

Information Ecologies : Using Technology with Heart (1999). Bonnie A. Nardi & Vicki L. O'Day. Cambridge, MA: MIT Press. xiv, 232 pages. ISBN: 0262140667

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This book elaborates several issues of importance for the field of educational technology. What is technology? How can we understand and interpret arguments about positive and negative effects of technology? What difference do people make in how technology is used and how it impacts them? Bonnie Nardi and Vickie O'Day¹ address these questions in three ways: 1) Through a review of different metaphors which have been used to understand technology; 2) By delineating a middle ground – the information ecology - from which to understand and use technology; and 3) By illustrating through case studies what that middle ground means in practice.

Nardi and O'Day start the book with a look at technology through the message of the 1927 Fritz Lang film, *Metropolis*. In this futuristic story, the troubled relationship between man and machine is examined. Who is better suited to do the work of the world, man or machine? *Metropolis* paints a picture of a world where machines are doing much of the work, but mankind is worse off. In a sense, mankind has lost control to the machines that were supposed to make life better.

This familiar struggle is revisited in literary classics such as Kurt Vonnegut's *Player Piano*, popular movies like *The Matrix*, and a recent wave of "cyberologists"² writing about the future of humans in the age of the Internet. In these and other popular depictions, technology is portrayed as magnificent and simultaneously villainous, hurdling the human race irreversibly toward an inevitable, though unknown, future. People are

cast as the unwilling victims or the unsuspecting beneficiaries of the inevitable march of technology.

Not so, Nardi and O'Day argue. We have the ability and perhaps the responsibility to design technology in practice – through use in our particular circumstances. The users of technology are in fact designers, making decisions about its use, whether consciously or not, which ultimately determine its role and value. The rest of the book is dedicated to making this argument.

Metaphors. First, Nardi and O'Day provide a sensible and compelling review of the various metaphors we use to think about and describe technology – technology as tool, as text, as system, and as ecology:

“Metaphors matter. People who see technology as a tool see themselves controlling it. People who see technology as a system see themselves caught up inside it. We see technology as part of an ecology, surrounded by a dense network of relationships in local environments.... Metaphors matter because they suggest particular avenues for action and intervention. Tools offer certain kinds of participation to their users, as texts do for their readers,” (pp. 27, 43).

In this discussion, Nardi and O'Day explain the metaphors through some of the important literature of the last century which dealt with the nature of technology. The list of authors they explore includes Norman and Gibson in the discussion of technology as tool; Latour and Callon, technology as text; Ellul and Winner, technology as system.³ Although brief, this discussion gives a reasonable introduction to philosophies of technology, and provides a starting point for those who might want to read more.

The Information Ecology. Second, Nardi and O'Day lay out a middle ground – between “technophilia and dystopia” – for understanding and using technology, arguing that technology is not purely good or bad, and neither is it merely neutral. Rather, it is defined in use, in interaction with the information ecology in which it resides. Its success or failure, its goodness or badness, are not a forgone conclusion merely derived from characteristics of the technology, but a product of decisions and actions made by the people who use it. This middle ground they describe metaphorically as an information ecology.

The idea of an information ecology – “a system of people, practices, values, and technologies in a particular local environment” (p. 49) – focuses on five defining characteristics. An information ecology is a system, with a diversity of people and tools which change or coevolve over time and through use. It is “marked by the presence of certain keystone species whose presence is crucial to the survival of the ecology itself,” (emphasis added, p. 53) such as librarians, or teachers, or even the precocious teenager who keeps the network running. Finally, it is defined by its locality, the most important and difficult characteristic to grasp. Locality is fundamental to their argument that technology is only fully defined once it is in place and in use in a “local habitation.” “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,” (emphasis in original, p. 55).

In this metaphor, technology is seen as but one element in an evolving and participatory environment. People decide what to do with technology and how to use it in light of their ongoing practices and problems. Technology offers characteristics and affordances that can be interpreted and used in vastly different ways and with widely varying results.

Case Studies of Technology-in-Use. Finally, the authors illustrate the ecology metaphor and its usefulness in exploring the middle ground through case studies of technologies in use in a variety of settings, both educational and commercial. One case illustrates a failed technology – an operating room in a teaching hospital - in which the technology was used in ways that alienated people and changed work practices for the worse. Another case illustrates the sometimes invisible work of a keystone species – the reference librarian – in two corporate cultures. The librarians take on roles which may become more important as technology is woven into the fabric of corporate life, even as their work remains hidden to their public. A third case shows how a particular keystone species – named the “gardener” by Nardi and O’Day – bridges the gap between technology and users in a variety of settings. Gardeners help the information ecology grow and evolve by virtue of their technical expertise and their relationships with other users. They are the local experts who care about both the technology and the work practices and people.

One case of special interest and relevance to educators describes a digital photography class in a high school art curriculum. In this class, the teacher kept her focus on the art. The authors point to this as a critical decision by the teacher, one that marked this classroom as different from others in the same school where the focus turned

away from the subject and toward the technology. "Information ecologies support real human activities. They are not about technology for technology's sake. Nearly all of the students who took the Digital Photography class were more interested in photography than computers.... Some students were pleasantly surprised at how much they enjoyed the digital aspects of the class," (p. 160). Two other aspects of this information ecology stood out: the teacher provided "a structured curriculum in which students were not just expected to 'get it' without systematic instruction [about how to operate the computer]"; and the teacher "did her work in a diverse information ecology in which she herself was supported amply in installing and maintaining the equipment...and in getting help with technical matters whenever she needed it," (p. 160). The authors illustrate these points with compelling descriptions of the class in action. In the end, Nardi and O'Day conclude:

"We believe it is easier to find teachers who can grow technically than to find technical people who will somehow come to understand the pedagogical issues that confront teachers. Teachers understand the needs and habits of young people, the pace of a school day and year, activity flow, and student attention spans. They understand how to manage the zillion pieces of the puzzle that make a classroom work: sign-up sheets, contracts, handouts, grouping of students, assessment, communication with parents, and many other things. Just as we saw gardeners forming crucial links between their co-workers and the capabilities of the tools they were using, teachers are the natural bridge between students and technology," (p. 168).

The point is that the technology is used here in a way that supports and enhances the educational substance of the class. It is neither an add-on used to catch the interest of

students, nor a replacement for other substantive elements of the class. The teacher, experienced in her field and familiar not only with art but with pedagogy and students, functioned as a keystone species as she kept the focus on photography while using authentic tools of the trade as she might use other photographic technologies.

The Heart Part. The subtitle of the book is “Using Technology with Heart.” Where does the heart part come in? Nardi and O’Day themselves seem to be passionate supporters of technology, but not of technology for its own sake. Their heartfelt plea is that we all approach technology with our hearts as well as our heads, to consider and decide how to use it in our lives. The heart part is a appeal to the reader to take seriously the value of emotion, affect, and human relations in making decisions about technology, and the need to make those decisions.

"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," (p. 55).

What does this mean for education and for educational technology? In some respects, this is not news: that teachers and students adapt technologies to their particular circumstances has been documented repeatedly.⁴ Nonetheless, some educational technology designers continue to use design methods which preclude adequate consideration of what happens in real classrooms with real teachers and students. In some ways, the idealization of design is sensible – if the software is well-designed for

some imaginary ideal situation, perhaps it stands the best chance of being used well in real classrooms. This approach seems to assume the metaphor of technology as tool. If the tool is well-designed, it can, and perhaps will, be well-used. Nardi and O'Day's approach provides an alternative: a framework for designing for a (classroom) information ecology, anticipating the diversity of users and uses, the evolution of the ecology over time, and the variety of local conditions which come into play. For education, this is a reminder that technology in schools is not just about what happens between a student and a machine.

In many ways, this eloquent book seems to offer a simple and straightforward perspective on technology in a variety of settings. A closer reading, or for this reader, a second reading, reveals careful and thought provoking ideas about the nature of technology and its relationship to humans. Nardi and O'Day, trained as an anthropologist and a computer scientist respectively, think first about people rather than technology; use rather than features; and taking responsibility for change and evolution rather than accepting or yielding to an inevitable force. Their book is well worth a careful and open-minded reading and re-reading. The language is clear and simple; the ideas are deep and powerful.

¹ For more information about Bonnie Nardi and Vickie O'Day and about the book itself, see the book Web site: <http://www.calterra.com/infoecologies/>

² "Cyberologist" seems to be a new term applied to the technology gurus whose work tries to ferret out the implications and future of digital technologies. My introduction to the word came in a piece by

Carlin Romano in the *Chronicle of Higher Education* (“Gutenberg's revenge.” Chronicle of Higher Education XLVII(21): B11.) Cyberology is a specific kind of futurology, focused on cyberspace.

³ For example, they cite Michel Callon (1992), *The dynamics of technoeconomic networks*, in Technological change and company strategies, R. Coombs (ed), London, Academic Press; Jacques Ellul, (1964). The technological society. NY, Vintage Books; James J. Gibson, (1979). The ecological approach to visual perception. Boston, Houghton Mifflin; Bruno Latour, (1995). *Mixing humans and nonhumans together: The sociology of a door-closer*, in Ecologies of Knowledge, S. L. Star (ed), New York, State University of New York Press; Donald A. Norman, (1986), The design of everyday things, New York, Doubleday; Langdon Winner, L., (1977), Autonomous technology: technics-out-of-control as a theme in political thought, Cambridge, MA, MIT Press.

⁴ For some discussion and examples of this phenomenon, see Cohen, D. K. (1988). *Educational Technology and School Organization*. In R. S. Nickerson & P. P. Zoghbiates (Eds.), *Technology in Education: Looking toward 2020* (pp. 231-264). Hillsdale, N. J.: Lawrence Erlbaum Associates; Edelson, D. C. (1998). *Realising authentic science learning through the adaptation of scientific practice*. In B. Fraser (Ed.), *International Handbook of Science Education* (Vol. 1, pp. 317-331). Dordrecht, The Netherlands: Kluwer Academic Publishers; Fisher, C., Dwyer, D. C., & Yocam, K. (Eds.). (1996). *Education and technology: Reflections on computing in classrooms*. San Francisco: Jossey Bass Publishers; Reiser, B. J., Spillane, J. P., Steinmuller, F., Sorsa, D., Carney, K., & Kyza, E. (2000, June). *Investigating the mutual adaptation process in teachers' design of technology-infused curricula*. Paper presented at the International Conference of the Learning Sciences, Ann Arbor, MI.