From Electrons and Logic Gates to Everyday Life: On the Asymmetry of Technological Devices

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Abstract

Information technology has increased in power and complexity over the last few decades. What impact has this had on individuals and on society? One might be tempted to believe that a new flourishing is upon us, or that the new products have ushered in an age of enlightenment. On the other hand, perhaps these tools have diminished what was once a vital and energetic engagement with the natural world. This article examines the impact that the new products of technology have had on the human condition, and asks how these instruments might be more usefully integrated into our everyday lives.

Keywords: Information technology, society, computers, philosophy

Information technology pervades and transforms everyday life. It does so most directly in the ways we deal with information and communication. But even our tangible engagements with the world, the way we move in space and eat our food, are informed and transformed by computers. At the heart of information technology are computer chips, at the heart of computer chips are transistors, and a transistor is the fusion physics and logic. Evidently, the basic building blocks of information technology are electrons and logic gates. Both of these building blocks are known to us through theories of great simplicity, beauty, and power—quantum mechanics for electrons, Boolean algebra for logic gates. Well, the theories are simple as long as they deal with just one electron in quantum mechanics and one inverter in logic gates. As soon as you consider electrons in elements and semiconductors things get quickly complicated. So do logic gates as soon as inverters are joined into a NOR gate, an AND gate, an adder, and so on up in computer chips.

It has taken the ingenuity and cooperation of hundreds of thousands of scientists and engineers to develop and control the complexity of computer chips and to make computer chips have an impact on the world through the machineries of sensors and effectors. The results have been stunning in their functional density and operational power. Computers are surely the most astounding and characteristic creations of our time even though they are receding into the background of normalcy too quickly and are taken for granted too easily. Perhaps you have to be born in the first half of the twentieth century to appreciate the wonder of an iPad, the power and ease furnished by a tablet that measures 242.8 x 189.7 x 13.4 mm and weighs 0.68 kg, soon to do more and measure less.

But two shadows rest on this admirable accomplishment. They overlap in fact and have made for a troubling darkness. One of them is the popular ignorance regarding the foundations of what today is simply called "technology". That shadow is not hard to see and could be dispelled

by more enlightened and rigorous general education. The fundamentals of quantum theory, going from the structure and behavior of an electron to the elements and semiconductors, are things most people could learn in college if not in high school.[i] Note that this is not specialized knowledge. It tells you not only about information and communication technology, but also why reality is both intricate and stable and why there are colors, music, and much more. Similarly, Boolean algebra should be part of general numeracy. It too is part of a broader and deeper understanding of our world, of symbolic logic, syntax and semantics, digitality, numbers, and letters.

There is of course a gap between the bottom of electrons and logic gates and the surface of everyday life. It is filled by a middle layer of theories and practices. We have several terms to describe the ascent of theory from bottom to top: coarse graining, black boxing, higher level languages, modularity, etc. The practices of engineering, production, and marketing have vertical and horizontal structures of coordination (1). If you know the foundations of physics and logic, you are at a minimum aware of the fact that between electrons and logic gates and the everyday world of iPads there have to be intricate organizations and machineries.

The shadow of ignorance and indifference darkens that middle structure no less than it darkens the bottom layer, but that shadow is no harder to dispel than the ignorance of physics and logic. There is however another shadow that is much more difficult to see. It comes into view when we consider the development of another technological device—the automobile. Early in the twentieth century it still resembled a horseless carriage. To get it going, you had to crank the motor. It took strength, timing, and the right grip to do so without getting your thumb or wrist fractured. Once moving, you felt wind and weather about you and the ruts and potholes beneath you. By then cars were more reliable and drivers had to be less resourceful than the formidable Bertha Benz who in 1888 had taken her pioneering trip from Mannheim to Pforzheim and back. Still, break-downs were likely twenty years later, and competence in dealing with them was needed.

By the middle of the twentieth century, you started a car with the turn of a key. A fully enclosed body protected you from the elements and shock absorbers from the jolts of the road. But there could still be heat, wind noise, and, if you were lost, many a stop at a gas station. It was still possible at the time to understand the engine and the entire car all the way through, and often youngsters were taught by their parents how it all worked, had to be maintained, and could be repaired. Today, driving a car is a pleasant and easy experience. Few people know what a choke is, how to shift gears manually, and how to double-clutch when shifting. Temperature is controlled summer and winter, any kind of music is available, and a GPS system will guide you to whatever destination. Computers control the engine and much else, and there is no way to open them up, to understand them, far less to repair them.

Automobiles continue to be improved; the rich and research tell us in what direction. So imagine a rich person in ten or twenty years. She clicks on an icon or pushes a button ten minutes before she wants to leave her condominium. The elevator lifts her car to her doorstep. She opens the door of her condo. There is the car, the door open, the interior warm, a cup of coffee in the holder, the morning news on the radio. She gets in, has a sip of coffee, and turns on her iPad while the car descends and automatically drives her to the office car elevator. It climbs to the suite where her office is located, the car door opens, she gets out and goes to work.

What has happened over the century that began with the horseless carriage and ended with ease and comfort? Imagine a person tracing this trajectory, say Bertha Benz. To put it very briefly, she would travel from comprehension and competence to ignorance and passivity. A hundred years ago she knew, when driving, what the weather was like, where people walked, rode, and drove to work, what was happening in the fields and pastures, whose house and garden were cared for and whose were not. She understood how her car got going, what kept it moving, and how to repair it or have it repaired. A century later she knows—she certainly needs to know—none of that. She is bathed in pleasure and ignorance.

Today the shadow of ignorance overlaps with the shadow of everyday incompetence. Most people in America live in a cultural darkness that becomes visible when we understand the growing asymmetry of technological devices. More and more of the engineers' ingenuity accumulates in the machinery of technological devices, and less and less competence is required in using whatever commodity the machinery supplies. Does it have to be that way? Certainly not. Technological devices can be and are in fact used at a high level of expertise. Great skill is required when cars are used in competitive motorsports. Enormous intelligence is displayed and deposited on iPads or laptops when physicists, biologists, and philosophers get together to move naturalism forward (2).

In fact for most of human history there's usually been a symmetry of competence in the production and in the use of tools, instruments, and devices. A blacksmith needed strength and skill to make an ax; so did the woodsman who used it. Even today violin making is a demanding art, and its product constitutes a challenge for the violinist to acquire and practice a different but equally demanding art. Yet in the majority of uses it's today as though engineers produced all these wonderful guitars, and the users amused themselves by setting them on fire—the cheap way of being Jimi Hendrix.

The cultural conversation in the United States and perhaps elsewhere has a hard time acknowledging the asymmetry that casts its shadow on today's characteristic devices. There is anecdotal evidence of a subclinical malaise. Many a rueful column tells us about the distraction a writer suffers through iPhones and iPads. Parents who work at the high-tech firms of Silicon Valley are sending their children to a computer-free Waldorf School (3). But the prevailing trend is to cling to the traditional conceit that the sophistication of devices is matched by sophisticated use. When cars are reviewed in the *New York Times*, what gets attention is their handling, responsiveness, acceleration, behavior in tight high-speed turns—athletic virtues that are irrelevant in normal use. When iPads are introduced in elementary schools or the Surface to the public, there's the assumption and often the prediction that great creative and cognitive feats will follow. But the evidence is to the contrary. Mobile devices are used primarily for entertainment (4).

Should that bother us? Is there anything we ought to do? When we confront what is the case with the question what we ought to do, we're looking at ethics. The prevailing ethics of America's cultural elite would tell us that the moral consequences of the asymmetry I've been discussing are no one's business. I'm not saying that the liberal American elite of which I'm a member is morally indifferent. We worry about social justice and environmental stewardship. But for now my chief concern is with why the ethics of the well-intentioned elite has nothing to say about the common decline of competence and comprehension and whether that silence is finally justified.

Taking once more the iPad as the emblem of culture, liberals are concerned with the unequal distribution of iPads, and occasionally they take remedial action. An anonymous donor recently gave $85,000 to an elementary school in Missoula, Montana so that all pupils would have their own iPad (5). And we worry of course about the wages and working conditions of the people who produce our electronic devices. Similarly, we are concerned about the proper environmental disposal of those devices, and we note with relief that millions of youngsters playing video games do less physical damage to the environment and themselves than those who cruise the strip in a pickup.

The overriding moral consideration, however, shared by liberals and many conservatives, is this: As long as individuals do no harm to others, no one is to tell them how to conduct their lives. Individual autonomy has to be respected and protected. That view is not incorrect, yet it is superficial. We have engineered an environment that directs life in the United States with powerful moral consequences. The moral guidance that is built into the framework of everyday life extends from hard constraints to subtle inducements.

When the typical American wants to move from point A to B, there is not much autonomy in her choice of means. Most of the time she can't walk, ride a horse, bicycle, or take a bus or a train. If the distance is less than five hundred miles, she'll have to take her car, if more than that a plane. This is a hard constraint. When she comes home from work, she could summon her partner and her children. Together they could prepare a meal and sit down to dinner. But subtle inducements direct her otherwise. Some are negative: The obstacle of getting her beloved together and getting started. Some are positive: The availability of convenient and outwardly attractive food; the possibility of eating and watching television or surfing the web while eating.

But where is ethics in all of this? Is life in a technological society bad? Up until roughly the middle of the twentieth century technology had been improving life in definite ways. There was less hunger and illness and more education and mobility. But since then the fabric of daily life has become worse in equally definite ways. It has caused health to decline through overweight, obesity, and lack of exercise. A third of our illnesses are self-inflicted. A mental analog to our physical shapelessness may now be emerging—distraction, short attention spans, inability to focus on an extended intellectual challenge.

Still, what's moral or immoral in all of this? Is it not likely that we'll find technological solutions to overweight and distraction? And would that not vindicate the view that within the framework of technology autonomy should

rule? Would it not be needlessly, not to say injuriously, divisive to argue about "the good life"? Do not people endlessly disagree about the good life? Is it not a matter of taste rather than ethics?

It's not. The good life is not a mystery. It's not really controversial. It commands wide though implicit support and agreement. Its commanding presence comes into view from three converging lines of sight. The first is the bequest of tradition. Humans have been thinking about the good life for a very long time and in very different settings. But nearly all traditions have seen that the good life is one of virtue and that there are chiefly three. In the terms most familiar to us in Western Civilization they are wisdom, courage, and friendship.

The second point of view is that of the social sciences, particularly of hedonic and positive psychology. It is helpful not only in supporting traditional virtue ethics, but also in suggesting how the traditions have to be revised and invigorated in a technological culture. Social science research has shown that profound and enduring happiness, sometimes called human flourishing, can be validly and reliably measured along with its contributing factors. Human flourishing is supported by a well-informed sense that life has meaning, when it is guided by wisdom. Human flourishing is aided by vigorous bodily engagement with reality, by courage. And finally, the good life is one of warm and steadfast social interaction, a life of friendship (6).

The third point of view is the most intimate and perhaps the most convincing. It emerges in the hopes you have for you new-born child. What kind of person do you want her to become? An ignorant and awkward loner? Of course not. You hope she will become a well-educated and athletic woman, who has affectionate friends she cares for in return and, most important, finds a loving partner for life (7). Everyday life in America is mostly not like that. It's all too often a life of ignorance, passivity, and individualism. How should we respond? Violations of social justice and environmental stewardship entitle us to outrage. Not so ordinary life in a technological society. It's not the worst kind of life by any means. It's lived by people who as individuals are for the most part profoundly decent, who do their part to keep society going, and who will come to your aid when you knock on their door. People differ in their responses to the circumstances of the culture of technology. Very few can overcome its hard constraints, the need to use a car, rely on electricity, and buy food. Few

are immune to its inducements, the ubiquitous availability of food and entertainment. The moral injuries of the consumer society are the consequence of a mismatch between deeply rooted desires and an overindulgent environment.

Some of us have been so favored by genes and experience that we lead a knowledgeable, vigorous, and communal life. A long life of teaching ethics has taught me that the fortunate, when contemplating ordinary everyday life, are entitled neither to outrage nor to self-congratulation. The right response has to be sorrow at lives that are less educated, athletic, and truly sociable than they need to be; and it has to be the responsibility to acknowledge and change the mismatch of contemporary culture and human flourishing.

This is a common civic responsibility. Does the cultural elite have a special responsibility in refashioning the culture so its inducements favor human flourishing? Should they demand devices that are fundamentally different from iPads? Should they resist ubiquitous computing? The answer, I believe, is no. iPads in their ways are perfect and are becoming more so. It would be absurd to make iPads more engaging by making them more difficult to use. Ubiquitous computing can improve health and safety and reduce environmental harms. And there are already apps that can serve the good life and buttress our concentration. There is, to be sure, a need to make the physical environment more conducive to bodily vigor, cultural awareness, and communal interaction. But this is primarily the task of civil engineering and urban planning.

The members of the cultural elite are coping well with the asymmetry of technological devices and the cultural inducements that these devices carry with them. There is anecdotal and statistical evidence that they are typically knowledgeable, physically active, culturally engaged, and less likely to get divorced (8-11). Their lives are good. What we need in the United States is a conversation about the good life and its two settings, the civic infrastructure and the household. There is already a discussion of the good city, and there are beneficial changes. Changing households for the better can at most be an indirect task of government action. In a democracy, you cannot manipulate people into living the good life. You have to engender insight, inspire confidence, and get consent. What is badly needed is insight into the structure of the devices that surround us and confidence that they can support rather than displace the good life. The expertise and example of the members of the cultural elite could be powerful in

encouraging ordinary people to move the center of their lives from passivity and screens to the skillful engagement with actual persons and tangible things.

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Competing interests

The author declares that he has no competing interests.

Notes

i.   For an example of the balance of rigor and accessibility at which general education should aim, see Feynman, R. QED. Princeton, Princeton University Press, 2006, and Cox, B. & Forshaw J. The quantum universe. Boston: Da Capo Press; 2011.

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