From

Norman, Donald, *Things that make us smart*.

**A Human-Centered Technology**

The good news is that technology can make us smart. In fact, it already has. The human mind is limited in capability. There is only so much we can remember, only so much we can learn. But among our abilities is that of devising artificial devices – artifacts – that expand our capabilities. We invent things that make us smart. Through technology, we can think better and more clearly. We have access to accurate information. We can work effectively with others, whether together in the same place or separated in space or time. Three cheers for the invention of writing, reading, art, and music. Three cheers for the development of logic, the invention of encyclopedias and textbooks. Three cheers for science and engineering. Maybe the bad news is that technology can make us stupid. The technology for creating things has far outstripped our understanding of them. Things that make us smart can also make us dumb. They can entrap us with their seductive powers – as with commercial television – or frustrate us through their artificial complexity. Television has the power to entertain, we are told, but does it? Peer into the nation’s living room in the evening and see the stultified masses, glued to their television sets. Television has the power to inform, we are told. The average television viewer in the United States watches twenty-one thousand commercials per year. News of the world is reduced to a few minutes per topic, each starting with the obligatory “reporter on the scene,” where the reporter stands in front of some “local color,” a background scene with appropriate sound and view to establish the fact that the reporter is actually there, followed by a few hundred words of text. A few hundred words of text. That is less than is on this single page. It would be only a tiny newspaper article, and even long newspaper articles are but brief summaries of complex events. Is this the kind of informing we had in mind?

Companies and homes are inundated with new artifacts, new technologies. The artifacts come with buttons, lights, and display screens. The old days of audiovisual presentations have given way to the new days of interactive multimedia in which computers merge with television, merge with the telephone. New forms of media are being invented, new methods of communication, of education, of entertainment, and of doing business. New consumer goods invade the home. All the ailments of the past, it is claimed, will disappear once these new approaches are in place. Are you dissatisfied with the school system? Don’t worry, for now the science museums and school systems can use interactive, multimedia video computers and other fancy technologies to entrance the student. Every home will want to have one. Every office. Entrance the student? Entertain? Does entertainment make us smart?

I am a cognitive scientist, interested in the workings of the mind. My most recent research has concentrated upon the development of tools that aid the mind – mental tools I call “cognitive artifacts.” My original goal in writing this book was to discuss how these tools work, what their principles were in adding to our mental abilities. Along the way, however, my studies caused me to question the manner by which our cognitive abilities are, in turn, manipulated by the tools cognition has helped to create.

We humans have invented a wide variety of things to aid our cognition, some physical, some mental. Thus tools such as paper, pencils, calculators, and computers are physical artifacts that aid cognition. Reading, arithmetic, logic, and language are mental artifacts, for their power lies in the rules and structures that they propose, in information structures rather than physical properties. Mental artifacts also include procedures and routines, such as mnemonics for remembering or methods for performing tasks. But whether physical or mental, both types of artifact are equally artificial: They would not exist without human invention. Indeed, anything
invented by humans for the purpose of improving thought or action counts as an artifact, whether it has a physical presence and is constructed or manufactured, or whether it is mental and is taught.

The technology of artifacts is essential

For the growth in human knowledge and mental capabilities. Think of where we might be without written history or without the development of logic, arithmetic, or skills of reasoning. Artists and musicians have often been the first to push new technologies, to explore their potential for enhancing our perceptions. But technology can enslave as well. It can be used as a drug, diverting people from more productive pursuits. Technology also gives power to those who have it, thereby disenfranchising those who do not.

I recently acted as a consultant to a company (which I am not allowed to name) that invited a group of people together to discuss an ambitious, large project (which I am not allowed to describe). Most of the people were noted film and television directors, producers, and writers. They told some of the methods they employ for inducing tension, horror, and excitement in their audiences. I was impressed.

I was entertained and enthralled by these people. Afterward, I eagerly watched some of their television shows and movies. These were bright, educated, intelligent individuals. I expected educated, intelligent television and films. Alas, the shows and movies were disappointing. What they demonstrated was yet another dumbing of the audience, yet another way to keep people trapped in their homes for hours a day, glued to the never-ending stream of entertainment on their video screens. In the case of the new technology I was being asked to give advice about, there was to be yet an even higher-technology means of entrapment.

Were the television shows and films clever? Yes. Engrossing? Sort of. Edifying? Enlightening? Informing? Absolutely not. Yes, if I watched the techniques, I could see the brilliance, but mostly aimed at keeping the action moving, at capturing and maintaining the viewer’s attention. Yes, there were clever subtleties in the actions and settings, but mostly in the background and as asides to the main scenes and story lines.

The more I thought about the plans I had been asked to advise on, the more I thought them wrong. Not just wrong, but harmful. Yet another means of reducing the intelligence level of the watcher. Another way to make people willing victims of an increasing stream of commercials. But now high-technology commercials, ones that interacted with you, that got you to commit yourself and your credit card number even as you watched. Actually, you probably wouldn’t even have to tell the system your credit card number: It would already know the number. It would know more about your likes and dislikes, personal activities, and bank accounts than you would realize, perhaps even more than you yourself would know. Was this the promised land of the new technology?

Howard Rheingold – writer, author, and editor of the Whole Earth Review – started a speech by telling us that he was an addict. He was hooked. He needed his daily dose, else his body rejected life and rebelled. Worse: He was also a pusher. He pushed his addiction on everyone he met, starting with his own family. Rheingold was a technology addict, a technology pusher. Television, computers, electronic games, household appliances. The electronic networks of the world brought thousands of mail messages and electronic bulletin boards daily to his computer screen. He communicated for hours a day with friends he had never met.

“But,” Rheingold now tried to assure us, “I am aware of my addiction, aware of the dangers that it brings, the neglect of home and family that it causes.” “Am I addicted?”
I asked myself, listening to the talk. My home not only has computers, it has a computer network. I use electronic mail a lot. Perhaps it is actually using me: I get almost twenty thousand electronic mail messages a year. Rheingold was now reformed, but not yet free of the addiction. And like most newly reformed addicts, he proselytized many cures. He questioned the cause of his addiction, crusaded even, enlisting the old-fashioned technology of books against the new-fashioned technology of computers and communication.

I went out and bought the book Rheingold said had finally brought him to his senses, Jerry Mander’s In the Absence of the Sacred. I read the book and, just as Rheingold would have hoped, got depressed. Demoralized, but not entirely convinced. Mander thinks the negative side of technology is bad enough that much of it should be abolished. I think the positive side is good enough to keep, to cherish, to be expanded. I don’t think we disagree about the potential benefits or perils. The difference is that he thinks that today the negative outweighs the positive.

I remain more optimistic.

I maintain that much of our human intelligence results from our ability to construct artifacts. Yes, we humans have capable brains, but our brains are limited in power. But we, unique among all the animals, have learned how to overcome our limitations. We have invented tools that make us stronger than the unaided body would otherwise be, faster, and more comfortable. Our inventions warm us, clothe us, and feed us. Our technologies also make us smart: They educate and entertain us. Only the most rabid antitechnologist among us would want to do without clothing, shelter, and heat. Who would be ready to give up language, reading, and writing? What about arithmetic or simple tools? Why are some of the artifacts of technological development thought to be beneficial, others not?

Perhaps it is because technology has developed by accident. That is, technology has not been planned, it just happened. It started off slowly, with the use of simple tools in the wild. Modern humans made more complex tools than any other animal, more complex than Neanderthals or other hominids that preceded us. Whereas apes might trim a branch to make it into a probe for insects or use rocks to pound and break, modern humans learned to shape rocks into cutting instruments, then to tie the rocks to sticks to form spears. Eventually, modern humans learned to make clothing, to control fire, and from fire, they learned to extract metals from rocks and shape them into tools.

Although these early attempts to make tools and clothing were simple by modern standards, they were sufficiently complex to require a specialization of effort. The tools used for mining, metalworking, and carpentry are different from those for hunting, farming, cooking, and making clothes. Moreover, the skills and knowledge needed to use these tools efficiently are vastly different. As a result, from the natural, unplanned development of tools came specialization in tool-making. Those who were good at making one class of tools were distinguished from those who were good at making another class and, in turn, different from those skilled at using the tools. Those who were better at observing than hunting might stare for weeks and weeks at the sun, moon, and stars, apparently shirking their share of work, but also learning how to predict the seasons of the year, the good times to hunt, to plant, and to harvest. Each new advance of technology added to the powers and abilities of human society; each new advance also added to the amount of knowledge that newer generations would have to learn.

Each new discovery changed society to some extent. The background knowledge required more and more learning, thereby leading to more specialization. Cultural groups who had the most technology enjoyed some benefits over those who had less, so over the thousands of generations that human society has existed, power naturally drifted toward those with the most advanced technologies. Each technology added to the human ability to produce yet more technology; each required more and more skills to master, more and more
schooling, more and more specialization. This means that society became divided into groups of those with some specialized knowledge and abilities and those without. But none of this was planned. The implications were not clear to the inventors, the developers, or the promoters.

I am not the first to have pondered the duality of technology. But unlike many of those who have preceded me, my goal is to increase the general understanding of how these technologies of cognition interact with the human mind. Some critics of technology hold it responsible for much that ails modern society; they hold that technology inevitably leads to problems. I do not share these views. I believe that although technology has indeed contributed to many of today’s problems, a perverse outcome is not inevitable. Technology, after all, has done much to benefit humankind. Some aspects of technology enhance life even as others diminish it. If we learn the reasons for and the properties of these various technologies, then maybe we can control the impact. So, yes, I am delivering a message of warning, but one accompanied by hope, not despair. (Don Norman, pp. 531-538)