Information Ecologies

Using Technology with Heart

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Information Ecologies

We define an information ecology to be a system of people, practices, values, and technologies in a particular local environment. In information ecologies, the spotlight is not on technology, but on human activities that are served by technology.

A library is an information ecology. It is a place with books, magazines, tapes, films, and librarians who can help you find and use them. A library may have computers, as well as story time for two-year-olds and after-school study halls for teens. In a library, access to information for all clients of the library is a core value. This value shapes the policies around which the library is organized, including those relating to technology. A library is a place where people and technology come together in congenial relations, guided by the values of the library.

A hospital intensive care unit is an information ecology. It has an impressive collection of people and technologies, all focused on the activity of treating critically ill patients. Human experts (nurses, physicians, therapists, ethicists) and machines (monitors, probes, and the many other devices in the ICU) all have roles to play in ensuring smooth, round-the-clock care. Though this is a setting with an obvious reliance on advanced technologies, it is clear that human expertise, judgment, empathy, cooperation, and values are central in making the system work.

A self-service copy shop is another kind of information ecology. In our local branch of Kinko's, for example, there is a floor full of copy machines, paper stock of different colors and patterns, paper cutters, scissors and glue, computers that can be rented by the minute, and laser printers and scanners. There is also a computer expert who sits on a stool near the row of computers to answer questions. There are workers behind the

counter who can help with copying. Customers ask one another where to find supplies and how to get started on an unfamiliar machine. It is a busy and hospitable place.

In each of these settings, humans help other humans use technology. Simple things are done with simple tools. The library, hospital, and copy shop have typically sought out advanced technologies, but these technologies are carefully integrated into existing habits and practices, according to the values of the information ecology.

We introduce the concept of the information ecology in order to focus attention on relationships involving tools and people and their practices. We want to travel beyond the dominant image of the tool metaphor, an image of a single person and his or her interactions with technology. And we want to capture a notion of locality that is missing from the system view.

An ecology is complex, but it does not have the overwhelming breadth of the large-scale systems and dynamics Ellul and others describe. An ecology responds to local environmental changes and local interventions. An ecology is a place that is scaled to individuals. We can all name the ecologies we belong to and participate in. In an ecology, we are not cogs in sweeping sociological processes. Instead, we are individuals with real relationships to other individuals. The scale of an ecology allows us to find individual points of leverage, ways into the system, and avenues of intervention.

CHARACTERIZING INFORMATION ECOLOGIES

The notion of an ecology as we use it is metaphorical, intended to evoke an image of biological ecologies with their complex dynamics and diverse species and opportunistic niches for growth. Our purpose in using the ecology metaphor is to foster thought and discussion, to stimulate conversations for action.

We believe that the ecology metaphor provides a distinctive, powerful set of organizing properties around which to have conversations. The ecological metaphor suggests several key properties of many environments in which technology is used. An information ecology is a complex *system* of parts and relationships. It exhibits *diversity* and experiences

continual evolution. Different parts of an ecology *coevolve,* changing together according to the relationships in the system. Several *keystone species* necessary to the survival of the ecology are present. Information ecologies have a sense of *locality.*

System

Like a biological ecology, an information ecology is marked by strong interrelationships and dependencies among its different parts. The parts of an information ecology may be as different from each other as the sand, sunlight, saltwater, and starfish of a marine ecology, but they are as closely bound together. In an intensive care unit, for example, the jobs of nurses and doctors can be seen to fit together in complementary ways, and the nature of their work is both extended by and dependent on the technologies they use in patient care.

Change in an ecology is systemic. When one element is changed, effects can be felt throughout the whole system. Local changes can disappear without a trace if they are incompatible with the rest of the system. For example, when schools set new goals for what students must learn in math, they also have to develop new ways of evaluating what the students have learned. Otherwise, teachers will find themselves under pressure to teach the material that was covered on the old tests, and the innovation will fail.

Diversity

In a biological ecology, different species take advantage of different ecological niches, which provide natural opportunities to grow and succeed. The complexity of biological ecologies ensures that there are niches for many different kinds of roles and functions. Just as it would be surprising to find only one grass or wildflower species in a biological community, we should not look for only one or two roles for people and tools in an information ecology.

In an information ecology, there are different kinds of people and different kinds of tools. In a healthy information ecology, they work together in a complementary way. In a library information ecology, for

example, we find that librarians fill niches such as handling rare books, telling stories to children, answering reference questions, and publishing World Wide Web materials. All of these different roles of librarians help make the library work well for its community, providing different resources for varied audiences and their needs. The set of technical resources in a library is also diverse. There are computers that provide electronic catalogs and Internet access, paper and pencils for writing down call numbers, and labels on the shelves so you know which section of books you are looking at.

Diversity is necessary for the health of the ecology itself, to permit the system to survive continual and perhaps chaotic change. Monoculture—a fake, brittle ecology—gives sensational results for a short time, then completely fails. Information ecologies should be teeming with different kinds of people and ideas and technologies. It is captivating to wander through a rain forest and stultifying to be stuck in a hundred acres of soybeans. A diverse information ecology is a lively, human, intensely social place, even if it incorporates very advanced technologies. It has many different resources and materials and allows for individual proclivities and interests.

Coevolution

A natural environment offers many toeholds for life of various forms. With tenacity and vigor, species migrate and change to fill the available niches. These adaptations lead in turn to further change, as the entire system adjusts to new constraints and possibilities. A healthy ecology is not static, even when it is in equilibrium.

Similar dynamics are at work in evolving information ecologies. The pace of new technology development ensures that school, work, and home settings will continue to be offered newer, faster, and *different* tools and services—not just once, but repeatedly. Information ecologies evolve as new ideas, tools, activities, and forms of expertise arise in them. This means that people must be prepared to participate in the ongoing development of their information ecologies. For example, as schools across the country are wired by enthusiastic volunteers on NetDays, school teachers and administrators should expect to make decisions about how

to use the new classroom Internet access not just once, but again and again. The Internet is rapidly changing, and the information ecologies in which the Internet plays a role must participate in those changes.

Information ecologies are filled with people who learn and adapt and create. Even when tools remain fixed for a time, the craft of using tools with expertise and creativity continues to evolve. The social and technical aspects of an environment *coevolve.* People's activities and tools adjust and are adjusted in relation to each other, always attempting and never quite achieving a perfect fit. This is part of the dynamic balance achieved in healthy ecologies—a balance found in motion, not stillness.

Evolution implies a past, as well as a future. An information ecology as a persistent structure over time acquires its own history. It displays the stable participation of an interconnecting group of people and their tools and practices. An experience with an ATM machine, for example, is not an information ecology. It is a useful but isolated service that is too simple to be an ecology. By contrast, a bank office is an information ecology with diverse services and activities, where there are interconnections among people and their tools. When we are in a bank, we can sense that the activities, materials, and tools of the trade have a continuing history of development and change.

Keystone Species

An ecology is marked by the presence of certain keystone species whose presence is crucial to the survival of the ecology itself. In the Indiana sand dunes, marram grasses send out root systems up to twenty feet in length to stabilize their sandy environs. Without these grasses and their roots, the dune sands would disperse and shift erratically in the face of strong winds blowing in off Lake Michigan.

When we add new technologies to our own information ecologies, we sometimes try to work in the absence of essential keystone species. Often such species are skilled people whose presence is necessary to support the effective use of technology.

Some high-technology businesses are recognizing the need for people who can serve as translators, facilitators, and teachers. For example, Farallon Computing, a California network products company, was

recently featured in a news article because of its innovative hiring practices.[1] This company has developed a strategy of hiring technical support workers with little or no previous computer experience—a former cocktail waitress, social worker, and hotel room service manager, for example—because they outperform highly technical people in helping other people with problems. As quoted in the news article, Farallon's technical support manager said, "You can teach people to use a computer but it's real hard to teach patience. I look for natural born teachers because that's what they're doing all day." Farallon has clearly recognized the value of a certain keystone species—the natural teacher—in its work force.

Mediators—people who build bridges across institutional boundaries and translate across disciplines—are a keystone species in information ecologies. Ironically, their contributions are often unofficial, unrecognized, and seemingly peripheral to the most obvious productive functions of the workplace. Although the success of new tools may rely on the facilitation of mediators who can shape the tools to fit local circumstances, technology is too often designed and introduced without regard to the roles these people play.

Locality

In *A Midsummer Night's Dream,* Shakespeare wrote this description of the creative work poets do:

> And as imagination bodies forth
> The forms of things unknown, the poet's pen
> Turns them to shapes, and gives to airy nothing
> A local habitation and a name.

We believe that a key to becoming an active participant in technological change lies in joining ranks with the poets, whose creativity is grounded in local settings. The notion of "a local habitation and a name" captures for us the essence of an information ecology. The *name* of a technology identifies what it means to the people who use it. In a sense, it positions the technology more directly under the control of its users.[2] We do not just refer to what the technology is called, but to how people understand the place it fills. A computer in a library is most likely a card catalog or an Internet access machine. A computer in an office is often a personal

information appliance. A computer in a small business might be a budget and payroll machine. In each of these settings the computer can have precisely the same hardware configuration, but what it *is* for each user population is different. This is not just a matter of different software packages installed on each machine. The identity of the technology is different in each of these local settings because the perceived role, availability, utility, and other properties of the machines are different. The local participants in each setting—librarians, office workers, small-business owners—construct the identities of their technologies through the rhythms and patterns of their use.

The *habitation* of a technology is its location within a network of relationships. To whom does it belong? To what and to whom is it connected? Through what relations? The habitation of a technology is its set of family ties in the local information ecology. An office computer is used by some person or group of people, maintained perhaps by others, and networked to other computers. It has a place.

We cannot overemphasize a key point here: only the participants of an information ecology can establish the identity and place of the technologies that are found there. Indeed, this is a responsibility, not just an opportunity. Designers of tools are responsible for providing useful and clear functionality, but they do not complete the job. As users of tools, we are responsible for integrating them into settings of use in such a way that they make sense for us.

Locality is a particularly important attribute of information ecologies. We all have special knowledge about our own local ecologies that is inaccessible to anyone outside them. Along with knowledge, we have influence. While it may be impossible even to think about trying to make an impact on national policy (unless you are a player in information ecologies at a national level—say, a member of the United States Senate or a federal judge), it is entirely possible to step up and say how you want to use technology in your own home, in your children's classrooms, at your workplace, in your doctor's office, or at your public library. These sites of local participation offer both opportunities and responsibilities for shaping the way technology works in our lives.

Only people who are immersed in a particular information ecology can provide a local habitation and a name to new technologies. Healthy

information ecologies are sustained by the active, intelligent participation of the people involved in them.

WHY ECOLOGIES?

The word "ecology" is more evocative for us than "community," despite some similarities. Ecology suggests diversity in a way that community does not. Communities can be quite homogenous, or defined along a single dimension (the gay community, a community of scholars, a religious community). The parts of an information ecology are as different from one another as oak trees and scrub jays in a California woodland ecology.

Ecology implies continual evolution. The idea of community does not put the same emphasis on change. We often think (perhaps naively) of communities as timeless or slow to change (a prototypical Irish village or a Tibetan monastery).

There is an urgency in the notion of ecology, because we all are aware of the possibility of ecological failure due to environmental destruction. While communities do indeed break down, and there is anxiety about this breakdown, ecological breakdown is disastrous and irreversible in a way that community breakdown is not. We feel a sense of urgency about the need to take control of our information ecologies, to inject our own values and needs into them so that we are not overwhelmed by some of our technological tools.

Penetrating the process of technological development involves defining our own local information ecologies—creating a local habitation and a name for the technologies we use. Our leverage point lies in acting within the spheres where we have knowledge and authority. It may be that we will have the effect of shaping practice in our own settings with an extra measure of reflection and intention, or it may be that our efforts will be noticed and emulated by others. We are not asking people to think globally and act locally (recycling soda cans will not prevent Chernobyl). We are suggesting that people act locally in a committed, reflective way that acknowledges *technique* as Ellul documents it, but having recognized it, chooses to respond with initiative that is grounded in local understanding and values.

We cannot say how far this will take us. But we can imagine that if we used technology responsibly in our own homes, schools, offices, hospitals, libraries, and communities, a major change would be under way. The worst thing we can do is to ask too little of the future—and ask too little of ourselves in determining the future.

We believe that Ellul and other cultural critics are deeply pessimistic because their analyses are of whole systems—macrolevel processes that indeed seem impenetrable. As sociologists and political scientists, they are trained to look at the biggest picture possible. This is a wonderful gift and a very useful thing to do. But it is not the only way to see. Using anthropological methods and perspectives, we have looked "on the ground" at small social groups to find out what they are doing. Looking "in the small" can provide inspiration and practical ideas for how to change our own ecologies for the better. We see local participation as a viable point of intervention in a larger system that does, from many vantage points, seem to have its own agenda, as Postman says.

Rather than *resistance* we prefer to speak of *engagement* and *participation*—specifically, engagement and participation in our own information ecologies. Rather than individual heroics in the gynecologist's office or on the factory floor (à la Foucault), we advocate collective participation in socially shared and valued activities. While there are certainly times when resistance is appropriate, it is not enough, and we advocate taking the longer view involving the work of collective, ongoing *construction* of enduring information ecologies. The technology might be high or low; it should fit the needs of the ecology as determined by the members of the ecology.

Of course the problem of the pervasive, distributed technologies such as automobiles will continue to bedevil us, because they depend on a broad infrastructure and resist situation-specific adaptations. We must say more here about what we mean by participating in *local* information ecologies. "Local" is a relative term, relative to the specific individuals in an information ecology and their own spheres of *influence* and *commitment*. A head of state has a wider sphere of influence than a schoolchild. But each can speak up in his or her own ecology. Spheres of influence change over time, contracting and expanding. With pervasive

communication technology, it is no longer appropriate to speak of a physical geography as providing a defining boundary (though it might). Local is now defined by influence in an ecology—which comes from participation and engagement—and commitment to a set of shared motivations and values.

Healthy information ecologies take time to grow, just as rain forests and coral reefs do. An information ecology begins with our own efforts to influence the shape and direction of the technologies we use and the settings in which we use them. We urge people to get involved in the evolution of their information ecologies—jump into the primordial soup, stir it around, and make as many waves as possible.

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Values and Technology

In early 1997, pictures of Disneyland visitors in various stages of undress appeared on a number of Internet sites. A video camera mounted inside the Splash Mountain ride takes souvenir pictures of riders as they plunge down the five-story watercourse. The pictures are offered for sale to riders as they exit the ride. Some Disneyland veterans know when the photos are taken and pose for an "R-rated memento from the G-rated Magic Kingdom," as our local newspaper put it.

Disney owns the photos. Unbeknownst to Disney, a park employee (or employees) posted the pictures to the Internet. They have circulated at a number of sites. This incident raises the question: Is anyone's privacy being violated from the dissemination of the photos on the Internet? The park visitors willingly posed, they knew they would not own the images but would only be given a print of the photo, and they were aware that park employees would see the photos.

While Disney could sue the perpetrators, they have not chosen to do so. The rationale is that no money is being made from posting the photos. And indeed, why not post the photos more publicly? Where exactly are the boundaries of privacy to be drawn? Does Disney have an obligation to provide privacy for its visitors? Or should visitors assume that if their picture is taken, it is fully public? With the ubiquity of video cameras and the possibility of easy publication of images to a worldwide audience, privacy issues are more complex than ever.

The Disney example is an amusing instance of much more serious privacy problems raised by technology. For example, should the Internal Revenue Service and the Department of Motor Vehicles share data with other government agencies and private companies, as they have discussed