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## **Information Technology in Sustainable Development**

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### **Abstract**

As more and more companies begin to grapple seriously with sustainability, and the economic case for implementing it in their businesses, there emerge two interrelated yet distinct themes: how to achieve the necessary organizational change, and what technology must actually accomplish.

These two themes are in many ways complementary. Organizational change and learning are not new; they encompass fundamental facets of human inter-action, which must be constantly reviewed and seen in different perspectives in order to move a given group of people, under unique external constraints, in a new direction. Technology, on the other hand, like the science on which it is partially based, involves discovery and originality; it forms part of the constraints that define what the organization can do. Several voices have been recently raised with the theme that dramatic innovations are required in the way we deliver the functionality that customers want. Yet these new technologies (and their means of delivery) will be meaningful only in the context of the organization, as well as the other constraints (the economic system, public policy, local price anomalies, and so on), and these factors are important determinants of what technology choices are made.

A group at Hewlett-Packard Laboratories has begun to grapple with the role of technologies, in particular those in which HP has competency, in achieving a sustainable planet. At the same time, placing these business goals in a prominent position requires major organizational and cultural changes.

The concept that sustainable development should be a business-driven agenda, rather than a matter of environmental protection, has been enunciated by many people. The primary outcome, from the business point of view, of moving toward sustainability is getting more income with less material through-put and operating cost. So why isn't this automatically and ubiquitously done, and why is it that sustainability conferences are still attended primarily by the staff of EH&S (environment, health and safety) functions rather than R&D, new business development (NBD), and marketing?

One component of the problem is a coherent technological vision, adapted to the competencies of the company. It is one thing to say that radical innovation and the generation of new products is required for sustainability, but a realistic technology

roadmap must be articulated if management is to be convinced. The timeframe for investment payback must be understood, and the business model clear. R&D and NBD staff are in general not the people who are likely to be confronted in their daily responsibilities by sustainability issues. Someone with a good grasp of the technical capabilities of the company, along with an understanding of the current situation of the planet's resources, must bridge this cultural gap. Fortunately, scientists from many fields are beginning to lead in urging solutions to environmental impact issues, and technical staff will probably be a relatively easy sell. Making the business case, in as quantitative as manner as possible, then becomes a paramount demand.

However, it is a simple fact of life that people working in corporations respond to immediate challenges: we optimize our local environment regardless of what dire threats may be lurking far off. The biggest challenge in the business realm is how to provide a path from here to there that is profitable enough along the way to be acceptable to the managers who live in such a world.

Information technology (IT) (and the electronics and photonics that comprise it) can play a pivotal role in moving companies and people toward sustainability. Obvious examples such as teleconferencing have been given substantial attention. When people do need to move, IT can make the process vastly more efficient than it currently is. But there is far greater scope for progress than current discussion has suggested. Micro-fabrication, combined with biotechnology, has the capability to allow much materials processing to be done locally, eliminating waste in processing as well as much transportation. Modern display technology will, within the next ten to fifteen years or so, obviating the need for at least 90% of the paper currently used. Properly integrated IT systems, wirelessly networked to rural areas around the world, can provide a developed nation standard of living to people currently living in poverty, without significantly increasing their material usage. Although there is certainly much challenging R&D involved in fully realizing these visions, by far the greatest concern is how to get different skill sets from different businesses to cooperate in the necessary way. Businesses today are not really organized to subsume physical products under a service model, nor do they easily adjust to serving markets very different from their accustomed ones. The establishment and encouragement of entrepreneurship, both for small businesses and for large ones, may be the most important ingredient in moving further toward sustainability.