

# New Product Sustainability: Innovation and the environment

“It is no longer enough to measure a company by standards of profit, efficiency, and market share; it’s critical to ask how business contributes to standards of social justice, environmental sustainability, and values.”

Jeff Swartz, President and CEO,  
The Timberland Company

So far in this study book we have established that innovation is central to an organisation’s ability to compete and thrive in demanding and complex markets. This means that consumers are actively encouraged to buy new or updated products to replace existing ones. However, there is also a growing acceptance that the current model of global economic development is unsustainable: put simply, the world is living beyond its means.

The argument is that the increasing stress put on natural resources and environmental systems in order to support continued economic development cannot be sustained. It is a dominant question,

“For those of us closely involved in the Sustainable Development Stakes, it’s nail-biting stuff – even though this is a race being played out over decades rather than minutes. The stakes could hardly be higher: can we reach that point in our evolutionary history where we start to live sustainably on this Planet *before* we inflict irreversible damage on the life-support systems that sustain us? Or will we remain hell-bent on testing those systems to destruction (and beyond)?”

Jonathan Porritt, 2004  
Chairman, Sustainable Development Commission

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It is a compelling one, a combination of factors – higher customer expectations, government policy and resulting legislation, media scrutiny and the need for investor and stakeholder management – are therefore encouraging companies to adopt higher standards of business and marketing conduct. According to Kotler and Keller (2009: 675),

“The most admired – and increasingly most successful companies in the world – abide by a code of serving people’s interests, not only their own.”

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## Learning Objectives

By the end of this section you should be able to:

- critically evaluate the role of organisations in their societies,
- define sustainability,
- assess the value of social initiatives for organisations and their stakeholders,
- appreciate the environmental complexities that are influencing organisations to be more socially responsible, and
- outline different approaches for corporate social responsibility.

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## The role of the organisation in society

A belief in the value of social responsibility has not always existed. More traditionally the role of commercial organisations has been viewed as delivering profit to their owners and stakeholders. The economist Milton Friedman declared social initiatives “subversive” due to a belief that they undermined this profit-seeking purpose and wasted shareholders’ money.

There are critics who believe that investment in key activities such as R&D could be undermined by a focus on social responsibility (Grow, 2005). In contrast, Sisodia *et al* (2007) define a 21st century marketing paradigm

that creates value for all stakeholders and results in “beloved firms”. These “firms of endearment” (Diagram 7.1) are those that “have a culture of caring and serve the interests of their stakeholders”. These companies create a “love affair” with stakeholders – defined as society, partners, investors, customers and employees (“SPICE”). They spend less on marketing as a percentage, but earn higher profits.

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Best Buy	Caterpillar	Costco	Progressive Insurance	Toyota
BMW	IDEO	JetBlue	Timberland	Starbucks
CarMax	Commerce Bank	Honda	Johnson & Johnson	L.L. Bean
Google	Container Store	IKEA	Jordan’s Furniture	REI
Harley Davidson	eBay	Patagonia	New Balance	UPS
	Whole Foods	Wegmans	Trader Joes	Southwest

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Diagram 7.1 Top ‘firms of endearment’ (after Sisodia, Wolfe and Sheth, 2007).

## Is marketing irresponsible?

Marketing has borne the brunt of many criticisms surrounding the role of business in society. Its practices are perceived to enable and fuel instances of injustice and undesirable corporate social behaviour.

These fears are perhaps most notoriously associated with the development of the ‘mass market’ during the 1950s. With the post World War II economic regeneration, wider sections of many nations’ populations were able to participate in a greater range of marketplaces on a regular basis. In the UK and United States this growing involvement was matched with an increasing alarm at the machinations that were perceived to be behind the emergence of the modern consumer. Journalist Vance Packard (1961) and critical theorists, such as Theodor Adorno (see for example Adorno, 1938) and Herbert Marcuse (see Walsh, 2008), sought to expose the ‘hidden truths’ behind the consumer society. These truths often revolved around the use by corporations of technologies of manipulation. The tools of choice for corporations were proclaimed to be advertising and marketing (Mayer, 1958). These tools were being employed in ways that rendered the ‘new consumer’ myopic to the true forces of change or the individual’s reality.

Today most people are fairly familiar with the ‘bluff’ of marketing speak, the manufacture of unrealistic images and invasion of personal privacy

through regimes of market intelligence. Today there is a host of organisations that are willing to assist the consumer with consumption issues. From television programmes (BBC's *Watchdog*) to magazines (*Good Housekeeping*), pressure groups (*Which?*), corporate reports (Goldfish), Government and regulatory agencies (Trading Standards, OFTEL) and an increasing number of Internet sites and dedicated sections in newspapers, the consumer is able to draw from a wide variety and depth of information about products. In many cases these information providers also offer forums through which the consumer can vent their dissatisfaction and seek redress against the product providers.

Despite this level of education in the ways of marketing, scepticism of marketing remains (Nava, 1990). We may nod knowingly at the latest marketing technique, believe that we are able to see through the doublespeak, but retain a protective distance. The fear of manipulation, brainwashing and underhand behaviour, partly descended from the 1950s, is still played out in some fashion within contemporary society. To spare ourselves the humiliation of being bamboozled we may position marketing as a practice that is not natural or part of our assumed social order, in short we often position marketing as 'other'.

It is of course comforting for many to perceive marketing in oppositional terms. Arguably knowing the enemy and guarding against it makes the issue visible and stable. Marketing can be labelled and the rules rehearsed for when it is necessary to engage with it again, however, this arguably fails to appreciate the nature and directions of marketing.

Social responsibility has traditionally been a key area of concern for marketing thought; from the early days of the marketing discipline to the green marketing crusades of the 1990s, to the social activism of today, marketing has retained a fascination with issues of ethical behaviour. Here contemporary thought can be seen to stretch back long before the 'crisis of capitalism' (Cable, 2009) and Naomi Klein's critique of marketing and capitalism in *No Logo* (2000), as perhaps typified by a statement in 1997 in which the Marketing Society then acknowledged that the future of marketing lay in the management of ethics (in Curtis, 1997).

The strides being made within marketing to regulate and tackle immoral practice are intriguing and often overlooked by critics. These strides may be partly explained by the desire of marketers for a professional status to be respected, however, it seems to go beyond this. The expressed intent of marketing to contribute to what is perceived to be the 'social good' is a demonstrable, central tenet within marketing thought. This involvement within social concerns does of course raise questions about the role of marketing within society. Is marketing merely a mirror reflecting societal desires? Should we trust the use of marketing tools to understand public concerns and then believe that marketers will act to ensure that these

concerns are allayed? These questions revolve around how marketers perceive this ethical ambassadorial role and how they incorporate it within the demands of executing marketing strategy.

These questions help to shape some of the debates and positions surrounding marketing ethics. Of course there are many other possible debates, some of a more narrow and direct nature, for instance Pearson's concern with process integrity and trust (in Pearson and Parker, 2001), or a concern with pricing policies, product quality, exclusion and targeting. Situating the debates in the broadest terms should remind us, however, that other social issues, one of which is corporate social responsibility, influence the content and positions taken by the participants.

The remainder of this section will provide an examination of why the debate on social responsibility and business has become so involving for marketers and how it has impacted innovation.

## **Marketing and responsibility**

Since the 1960s, in many developed countries, there has been an awareness and acceptance that the resources of the planet are finite. This understanding and the realisation of our impact upon the planet, is encouraging many to make calls for a re-evaluation of human and natural resource management. Due to the sheer scale of the perceived environmental and social problems and the power exercised by corporations, this reappraisal of human activity has been accentuated most markedly in personal consumption.

Research reports are claiming that consumers are increasingly scrutinising corporate activity (BARB/Mintel, 1991). Accordingly we are told that the inspection of price, country of origin or nutritional content has been supplemented with an examination of corporate behaviour beyond areas that directly affect the buyer. Individuals are expecting corporations to make a positive contribution to society (Mazur, 1991). This concern with corporate behaviour is, according to Mazur, not merely a statement of intent. Individuals will act according to their sympathies and are attracted to companies and products that support their values and make a positive difference on issues of governance and ethics. The phenomenal growth of ethical investment funds is presented to be testimony to the increased interest amongst people to put their money where their principles are.

The demonstration of ethical values through the act of consumption has led Frank (2001) to argue that the marketplace is increasingly perceived to

be a form of democracy, a means of exercising individual will in a social arena. The market is being ascribed with new values just as the traditional forum for democracy, the party political system, is being subjected to criticism. Poor voter turnout, a distrust of politicians, and well-publicised scandals have all contributed to a questioning of the efficacy of the party political system. In contrast the market is being held up as more than merely an exchange mechanism. Markets as 'mediums of consent' (Frank, 2001) have encouraged people to believe that the popular will of the people can be exercised more effectively through the marketplace rather than the ballot box. Through direct engagement with and participation within the market, the individual is able to exert influence to ensure they get what they want. The market is perceived to be part of the social fabric, closer than Parliament, less pompous than politicians and more transparent than the Government. In short, the will of the market is perceived to correlate with the will of the people.

This market populism is apparent in the work of Sorell and Hendry (1994), who argue that to some degree, ethical consumption has become a lifestyle choice. They highlight the publication of *The Ethical Consumer* by the Ethical Consumer Research Association, and the magazine *New Consumer*. Both of these publications attempt to provide the reader with information about the product and manufacturer to enable them to make informed decisions about their purchase behaviour. Companies are rated according to criteria, for example whether the firm operates within countries with oppressive regimes, the firm's relationship with the environment and attitude to animal welfare, whether they are involved in the armaments trade and whether the firm make political donations.

The inaugural statement of the *New Consumer* reads,

"I observe people whose behaviour as consumers does not seem to fit in with the rest of their lives. It is as if being a consumer is somehow detached from everything else they do: the tireless Trade Union leader after an evening of meetings drives home in a car made by a company with a record of hostility to Trade Unions; the churchman renowned for his campaigns of social justice [...] dines on fruit picked by people who have been forcibly removed from their land by a company who now pays them starvation wages; the nuclear disarmament campaign supporter whose favourite past time is listening to records on a stereo manufactured by a company who makes missile guidance systems."

cited in Sorell and Hendry, 1994: 80

These moves toward making statements through the act of consumption have had an impact in the classroom and in the marketplace. Business

authors advocate that social responsibility should be the foundation for management philosophy (see for example Kotler *et al*, 1999).

Increasingly, traditional and new market entrants are claiming or emphasising their ethical values as a means of competitive advantage. The well-publicised corporate scandals and debacles such as Guinness, Bhopal and the Exxon Valdez oil disaster added weight to the pressure for business to demonstrate the safety of their product and integrity of management. In light of this companies are attempting to minimise the social and environmental harm of their products. Ethical codes, Corporate Credos and Codes of Conduct are a popular method to aid employee behaviour and decision-making. A survey of Fortune 1000 companies in the United States found that of those companies surveyed 93 per cent had a code of ethics (Schlegelmilch, 1998). Corporate donation to social causes and secondment of staff to support the local community is encouraged (e.g. BT, Tesco). Human and animal rights, social welfare and environmental protection, once the preserve of special interest groups and governments, have become concerns to be discussed within the boardroom of multi-nationals.

Business is increasingly finding spaces in which it can openly establish agendas for debate on social issues. This ability, according to Frank (2001), is an aspect of market populism; those closest to the marketplace are perceived to be speaking from and for the people. Entrepreneurs, being able to understand and manage successfully in the market, are encouraged to speak the will of the people.

In this light it is possible to read the famous adverts of Oliviero Toscani for Benetton (running 1982 to 2000) and their focus upon contemporary social concerns. Issues such as capital punishment, war, AIDS, gender and race were presented in an advertising format. This focus on the social commentary was often more apparent in the advertisements than the Benetton product. Increasingly the Benetton clothes became a peripheral element as Toscani traded what he referred to as the “bullshit of fashion” for the historical documentation of social injustice (BBC, 2001).

Benetton are not alone in making social statements. The Body Shop is both a lobbying group for fair trade as well as a cosmetic retailer. Starbucks positions itself as its customers’ ‘third place’, between home and the office. In doing so Starbucks offers a space in which their customers can gather and contemplate, this contemplation being

perceived to aid the rebuilding of community around the coffee shop [Note 1]. These organisations, amongst many others offer voices of social leadership from within the market.

## Globalisation and social responsibility

Trans-national corporations and economic growth have helped to intensify the focus on corporate activity. According to the famous CorpWatch *Corporate Globalization Fact Sheet* (2001), the revenues of the top 500 corporations in the US are equal to about 60 per cent of the US gross domestic product (GDP). The same factsheet reports that the combined sales of Japan's top six trading companies are nearly equivalent to the combined GDP of all of South America. In a list of the top one hundred largest economies, fifty are corporations (Handy, 1997). The sheer scale of their size dwarfs many nation states, indeed Handy suggests that rather than seeing corporations as *trans*-national, operating within and across nation states, we should rather refer to them as **supranational**, floating above the nation state. The ability for business to detach itself from the foundation of a nation state provides the corporation with the power and authority to demand the right to pursue their interests. With the demand for rights comes the reciprocal demand from the state and the community for those rights to be exercised responsibly.

Some areas of the world have seen extraordinary economic growth, improved standard of living and an ever-increasing scope of products to experience and consume, however, this contrasts sharply with the experience of the majority of the world's population. The 'Worldview' statement from The World Bank offered insight into this in 2000,

“A sixth of the world's people produce 78 percent of the world's goods and services and receive 78 percent of the world's income – an average of \$70 a day. Three-fifths of the world's people in the poorest 61 countries receive 6 percent of the world's income – less than \$2 a day. But their poverty goes beyond income. While 7 of every 1,000 children die before age five in high-income countries, more than 90 die in low-income countries.”



Nine years later, a bad position had got, if anything, worse,

“Poor people in developing economies are highly exposed to the global crisis. World Bank estimates for 2009 suggest that lower growth rates will trap 46 million more people below the \$1.25 a day poverty line than expected before the crisis. An extra 53 million people will be living on less than \$2 a day, and child mortality rates could soar. It is estimated that 200,000–400,000 more children a year, a total of 1.4–2.8 million from 2009 to 2015, may die if the crisis persists.

“Poor consumers are the first to be hurt by lower demand for labor and falling remittances. In addition, shrinking fiscal revenues and potential decreases in official aid flows threaten to reduce access to social safety nets and to such social services as health care and education. Households may have to sell productive assets, pull children out of school, and reduce calorie intake, which can lead to acute malnutrition. The long-term consequences can be severe and in some cases irreversible, especially for women and children.

“Almost 40 percent of low- and middle-income economies are highly exposed to the poverty effects of the crisis. Yet three-quarters of them cannot raise funds domestically or internationally to finance programs to curb the effects of the downturn.”

The World Bank, 2009

This notion of two worlds within one is not something new. What is new are the inter-relationships across the globe, and associated speed and impact events in other parts of the world may have on our own (see Beck, 1992). This reflection of past environmental and social harm through human development is intensified by the acceptance that we are not able to predict the outcome and repercussions of our present behaviour on the environment. With the rapid change brought on by new technology and a more flexible flow of capital (Harvey, 1989) these tensions are exacerbated to potentially debilitating levels. This level of unease at the variety and depth of impact of corporate activity on social and natural environments is becoming increasingly evident.

# Corporate social responsibility, sustainability and innovation

**Corporate social responsibility** (CSR) may be defined as,

“The voluntary actions taken by a company to address the ethical, social and environmental impacts of its business operations and the concerns of its principle stakeholders.”

Institute of Business Ethics

“A commitment to improve community well-being through discretionary business practices and contributions of corporate resources.”

Kotler and Lee, 2005

CSR is not new, for example companies such as Cadbury and Unilever invested in social reform with the building of towns such as Bourneville (1905) and Port Sunlight (1894) to house their workers in good conditions. Many companies now embrace the ideals of CSR, which is based on the stakeholder theory of the firm (Freeman, 1984) which states that an organisation has obligations not just to its shareholders, but to all parties affected by its activities.

## ***Dimensions of CSR***

Jobber (2007: 203–204) proposes that there are *four* key stakeholders who should be considered, combined with the impact of the external environment (Diagram 7.2).

Dimension	Key Issues	Marketing Response
<b>Physical environment</b>	<ul style="list-style-type: none"> <li>• Combating global warming</li> <li>• Pollution control</li> <li>• Conservation of energy and scarce resources</li> <li>• Use of environmentally friendly ingredients and components</li> <li>• Recycling/non-wasteful packaging</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable marketing</li> </ul>
<b>Social (community involvement)</b>	<ul style="list-style-type: none"> <li>• Support for the local community</li> <li>• Support for the wider community</li> </ul>	<ul style="list-style-type: none"> <li>• Societal marketing</li> <li>• Cause-related marketing</li> </ul>
<b>Consumer</b>	<ul style="list-style-type: none"> <li>• Product safety</li> <li>• Avoidance of price fixing</li> <li>• Honesty in communication</li> <li>• Respect for privacy</li> </ul>	<ul style="list-style-type: none"> <li>• Societal marketing</li> </ul>
<b>Supply chain</b>	<ul style="list-style-type: none"> <li>• Fair trading</li> <li>• Standard-setting for supplies</li> </ul>	<ul style="list-style-type: none"> <li>• Fair trade marketing</li> </ul>
<b>Employee relations</b>	<ul style="list-style-type: none"> <li>• Fair pay</li> <li>• Equal opportunities</li> <li>• Training and motivation</li> <li>• Information provision</li> </ul>	<ul style="list-style-type: none"> <li>• Internal marketing</li> </ul>

Diagram 7.2 Dimensions of corporate social responsibility.

Marketing is at the interface of the organisation and its environment and is therefore responsible for leading the move to more sustainable products and strategies.

## Sustainability and innovation

There are many perspectives on ‘sustainability’ and therefore many definitions. Whilst these definitions vary depending on the view of the author or organisation, they tend to have three factors in common. These are:

- limits,
- interdependence, and
- equity in distribution.

## ***Development of the sustainability concept***

The concept of 'sustainable development' was crystallised and popularised through the United Nations in *Our Common Future: Report of the World Commission on Environment and Development*, the 'Brundtland Commission', published on 20 March 1987. This drew upon long established lines of thought that had developed substantially over the previous 20 years.

The Brundtland Commission's shorthand characterisation of 'sustainable development' is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

Other definitions include:

"A sustainable society is one which satisfies its needs without diminishing the prospects of future generations."

Lester R. Brown, Founder and President, Worldwatch Institute,  
Brown and Wolf, 1988: 171

"[Sustainability is equity over time.] As a value, it refers to giving equal weight in your decisions to the future as well as the present. You might think of it as extending the Golden Rule through time, so that you do unto future generations [...] as you would have them do unto you."

Robert Gilman, Director, Context Institute, 1990

"For the business enterprise, sustainable development means adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining, and enhancing the human and natural resources that will be needed in the future."

International Institute for Sustainable Development, 2007

Sustainable development has three aspects:

- social development (meeting the needs of all people),
- environmental protection (safeguarding the continuation of the planet),
- economic development (profit-making for all to improve continually quality of life).

They must *all* be sustainable. They are commonly portrayed as pillars supporting development, as shown in Diagram 7.3.

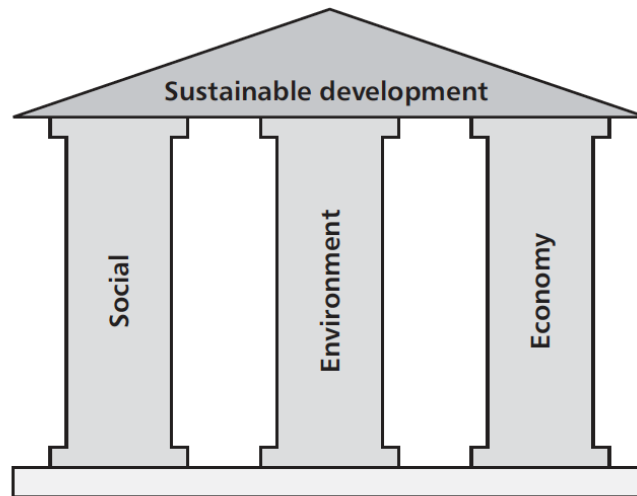


Diagram 7.3 The three pillars of sustainable development.

### ***How does sustainability link to innovation?***

Innovation is at the core of creating a more sustainable world. It is the only way to meet the needs of an expanding population and a growing economy without causing unacceptable environmental damage. For example, the world needs to produce more energy – but with lower carbon intensity and more food – but not in ways that spread deserts or waste resources such as water.

Business is the main source and user of technology, it therefore has a leading role to play in meeting these challenges. Developments in such areas as waste recycling, nanotechnology, information technology, biotechnology, and alternative energy are already making a contribution. The next challenge is to encourage wide acceptance of these new technologies: for example, inventing car engines that can run on alternative fuels will not transform car transport without major changes in the fuel infrastructure and in society's view of travel.

According to Dearing (2007: 103),

“The private sector's contribution to sustainable development comes from developing and using environmentally better, eco-efficient, ways to produce and provide products and services

and by creating wealth and employment respectful of changing expectations of corporate responsibility and behaviour.”

Dearing argues that a company’s ability to extend sustainability beyond eco efficiency depends upon the “continued innovation that effective design and the development and use of better technologies will make possible.” He sees sustainability as a “metaphor for opportunity and progress as well as a reminder of obligations and uncertainty”.

The World Business Council for Sustainable Development accepts that commercial success depends on value creation and believes it can be achieved by “addressing innovative opportunities that reflect changing social expectations and support a transition to greater sustainability”. There is no single approach for achieving this but a set of key principles informing all approaches (Dearing, 2007: 103–105). These include:

- Innovation as a process of change to better meet human needs and values.
  - Improved design and new technologies offer opportunities to act “smarter and in more sustainable ways” but also create uncertainty and risk. Using them well depends on understanding what the public expects, meeting needs cost effectively and without “raising fears”.
  - The process of innovation is taking place within “increasingly networked economies”. These networks have “changing social values and growing environmental pressures” and these forces are “unavoidable but not unmanageable”. A successful commercial response depends on having flexible, multi-disciplinary skills.
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- The task of leadership in business organisations is to “harness economic and social trends” and capture the knowledge and experience that exists in networks in order to combine the two in ways that “command respect, generate enterprise and create value”. For this to happen, the “principles of transparency, learning, corporate social responsibility and eco-efficiency need to extend throughout the innovation process”.
  - The commercial challenge is therefore to “treat sustainable development as a framework for innovation”.

Sustainable innovation is a way for companies to compete effectively by meeting the varied needs and expectations of their various stakeholders better than competitors. They therefore achieve an advantage which may be increased market share, new target audiences etc.

Jobber (2007: 96) describes the process of consumerism whereby organised action is taken against business practices that are not perceived as being in the interests of consumers. He states that,

“Pressure from the consumer movement, environmentalists, individuals who engage in ethical consumption and the media has resulted in many organisations adopting corporate social responsibility as a guide for their business practices.”

The aim is to consider the consumer movement as an “opportunity to create new product offerings to meet the needs of emerging market segments”. For example, the launch of environmentally-friendly cleaning products.

Kotler and Keller (2009: 679) describe the way in which sustainability has become part of the strategic decision making of many organisations with investors often looking for “concrete information about what firms are doing to achieve sustainability”. Sustainability ratings exist but as yet there is no universal agreement over appropriate metrics. (Engardio, 2007) However, the ability to create solutions capable of reconciling prosperity with environmental protection offers significant opportunities to companies able to meet these criteria.

Dearing (2007: 105–106) states that leading companies have already positioned themselves along three guiding principles which are:

- **Attitude** – ensuring the company understands society’s expectations of it, states its own values clearly and then reinforces these in a way that creates a process of continuous improvement.
- **Building the capacity to act** – developing the tools and approaches to improve performance across the three pillars of sustainable development.
- **Checking progress** – setting targets and measuring performance.

Kim and Mauborgne (2005) go further by claiming that companies have “long engaged in head to head competition in search of profitable growth” but “competing head on often results in a bloody red ocean of rivals fighting over a shrinking profit pool”. They define nine key points of “blue ocean strategy” where the aim is “not to out-perform the competition in the existing industry, but to create new market space or a blue ocean, thereby making the competition irrelevant”.

They consider that “innovation has been seen as a random/experimental process where entrepreneurs and spin-offs are the primary drivers” and propose,

“... systematic and reproducible methodologies and processes in pursuit of innovation by both new and existing firms. The three key conceptual building blocks of ‘blue ocean strategy’ are: value innovation, tipping point leadership, and fair process.”



## Concluding Comments

Sustainability is generally accepted as having the capacity to maintain a certain process or state indefinitely. It applies to business because there is evidence that the world is living in an unsustainable way by consuming natural resources more quickly than they can be replenished. This requires business leaders and innovators to consider how they develop their activity. It is a complex term which is used in different ways.

Ethical issues in business relate to the moral principles and values that guide an organisation's behaviour. Its values will therefore affect its approach to sustainable development.

The main business response to ethical concerns has been the adoption of corporate social responsibility as a guiding philosophy, whilst societal responses have included consumerism, environmentalism, ethical consumption and recycling.

Corporate social responsibility is the principle that an organisation should take responsibility for how its behaviour affects society and the environment.

Responsibility for corporate social responsibility cuts across the business: the physical environment, social, consumer, supply chain and employee relations.

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## Task

This is a summary of the World Business Council for Sustainable Development's case study on Toyota's efforts to create an 'eco-car' (WBCSD, 2008). Read it, then do the task.

### **Towards the ultimate eco-car**

In the early 1990s, Toyota sought to define the requirements of the next generation of motor vehicles and its vision for the future. It was driven by the idea that future vehicles must set an example by addressing natural resource and environmental issues without compromising on convenience and comfort. This focus on the environment stimulated Toyota to create 'hybrid' vehicles that address these contemporary issues, catching popular sentiment and building its market share. Toyota's hybrid line-up included a total of eleven vehicle series in July 2008 and, as of March 2008, it had sold more than 1.4 million hybrid vehicles worldwide.

In 2008, Toyota had 12 plants and a number of manufacturing subsidiaries and affiliates in Japan, plus a further 52 manufacturing companies in 26 countries and regions that produced Lexus and Toyota brand vehicles and components. Toyota employed some 300,000 people worldwide (on a consolidated basis), and marketed 8.5 million vehicles in more than 170 countries in 2007.

#### **Asking the right questions, setting the right goals**

Toyota sought to answer two important questions: "What are the requirements of motor vehicles for the 21st century?" and "What sort of vision must Toyota have to meet the challenges of the new era?" To answer these questions, it assembled staff members from various departments to develop a totally new type of vehicle.

In 1994, the group set a target of a 50 per cent increase in fuel efficiency (1.5 times that of contemporary vehicles). Akihiro Wada, a Toyota executive vice president at the time who was responsible for the project, felt that this was inadequate: "Fifty per cent is not good enough. Our fuel efficiency improvement target must be 100 per cent" (twice that of existing vehicles). In 1995, Toyota decided that the double efficiency target vehicle would have to be a hybrid vehicle and aimed to release it by the end of 1997.

## First generation Prius

Toyota adopted the 'Toyota Earth Charter' and positioned environmental responses as a priority management issue in 1992. The following year, it launched the Global 21 project (G21), which sought to establish the standard in cars for the 21st century. The company also started developing power trains that feature both high fuel efficiency and clean emissions. Both projects entered the phase of linking development results to mass production in 1994.

By the end of 1994, Toyota realised that a hybrid system it had been developing in a separate project over the last few years might provide the 'power train' (the system of components producing movement of the vehicle) for a new type of car. At the Tokyo Motor Show in October 1995, the company displayed a car featuring *two* power sources: a highly efficient petrol engine and an advanced electric motor.

In January 1997, Toyota declared the start of the 'Toyota Eco Project'. As part of this effort, it decided to address the international consensus for reducing CO<sub>2</sub> emissions (in order to prevent global warming) and accelerated the development of a hybrid vehicle. In March of the same year, the company announced the completion of a new power train called the Toyota hybrid system (THS) for use in passenger vehicles. This power train combined a petrol engine and an electric motor and did not require external charging. The system achieved nearly twice the fuel efficiency of conventional petrol engines.

THS was first installed in Toyota's Prius passenger vehicle and introduced to the Japanese market in December 1997 as the first mass-produced hybrid passenger vehicle in the world. In 2000, after further improving THS, overseas marketing of the Prius began.

## Redesigned second-generation Prius with THS II

After the launch of the Prius in December 1997, it underwent two minor redesigns, improving fuel efficiency. Building on the environmentally-conscious THS, Toyota developed the concept of its hybrid synergy drive. Based on this, the company developed a new-generation hybrid system called THS II.

This achieved high levels of compatibility between environmental performance and power by increasing the motor output 1.5 times, greatly boosting the power supply voltage and achieving significant advances in the control system, aiming for synergy between motor power and engine power. Toyota thereby improved the driving performance, which had been one of the challenges facing the first-generation Prius.

Once the first-generation Prius had established the image of Toyota as an environmentally-conscious company, the second-generation Prius aimed to

enhance the appeal of hybrid vehicles, focusing on the promotion of widespread use and driving performance. Consequently, further development of the concept was no easy matter.

### **Challenges of increasing power performance**

In order to improve the driving performance of the Prius, its power train was completely redesigned. To increase motor output, a high-voltage power control was adopted. Although this technology was used in industrial machines and trains, the idea of incorporating it into a car did not easily occur at first. First of all, the system itself would take up a substantial amount of space, and second, there was no prior example of applying this method to a motor that switches between output and power generation at such pace.

Once the development of the high-voltage power circuit began, there were many problems, such as what to do about the heat generated by increasing voltage and the noise generated. To re-evaluate the power train, the project team had to produce prototypes and repeat numerous tests. The prototyping stage went to seven prototypes instead of the usual three, and the total distance driven by these prototypes during testing exceeded one million kilometers.

### **Expanded line-up of SUVs**

Toyota decided to launch hybrid sports utility vehicles (SUV). The Harrier Hybrid (sold as the Lexus RX400h in the US) and the Kluger Hybrid (sold as the Highlander Hybrid in the US) went on sale in March 2005. They boosted driving performance and featured outstanding environmental performance with a fuel efficiency of 17.8 km/litre and 75 per cent lower emissions than the 2005 Exhaust Emissions Standard of the Japanese Ministry of Land, Infrastructure and Transport.

Compared to passenger cars, SUVs have somewhat larger and heavier frames and improving driving performance means increasing engine output, resulting in lower efficiency. The system operating voltage of the second-generation Prius was raised to 500V, but for the Harrier and Kluger it was increased to 650V, and the motor rotation rate was increased to 12,400 rpm (revolutions per minute), about double that of the Prius, boosting the output of the front motor from 50 kW to 123 kW.

“The one problem that we struggled with until the end was the installation of the battery. With the Kluger, which has a third-row seat, making the battery smaller and cooling it were the key issues,” according to Chief Executive Okane. Sacrificing the spaciousness of the interior would have affected the SUV’s functionality and comfort, even if the vehicle is a hybrid. No compromise was made so “environmental performance could be enhanced without losing any functionality”.

## Results

The target of 100 per cent increase in fuel efficiency was achieved in the first mass-produced hybrid Prius in December 1997. After that, it underwent two minor redesigns, improving the fuel efficiency from 28.0 km/litre to 31.0 km/litre in 2002.

The second-generation Prius, launched in 2003 improved fuel efficiency to 35.5 km/litre while enhancing driving performance with THS II. THS II also made SUVs with hybrid possible.

### Towards the ultimate eco-car

At Toyota, hybrid systems play a central role in meeting environmental concerns. Talk of an 'ultimate' eco-car calls to mind electric vehicles (EV) and fuel cell hybrid vehicles (FCHV). Hybrid vehicles are *not* a transitional stage towards achieving an ultimate EV or FCHV; the applicability of hybrid technology is broad, and can be used not only on petrol vehicles, but also with diesel and alternative fuel engines, and it is even effective in combination with fuel cell technologies. If the hybrid system can increase performance regardless of the energy source, it will remain a core technology in the development of the ultimate eco-car.

Toyota is working on developing a fuel cell vehicle with hybrid technology; in order to commercialise the fuel cell vehicle, the main challenge is to reduce the manufacturing cost of the battery, a fact that will require a technological breakthrough. Since the end of 2002, Toyota has leased fuel cell vehicles to a small number of customers, with 22 vehicles in Japan and 8 vehicles in the US.

"Plug-in hybrid" technology brings further potential for substantial CO<sub>2</sub> emissions reductions from vehicles. It has a higher battery capacity and is thus more fuel-efficient than the current hybrid, assisted by the power of the engine. For a short-distance drive it could be run with electricity charged during the night. Depending on how electricity is generated, the vehicle could run with much lower CO<sub>2</sub> emissions.

In order to commercialise the plug-in hybrid, there is again a need for a breakthrough in battery technology. It is necessary to develop a smaller-sized battery with higher capacity. Plug-in hybrids could contribute to reducing substantial amounts of CO<sub>2</sub> emissions from vehicles, as well as fossil fuel use, by charging from cleaner electricity sources in the future.

### The need for technology co-operation

When looking ahead to future prospects, the issue of further proliferation of environmental technologies will need to be addressed. "We believe that the proliferation is not something that Toyota can achieve on its own, and when

considering the global environment, it is important that automakers from around the world work together. That is why we are considering disclosing technologies. This has so far led to the signing of licencing agreements with Nissan and Ford. Toyota will continue to work in the future with numerous automakers to promote the widespread adoption of hybrid systems," says Toyota's former Executive Vice President Akihiko Saito.

- 7.1 By 2004 the Prius was such a success that it had a six month waiting list having successfully combined an ability to switch power sources – resulting in 55 miles/gallon for motorway and urban driving – with space and eco-friendly design at an attractive price.

What are the key lessons from this example? How can Toyota defend its 'new' market space in order to remain in, using the words of Kim and Mauborgne (2005), a "blue ocean"?

How do the public funds made available in 2009 by some governments for the development of 'next generation' cars change Toyota's innovation environment?



## References and Further Reading

The following sources provide appropriate further study for this section, and you are strongly encouraged to read them. The references are correct at the time of writing, but note that internet addresses, editions, publishers and so on are apt to change. We will note changes *where we are aware of them* on Blackboard.

Adorno, T. (1938/1995), 'On the fetish character in music and the regression of listening', in A. Neill and A. Ridley (Eds), *The Philosophy of Art: Readings ancient and modern*, Maidenhead: McGraw-Hill

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