Politics, Technology, and Values
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When I taught computer aided design during the late 1980s and early 1990s, I began each course by listing the technological values that each student would have to adopt if s/he was going to be a successful drafter, designer or CAD technician. These were the values the students had to articulate if they wanted to pass the course:

- Neatness and Clarity
- Accuracy and Precision
- Flexibility
- Control
- Speed
- Standardization
- Comprehensiveness

I was militant as I pointed to these values on the board and explained the industrial context of drafting and CAD, pounding the podium to get the points across. The fact was that students had already been socialized in the practice of these values. Living in a technological culture, they were immersed in these values as consumers. Now, as far as I was concerned, they were producers and had to articulate the values in their products and skills. When I assessed the processes and products, or skills, of their work in the course, I would write NEATNESS –2 across messy drawings to indicate the emphasis placed on these values. Their drawings and design expressed degrees of neatness, clarity, accuracy, standardization and comprehensiveness and I marked accordingly, deducting points for misapprehending the importance of these values. Even the CAD drawings could be messy, although neatness and accuracy were automated in the CAD software we used. The values were embodied by the software, written deeply into the programming code.

For those who argue that technology incorporates values, or that technologies have particular values built into them, AutoCAD is a primary example. AutoCAD made the values of control, flexibility and speed explicit. For example, control is automated and much of the students' own locus of control has to be surrendered to the application. The students struggle to give up control and feel extremely frustrated when AutoCAD will not let a command or solution be operationalized. Often, the resolution of this struggle comes down to a contest of wills: the student's will versus the will of AutoCAD. I saw some threatening gestures, but usually the will of AutoCAD triumphed.

My courses were merely a subculture of the larger technological culture in which we find ourselves. The values that I emphasized are articulated daily in our lives. Some say this is unavoidable given that we are basically cyborgs in our close relationships with our technologies. Isolated and disaggregated in individual schools, technology courses, offices and factories, these values may not be a problem. Aggregated across all students and workers of technology, and all factories and offices, these values are concentrated, intensified and magnified. In fact, some analysts note that modern life is marked by a range of values that are realized when we aggregate our technological practices. In addition to the values that I emphasized, modern technology is characterized by the following values (Sullivan, 1987):

- Power
- Concentration
- Centralization

- Intensification
- Magnification
- Finality
- Persistence

- Scale (Expansion and Miniaturization)
- Scope (Convergence and Integration)

We value expansion and miniaturization, for example. Scale refers to size, and contemporary technology extends scale in two directions. Larger and larger technological complexes mark our landscapes, and the concentration of power intensifies our relationships with the environment. Smaller and smaller scales of technology, miniature electronics and nanotechnology, define the trend in digital and biotechnologies. Scope refers to the convergence of technologies and the integration of technologies into every facet of our lives. Scope also refers to the ever-increasing invasive and pervasive characteristics of technology. Technology is characterized by our values of persistence and precision. Technology is persistent, relentless in its increasing effects on our education, health, play, imagination, wars and work. Technology is increasingly precise and final, but it is also increasingly imperfect.

Theorists of culture maintain that economic values of capitalism intensify the values of technology. Convenience, efficiency and liberty— free enterprise and freedom of consumer choice— are the seemingly inescapably dominant economic values of our time. Capitalism is dependent on ever-expanding markets of consumers and producers who can respond to the values of convenience, consumer choice and efficiency. These values are built into the industries that produce the products and services that drive and respond to consumer desires and needs. Not coincidentally, large majorities of people in capitalist societies value convenience, consumer choice and free enterprise. Again, if isolated in a few individuals, this would not be a problem. When large numbers of individuals and vast majorities of populations adopt the values of convenience and liberty or free enterprise and freedom of consumer choice, problems arise. Critics counter economic and technological values with sobering thoughts on the rise of rational thinking, threats to class mobility, disability, gender and racial equity, labor, liberty, and unforeseen problems. Critics question popular notions of autonomous and advancing technology, along with technological progress. Notions that technology autonomously advances and, in effect, impacts either positively or negatively on society are reflections of an ideology in which new technology is assumed to be socially progressive.

Critics counter the pervasiveness of technological values in everyday life by providing alternatives to the concentration and centralization of power and scaled-up complexes that characterize modern technology. For example, advocates of "appropriate technology" (AT) prioritize values that are the antithesis of modern technology: simplicity, smallness (small scale), affordability (low-cost) and harmony (with communities and nature). Proponents of AT value diversity, sustainability and the humanization of technology. AT advocates, ecologists and humanists do not reject technology *per se*. Rather, they note that technologies can be made more ecological and humane by investing technology with natural and human values and by turning technological practice to peaceful and sustainable ends. Over finality, intensification, power and speed, ecological critics note that technology requires an emphasis on natural values such as diversity, interdependence, permanence and sustainability and humanists advocate values such as community, democracy, patience, prudence and spirituality. Feminists argue for values such as equity, justice, participation and responsibility. Marxists attempt to orient economics and technologies toward egalitarianism, socialism and the redistribution of power and wealth. Most

critics of modern technology argue that new technologies and technological practices are needed, along with a re-prioritizing of values.

Can we expect students to merely adopt values on the basis of authority, peer pressure, propaganda or immersion in capitalist economics? When it comes time to choose from among a range of values in technology, or life in general, how can young people choose their own course of action? Ought we model or teach certain values regarding technology in the labs and workshops? Dealing with values, whether directly or indirectly, requires that moral choices be made. Teaching with a values consciousness requires that we understand moral reasoning and the processes of ethics.