

ECODESIGN – The Competitive Advantage

**ALLIANCE FOR GLOBAL SUSTAINABILITY BOOKSERIES
SCIENCE AND TECHNOLOGY: TOOLS FOR SUSTAINABLE DEVELOPMENT**

VOLUME 18

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ISBN 978-90-481-9126-0 e-ISBN 978-90-481-9127-7
DOI 10.1007/978-90-481-9127-7
Springer Dordrecht Heidelberg London New York

Library of Congress Control Number: 2010934421

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Preface

Dealing with environmental issues should no longer be considered simply as a cost of doing business. Effective environmental improvements to a company's products and services can be turned into business opportunities. This book was written with the express purpose of helping managers of companies, in particular of Small to Medium sized Enterprises (SMEs), to better deal with environmental challenges and address customer requirements, all in order to turn their environmental investments into competitive market advantages.

Several examples are provided throughout the book, but also warning signs (Alert Boxes). These "Alerts" are posted to help managers avoid typical traps when working with environmental considerations in business processes.

The authors have many years of experience in the various aspects of implementing Ecodesign. This experience includes working in industry for many years; leading the environmental departments in a multinational company; managing research projects in eco-product development; Life Cycle Assessment; and national and international environmental communication and marketing.

This book is the latest in a series. The 2002 "Ecodesign Pilot" introduced a tool and software to help design more environmentally compatible products. It was directed specifically at designers. The 2004 book, "Ecodesign Implementation", was written to help project managers optimize product development processes from an environmental perspective.

The current book is intended to help CEOs, and management staff, address environmental issues more systematically in their strategic programs and management systems. Although many examples are taken from the electrical and electronics (E&E) industry, managers in all industry sectors will, hopefully, also find the book useful as they also have products, plants, services, and software.

In this book, the authors have attempted to provide managers with some background information on what will be needed, strategic information on what should be done, and advice on different types of tools and actions. A systematic and (hopefully) understandable approach was used in writing the book and includes the kind of information needed at five different decision-making levels:

- Corporate
- Market

- Product
- Production
- Management

These five levels are interlinked with three leading questions:

- What is the problem?
- What should be done?
- How should the problem be approached?

The book starts with a chapter on the potential for environmental issues to contribute to competitive advantage. The concept of Sustainability used is explained and a new business paradigm is defined.

From Chapters 2–4 the five decision-making levels and the three leading questions are combined. The following matrix serves as a roadmap:

| | What is it? Chapter 2 – Situation analysis | What should be done? Chapter 3 – Strategy development | How to approach the problem? Chapter 4 – Action plan development |
|------------------|---|--|---|
| Corporate level | 2.1 Corporate analysis | 3.1 Corporate considerations | 4.1 Corporate action plan |
| Market level | 2.2 Market analysis | 3.2 Market considerations | 4.2 Market action plan |
| Product level | 2.3 Product analysis | 3.3 Product design considerations | 4.3 Product design action plan |
| Production level | 2.4 Production analysis | 3.4 Production considerations | 4.4 Production action plan |
| Management level | 2.5 Management analysis | 3.5 Management considerations | 4.5 Management action plan |

In Chapter 5, three examples are presented:

- CE-Marking of complex set top box
- Redesigning a mobile phone base station
- Carbon footprint, carbon reduction opportunity, and carbon management approach using complex set top box

The book concludes with Chapter 6, in which an outlook on possible future scenarios is explored.

A unique feature of the book is the checklist that accompanies each section. Collectively, these checklists are designed to help managers analyse their situation, develop their strategy, and then develop their action plan for achieving competitive advantage with Ecodesign.

The checklists can be downloaded as files from:

www.ecodesign-company.com/competitive-advantage. The username is “manager”, and the password is “ecode\$ign”.

The checklists in the book and website contain the following elements:

| Assessment questions | Answer | Comments | Recommended follow-up activities | Related chapters |
|-----------------------------|---------------|-----------------|---|-------------------------|
| Is there a ...? | Yes☺ No☹ | Integra, etc. | Opti ... | 2.3, 3.... |

The authors hope that this book will be useful in helping reduce the environmental impacts of a company’s products and services, but also in gaining competitive advantage. We encourage the reader to (a) use the ideas described in the book, (b) be aware of the potential traps described in the Alert Boxes, (c) learn from the examples provided, and (d) use the checklists.

Introduction

Environmental Problems

When confronted with a question about their views on the state of our collective environment, many people will likely respond in a way that defines environment in a narrow way, as a uni-dimensional problem, or perhaps as a simple or somehow homogeneous issue. The particular outlook will, of course, vary from person to person, depending on background knowledge, exposure to, and experience with environmental issues. However, it is expected that most would view or define environmental problems as those related to garbage, dirty air, or dirty water. Certainly the routine media reports on smog days, garbage disposal challenges, recycling issues, sewage treatment problems, risks associated with hazardous chemicals, and oil spills would support those views. However, the kinds of environmental problems we deal with today are multi-faceted, non-linear, and complex. We need to understand and deal with them through an open-system approach.

One could argue that there has been an evolution in the kinds of environmental issues we face, from simple and local problems to the current environmental challenges that are much more global and complex in nature. Attempting to deal with all issues in a single way is, of course, naive. On the other hand, attempting to discuss every possible solution for every specific issue is a far too daunting task.

Therefore, it may be easier to think of environmental challenges in three broad categories:

- Direct environmental problems or “end of pipe” pollution types of problems, such as oil spills and raw sewage discharges.
- Indirect environmental problems with unintended consequences or unanticipated effects arising from designed activities. Examples include pesticide development and application leading to impacts on the reproductive capability of waterfowl, sulphur and nitrogen oxide releases from industrial activity leading to acidification of lakes, ozone depletion from releases of chlorofluoro carbons (CFCs), and climate change arising from releases of greenhouse gases.
- Resource mismanagement problems, such as over-fishing, poor forest management practices, and over-consumption of certain metals, that result in scarcity, net resource depletion, and species and habitat loss.

The latter two categories of issues, “Indirect” and “Resource Management” can both be characterized by root causes that were developed as solutions to problems and “seemed like a good idea at the time”. DDT (Dichloro-diphenyl-tri-chloro-ethane), CFCs (chloro-fluoro-carbons), PCBs (polychlorinated biphenyls), over-fishing, unsustainable forest management, and gasoline, oil, and coal as primary energy sources, are all examples in which the product, chemical or practice were considered, in their day, to be tremendous progress, if not futuristic breakthroughs. However, no-one anticipated the consequences.

Environmental Implications

When addressing environmental problems at a product level, one should consider all of the environmental issues across the product’s life cycle, including the concepts related to the “Carbon Footprint”, energy efficiency, opportunities for recycling and reuse, and toxicity. In general terms, this all relates to the “Sustainable Product Development” approach, or, as is intended in this book, “Ecodesign”.

And so, Managers, it’s time to play a more active environmental role in your company by initiating and promoting the “Ecodesign” of your products. The cost of resources, including energy, and particularly non-renewable resources, is at best unstable, but likely to explode because of either scarcity or over-consumption. “Eco” is no longer some crazy term. In fact, it may well contain the solution to some of your company’s challenges and convert these challenges into opportunities.

Exhaustive consumption patterns can be overcome by the application of concepts related to higher levels of sustainability. Recycling of resources not only extends resource life, but also avoids the need for new resources, thereby eliminating the environmental impacts of the related acquisition and refining processes. Environmental strategies are needed, not only for the enterprise, but also for the way the product is designed. It is no longer enough to simply exchange one hazardous material in a product for another that is slightly less toxic. A more sustainable approach uses all of the environmental and cost-saving potential over the entire life cycle of the product.

However, and in particular for Small to Medium-sized Enterprises (SMEs):

- Managers frequently complain that the concepts of sustainability and Ecodesign do not, or perhaps even cannot, be applied to their business. More than 10 years ago, the Boston Consulting Group showed that after Cost and Quality [1], “Environment” has become the most important decision-making criteria for customers. If the environmental properties of a product are superior to those of competitors’ products, the rules for that market sector will already have been changed. If the environmental investment has not yet been made, there is still time to become a market leader, even when currently lagging behind.
- It is often thought that an SME need not be concerned about the environment because each individual company sells too few of any particular product each

year to be of broader concern. However, all of the players in a market sector together may well produce millions of similar products. Regulatory agencies may be concerned about the environmental impact of certain types of products in the marketplace, and if adequate environmental progress is not initiated, then new regulations or directives may be imposed. With some degree of new thinking, a leadership role can be attained which, quite possibly, could create a number of opportunities.

- SMEs should not necessarily feel alone in the development of environmental strategies and concepts. They can cooperate successfully in concepts such as “recycling” or “take back” with either other big or small companies or with governmentally organized systems. This works especially well for capital goods where “take back” can be collectively planned, thereby generating direct benefits for customers. Also, recovered parts can often be sold as being functionally as good as new.
- Environmentally compatible products are not necessarily more expensive. By smart management of resources, mass can be reduced and a transition to other materials may be possible. Today, the tight market between suppliers and producers often does not allow companies, especially individual SMEs, to change materials easily. However, co-operation within the supply chain can result in better information about materials and facilitate material substitution.

Another important consideration is that companies do not always just sell hardware products, like computers, in isolation. Products can often play an active role in systems. For example, in the “Internet System”, a computer’s application and environmental impact will depend on how and where it is used (e.g. private use, while travelling, or in industrial applications). Appropriate environmental planning and preparation can pay significant dividends.

Regardless of physical location, companies must know the local rules and regulations. Even if production takes place in a developing country for a non-regulated global market sector, one should not feel immune from environmental regulations. Many countries are developing regulations related to “take back” requirements, substance restrictions, product labelling and energy consumption. One will need to know what is necessary in the target markets to successfully sell into those markets. Management strategies for environmental risk assessment will help a company to more effectively deal with upcoming regulatory action and even prepare, at least partially, for possible surprises. For example, if a company exports into the European Union, the company should be aware that:

- The European Commission has already announced that companies should not stop with the “Ecodesign Directive” as it is, but extend its application to all kinds of products.
- The “CE” mark (“Conformité Européene” in French) will eventually also guarantee the environmental properties.
- The Integrated Product Policy (IPP) will challenge all manufacturers by providing best practice examples. While the legal future of the recently released Green Paper on IPP is uncertain, the principles contained therein can be expected to be implemented in some manner or another [2].

The “technological age” of a company’s product with respect to innovation is another important consideration. Has the company already planned the next “innovation leap”? The competitors, if they haven’t done so already, will certainly be thinking about it. Customers will be very interested in new products that, for example, consume 50% less energy.

Addressing the types of problems and implementing the kinds of approaches noted above could very well result in technology and process changes which, in turn, would create better long-term sustainability of resources and, not insignificantly, create immediate and long-term economic benefits. However, it is management’s decision whether to be constantly reacting to new and upcoming regulations and market requirements or whether a more proactive approach is desirable in which the environment is viewed as a business opportunity.

Environment as a Business Opportunity

Since the 1960s, awareness of environmental issues has increased dramatically as has the resultant demand for related solutions. In recent years, this has been driven by concern over climate change which has a direct correlation with fossil fuel use and energy efficiency. Pressure in the form of international agreements (e.g. Kyoto Protocol), politics at both the national and international level, non-governmental organizations’ calls for action, media coverage, and domestic action plans have all resulted in a high level of public awareness.

Companies, such as General Electric (GE), Philips, Siemens, Walmart, and Tesco have recognized the economic opportunity related to appropriate environmental stewardship and have built it into their corporate strategies through initiatives such as GE’s “Ecomagination”, and Philips’ “Ecovision”. A few industries are even calling upon governments to show leadership.

At the same time, and probably not coincidentally, there has been a significant growth in the use of various types of environmental labels, ranging from resource management labels through to labels that consider impacts across the full life cycle. Together with this growth in the use of ecolabels has also come, quite predictably, misrepresentation and misleading or even false environmental claims. While this misuse is certainly regrettable, the overall growth in the use of environmental marketing does signal the importance with which companies (the private sector) deal with the environment overall.

Progressive companies will want to lever their environmental investment to gain market share, in large part through their marketing efforts. On the other hand, some companies are taking a “wait and see” attitude. How will the marketplace respond to these opposing strategies? Will consumers continue to embrace environmental concerns? Will there be a return on environmental investment? Does environmental marketing create further demands that may be difficult to meet?

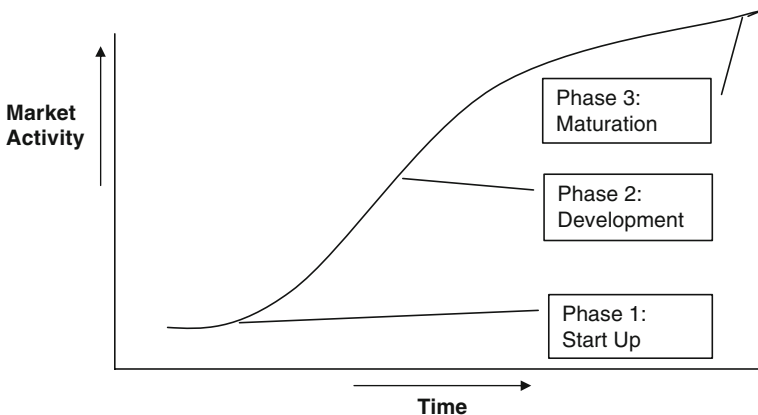
While one can interpret the demand for environmental action in many ways, the authors contend that it should be seen as a catalyst for economic development. And,

furthermore, that this growth already has significant momentum and is not likely to abate for many years to come. The fact is that the multi-dimensional issue of environment has consistently been measured as being in the top three or four concerns for citizens in North America and Europe for the last few decades. Therefore, it should not be surprising that the environment has become a serious component on the political agenda of many countries. In short, this issue of environment is not going away any time soon.

Many signals are already visible. A number of countries are either debating or implementing carbon taxes. Others are considering or actually using carbon trading within regulated cap and trade systems. Many companies and even whole industries are using supply-chain management techniques to not only help them manage financial and quality issues better but also as a mechanism to improve overall environmental management and reduction of environmental impacts across their product’s life cycle.

The key point is that, from a business perspective, and the choices that businesses make, the market dynamics of the situation will give rise to opportunities and also threats. The standard “S” Curve of business is likely a good representation of how the marketplace responds to the increase of importance of environment. As the following diagram shows, where innovation takes place, there is rapid growth. As markets become saturated, market maturation is reached and growth levels off. This curve can repeat itself many times in any one sector, with new product development and innovation, or the introduction of a new issue of concern, like environment (see Fig. 1).

Each phase has different characteristics and implications for strategic planning. Of course, the time dimensions and rates of growth are highly variable and depend on the nature of the market and the economic climate in which it operates.



- Phase 1 – Start up as the concept has low awareness and acceptance.
- Phase 2 – Development as the concept gains higher awareness and acceptance.
- Phase 3 – Maturation as the concept reaches full penetration.

Fig. 1 The business S curve

Because of the evolution of the environment as an important issue to consumers, and thus the marketplace, new investment will be attracted, causing new products to be created and bringing in new players. As is normal in any healthy market-based economy, this will create winners and losers. Needless to say, failure to recognize and act in this new context will ensure its own rewards.

Alert

While the discussion above is general in nature, not all product categories are at the same point in the S Curve at the same time. Environmental investments may produce different results depending on the product category. Product specific market analysis from an environmental perspective will pay dividends.

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Chapter 1

Sustainability as a Competitive Business Advantage

“Sustainability”, “Sustainable Development”, and “Corporate Social Responsibility” are all terms that are increasingly being used in daily communication. Also, companies are finding that the use of environmental claims in their marketing efforts can pay dividends. Product performance related to “lower energy consumption”, “better recycling rates”, etc., are often declared. But, in considering Sustainability or Sustainable Development from a more holistic perspective, the broader picture needs examination.

1.1 Our Understanding of Sustainability

There are many (perhaps too many) definitions out there about the meaning of Sustainability or Sustainable Development. In order to develop a working understanding, the authors have *not* attempted to come up with more definitions, explaining in comprehensive sentences what cannot be expressed with only a few words.

So we’ve tried a different approach. Something is definitely not sustainable and cannot be referred to as Sustainable Development if:

- Renewable resources are depleted too quickly (or at all).
- Consumption exceeds need – you would be surprised by the percentage of unpacked food in the waste stream of industrialized countries!
- Products or processes that waste energy (e.g. stand-by consumption).
- Waste products from industrialized countries end up in developing countries for inappropriate “recycling” thereby causing health and environmental damage.
- Companies create environmental hazards or risks or inappropriately exploit staff for enhanced profits, etc.

The list could be quite long and would still be incomplete. Certainly, one can easily understand that the above examples are definitely not examples of sustainability. Although it is difficult to define what Sustainable Development is, it is easier to identify what is just the opposite.

In this book we assume that the reader is aware of the environmental and social problems caused by industrialized countries seeking the “quick and easy dollar or euro” without long-term strategies or thinking. Consequently, we want to focus on the link between Sustainability and the way of doing business.

How Sustainability is relevant to a specific business model requires some exploration. If it is argued that “*this* particular business model is not linked to Sustainability”, then the vulnerability of the business model and perhaps the business itself should be assessed. Some questions warrant consideration:

- How will the business be affected if oil costs rise to US\$250 per barrel? What will be the direct and indirect consequences?
- What is the most important raw material (e.g. metal) used in the product?
- Where does this material come from?
- How “safe” is the supply chain?
- How scarce are the materials being used in the production of products?

These questions may lead to a new understanding of Sustainability beyond simply being, or being seen to be, “green” or “socially responsible”. The concept of Sustainability can serve as a forecasting system to highlight potential problems. The question is how one can use this forecasting system to improve and strengthen a business model to avoid problems in the future – or, even better, to gain competitive advantage because potential problems were detected early and opportunities were acted on accordingly.

Before going further, let’s have a look at some developments in the recent past. They are presented here to help predict and understand what the future may bring.

It can be argued that, with the current oil price well under US\$100, there is no need to worry about an oil price of US\$250. This might be true, but then it may be only a short-term perspective. While there are currently significant oil reserves, the International Energy Agency published the World Energy Outlook (WEO) 2008, which contained some critical warnings. The Outlook noted that: “The world’s energy system is at a crossroad. Current global trends in energy supply and consumption are patently unsustainable – environmentally, economically, and socially. But that can – and must – be altered; there’s still time to change the road we’re on”[1].

In the WEO 2008, the production of 800 oilfields, including the 54 super-giant fields which hold more than five billion barrels of oil, were analysed in detail. The result is frightening: “We estimate that the average production-weighted observed decline rate worldwide is currently 6.7% for fields that have passed their production peak. In our Reference Scenario, this rate increases to 8.6% in 2030.” With an annual decline rate of 6.7%, only 50% of the reserves will remain in just 10 short years! With such a dramatic reduction in supply, we can probably guess the impact on price.

Another example is the scarcity of metal resources. The rare metal indium is used primarily in electronic components (especially in lead-free solder), on liquid crystal display (LCD)-glass, and in light emitting diode (LED) screens. Every

mobile phone, personal digital assistant (PDA), and Laptop, and flat panel LCD-TV contains a small amount of indium. The world production is around 500 t per year, and occurs predominantly in zinc-sulfide when mining the carrier metal zinc [2].

The worldwide total reserves, including those that are economically extractable today (about 2,800 t), amount to 6,000 t [3]. As such, the supply horizon for this rare metal is only between 5 and 10 years. Business models using new technologies like thin-film solar cells based on indium may be in danger because of the scarcity of this metal.

What does your own business model depend on? Which source of energy? What (scarce) resources? Upon what (currently changing) assumptions or system boundaries, market requirements, etc., are you making plans? With this type of understanding, the concept of sustainability takes a different perspective – it has much to do with addressing business vulnerability. How vulnerable is your business model and are you able to detect early enough where and how to change it according to the main elements of sustainability? The following criteria can be useful guides to follow when designing solutions to problems related to products, services, processes, and technical systems:

- Use of renewable resources
- Use of regional resources
- Level of efficiency in products and processes
- Use of cycles, such as reuse and recycling
- Degree of adaptation and compatibility of technologies
- Level of failure tolerance and risk prevention within systems.

If the analysis and related efforts fail, not only may the business model fail, but there may be broader consequences leading to unsustainable economies.

Nicolas Stern noted in his 2007 report [4] that global warming could shrink the global economy by as much as 20%. But he also stated that taking action against climate change now would cost just 1% of the global gross domestic product (GDP). In more recent statements, he declared that climate change is proceeding faster than expected and that the costs related to dealing with the consequences of global warming now, as opposed to later, are most likely 2% of the GDP.

This raises other questions linked to sustainability:

- How well is your business model prepared to deal with the climate change issue?
- What are the potential consequences of climate change that may affect your business model?

The consequences of climate change could range from direct environmental impacts (storms, floods, etc.) to increased overhead costs (insurance, transportation, energy, emission certificates, etc.), and even to low acceptance of products with large (or not well defined or communicated) carbon footprints.

Throughout this book, the authors have attempted to provide ideas about how to improve the environmental performance of products and whole enterprises, how

to lower the vulnerability for your specific business model and, consequently, how to achieve competitive advantage.

We certainly do live in difficult economic times. But we also live in a transitional period, from a fossil energy-based society to a society based on renewable energy and materials. This transition will challenge us in different ways and we will need to find new and smart approaches with which to move forward. The old approaches and pathways will no longer be useful. From a business perspective, as well as for the environment on which we rely, it may well be too dangerous and too expensive to hold on to the old ways much longer.

Meeting the future challenges using an Ecodesign approach aimed at sustainable product and service development also helps move towards more sustainable business models. We may not know exactly how and where this may lead, but what is known is that business models ignoring sustainability will be in real danger. Consequently, managers developing business models and engineers developing products and technical systems need to integrate sustainability issues now. But how does product sustainability translate into your business model? What does this mean for your own products? The following sections lay out what the authors see as important environmental and sustainability trends to be aware of as you design the future of your own products and your business.

1.2 European and Worldwide Regulations and Standards

There are a variety of environmental trends that have the potential to dramatically influence the acceptance, and thus the design, of products. These trends relate to legislative and regulatory initiatives, standards, evolving programs, and market demands. Every manager should have in place a process to identify, analyze, and evaluate existing and forthcoming legislation, regulations, standards, and other product-related programs and pressures. This is important not only in the country of primary market activity but also in the major economies around the world.

At the moment, the product-related environmental issues that are subject to probable regulatory action include

- Management systems
- Ecodesign
- Reduction of GHG emissions, as well as improving energy efficiency
- Substance restrictions
- Take-back and recycling
- Batteries
- Packaging.

Existing environmental product legislation can often be obtained from manufacturers' associations [5] that get information on their products of interest from legal consultants or through their network of political organisations around the world. Specialized consultants also frequently offer investigations into, or regular reports