

# EcoLab, Part I

## A Jump toward Sustainability

Chris Ryan

The recent republication of two articles, one by McDonough and Braungart (1998)—“The Next Industrial Revolution”—and the other by Manzini (2001)—“Leap-Frog: Short-Term Strategies for Sustainability”—should give needed impetus to a reevaluation of the rate and direction of change toward a sustainable industrial ecology. Both articles were written about five years ago, addressing the prospects for a transition to sustainability and placing (eco)design at the center of such change. In common with many people who are associated with industrial ecology, McDonough, Braungart, and Manzini are convinced that sustainability implies major industrial and social transformation—the creation of radically new systems of production and consumption.

Rereading these articles reminds us that the critical question has not changed over the intervening time: How can we find strategies for improvement that, to use Manzini’s neat encapsulation of the issue, result in a “change in the rules of the game.” He called for strategies that would require “firms . . . to leave their business-as-usual routines; users . . . to modify consolidated behaviors; and institutions . . . to revise their roles and policies.” McDonough and Braungart talked in similar terms of the need to find ways to ground production and the economy in a new sense of “eco-effectiveness”—as a basis for the next industrial revolution.

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The excitement and power that both these articles first conveyed rested not so much on their arguments but on the examples, the quick sketches of possible new systems of production that they used to illustrate the power of their ideas. McDonough and Braungart talked of redefining—and redesigning—upholstery fabrics to be beautiful, desirable, practical, and, ultimately, biological nutrients. In their new industrial revolution, chemical sales would have given way to pest-management services. Manzini described case studies that

pointed to developments in products and services that held a promise of triggering “leap-frog” changes in the rules of the game. (Such changes are essentially nonlinear jumps from one system of production and consumption to another, with fundamentally different sets of technical and economic relationships.) He concluded that “by taking seriously the theme of a transition towards sustainability it is possible . . . to spark

new and hitherto unthinkable opportunities” [emphasis added].

Five years later, you could reasonably conclude that for Europe at least, the theme of a transition to sustainability is being taken seriously, by governments and industry. The European Union is working on a set of EU-wide integrated product policies (IPP) to drive product design and reduce the life-cycle impacts of production. This reflects a broadening of political support for intervention for more sustainable outcomes and a sense that product eco-design provides a successful (and acceptable) market-based mechanism for change. Within many

larger companies, environmental management systems, innovation, and eco-design *have* had an impact on products and services. Eco-efficiency—achieving more with less—has reached the level of being an endorsed goal for business organizations and international agencies concerned with industry, economics, and the environment.

In spite of this action, however, there seems to be little evidence that the situation is sparking the “hitherto unthinkable,” or that we are in the midst of a new industrial revolution. Things still seem to be constrained to improvements that are achievable within the rules of the game, within business (almost) as usual, and within “consolidated user behaviors.” Too much of the existing system seems to be locked in, by investments in equipment and product, by business chains and markets, by organizational structures and shareholder expectations, to allow new alignments and directions to emerge. Eco-efficiency appears to have become (as McDonough and Braungart predicted) an excuse for complacency, a new and simplistic technological optimism that things as they are can become sustainable by improving the efficiency of processes and resource use.

Almost at the same time as Manzini, McDonough, and Braungart were writing, Donella Meadows was reflecting on her years of experience working with, and modeling, systems. In her wonderful piece “Places to Intervene in the System” (1997), she put numbers (taxes, subsidies, standards), regulating negative feedback, and driving positive feedback loops, along with information flows, among the lowest levels in effectiveness. Yet, today, these are the main approaches for product policy intervention. Toward the top end of the effectiveness scale she placed the goals of the system; at the very top was the *mind-set* and *paradigm*, out of which the goals, rules, and feedback loops arise. “People who manage to intervene in systems at the level of paradigm hit a leverage point that totally transforms systems. You could say paradigms are harder to change than anything else . . . and . . . should be lowest on the list. But there is nothing physical or expensive or even slow about paradigm change. In a single individual it can happen in a millisecond” (34). How do you change paradigms? Meadows paraphrases the philosopher

and historian of science, Thomas Kuhn: “You keep pointing at anomalies and failures in the old . . . and insert people with the new paradigm in places of public visibility and power. All it takes is a click in the mind, a new way of seeing” (34).

### Intervening in the Conceptual Marketplace

“Leap-Frog” and “The Next Industrial Revolution” were two widely read calls for a paradigm change. There have been and presumably will continue to be, in these pages and elsewhere, numerous other pieces written by other authors with the same intent. Those publications, like the republication of these two seminal pieces, will help build up the idea of change. But, are sporadic articles likely to be enough to achieve this goal? At this time, there is very good reason to suspect that the anomalies and failures in the current approach are becoming widely apparent, producing a discernable sense of unease within business and government. So, in that sense, the situation is ripe for a paradigm shift, if there is a critical mass of new paradigm articulation—a critical mass prominent enough to change ways of seeing, to spark widespread interest and attention to different visions of “how things might look.” It all comes down to the issues of public visibility and power.

The collapse of the “eco-efficiency pathway to sustainability” is occurring at the same time as an apparent shift in the nature of the market and business activity, a shift that values foresight, visible engagement with the future, and conceptual capital. This suggests that the time is ripe for the creation of what an informal international network of eco-designers have started referring to as an EcoVisionLab, or just EcoLab for short.<sup>1</sup> This is some form of large concentrated focus for design, innovation, and research *in the public arena*, able to *intervene in the conceptual marketplace*. You can think of EcoLab as a *paradigm creator* to help our underresourced and locked-in industry venture into hitherto unthinkable territory. It will shift the conceptual terrain in which producers and consumers see themselves as operating. Evidence exists for the potential success of this approach from the key innovation powerhouses of the information

technology revolution, which also provides a model worth investigating.

Before developing the idea of EcoLab further we need to quickly review the elements of the current situation that suggest this as a possibility.

## Current Incremental Strategies

Current interest in product (eco)design rests on a set of familiar propositions:

- Environmental impacts from products have continued to rise (in gross terms) relative to production processes.
- A life-cycle perspective on the environmental impacts of a product captures the whole production-consumption chain.
- Of the (life-cycle) impacts from products, 60% to 80% are determined at the design stage.
- When product-related impacts are made explicit in the design process, there are well-tried design strategies for reducing them.<sup>2</sup>
- A focus on products is a better way to engage business interest and action because it focuses on the products' market vulnerability.

Product policies, explicitly or implicitly, assume one further proposition: *The existence of new eco-designed products changes the market, projecting a new demand space for product competition.*

Thus we see a continuing interest in government-supported demonstration projects,<sup>3</sup> green-product marketing campaigns and consumer advice, green-product procurement programs, and product eco-labeling, all aimed at increasing demand for improved products.

## The Contradictions in Current Policy Strategies

Current strategies seek to stimulate product improvement throughout the economy as a way to increase the eco-efficiency of the total system. But such strategies face one major criticism: They assume that, in overall terms, the rate of reduction of impact from product improvement can be greater than the increase in impact from growth in product consumption. That idea has

been under challenge for some time. Consumption is showing up as the real limiting factor in product improvement strategies; it is currently rising faster than improvements in eco-efficiency. An added complexity is that efficiency and consumption are interconnected in practice by the so-called rebound effect, where improvements in eco-efficiency generate increased consumption. When policies are designed to stimulate demand for improved products, these issues become very important. Promoting product substitution risks stimulating more consumption (total and/or rebound).

Hence, the growing interest is in *sustainable consumption*—keeping resource consumption to sustainable levels.<sup>4</sup> In practice this is a sensitive and politically difficult concept. It implies a radical change in what could be called *the means of satisfaction* (after Ehrenfeld and Brezet 2001), affecting products, technology, social and cultural values, and the provision of goods and services.

A strategy based on incremental product improvement (as it is currently conceived) seems unable to deal with the problem of consumption, except to note that we need to see a more dramatic reduction in materials flows, or an increase in the rate of dematerialization. So we continue to hear about sustainable service systems, increasing the information intensity of products, new sophisticated systems of component collection and remanufacturing, virtual products, long-life upgradable products, and so on. But these are nowhere near mainstream ideas,<sup>5</sup> with just a few interesting models, endlessly repeated as case studies in numerous reports and often extrapolated beyond their current context. The overall impression is that innovative ideas in this area are not being taken up, modified, or adapted for other contexts; the current situation appears to lock them out.

In the second part of this column, I describe how an EcoLab could be established, building on lessons from innovation in the information technology sector.

## Notes

1. In fact, we originally called the idea the “Eco-Design Lab,” then “EcoVisionLab,” but it quickly became “EcoLab;” however, this is not intended

as a brand name because it is already used by a large sterilization and decontamination company originating in the United States.

2. Practical guides such as *How to Do EcoDesign* (Tischner et al. 2000) illustrate well-known strategies for reducing product-related impacts when these impacts are made explicit in the design process.
3. Countries that have had government-supported demonstration projects include Australia (the EcoReDesign program 1994–1999), Netherlands (the Promise—EcoDesign program), and Sweden (the program for Ecodesign in SMEs).
4. The United Nations Environment Program (UNEP) is preparing a global status report on sustainable consumption for the Rio+ 10 World Summit in Johannesburg in 2002. More information on this report will be available in 2002 from the Sustainable Consumption Unit in the Division of Sustainable Production and Consumption of UNEP in Paris.
5. In fact, the burgeoning interest in the idea of replacing products with services shows a sense of desperation, grabbing at a germ of an idea in a way that often does not stand up to scrutiny (Ryan and Mont 2001; Ehrenfeld and Brezet 2001; Ryan 2000).

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## EcoLab, Part II

### Learning from the Information Technology Revolution

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Will sustainable systems of production and consumption emerge through the interplay of incremental market forces, of product improvement and increasing technical or resource efficiency? The answer is clearly not simple; all indications are that current systems will have to change very significantly, and like any industrial revolution, such change will encompass social, economic, technical, and institutional reorganization. It is in the nature of such complex systems that change is not linear; “systemic discontinuities” can be expected to appear and are frequently observed.<sup>1</sup> The EcoLab idea—a large, concentrated focus for design, innovation, and research in the public arena, able to intervene in the conceptual marketplace—emerged from thinking about the potential for stimulating such discontinuities, or breakthrough changes, in current industrial systems. A broad sense of unease about the potential of current approaches to deal with the environmental consequences of economic growth and consumption, a necessary condition for revolutionary change, was discussed in Part I of this column (Ryan 2001).

*The potential power of adapting the MediaLab model for a new venture to transform industrial ecosystems, products, and patterns of consumption is that visionary work could be scaled up, concentrated, and linked directly with industry and government to catalyze new activity and investment.*

#### Exhibiting the Future Has Value

At the same time as the looming crisis in current product development strategies is becoming more apparent, other changes in the market cast the competition for “greener” products in a different light. The usual description of such competition is that green characteristics are reflected in consumer demand, generating competitive pressure on other producers to respond with similar (or improved) characteristics. A better way of describing this same effect is that new products change the boundaries of the *design and innovation space* within competing companies (to incorporate, say, new technologies, new user behaviors, new functions, new expressions). In other words, new products modify the idea of what is possible and what is expected in design, altering the criteria of market value in the process.

Of course, we cannot talk about design and innovation space as if it exists within all companies; for many companies, design and innovation reduces to something akin to slavishly copying competitors’ products and design. Only those producers that do allocate substantial resources to design and innovation should interest us, however, because product and service typologies and performance are “set” by such companies.

The market, competitive standards, and chains of component production are shaped by

product leaders. For such companies the process of generating productive design and innovation space is valued. This often involves investment in *future-concept design*, testing out ideas that are (way) ahead of current production models. A decade or so ago, such design concepts would have been closely guarded secrets, protecting investment in intellectual property. But that approach seems to have changed significantly.

Perhaps it was the pressure felt in rapidly evolving product areas, such as computer software, that generated a change in company behavior; “prerelease” beta-ware became a common way to test products, capture future markets, and establish a product or company name. Now, as the time to market is reduced for all product areas, the need to simply stay ahead of the game can become more important, economically, than protecting intellectual property. Company position and brand identity is not just fought out in the here-and-now marketplace, but in the ability to bring the future into the present, making ideas and scenarios for the future visible and tangible. Words, reports, and data analysis are not enough; this requires something closer to *exhibiting the future in the present*.

The big auto producers, for example, have long recognized that motor shows are not merely a venue to exhibit new models to consumers eager to make buying decisions. Such shows attract large media and consumer interest in concept models that may never be intended for sale. Where motor shows may have just had one or two prototypes, now they show future models on almost every stand. Showrooms and company Web sites seem to give more prominence to future-concept vehicles<sup>2</sup> than current models. This approach is no longer restricted to big-investment products such as automobiles; smaller consumer products, such as appliances and electronics, are showing the same dynamic, as indicated by the work of Electrolux and Philips, for example.

Marketing future design is a way to consolidate a company brand. “Envisaging the future” is not a figure of speech; design processes once restricted to internal company activity, such as three-dimensional modeling and rendering, prototyping, and storyboarding, have moved to the forefront of marketing. For many powerful and

prominent companies, visions of the future—models, prototypes, and design concepts—have become a commodity, an asset with significant market value.

## Learning from the Information Technology Revolution

It is tempting to see parallels in the current situation with respect to sustainable development and that facing information technology (IT) development 10 to 15 years ago. At that time, there were a small number of visionaries who could see the changes likely to result from IT development, even though little of what they predicted was visible in practice. Some generalized sense existed in industry and government that the diffusion of IT and the growth of the communications infrastructure might unleash hitherto unexpected structural changes, but the business and policy focus remained largely on the development and diffusion of improved products.

Some analysis of the IT revolution has focused on the changing role of research and development (R&D) within company laboratories, seeking to understand how, as Robert Buderer describes it, “the best companies use[d] their research labs to win the future” (Buderer 2000). What emerges from such studies is a description of the dramatic changes in the organization and strategic focus of research in the sector as individual companies tried to harness knowledge and invention for product innovation and market development. Research labs at companies such as Hewlett-Packard, AT&T, Xerox, General Electric, IBM, Microsoft, and NEC have a fascinating and varied history, yet they share some similar characteristics that have been forged over the last 10 to 15 years. Each has had to find new ways to straddle R&D and to ensure that research is strongly shaped by development.

Buderer’s study suggests that what really goes on in these company labs would be better described as RD&D: research, *design*, and development. The tendency is to define laboratory teams by work around a future concept generated by a “what if” (imagine the office/home/transport system/etc. looked like this . . . ). Teams incorporate the multidisciplinary expertise required to deal with physics and technology, user behavior,

culture and aesthetics, and production processes and materials. They use metaphors and visual language enthusiastically, with evocative project names such as “smart dust” and “embedded intelligence.” Lab-based R&D became fundamentally grounded in the idea that the future can be imagined and played with; if the vision is powerful, seductive, and challengingly possible, then this can drive discovery, invention, innovation, investment, and—ultimately—profits.

IT firms became adept at opening up their future speculations to the public’s gaze, offering tantalizing glimpses for the general media and laboratory visits and seminars for potential industry collaborators and clients. R&D involved a process of shaping market anticipation of a new future, creating demand at the same time as the products able to fulfill it. The lesson from other famous “breakthrough” product developments (such as the Sony Walkman) has transformed the context of R&D: It is not possible to estimate the potential market for a radically new product by asking people whether they would buy one if it did exist. Instead the new product has to be shown to people in a sufficiently tangible form that they can see what it could mean for them; then there is some value in market analysis.

### **The MediaLab as a Model for EcoLab**

Looking to the IT revolution for approaches that might be applicable to creating an EcoLab to kick start the sustainability revolution is potentially productive. But the laboratories that were described by Buderer (2000) all belong to individual firms developing IT hardware, software, and systems infrastructure. No obvious equivalent to such firms exists in the current situation. In fact, the new systems of eco-production are likely to break out of current industry/company sectors with new alliances and networks, so we cannot expect too much to emerge from within the research areas of individual companies (with the possible exception of larger corporations, which are often more vertically integrated).

Another model from the IT sector seems very relevant, however: the MediaLab at the Massachusetts Institute of Technology (MIT) in the

United States. This lab began as a way of exploring the future convergence of three separate industry sectors: computing, publishing, and broadcasting. Commitment to established paradigms within these competing industry sectors was seen as a barrier to innovation and development (prohibiting the exploration of the “hitherto unthinkable”). The MediaLab was explicitly established to articulate and explore the emergence of a new paradigm.<sup>3</sup> It grew out of the School of Architecture at MIT and, from the start, was confidently based in design and innovation space.

This lab (and others like it, such as the KnowledgeLab in London) represents a radical alternative to the organization of R&D in the big company labs. The MediaLab is a shared resource for a wide range of companies, and all research and product development is open to all the other member companies. This generates a powerful cross-fertilization of ideas and a shared sense of industry-wide transformation.

The MediaLab gains expertise from a pool of researchers at MIT; its staff include professors, researchers, and students completing degrees. Close interaction with company personnel ensures that the productive link to commercial possibilities is always part of the picture. The lab sets out, explicitly, to deal with the creation of new concepts, selling “not what works, but what *might* work,” a source of new ideas and concepts able to be “picked up” by the member companies, who are encouraged to commercialize intellectual property (Brand 1988). Company personnel—technical, scientific, design, marketing, and management—have open access and are encouraged to use the lab as a way of thinking radically about the future. To help break existing paradigms, the lab involves artists, designers, musicians, and philosophers, as well as scientists and engineers. Together with the visiting company personnel, they become a “user group of the future.”

The MediaLab has been expanding and replicating in other locations; its role and influence is widening, and it has remained economically viable (with a mix of research grants, royalties from business ventures, and, most importantly, annual fees from its member companies). Its contributions to knowledge and innovation are more

dispersed and generic than are the contributions of the single-company labs, laying down some of the fundamentals of digital media that have shaped products, technology development, and research across the market. Its success lies in catalyzing new domains of activity.

The value of case studies as exemplary forms of education and motivation is evident in reports and writing on sustainable development and eco-design. The limited number of real case studies able to demonstrate directions for change means that many people turn to concepts and hypothetical examples. Visionary writers make good use of such illustrations. A number of design journals and Web sites also make good use of imaging an alternative future.<sup>4</sup> All of these remain dispersed and mostly disconnected from the institutions they seek to change, however. The potential power of adapting the MediaLab model for a new venture to transform industrial ecosystems, products, and patterns of consumption is that visionary work could be scaled up, concentrated, and linked directly with industry and government to catalyze new activity and investment.

Now that there is a general sense that sustainable development is an industrial revolution about to happen, it is time to learn from the MediaLab and think about the formation of an EcoLab to fill the conceptual void that is such a significant barrier to the creation of new sustainable systems of production and consumption.

## Notes

1. The impact of nonlinear changes in economics, history, social organization, ideas, and so on seems recently to be of great interest, with references to new terminology appearing in policy documents such as *Butterfly Economics* (Ormerod 1998), *Breakthrough Thinking* (Perkins 2000), and *The Tipping Point* (Gladwell 2001).
2. Look at the large showrooms for the auto companies that have replaced the fashion houses on the Champs Elysées in Paris. Renault, for exam-

ple, calls their showroom an “atelier” and uses it as a general design exhibition for concept models, which are finished in full detail and set out with the same descriptive information as current vehicles.

3. Its mission was to focus on the study, invention, and creative use of digital technologies to enhance the way people think and express and communicate ideas and to explore new scientific frontiers.
4. See, for example, the Web site of the international eco-design group O2 ([www.o2.org](http://www.o2.org)).

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