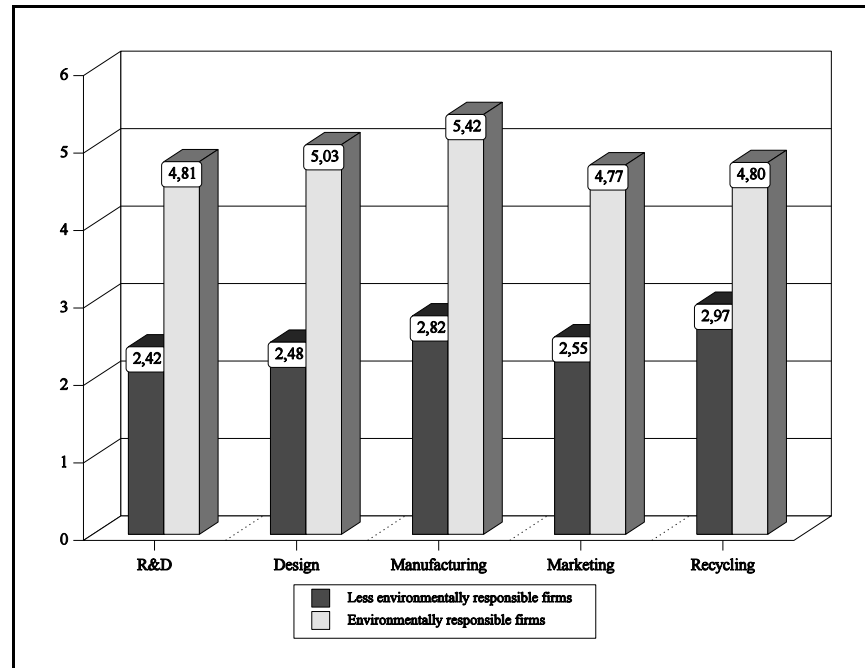


Figure 7: Environmental strategy pursued over the next five years

Interestingly enough, the more advanced firms will definitely continue to make efforts at the front-end stage of the process but a significant increase should also occur in production and recycling. This is quite revealing considering that these firms do not consider that they have gained significant benefits from their past efforts. Why would they want to continue?

One can speculate that they anticipate tighter regulation and potential long-term competitive advantages which will outweigh short-term environmental costs. As they have already met some of the tremendous challenges of incorporating environmental requirements into the firm's activities, they most certainly have increased awareness of their employees to the importance of taking into account environmental concerns.

This is probably the most important and most difficult task for any organization to achieve and yet the one required to ensure significant long-term benefits.

9. Conclusion

In order to effectively improve the environmental performance of manufacturing firms, it is strongly suggested that a systematic approach focusing on all stages of the product's life cycle is required. However, this is easier said than done since it implies the redesign of the entire industrial process involving changes at every level of the organization. Besides managing these tremendous changes, turning environmental costs into profits is extremely hard to achieve.

Yet, environmental concerns constitute for the firm an opportunity to reevaluate their products' development stages in light of the new industrial and competitive realities, and identify ways of both reducing costs and of being more environmentally-friendly. For some firms, meeting those standards and responding to the regulations will represent a major financial strain.

Obviously, all manufacturing firms do not have to deal with environmental issues in the same manner. Specific sectors are being targeted by both governments and pressure groups (e.g. pulp and paper, chemical industry, etc.) and as a result they already need to meet specific norms. Yet, as time goes, all manufacturing firms will have to bear the social cost of pollution and will be facing ever more stringent regulations. For those firms already environmentally responsible and already engaged in a proactive and integrative manner the transition will be easier. Experience in dealing with environmental concerns and a corporate culture favoring environmental efforts may become key competencies that firms must strive for. It has been shown here that there appears to be a cumulative effect in terms of the derived benefits and proposed future actions in the firms. This suggests that the gap between those that have environmental concerns and those that have none may continue to increase and that the catching up game will become ever more difficult. In fact, those who do not grasp the seriousness and magnitude of the environmental problems will not be able to start implementing the learning mechanisms that will eventually provide the necessary competencies. In order to be pervasive, every organizational group must be committed to this goal and be able to follow clear directions and guidelines from senior management. This appears to be a distinctive characteristic of firms that today are significantly involved with environmental efforts.

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