Sustainable Innovation: Drivers and Barriers.

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Summary

People often describe sustainable development as requiring a joint and long-term outlook by society that integrates social, economic and environmental objectives. Today, the private sector's contributions come 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 behavior.

Delivering and extending this contribution beyond eco-efficiency depends upon the continued innovation that effective design and the development and use of better technologies will make possible. Sustainable development is a metaphor for opportunity and progress as well as a reminder of obligations and uncertainty. It requires a step-change improvement in performance. Merely doing better what we are already doing is not sufficient to meet the needs and aspirations of a growing world population with dignity.

At the same time, commercial success depends upon carrying out business in value-creating ways. Increasingly, the World Business Council for Sustainable Development (WBCSD) believes that this can be achieved by addressing innovative opportunities that reflect changing social expectations and support a transition to greater sustainability. Whereas our research suggests that no single approach will apply to all firms in all situations, some common underlying principles emerged, which are summarized below.

1. Sustainable development offers an organizing framework based on opportunity and respect for human values. Innovation is about using change to better meet human needs and values. The connection seems obvious although it is hard to realize in the absence of clear market signals and a common language, especially since innovation can come unexpectedly "out of left field" and have uncertain consequences.

2. Better design and new technologies provide the means to act smarter and more sustainably but this technology also creates uncertainties, for example about the consequences of the scale and scope of application. Using these tools well depends upon understanding what the public is expecting and being able to meet these needs cost-effectively and without raising alarms and fears.

3. The process of innovation is taking place within increasingly networked economies with changing social values and growing environmental pressures. While these forces are unavoidable, they are not unmanageable. Successful commercial approaches depend on having the flexible, multidisciplinary skills to respond to this changing context. Sustainable development is not unusual in this respect.

4. Within developing nations in particular, technology's contribution to sustainable development comes largely through business-to-business transactions. Here, the large gap in performance is typically not a consequence of the lack of cost-effective technologies. The priority is to increase the capacity to apply available solutions well. Key focus areas are to develop skills and capacity especially in the small-and-medium enterprise (SME) sector and to find ways to reduce project investment risk. Overseas Development Assistance (ODA), Foreign Direct Investment (FDI) and the newer flexible market instruments such as the Clean Development Mechanism can be brought together to support innovative and effective public-private partnerships to address these points.

5. In some situations, people respond best to sustainable development as a vision, whereas in others, more pragmatic approaches work best. Whichever approach is preferred, innovation often comes from facing strategic dilemmas that can only be resolved by finding new approaches. This is one reason why credible stretch targets can be an effective way to secure major improvements.

6. The leadership task is to harness economic and social trends, capture the tremendous amount of knowledge and experience that exists in networks worldwide and combine these in ways that command respect, generate enterprise and create value. Traction is likely to be greatest when the management approach is positioned appropriately for the company in its network and seen by staff to be relevant and self-evident, if not simple, in purpose and content. This needs clear direction backed up by resources, management support and good metrics.

7. We believe that achieving this requires extending the principles of transparency and learning, corporate social responsibility and eco-efficiency throughout the innovation process. This process extends from research and development through technology selection and use, product and service design, investment and employment policies and global and local business activities, as well as to issues management and government relations.

In summary, the commercial challenges are to learn to treat sustainable development as a framework for innovation and to use and extend established management principles to make this framework operational and effective.

Already, leading companies have demonstrated the willingness to express what they stand for and in turn understand what society expects of them. These companies are actively developing and incorporating the tools to improve performance across the three pillars of sustainable development. They are learning how to stimulate innovation and are setting focused targets that measure progress and assure the link between their own values and those of their customers. But there is much more to be done and important lessons to be learned and applied, especially to obtain innovation that addresses the social pillar of sustainable development.

There are many ways in which other stakeholders can assist these efforts. For example, governments can design regulatory frameworks that set the direction, encourage and reward the experimentation that fosters innovation and improves sustainability. They can demonstrate (through procurement policies and the information provided to the public) that they are committed to achieve the same objectives being expected of others.

1. Innovation and Sustainable Development

Firms have used technology as an engine of progress since at least the time of the Industrial Revolution, which gave remarkable ways to marshal the physical world for human benefit. Innovation, which we use to mean the successful implementation of new developments and ideas, depends upon much more than technological advance, but technology has consistently provided the opportunities from which to make and sell better goods and services and to do so more cleanly and more safely.

Many of today's social and economic developments are a result of technical discoveries and developments in fields such as communications, information processing, health sciences and energy supply. These promise smarter, more tailored solutions to the tasks we wish to accomplish. Rather than being monolithic in approach, the tools are used by dynamic and responsive networks of small and large, public and private organizations, working together and in competition in ways that were never before possible.

The changes are tremendous and the opportunities profound, but it has become clear that technology can only be part of achieving a more sustainable development and its contribution is not always as positive as we might wish. Furthermore, other factors that can drive and support progress are themselves changing and need to be understood.

For example, the well-defined social categories for which post-war Western institutions were designed no longer fit well with people's aspirations and values. Richer countries are experiencing a shift towards an increasingly multidimensional and diverse "Mosaic Society", with uncertain needs but very real concerns about many subjects including science and technology. At the same time, despite there being greater affluence than at any time in history, most of the world's population remains poor yet increasingly aware of its relative poverty. For these people, the economic and social benefits of globalization and global markets are increasingly being questioned.

Many other writers have offered cogent, visionary ideas of the improved sustainability that can be obtained by marshaling recent developments. The focus of this paper is on how firms can organize themselves to realize these opportunities in ways that will benefit and be acceptable to society and also create the value that permits them to remain in business.

The approach that is suggested is based on understanding how companies have handled the concepts of corporate social responsibility and eco-efficiency, examining how they are now managing innovation and technology and finding ways that will bring these approaches together in today's and tomorrow's economies.

Leading companies have built their approaches to sustainable development upon principles that can be summarized as follows:

- Ensuring the corporation understands what society expects of it, in return expressing clearly what the firm itself stands for, then reinforcing these values in ways that stretch the organization and create a spirit of continuous improvement. (Attitude)
- Developing the tools and approaches to improve performance across the social, environmental and economic pillars of sustainable development and incorporating these tools within routine business processes. (Build the capacity to act)

- Setting focused targets and putting in place the means to measure performance and confirm that the targets are being achieved. (Check progress)

For existing business operations undergoing normal business development, these are mutually reinforcing principles. They provide a positive and effective framework that firms can use in mitigating environmental impact and allaying public distrust.

Whereas twenty years ago, most companies based performance standards on regulatory requirements, today many choose to go beyond regulation because they see commercial benefit in doing so. Established practice in areas such as safety and quality management has demonstrated that uncompromising principles are perfectly compatible with the spirit of continual improvement.

Stakeholder dialogue now helps firms learn more about others' points of view and then use this understanding to set better priorities and move away from confrontational approaches. In extending systems of financial control and audit to cover environmental impact, they have recognized the need to gain early "buy in" by ensuring relevance to the specific priorities of individual business units. Technology is playing a central role by providing the means to move forward and engineers generally seem to relish the opportunity to find more eco-efficient solutions once the parameters for improvement have been established and agreed.

The stock market returns achieved by those companies included in the recently launched Dow Jones Sustainability Index suggest that investors are now recognizing the management qualities that have made this progress possible.

Good Enough or Could Do Better?

This is intended to be a rhetorical question. During the last decade, the arguments and counter-arguments about rates of improvement have been well rehearsed. Economic focus leads to "short-termism". Regulatory frameworks offer too much (or too little) "command and control", so we are not properly pricing public goods, environmental services and social well being. New approaches are uneconomic in the face of established manufacturing capacity.

Undesired impacts are associated with large, interdependent infrastructures (for example, the car, its fuel and the city), so require more systemic approaches that can transcend traditional business and political boundaries and avoid stranded assets. Technical progress is slower than expected, gets sidetracked through lack of customer pressure or creates "rebound effects" by stimulating new demand that consumes the improvements that have been achieved.

These concerns are valid but (with considerable effort and a fair dose of humility) there are ways to overcome them. In some cases, effective solutions are already available; in others, we may need to change the market's rules of the game. For example, it seems likely that economic instruments such as tradable carbon emissions permits will improve the market's effectiveness in dealing with climate change. Demonstrating that these instruments do work well requires agreement on rules and modalities and the willingness to take action and learn from our mistakes.

In other words, sustainable innovation involves risk but it also requires structure. While much can be achieved by "continuing to do better", it will be far more challenging and rewarding to learn how to:

- Bring design, smart technologies and the "new economy" together to drive growth in ways that reflects changing concerns and values of a connected world
- Support faster and more sustainable development in the developing nations

We believe that success with these tasks can turn sustainable development into an approach that is intrinsically value creating. But we also believe that some established ways of doing business and the assurance processes that accompany them will need improving in order to achieve this.

For example, sound science is a lynch pin of corporate approaches to technology risk management. Even though no one questions the need for high safety standards, too much recourse to scientific evidence and argument can now seem complacent and paternalistic. The public's sense of the role of technology has changed and its awareness of previous mistakes has grown. We need to find better ways to show that firms (and governments) are keeping their scientific houses in order.

A paradox is that the success of today's activists owes much to their mastery of communication technologies in getting their messages heard. Governments, inter-governmental bodies and corporations now find themselves to be hopelessly cumbersome in the face of resolute single-purpose advocacy. Stakeholder dialog offers a powerful way forward but requires that we learn how to achieve open discussion about subjects for which the risks seem large and the benefits unclear.

2. Thinking about Innovation and Technology

In preparing for an uncertain future, we need a sense of what might develop while avoiding placing expensive bets on particular outcomes. Scenario planning offers one way to extend our strategic thinking. The WBCSD has used this tool in several projects and we have found the approach helpful in looking at the broad questions of business-led innovation and use of technology. The paper we contributed to the OECD's December 1998 workshop in Budapest gave a detailed assessment of the Global Scenarios. This section briefly summarizes these and our more recent Biotechnology Scenarios.

The Global Scenarios (*FROG!*, *GEOPolity* and *Jazz*) explored sustainable development in terms of two parameters:

Uncertainty: How we will recognize the resilience, limits and critical thresholds faced within the global ecosystem.

Governance: What forms of social system can best respond to the challenge of sustainable development.

FROG! describes a low-trust world in which people focus on jobs, economic survival and short-term financial returns. Although people believe they value sustainable development, local economic pressures dominate their thinking. After all, people (at least those who are already affluent) find it obvious that their neighborhoods have become far cleaner, presumably because they have already adopted the right approaches.

This local focus leads to a poor reading of signals. Signs of global environmental problems such as the risk of climate change and growing social inequity either go unnoticed or trigger disagreement about what signs of change mean. No action will be taken until it becomes impossible to continue ignoring the signs, by which time it will be correspondingly harder to respond effectively.

In the meantime, the public takes advantage of what business offers and punishes companies that are seen to cause harm through their goods and services and ways of operating. Voter-sensitive governments ensure that exposures are discovered and dealt with promptly, so firms act defensively to anticipate and limit liabilities.

FROG! generates solid economic growth yet this will probably be unsustainable because no-one takes care to address sustainability as their ambition. There will be technological progress but this is unlikely to be directed towards greater sustainability: instead, existing approaches, ways of working, etc., will be extended rather than replaced by something better. There will be an emphasis on tools for monitoring, quantifying and documenting the performance of existing operations rather than going pro-actively beyond these standards.

Governments will legislate, set technology policies and support R&D in order to stimulate local competitiveness and aspirations. Aspects of these policies, and the innovations that result, may accidentally align with the ambitions of sustainable development. Ambivalent consumer attitudes and lack of long-term thinking about ethical and other implications will limit the sustainable value of the results.

GEOPolity starts with a recognized environmental crisis. The palpable failure of national governments and multinational companies to deal with the crisis as well as past problems destroys the already limited credibility of these existing institutions. People recognize the need for new mechanisms to address global issues such as the health of the planet and to resolve conflicts of interest in a peaceful manner.

The spirit of the age – the “mood of the millennium” – captures the attention of people who have the ambition to put things right. This aligns their effort into a collective sense of purpose and they build an interlocking global governance system coordinated at an international level.

GEOPolity reflects a human desire for big solutions to grand challenges. Its institutions work towards market-based solutions but set new rules and regulatory frameworks for markets to follow. To achieve greater sustainability, these global institutions may engage companies in a joint attack on big challenges. Consequently, this will be the scenario that develops world-scale technologies and drives forward major global infrastructure projects. One can imagine the 21st century equivalents of *Concorde* and *Apollo*, designed to address climate change, provide equitable supplies of clean water and food, manage critical eco-systems and foster “connected-ness” and opportunity.

In such a world, technological prowess will be a key tool that firms use to ensure credibility and secure their license to operate, shape legislation and achieve competitive advantage. Technology-rich companies may see great value in encouraging and becoming contractors to these initiatives.

(Today's nuclear industry developed very rapidly in a world rather reminiscent of *GEOPolity*.) They are likely to prefer process and product technologies that can be patented to intangible knowledge-based approaches.

A strength of *GEOPolity* is its ability to set decent rules and regulations to steer our collective effort. This scenario will probably be very effective if global standards and regulatory frameworks are necessary (and can be agreed) in order to build better solutions. Its weaknesses include the difficulty of changing those existing institutions that already feel empowered to deal with matters and the general risk of bureaucracy and slow response associated with "big institution" processes.

As a result, there may be undue up-front selection of "winners" within *GEOPolity*, too little engagement of customers in the choices being offered and too little attention to unintended consequences and side effects.

Jazz describes a world in which people recognize that they can care about issues such as sustainable development without needing others to legislate the solution. These people harness the markets to find solutions to their concerns, in the process creating a complex market-led world of *ad hoc* experimentation.

This is a demanding world of partnerships between consumers, businesses, governments and non-governmental organizations. Alliances form and break fluidly to meet civil demands. High transparency enforces quick learning by allowing the public to identify and punish companies and governments that break the social norms. In *Jazz*, the public sees no need to applaud expert opinion for its own sake.

In this world, technology is a cross-fertilizer that enables firms to work within diverse partnerships but it also creates challenges for them to overcome. For example, in a transparent world, innovative companies need new ways to safeguard their intellectual assets. This will encourage greater speed of use of these ideas and emphasize the less-tangible, knowledge-rich technologies suitable within a service economy.

Jazz can align people worldwide to common cause but the nature of their alignment cannot be taken for granted. Initiatives such as the large-scale redesign of infrastructures and the handling of sensitive new technologies still require a consensual basis and public ground swell to move forward. Furthermore, in spite of the public desire to achieve progress across a broad front, communities and organizations that lack resources and skills may find it hard to join the *Jazz* band.

Implications for Company-led Innovation

Scenarios are intended to help focus thinking and sharpen understanding of the diverse forces within today's society. As a result of participating in the Global Scenarios project, quite a number of people have expressed the desire to realize the benefits of the dynamic *Jazz* world and look for solutions that will foster its innovative spirit and market-based approach. Others recognize this spirit but feel that *Jazz* will be a very challenging world in which to live and work and consequently may not deliver everything they wish to achieve. *GEOPolity* offers other ways to approach these challenges.

The stories suggest that sustainable innovation will involve companies in:

- Taking advantage of dynamic, experimental approaches while providing consumers the information and price signals to exercise informed choice.
- Being willing to build and work within institutional structures that can coordinate large-scale tasks and constrain unacceptable behavior while avoiding the tendency to use these structures to plan overly ambitious solutions.
- Expanding local focus to legitimize action on a broader front, for example by actively disclosing impact and working with the public on risks and benefits.

An important conclusion is that the approaches taken to education, regulation, social values, public understanding of complex subjects such as technological risk and the precautionary principle strongly influence how well societies can address their sustainable development. With no single point of leverage, a broad base of action is needed that will extend throughout and beyond the firm. In this sense, the social dimension of sustainable development seem to take on a particularly important role in stimulating innovation.

This conclusion was also reached in a subsequent WBCSD scenario project on biotechnology, which focused on the certainty that someone, somewhere will put scientific developments to use and also on the inevitable human anxieties about the unknown. It explored the impact of unintended consequences on the acceptability of a technology, the balance of risk and liability issues and consumer choice on sustainable development and the consequences of a widely accepted biotechnology industry.

The results demonstrated that, depending on the nature of public reaction to the unintended events that new technology triggers, the acceptance of technology can vary widely. Furthermore, apart from any such event, an industry that grows up around the new technology could prosper or not for reasons that depend on factors other than technology or sustainable development. A third unknown has to do with the consequences of a successful and widely accepted technology-based industry. What kind of world might this produce and how might such acceptance come about and be assured?

Finding good ways to deal with these types of issue is perhaps more important than understanding and developing the inherent potential of the technology itself. Although the scenarios do not give easy recipes for success, they do highlight the importance of gaining the public’s support in whatever is being attempted.

Social Expectations as a Driver for Sustainable Innovation

We have discussed these conclusions with people and organizations worldwide to learn their views on the role of company-led innovation in supporting concerned sustainable development. What we heard confirmed many of the tensions apparent in the Global and Biotechnology Scenario studies:

- growing awareness of social values in driving environmental issues,
- rediscovery of the sense of co-dependency,
- a more determined public with different priorities for innovation and use of technology.

Many people perceive innovation as technological progress related to indiscriminate economic growth, leading to depletion of the natural environment and increasing pollution. A real commitment on the part of corporations, rather than technology itself, is seen as the pre-requisite for creating the conditions for sustainable growth and better quality of life. Consumers expect companies to go beyond minimum requirements and be main actors in realizing these conditions.

Some leading companies have recognized that resolving these tensions provides the only basis for their profitability in the years ahead. Put one way (by Richard Branson) “the brands that will be big in the future will be those that tap into the social changes that are taking place”. Or as Roger Cowe expressed it recently (“Account-Ability”, The Planet on Sunday):

“Once a company has acknowledged it has to account for pollution … it is harder to deny wider social responsibilities. And once outsiders have been through the gates, it is impossible to stop them looking beyond one narrow aspect of business. Curiously, this odd little world of social auditing threatens to fuel a debate about the purpose and nature of 21st century capitalism which has escaped the politicians for decades.”

The sense is that markets will increasingly be characterized by the power of vision: to think the future, imagine the future and shape the future. In other words, firms are being expected, and some are themselves expecting, to address sustainability by design. Examples such as Dupont’s “To Do list for the Planet” demonstrate that this is already happening.

3. How Companies Manage Innovation

We surveyed around eighty firms that have indicated their commitment to sustainable development and environmental protection to explore how this commitment has been incorporated into their approach to innovation management and learn about the opportunities and barriers they are experiencing. Wherever possible we approached senior business managers with responsibility for aspects of innovation, product development and technology management, such as heads of R&D or Technology Development.

A first observation was that the commitment to sustainable development within these firms extends well beyond those who work in corporate offices. 88% of those interviewed “strongly agreed” or “agreed” that *sustainable development is a key business driver for the firm* and 83% confirmed that *sustainable development is an explicit part of the firm’s mission and values*. (Those that felt otherwise generally argued that this reflected the wider priorities of the marketplace.)

At the top of the list of items supporting this view are perceptions of company image and brand value. New product and service advantage, staff values and principles and cost advantage rank midway. Direct pressures from regulators, customers and special interest groups seem the least important of the factors we tested. This highlights an interesting and important paradox; conventional thinking would surely suggest that company image and brand value relate closely to the firm’s sense of customer pressures. One measure of a successful value-based approach to sustainable development might be to see this connection regained.

Most of these firms have formal processes for innovation management and technology development. Generally the processes require staff to take

sustainable development into account: 55% of firms expected this for both environmental and social matters; 28% for environmental matters only. Responsibility for integrating these and other commercial considerations is considered to be a shared responsibility rather than of one role such as the Chief Technology Officer.

One of the clearest benefits of managing sustainable development this way has been to focus attention onto the technological opportunities at the firms' disposal. Practically everyone considered that improved technology and better engineering skills are, and will remain, essential tools for supporting sustainable development. Many of the examples that were quoted during the survey were consistent with this technology-based perspective.

Information and energy supply technologies were rated highly: 92% and 88% of those interviewed see these as important in supporting greater sustainablility. However, 25% rated developments in the biosciences as neutral or indeed inhibiting progress. This probably reflects the negative publicity over GMOs, which flared up around the time the survey was taking place.

30% expressed neutral or negative views about measurement technologies. This can be interpreted as evidence of a movement beyond regulatory reliance on such tools to measure impact and assess performance or a feeling that the technical ability to measure surpasses what is required in order to assess and address the risk.

Achieving and Measuring Progress

A key challenge for staff in many of the companies we approached is to understand and make an effective business case (i.e. present a convincing argument in business terms) for investing into more sustainable products and services. There is an underlying belief that customers are keen to purchase more sustainable products but will not pay a significant price premium despite assertions in market research that they would do so.

Several managers commented on this tension between meeting short-term business goals and dealing with the uncertain, longer-term nature of sustainable development. Taken together, there is still the risk that sustainability considerations are seen as additional selling points "other things being equal".

In general, respondents also felt rather uncertain of their ability to manage and assess the creative skills required to address the broader agenda of sustainable development. Other challenges, such as existing capital assets, managing partnerships (important in a networked economy for obtaining improvements throughout the supply chain), understanding the role of design and dealing with product launch strategies were felt to present less substantial barriers to successful innovation.

The survey probed how close firms are towards having a fully integrated management process that places sustainable development squarely within the innovation process. Responses resembled a normal distribution centered on "half way there". Paradoxically, firms that had obviously made substantial efforts reported only modest progress. Others, newer to the game, felt they were further down the road. Perhaps the scale of the task only becomes apparent once the journey has really begun.

Most interviewees reported that considerations of sustainable development have helped the firm launch new products and improve existing products and processes. They find it more difficult to demonstrate that these have improved profitability. They also commented on the lack of adequate metrics for the social dimension of sustainable development and of ways to assess the ideas employees generate in response to the corporate commitment.

Differences in patterns of response between industry sectors were not marked and seemed to depend largely on how the person interviewed interpreted the questions we asked.

Those working for manufacturing firms tended to see sustainable development as a particularly important business driver and stimulus to innovation. They also felt best able to measure progress. In the chemicals sector, there was more emphasis on cost reductions and dealing effectively with stakeholders and a lower-than-average sense of success in finding innovative solutions. Those in the service sector tended to be less positive about the benefits of the business drivers we mentioned and less focused on technology as part of the solution.

Regional patterns were more apparent. Asian companies saw most direct connection between their commitment to sustainable development and sales, were most likely to believe that sustainable products and services will offer competitive advantage and expressed the strongest sense that corporate values are driving events.

Australian companies saw themselves in the early stages of addressing sustainable development. North American companies focused on cost advantage and were less likely to make sustainable development an express part of their published mission. Finally, responses from European-based companies fell close to the average for the survey as a whole.

In conclusion, the survey demonstrated that companies are in a dynamic situation of embracing sustainable development, understanding its implications and disseminating a leadership approach throughout their businesses. Several comments reflected these views. While *“Sustainable development is ripe with opportunity”, “the executive suite believes in the benefits but is still in the realm of affirmation”*. Partly this is because *“the benefits are long term gains”* and *“only the cost savings show up quickly”*

The commercial benefits seem more likely to come from driving product innovation that supports brand preference and improves market share, rather than from improving margins directly. Corporations are looking for innovative ways to align corporate and customer values towards sustainable development. They are generally placing strong reliance on technology and believe they can access the technologies they will need. But they lack the tools to support other management tasks such as measuring progress and mentoring staff, particularly in respect of the social dimension of sustainable development.

4. Technology Cooperation within Developing Nations

We explored the link between innovation, use of technology and the sustainable development of emerging economies in a recent paper in the OECD

Science Technology Industry Review. This section summarizes some of the main conclusions of that paper.

Developing nations seem to face desperate challenges in addressing sustainable development, with little choice but to adopt approaches that are less than state-of-the-art. Yet the problem is usually not the lack of cost-effective environmental technology or even examples of “best practice” that can be copied and improved. Attempts to overcome the central challenge of poverty are undermined by a host of problems such as limited resources and skills, small and ineffective markets, poorly developed legal frameworks and our widespread inability to learn from examples of success. It is also clear that public attention is being drawn to examine the benefits of globalization in ways that closely interweave issues of trade, technology and sustainability. Furthermore, the contributions that multinationals make towards overcoming these problems are highly sensitive and their records are coming under closer scrutiny.

Companies may find it hard to respond to this scrutiny unless local communities view their presence as beneficial. Evidence so far has often come from the labor standards offered by the multinational and the economic and social contributions it extends to the local community. Increasingly, firms are being judged more holistically, for example on their contribution towards improving the performance of local businesses and attitudes towards corruption and on the relative economic performance of the developing nation within the global economy.

More generally, the risks and benefits of foreign direct investment (FDI) will be interpreted in terms of these local social and economic issues. In other words, the more firms’ actions take place globally, the more their contributions will be assessed through local eyes.

During the WBCSD’s regional dialogs, partner organizations confirmed the important role small and medium-sized enterprises (the SME sector) play in getting a country out of poverty to become a dynamic part of the world economy. They told us that such firms might be far less able than the multinationals to mitigate their environmental impact but nonetheless have a wealth of practical experience and understanding that is not available to their counterparts in other countries. They also remarked on the Western tendency to lecture others about free trade while ignoring the barriers around our own markets.

One way to contribute to faster and environmentally better economic growth is to improve the availability and use of appropriate technology. Consequently, some have suggested that governments within the developed nations should transfer modern technologies to other nations as a matter of course.

This approach – “technology transfer” – has been widely discussed as a way to assist developing economies “leap frog” over environmentally and economically less effective approaches and avoid repeating others’ failures. Unfortunately, the initially high expectations have not been met. Technology becomes useful by being applied, which happens mainly within and between companies and through the products and services they generate. Governments have neither “owned” the technology nor been well placed to create the skills and facilities to apply it properly.

Since technology is disseminated primarily through business-to-business transactions, the WBCSD (and many governments also) now prefers to focus on market-oriented approaches that we refer to as technology cooperation. Below, we have attempted to identify the most important factors in making these approaches successful.

Explicit and Tacit Know-how

Using technology competitively depends both upon having the right know-how and access to the right tools. This know-how has at least two components:

- The *explicit* skills to assess the problem and use the necessary tools.
- The *tacit* skills to solve the problem effectively and appropriately in its setting.

Explicit skills can be taught but tacit skills are learned through practical experience and are difficult for either by the technology-rich company or the local community with practical understanding of what works and does not work to record and teach.

These skills combine to provide the knowledge capital that the economy requires to grow. Unlike physical assets, many can possess the same knowledge capital at the same time and use it in different ways to create value.

Sometimes, economies have been described as pipelines for converting raw materials into products. Today, it seems more appropriate to view them as dynamic networks that transmit learning and generate value through connectedness. Indeed, some describe economies using the language of ecology and give similar explanations for their success and failure.

The resources and skills that multinational companies, governments and non-governmental organizations, universities and civil society deploy within these networks are essential to sustainable development. Within this networked economy, people need to acquire more know-how and refresh this know-how more frequently in order to become and then remain successful.

Even within developed nations, the OECD recently estimated that the average half-life of worker skills has shortened to three and a half years. In the developing nations, the challenge of skill generation and skill maintenance is magnified further by the changing nature of technology and by the imbalance between local needs and global trends.

While the larger companies cannot remove this hurdle by themselves, progress is likely to be slow without their active participation. Using their economic power to strengthen and extend the connections within the networks helps reinforce people’s awareness and understanding of what needs to be achieved and provides the means to transform values and local priorities into action.

As networks evolve, roles will also change. Increasingly, the multinationals’ commercial success comes from funneling skills, technologies and sources of investment rather than holding proprietary control of all the key technologies and production processes. This makes it particularly important that they work in ways that will enhance the effectiveness and legitimacy of these channels.

Project Investment and Risk Management

Economic growth requires investment as well as know-how and this investment spreads most easily towards projects that offer good financial returns and present low risk. It may be helpful to view the situation as an iceberg. What lie above the water are the project opportunities that will be successful in any case. Below the surface are a far larger number of potentially vital projects.

Some of these projects may be commercially attractive but unnoticed; others may be desirable from the point of view of country development but too risky for the private sector to address. One challenge for governments, firms and the international community is to find ways to increase the number of projects that are actually selected for investment and progress to completion – to improve the “supply side”. This depends on reducing the risk of key projects “close to the water line” and generally raising the level of other projects that today lie deep below the surface.

Project risk has many components: location, choice of partners, suitable technology and means of finance. The market may seem too small or ineffectively regulated, the workforce unskilled, intellectual assets poorly protected, or the restrictions on repatriating profits too stringent. Only some aspects can be expressed objectively. Yet obtaining productive investment requires finding approaches that minimize the risks perceived by the investor.

Smart Partnerships

Official Development Assistance (ODA), including debt write-off, has been one vital tool for addressing the intractable needs of the poorest nations. Arguably, its real justification is to deal with the socially vital projects deepest beneath the water line in ways that also build capacity for the future. But too often it seems to be applied ineffectively as far as reducing future project risk is concerned.

In the course of this work, we learned about the contribution that can be obtained through public-private initiatives: “Smart Partnerships” as the Commonwealth Partnership for Technology Management describes them. These partnerships can operate at all scales from the skilled engineer upwards. They provide the means to learn from and combine the tremendous experience available in small and large companies, governments and civil society.

Combining grant-based, capacity-building approaches with practical experience, education and skill development increases both the competence of the individual to address local needs and the international community’s understanding of these needs.

Sound legal frameworks make it more likely that this capacity will be used to good purpose and increase the likelihood of making correct decisions about design and construction. This helps ensure that the international partner is able to complete projects more effectively, producing a virtuous circle that further improves local capacity and makes future investments less risky.

The newer market instruments such as the Kyoto Protocol’s Clean Development Mechanism, Tradable Emissions Permits, etc., offer ways to further increase project visibility. We feel it is useful to view these as *development tools*

that can tip the balance in favor of cost-effective investments addressing particular policy goals (in this case reduced carbon emissions).

Provided it is possible to agree the rules and modalities, these instruments can be used to reduce overall portfolio risk and shift investment towards greater sustainability without constraining the investor to use pre-determined solutions. We believe that running these schemes in ways that encourage participation rather than create bureaucracy will provide substantial leverage and improve project visibility.

Points of Leverage

However committed a firm is to sustainable development, it is likely to be challenged on its record in the emerging economies in the face of growing concerns about globalization. In working towards technology co-operation and smart partnership, the main messages are to focus on economic development, learn from examples of success and work in ways that will improve skills, reduce risk, foster partnership and extend the network.

There is a widespread willingness (and the resources) to invest where the skills, capacity and institutional frameworks can support that investment. Technology follows investment and when the perceived rules of the game change, so too will people's behavior. The SME sector plays a particularly crucial role as economies develop: a hot-house of effort with tremendous understanding of what is possible but often stretched in its ability to take up and use the tools already available to the multinational. Without a vibrant SME sector, economies do not flourish.

Finding innovative ways that can better drive this dynamic is a test of cooperative economic leadership, in which governments, multinational companies and local businesses each have key roles to play.

5. A Management Framework for Sustainable Innovation

The messages we have about the connection between Innovation and Sustainable Development offer a clear sense of both opportunity and obligation. Once the public believes (rightly or wrongly) that corporations – specifically the multinationals – are the main actors able to influence the future and drive innovation and the development of technology, corporate social responsibility inevitably extends to cover these processes.

At a dialog workshop held to explore the work covered in this report, participants from outside the business community told us to:

- Pay more attention to how business is being framed and recognize that few people are actually promoting the benefits that companies themselves consider that technology is providing,
- Recognize that innovation can be highly disruptive and requires ethical guidelines that are fit for the time and place,
- Pay more attention to the contributions made by government and regulation and not believe that a *Jazz* world can be achieved by industry alone,
- Learn how to structure dialog on the difficult issues surrounding the use of advanced technologies to obtain challenge without polarizing matters to a point at which progress becomes impossible,

- Take what we have learned and ensure it gets put into practice.

Eco-efficiency shifted the response to environmental impact from end-of-pipe solutions towards ways of eliminating impact at source. Its success has come from expressing a clear but challenging objective “to do more from less” that channels our aspirations to find environmentally better and more cost-effective solutions. Once companies recognized this was possible, eco-efficiency could become an established approach.

Similarly, there is no future in looking at sustainable development just in terms of costs and obligations. This is one way to get caught in the commodity trap. To be a successful, integral part of business thinking, sustainable development has to provide the food for long-term growth and profitability. To nourish innovation, its roots have to grow from deep within companies’ business units, not the corporate centers where the early attention to sustainable development has often been focused.

The nature of the challenge is apparent from the results of the company survey. It concerns people and economics much more than technology. Individual firms, with different spheres of business, will encounter different aspects of this challenge.

In larger companies, the required skills may already exist but may not be combined as a team. For example, technology management is often treated as an engineering task receiving little input from the social sciences. SMEs may be particularly strong in their design skills, in science or in their appreciation of the needs and values of the local economy, but weak in other important areas. Sustainable innovation requires us to combine these skills without creating inflexibility, reinforcing the on-going shift towards dynamic, results-oriented styles of management that is already happening for other reasons.

This report has not attempted to identify which technologies might solve which sustainability goals or which innovations will be successful and sustainable. That is something that (in general) we believe is best determined through well-regulated markets. However, we suggest that it is worthwhile for firms to look in more depth at how they manage innovation and consider how this can respond to the challenge of sustainable development during a period of rapid commercial, social and technical change.

One useful tool for presenting the distinct stages of discovery, development, deployment and maturity of ideas and technologies is the S-curve. This illustrates how impact starts off low and remains low while the scope and nature of the idea or discovery are being mapped out. It then grows rapidly after substantial investment has moved the idea into development, flattens off after the idea is implemented widely, then falls away as replacements (developed along their own S-curves) come along.

This reminded us that businesses need a balance of activities to remain profitable. What seem to be good business practices such as focusing investments and technology on the most profitable products currently in high demand (i.e. close to the top of their S-curves) can ultimately weaken the firm. The same is likely to be true when addressing sustainable development.

Breakthrough innovations of whatever form are likely to be rejected by mainstream customers because they cannot use them. Consequently, firms with

too strong a customer focus may fail to create the new markets for products of the future and become exposed to more nimble competitors. On the other hand, firms that invest too much in new technology fail because of the time it takes to bring these options to market.

Furthermore, depending on the nature of the technology and the degree of awareness of its potential consequences, public concerns about technology arise at different stages in its development and require different risk management responses.

So the question is one of balance. Ways of managing innovation and technology development to achieve this balance change over time. Around 1970, many large firms separated the management of their R&D and business operations. R&D was often equated with innovation and treated as a corporate responsibility that involved generating new options for business units while keeping an eye on the horizons of science and minimizing technology-related risk and environmental impact. Business units were responsible for understanding the evolving market's requirements and for creating products from the options available to them.

In many firms, this separation of roles disappeared towards the end of the 1980s as their core technologies became mature and market forces required greater integration of product development and technology deployment. At the same time, innovation became seen as much more than the product of R&D. Eco-efficiency became a priority, which large corporations were in a position to address cost-effectively using the technical capabilities at their disposal.

Reinforcing Trends

In determining the best approach to innovation and technology management in future, corporations must take into account many trends. Some are directly related to the growing attention given to environmental and social performance; others may be co-incidental. Nonetheless, we do not believe that any of these can be treated independently from each other.

The trend towards networking has already been mentioned several times. Another is that time to market has shortened dramatically in some sectors. The nature of new technologies, combined with large companies' focus on core competencies, has made it possible for small firms to take a leading role in these networks in bringing new ideas rapidly to market. Many younger people now prefer to work in these small firms and do not expect the certainties that large corporations used to offer.

In turn, large companies now spread their antennae much more widely to obtain the competitive tools they use in their businesses. The trends go together and it would not be possible for the new SMEs to be successful without strong connections to larger organizations.

Another important development is the changing profile of public concerns about technological risk and technology ownership. When most of the life cycle happened inside a large corporation, public concerns tended to arise during the later parts of this cycle (at the top of the S-curve), hopefully after companies had taken steps to understand and minimize the risk.

Today, concerns become visible sooner ("novelty" leading to "uncertainty") and the extent of use of some technologies goes beyond the scale that people can comfortably handle ("too big"). This means that new mechanisms

may be required to ensure that what is introduced is, and will remain, acceptable to the public.

6. Shaping the Future or Responding to the Past?

One way to formulate the question of balance is to ask what corporate social responsibility means for companies operating within a networked world. The research described above suggests that no single approach will apply to all firms in all situations, but there are some clear common principles:

a) Sustainable development offers an organizing framework based on opportunity and respect for human values. Innovation is about using change in ways that better meet human needs and values. The connection between the two seems obvious although, in the absence of clear market pressures and a common language, can be hard to realize, especially since innovation can come unexpectedly “out of left field” and have such uncertain consequences.

b) Some organizations respond best to sustainable development as a vision, whereas others prefer more pragmatic approaches. Clear direction backed up by resources, management support and good metrics seems more likely to achieve the desired results than reinventing business processes to accommodate sustainable development.

c) Whichever approach is preferred, innovation has often been the result of presenting (or being presented with) a credible strategic dilemma: a shock that can only be resolved by developing wholly new approaches.

d) Economies are networked, social values are changing and environmental pressures are here to stay. These are unavoidable but not uncontrollable forces. Commercial success depends on having the flexible, multidisciplinary skills to respond. This applies as much to sustainable innovation as in any other area. Metaphorically, we must ask ourselves whether to concentrate on stopping the tide from coming in or using it to get where we want to go.

e) Innovation based on better design and new technologies gives us the means to act smarter and more sustainably. Using these tools well depends upon understanding the public’s expectations and concerns and being able to meet needs cost-effectively without raising further alarms over the scale or novelty of technology.

f) The leadership task is to harness these economic and social trends, capture the tremendous amount of knowledge and experience that exists in networks worldwide and combine these in ways that create value. Traction is likely to be greatest when the management approach is positioned appropriately for the organization in its network and seen by staff to be relevant and self-evident, if not simple, in purpose and content.

g) Corporate social responsibility and eco-efficiency form important elements of the business response. Attention to these principles must be devolved throughout the corporation.

Achieving this success will require new business ideas and new ideas on business. These ideas are likely to be design-based, amplifying the

emerging signals from the marketplace in ways that cannot be reduced to either a “technology push” or a “market pull” approach.

This paper has concentrated primarily on what companies can do, but it is important not to overlook the role others play in supporting companies’ actions. An important role of governments is to provide the climate for sustainable innovation, the regulatory frameworks that reduce uncertainty that better solutions will succeed in the market place. Governments also act in ways that can reinforce the standards of behavior that are sought of others, for example within public procurement policies.

The financial markets have an important role to play in funding and rewarding the more sustainable solutions developed by companies. They are most likely to do so when there is compelling evidence that sustainable development has economic value. In March 2000, John Prestbo, Editor Dow Jones Indexes, commented about the new Dow Jones Sustainability Group Index:

I believe that the Dow Jones Sustainability Group Index will [continue to] outperform general market benchmarks over time. Enlightened and effective management means sustainability companies deliver more predictable returns, which also could be articulated another way: fewer negative surprises.

It is well known among money managers that the easiest way to beat your benchmark is not to find a bunch of hot stocks but simply to avoid owning the stocks that turn into disasters. Investors will seek out leading sustainability companies not for outsized performance, which is always temporary, but for the above-average growth on which they can rely.

The challenge for these companies is to find new ways to align innovation with public expectations and so provide a management framework that is based on discussing, deciding and then delivering sustainable value.

Leading companies have understood that this depends upon understanding the evolving nature of society and redefining the relationships they want to build with customers, employees and suppliers, with governments and with the public at large. This approach involves recognizing the connection between rights, roles and responsibilities in society.

Dealing well with these responsibilities takes time, needs an effective view of what the future may offer as well as leadership, courage and measures of progress, but is essential for the influence of the private sector to be accepted.

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