INTERNATIONAL COMPETITIVENESS, TECHNOLOGICAL CHANGE AND SUSTAINABILITY

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Keywords: Environmental management, business strategy, eco-efficient innovation, life-cycle management, end-of-pipe technologies, cleaner technologies, industrial ecology, organization, competitiveness.

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Summary

The international competitiveness of both companies, sectors and national economic systems, will inevitably be modified, whereas the environmental factors and the sustainable development paradigm will be deeply embodied in people's culture and behavior.

Since the conservation of environmental and natural resources requires the contribution of all global participants (both public and private), priority must be given to cooperation/integration agreements, whereby all those partners involved—both companies and nations—can contribute, to different degrees, towards the pursuit of the rational use of natural resources, thus avoiding compromising them for either present or future generations.

Of course, this cooperation/integration entails the adoption of certain environmental management tools, new eco-compatible technologies and products, and industrial ecology, in order to increase the global performance of companies and economic systems (closing the loop).

The type of competitiveness resulting from this revolution will be one involving the creation of a competitive advantage, both within and outside cooperation, based on the shared principles of sustainability, after the transformation of the environment and natural resources from constraints into economic opportunities.

1. Introduction

In recent years, competitiveness has become the key word in every economic context, even though it is not easy to give an exact definition of the term as such. Competitiveness may have different meanings depending on the various levels taken into consideration (the firm, the industry as a whole, the governmental level).

Firms, of course, are the basis of competitiveness; thus if firms are not competitive, then neither the sector nor the national system can be competitive.

At the firm level, the most important factors in achieving competitiveness are the traditional ones such as profitability, cost reduction and pricing, even though these factors are strongly influenced by other variables.

Traditionally speaking, environmental issues have been seen by most businesses as a constraint to competitiveness and profitability. The growing pressure of the economic system on scarce natural resources and on the environment as a whole has led to a subsequent social demand for corrective measures to be adopted: many firms have viewed this merely as the source of additional costs and a threat to competitiveness. However, an increase in environmental controls is not necessarily incompatible with continued economic competitiveness, and a close link may be drawn between competitiveness, technological change and sustainable development.

Recently, indeed, a growing number of firms—even in those productive sectors which have traditionally been considered to be less environmentally critical—have focused increasing attention on the environmental efficiency of their processes and products; there are a number of reasons for this, including their desire:

- to improve their technical and economic efficiency (cost-side advantages);
- to obtain market benefits (as a result, for example, of winning over new market segments) (revenue-side advantages).

Those forward-looking companies, having realized that environmental issues may in fact be transformed from a constraint into an opportunity for increased profitability, have started integrating the environmental variable into their management strategies.

As far as competitiveness at the industrial level is concerned, there has been the adoption of inter-firm cooperative relations. At the government level, states are

concerned with the competitiveness of whole industrial sectors, as measured by international trade balances.

A crucial contribution towards reconciling the objectives of firms with the needs of society and the environment, which may be considered to be one important aim of sustainable development, has been made by technological innovation; in particular by all those economically attractive new technologies enabling firms to reduce the environmental burden of their processes and activities, and to design and manufacture products having a lower environmental impact throughout their entire life cycle.

A further move towards a more sustainable economy may be provided by the transformation of traditional open-cycle economic systems into closed-cycle systems, where waste energy and material outflows of certain processes may be redirected as inputs into other processes. This transformation would involve new forms of collaboration among companies, and thus a different understanding of the idea of competitiveness: what may be defined as "environmentally sustainable competitiveness."

2. Environmental Business Strategies: towards the Creation of Sustainable Businesses

A number of factors, both internal and external, may lead businesses to respond to the environmental challenge:

- opportunities for improved efficiency; indeed, the more efficient utilization of raw materials and energy, together with a lower level of waste production, usually improve both the technical-economic performance of a company (because of the lower costs of input acquisition and waste management) and its environmental impact;
- government control; through the development of environmental regulations and the implementation of market instruments (such as taxes, subsidies, marketable permits, eco-label awarding, and so on), public authorities may influence the environmental performance of firms by encouraging certain activities, processes and products, while hindering others;
- the influence of other stakeholders; consumers have increased their awareness of environmental problems, and claims relating to the environmental performance of a company or its products may affect purchasing decisions; local communities are increasingly demanding that industry lowers its impact on the environment; moreover, due to the increasingly stringent laws concerning liability for environmental damage, the cost of insurance cover for such risks has risen significantly, and companies with a poor environmental record and a high level of environmental risk may find it difficult to attract investment and financing.

Given the above-mentioned factors, it is clear that companies making strategic choices aimed also at improving their environmental performance, and capable of proving this to their stakeholders, will enhance their competitive position through higher input efficiency, improved product and system quality, greater personnel commitment and

involvement, better relations with the community, easier access to funding, lower insurance costs, reduced risks and improved compliance.

Strategic choices made in response to the environmental challenge, and the subsequent management approach, may vary considerably. An interesting model (see Figure 1) has been proposed for the classification of the main typologies of environmental business strategy, according to the implementation timing and the predominant driving force involved.

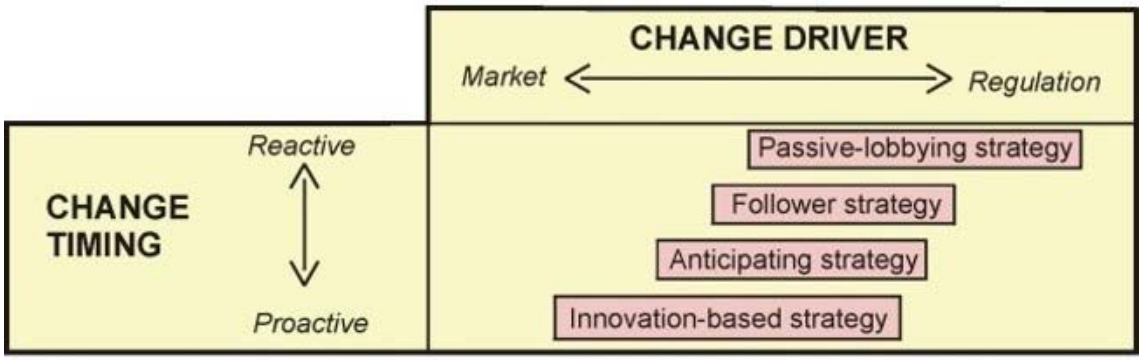

Figure 1. A classification model of typical environmental business strategies (Source: adapted from Azzone et al., 1997).

The following strategies can be seen (although actual strategies may cover a wide spectrum of positions, including intermediate ones lying somewhere between those listed):

- A defensive or "passive-lobbying" strategy: this strictly reactive strategy is characteristic of those firms which consider environmental problems to be merely constraints, and a source of extra costs, and thus tend to by-pass environmental laws and regulations and may even hinder progress towards a more environmentally-conscious form of legislation.
- An adaptive or "follower" strategy: firms pursuing this strategy simply adapt to new environmental regulations or other external pressures (e.g., market tools applied by governments, competitors' choices, consumers' behavior, etc.) without trying to anticipate or affect them.

An anticipating strategy: this is typical of "early movers," that is those firms seeking to respond to a current or foreseen change in the socioeconomic environment more promptly than their competitors do, in order to gain a competitive advantage.

- An innovative strategy: firms adopting this strategy do consider environmental protection to be of major importance from the policy point of view; innovative firms do not merely try to foresee and react to environmental pressures, but also try to influence the evolution of regulation, market demand and social perception in an environmentally-conscious way (active lobbying). By developing proactive responses to legislative pressure, industry will reduce its costs and its exposure to risk.

In general, firms' environmental strategies are not equally divided among the above-listed categories. Reactive-type strategies are more common during the early stages of the process towards increased social appreciation of the natural environment. Innovative strategies, because of the huge financial and organizational resources needed for their implementation, are generally adopted by relatively few, large-sized companies.

2.2 Conditions for the Successful Implementation of Environmental Strategies

In order that firms may successfully achieve their strategic environmental objectives, their strategy needs to be based upon the firms' characteristics and the socioeconomic context in which they operate.

A few variables may be chosen as being representative of the firm's structural features:

- The *environmental culture* of the firm: that is, those values and norms according to which the environmental problems are perceived by a firm. The more a firm (i.e. its management and employees) is environmentally conscious, the wider the range of potentially implemented environmental strategies.
- The *overall management strategy* of the firm: the general attitude of a firm towards competitive stimuli may, indeed, greatly affect the kind of environmental strategy adopted; for example, it is hard to imagine that a firm with a passive overall attitude to competition will pursue an innovative environmental strategy; however, an innovative firm may decide not to extend its dynamic approach to the improvement of its environmental performance.
- *Available resources*: the quantity and quality of presently accessible resources (financial, organizational, human, technical and relational) may greatly influence the effectiveness of a firm's environmental strategy.
- *Specific human skills*: that is, the integrated, interdisciplinary knowledge and expertise enabling firms to deal more or less successfully with the environmental challenge; these include: scientific and technological knowledge of company processes and products, and their present and potential impact on the environment; communication skills, needed in order to establish a relationship with stakeholders; in-depth information about applicable environmental regulations; and managerial skills.

The feasibility of environmental strategies also depends on the socioeconomic context within which the firms operate, such as the degree of social awareness of environmental problems, the evolution and strictness of environmental legislation, the rate of technological growth, the amount of resources available to competitors, as well as their environmental culture and attitude.

2.2 Key Principles for Proactive Environmental Management

As suggested by the International Chamber of Commerce, companies adopting proactive-type environmental strategies should have a number of goals, the major ones being:

- the recognition of the environmental dimension as one strategic corporate priority, leading to the establishment of policies, objectives, programs, and practices designed to improve environmental performance;
- the integration of environmental strategy at all business levels;
- the constant improvement of environmental performance according to scientific and technological advancement and the needs of society, and the application of the same environmental criteria internationally;
- the instruction and training of personnel to improve the environmental aspects of their operations and activities;
- the assessment of environmental impact prior to starting a new project or activity and decommissioning a given site;
- the design and manufacture of products (or the provision of services) having the minimum environmental impact during their entire life cycle;
- the informing and education of consumers, distributors and the general public, with regard to the safe use, distribution, storage and disposal of those products provided;
- the design and operation of facilities, and the management of activities, so as to minimize their negative environmental impact (including the depletion of natural resources, both renewable and non-renewable);
- the promotion and carrying out of research into the environmental impact of business products, processes and activities, with the aim of reducing this impact;
- the adoption of a precautionary approach to modifying the manufacture, marketing or use of products, in order to avoid irreversible damage to the environment;
- providing encouragement and support to the adoption of these principles by contractors and suppliers, so that their practices conform to those of the firm;
- the management of any potential hazards, through the joint elaboration and updating of emergency plans with the respective authorities and the local community;
- contributing towards the transfer of environmentally-sound technological and management approaches and methods;
- contributing towards the development of public and company policies and programs designed to improve environmental awareness and protection;
- sustaining an open dialogue with employees and the public, aimed at recognizing and responding to their environmental concerns, both at the local and the global level;
- the periodical carrying out of environmental audits designed to assess the firm's environmental performance, and the communication of the respective information to stakeholders.

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Biographical Sketches

Giancarlo Barbiroli has been full Professor of Technology of Production Cycles at the Faculty of Economics, University of Bologna, since 1975.

His fields of research are techno-economic analyses carried out on production activities, to evaluate their main features, with regard to the technologies adopted and their global performance; the efficient use of energy sources and materials; the impacts on ecosystems; quality. He has set-up and implemented special indicators and models, able to measure the aspects of global performance of production activities, at company and economic system levels, which can be useful to make efficient and appropriate choices, as well as to improve methodological procedures. The branches of production he has systematically investigated, as important case studies to draw general assumptions, have been durable goods (automobiles, appliances), metals and materials (e.g., steel, aluminum, cement, paper), foodstuffs.

Publications (180 articles and 14 books) have appeared in International Journals, such as: *Technovation, Energy Economics, Journal of Environmental Management, Energy Sources, Applied Energy, Structural Change and Economic Dynamics, Journal of Mathematical Economics, International Journal of Systems Science, International Journal of Sustainable Development and Industrial Ecology, Journal of Scientific and Industrial Research, Energy Policy, Resources Policy, Rassegna Economica, Note Economiche, and in the Proceedings of International Symposia*. He has participated in the project of the Italian National Research Council with theme "Alternative technologies for a dynamic dependence" (1984–1987), and as coordinator of Theme 1. He has taught in two European Master Degrees on *Environmental Management* (Sofia and Ankara) organized by the International Centre for Technical Research in London and funded by the EU (1994–1997). He is a Member of the Italian Society of Economists. He has been Dean of the Faculty of Economics, University of Bologna (1984–1993), during the celebrations of the 9th Centenary of the University of Bologna.

Andrea Raggi graduated in 1988 from the University of Bologna, Italy, where he studied economics and business administration.

In 1989 he joined the University of Bologna (Dept. of Business Economics and Management—Technology and Resource Valorization Area) as a research officer, and since 1998, he has been Associate Professor of Commodity Science and Technology at the University "G. d'Annunzio" in Pescara (Italy). Since starting his academic activity, he has been carrying out research on technological and economic aspects of production processes and objective methods, to determine quality characteristics of products and resources. Specifically, as far as research on environmental and natural resources is concerned, he has been working on the development of environmental quality indices, the assessment of the strategic value of eco-compatible technologies, the evolution of environmental management tools and their implementation.

He has been lecturer on environmental management issues for the European Masters Degree in *Environmental Management* at the University of Ankara, as well as the European Masters Degree in *Environmental Protection and Sustainable Development* at the Higher Institute of Chemical Technology, Sofia, both of which are sponsored by the European Union.