How the ecological metaphor involves constraint as well as insight.

At the Heart of Information Ecologies: Invisibility and Technical Communication

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Abstract

The ecological metaphor for technological systems provides a useful supplement to others dealing with the question of human control over technologies. However, it fails to develop adequately its own reliance on communication as the means whereby human values may be embedded in technologies, or to recognize the role of professional communicators in that process.

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Bonnie A. Nardi and Vicki L. O'Day (1999) describe themselves as "critical friends" of technology and their book as "an attempt to engender a public conversation" that will engage critically with the role technology plays in our lives (p. ix). Their self assessment is clearly accurate, and the mission of the book largely accomplished through a reasoned and intelligent style that makes the sometimes dense theoretical discussion they take on accessible to those previously outside that conversation. Their metaphor of technological systems as "information ecologies" is deliberately crafted to emphasize the importance of the needs and values of what we could call a "local habitat" to the design and use of interrelated technologies. In fact, that is what they see as using technologies "with heart"—"apply[ing] human values to the development of…practices and technologies" (p. 211). What is surprising about this book, given its emphasis on the importance of communication to this mission, is its failure to see the role of technical communicators in this process or, indeed, to see technical communicators at all.

Or is it? Nardi and O'Day themselves point out on several occasions the invisibility of the essential functions carried out by what they define through their ecological metaphor as keystone species, individuals (or roles) whose presence, they assert, "is crucial to the survival of the ecology itself" (p. 53). The authors describe such species as support personnel who may function as translators, facilitators, or teachers and add, "[i]ronically, their contributions are often unofficial, unrecognized, and seemingly peripheral to the most obvious productive functions of the workplace" (p. 54). If you recognize yourself in this description, please raise your hand. Or better yet, raise your voice. Nardi and O'Day, as perceptive as they are and as interested in promoting communication and local technological values, fail to see and thus never consider the critical role technical communicators can (and do) play in carrying out a mission based largely in communication about technological values.

This lapse is perhaps not surprising. The authors are researchers trained in anthropology and computer science, respectively, who are

interested in the design and use of technological systems in small-scale, local contexts. Like many outside the field of technical communication, they seem unaware of the roles technical communicators take on beyond the creation of what can be characterized strictly as the "documentation" of computer systems and software. The theoretical discussion they enter has only fairly recently been taken up by technical communication scholarship itself (Robert R. Johnson's 1998 *User-Centered Technology* provides an example of a limited group). They therefore concentrate their efforts on providing a comprehensible survey of scholarship that speculates about our ability to control our own technologies, and follow that discussion with ethnographic studies of technologies and people at work, together, in several sites. The result is thoughtful, readable, and well worth the time of technical communicators willing to take on the work that Nardi and O'Day see as crucial to healthy information ecologies.

In their introductory chapters the authors provide a survey of theoretical work by such writers as political scientist Langdon Winner, sociologist Jacques Ellul, and MIT's Nicholas Negroponte. They do a good job of bringing this high-level discussion to a point "on the ground" and "in the small," a scale that they suggest can bypass or alleviate both undue pessimism and optimism that can result when technology is contemplated on a grand scale (p. 57). The optimistic technological utopia Negroponte describes in *Being Digital,* they point out, misses the social meanings that technological artifacts carry as it describes a world of uncomplaining technological servants (p. 20). Nevertheless, Ellul's *Technological Society*, envisioning a world dominated by an unadulterated efficiency that overtakes all other human values, they find needlessly pessimistic (p. 34). Winner would probably

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be disturbed, though not surprised, to see his own work in *Autonomous Technology* characterized as calling for us to "slam on the brakes" (p. 210) in order to dismantle certain technologies, a process he suggests take place not physically but theoretically, "as a method of inquiry," in order to estimate the impact their actual absence might have (Winner, 1977, p. 330). What Nardi and O'Day want to do is to make a space for a rather vast middle ground, one that recognizes the very real social implications of technology design but sees in those implications the opportunity to embed local values in technologies through the design process.

It is the metaphors offered by thinkers such as Negroponte, Ellul, and Winner that, these authors say, are inadequate to the task of defining and occupying that middle ground. Conceiving of technologies as tools, in Negroponte's vision as simple means to rather simple ends, they rightly point out leads to a failure to see the ways that those "tools" neglect human values or embed their own. Relying on Donald Norman's *The Design of Everyday Things*, they note that while the human-machine relationship described by the metaphor of tool use does remind technology designers that "there is someone on the other end," it often does not take into account the context in which that someone is attempting to work (p. 30). In similar fashion a metaphor they attribute to Ellul, of technology as a "text," while it does take that context into account, fails in their view to notice how human values are involved in actions and interactions with technologies (p. 33). The most extensive and useful metaphor they report, technology seen as a system, they still find inadequate, claiming that Winner's systematic account fails to recognize the possibility that users of technology may be forces for technological change (p. 43).

It is as an alternative, then, to those technological metaphors that Nardi and O'Day offer their view of technologies as information ecologies, as systems of "people, practices, values, and technologies in a particular local environment" (p. 49). This metaphor, they explain, has a number of advantages over the others, including its ability to recognize the diversity of technological systems and the potential for change in localized contexts. If we view such systems as ecologies, they say, we no longer need to resist technologies, as Ellul and others urge, but to engage in and participate with them (p. 57).

As Nardi and O'Day point out, the choice of metaphor is significant because metaphors by their very nature both channel and limit the ways we think (p. 25), thus suggesting certain avenues for action while closing off others (p. 43). Their own ecological metaphor, despite the advantages they claim for it (advantages that much of their analysis demonstrates) similarly restricts their vision in a number of ways. The "ecologies" they examine are presented as givens, as supposedly revisable systems made up of components whose origins they do not question and whose design they thus automatically accept. To put this point into their own ecological terms, Nardi and O'Day seem to see only those species or technological components that currently exist in the ecosystem, failing to dip into the murky primordial soup of the design process that generated those species and components. This vision generates a tendency to slide into a naturalization of technologies that accepts their current configurations as natural or inevitable, and that thus occasionally leads to a bit too much technological optimism. For example, if "gardeners," those informally helpful co-workers the authors identify and that I discuss further below, are "an evolutionary outcome of the intensive use of software systems over time" (p. 151) there is no urgency for an employer to create or reward them, and attempts to do so might even be characterized as artificial interference with the "natural" system. And if diversity is "inherent" in the Internet (p. 186) then we need not worry about equalizing access, and giant e-businesses like Amazon.com and Virtual Vineyards need only draw on the "natural strengths" of the net in order to construct themselves as "neighborhood stores" from an earlier era (p. 193), a questionable characterization of today's e-commerce.

The authors, to their credit, are fully aware of the issues of access that limit the participation of many groups on the Internet. What they don't seem to be aware of, however, is that mere access to the Internet is not automatically empowering. Noting the "many choices" available to participants in virtual communities, they fail to note that the range of choices has been determined not by the participants but by the design of the technological system. Their claim that the software used to create an online community in a California school "is a social setting that feels like a warm, supportive, living community" (p. 116) misses an important point made by Stephen Doheny-Farina in *The Wired Neighborhood*, where he mourns that very "virtualization of everyday life" (1996, p. 7) and warns that this ever increasing trend can have dire consequences—increasing specialization and individuation that can erase or ignore differences, the undermining of physical, geographic communities (1996, p. 50-4). In fact, their natural metaphor even leads the authors to a limited view of the "end users" of technologies, for though they advocate involving some of them (librarians, particularly, but also teachers) in technological design processes, they leave to an "organic growth approach" the job of bringing the teachers' students (and, presumably, the librarians' clients) into that design process through the users' tinkering with and developing features not anticipated by the teacher-designers (p. 134-5).

If we keep that caveat in mind, there is much to learn from Nardi and O'Day's description of technologies as elements of information ecologies that also consist of people and practices. In their later chapters they provide some interesting and detailed illustrations of their metaphor through portraits of particular ecologies. An elementary school's use of the World Wide Web to link children with senior citizens in online chat rooms, and a high school's digital photography class, illustrate how educational

values can be designed into a network; a hospital's poorly thought-out installation of an operating room audio and video monitoring system provides an example of a dysfunctional ecology gone haywire due to lack of communication about local privacy and teaching values before the project's design and installation. Two chapters, however, are of particular interest to technical communicators: Chapter 7, where the authors describe the work of research librarians at Apple and Hewlett-Packard as an illustration of the crucial concept of "keystone species," and Chapter 9, which describes the very similar work of "gardeners," people who take on the frequently informal role of teachers and facilitators of technologies in their worksites.

As so-called keystone species, the librarians at Apple and Hewlett-Packard resemble nothing so much as technical communicators. Relying on their ecological metaphor, Nardi and O'Day describe as "keystone" those species whose disappearance would have a ripple effect, bringing down other species and entire ecosystems with them (p. 79). Such species, they say, are not necessarily immediately identifiable, in part because in technological systems as well as in biological ones the work of keystone species tends to take place quietly, or in the background. This was the case, they say, with the librarians they studied and interviewed whose work involved in large part "bridg[ing] gaps in language and expertise" between individuals with research needs and the publishers of the information they were seeking (p. 84). Technical communicators may recognize themselves in this description and appreciate the authors' realization that the librarians' services required not only technical expertise with search tools but also knowledge and understanding (p. 94) of the information they retrieved (and then "weeded" before handing the results to clients).

In Johnson's terms, the librarians were not only users of technologies but also makers of knowledge who have a role to play as citizens in a larger technological order (1998, p. 46), in this case in an information ecology that would have literally collapsed without their skill and knowledge. Key to the entire process of conducting research was communication—about the users' needs, about the capabilities and limits of the technologies, and about the substance of the information sought and found. In fact, Nardi and O'Day refer to the librarians' informal client interviews as "information therapy," and note that it is through this communication process that the librarians could not only learn how their clients intended to use the information they wanted but also help those clients refine their articulation of their own research needs (p. 89). Characterizing the librarians ultimately as experts and guides, they realize that "such guides will be keystone species wherever they are found" (p. 104).

Nardi and O'Day found more such guides everywhere they looked though, as I have noted, their ecological metaphor and professional backgrounds limited the range of their vision to settings and processes where those who function formally as communicators were least visible. Mixing metaphors a bit, but only a bit, they identified a species they referred to as "gardeners," individuals who were able and willing to "translate concepts and mechanisms back and forth between the domain of the work [at any given work site] and the technology itself" (p. 141). Neither outside consultants nor professional programmers, gardeners are people who like to tinker (generally, it seems, with computers) and are willing to informally train others at work to use the technologies on-site, from answering questions, to creating macros and scripts, to helping to set standards for terminology and documentation (p. 143). The importance of communication to the gardening role is apparent in the authors' description of it. Gardeners, they say, "have a unique set of skills, because they can speak more than one language—the language of the work domain (such as engineering or accounting) and the language of the technologies and tools" (p. 145). A "gardener" named James underlines the point, noting that a gardener "[has] got to be able to communicate…, to be able to speak the language of the end user" (p. 146).

Gardeners may differ from people hired specifically as technical communicators in that they are "domain experts" trained primarily in the major work of the site, though many technical communicators either arrive with or acquire a great deal of domain-specific knowledge. Technical communicators may ruefully recognize the words of one such domain expert and gardener who, describing his "affinity for technical things," declared "I don't read manuals" (p. 150). Like many, he turned to the manual only when "stumped."

This inauspicious comment is the only recognition of the function of traditionally conceived technical communication in the book, yet the crucial role of communication more generally is everywhere apparent. The plight of the librarians, the majority of whose work was conducted invisibly, reminds me of the plight of technical communicators who may still find that their work is undervalued or considered peripheral to the "real" job of their workplaces, despite the trend in much technical communication scholarship to stress that technical communicators do not simply convey information created by experts to a group of uninformed or non-professional "others," but participate in the making of knowledge themselves (Lutz and Storms, 1998, p. ix). Thus gardeners are conceived in the ecological metaphor as "translators," itself a metaphor that generally stresses not the making of knowledge but the necessity of transmitting from one forum to another with the least interference possible, invisibly.

I should note here that the authors characterize the invisibility of the librarians' work as such by design rather than by accident (p. 82), part of a strategy we might think of as making a difficult feat look easy (itself a strategy that in the case of professional athletes yields much monetary benefit but that in the case of technical communicators promises a less certain outcome). Gardeners seem to receive uneven benefits as well, with some performing the function informally and others receiving formal recognition for the contributions they make to their local ecology. Formally rewarded

or not, they perform what Harrison and Debs (1988) have described as a "boundary spanning" function typical of technical communicators and others who must serve as intermediaries between groups of workers or between workers and their technologies. Once again, the gardener James makes it specific, noting that an effective gardener is "like a cross between both worlds" (p. 145).

Nardi and O'Day's suggestion that the librarians' role be expanded to include their participation in the evaluation and design of research software (p. 97) reminds me of much current work that advocates involving technical communicators and users in the same process. Norman's work, for instance, calls for technological design to incorporate what he calls mental models, "the models people have of themselves, others, the environment, and the things with which they interact" (1988, p. 17). But Norman's model of the design process makes visible the gap that Nardi and O'Day want to fill, a gap apparent in his statement that the users of any technology and its designers "communicate only through the system itself: its physical appearance, its operation, the way it responds, and the manuals and instructions that accompany it" (1988, p. 190). More radical work, such as Johnson's, argues that users and designers need to communicate directly, that unless technologies "fit into the active situation of the user [they] will never be used" (1998, p. 83). For Johnson, it is the technical communicator who is most likely to bridge the gap between users and designers; for Nardi and O'Day, how that bridge will be crossed is not clear because they never really come to it.

Nevertheless the message—if not the means—is clear, and it speaks directly to technical communication as a field and to technical communicators as members of information ecologies. It is through communication, through a public conversation, that we may best participate in the technological order we live in, and it is through that process that we may avail ourselves of the opportunity not only to voice local values but to embed those values in the technologies we use. It is

unfortunate that the very heart of the solution this book endorses remains invisible to its authors, but they nevertheless present technical communicators with a role in the technological design process, a rationale for their importance to that process, and an opportune moment in which to act.

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