

On the Other Hand...

Cognitive Prostheses

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When hands are wringing, they are often wrung over the information revolution: the computer, the web, robots, the automation of manufacturing will all conspire to separate the rich and quick from the poor and slow, hurrying the trend to an informed, skilled, and employed elite living among an uninformed, unskilled, and unemployed majority. But both history and an understanding of human-machine interaction argue otherwise. Any number of forces may work towards the stratification of society, but the computer is not one of them. Computers, especially intelligent ones, are the great equalizers.

Humanity has always recognized that the powers of mind are limited, and has always made devices to compensate for those limitations. Our most obvious cognitive limitation is memory, and writing is a device for storing information outside the head so that it does not have to be remembered. Instead, the human brain need only store the code for reading. As soon as it could be economically reproduced and distributed, writing became in Europe an irresistible force for equality: within three centuries after Guttenberg, modern science had been created, ecclesiastical authority had been reduced, the divine right of kings had vanished, and democratic forms of government had emerged.

Calculation shows the same history. Roman enumeration methods made addition, multiplication and division impossible except for the gifted. To compensate, the abacus was

used in Europe as an arithmetical prosthesis. In the 13th century, Leonard Fibonnacci introduced into Europe the Hindu-Arabic system of numbers and the arithmetic algorithms they made possible. One of the first books after the Bible printed with moveable type was an Arithmetic. Even so, the algorithms were not easy and not widely disseminated. Most 17th century tradesman could not multiply. Today, every shop assistant

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can calculate better than Renaissance experts, just by pressing buttons.

Purists may mutter that the shop assistant isn't *really* calculating. But fitted with the right tool, i.e. prosthesis, they can get the calculations done, which is what matters in the marketplace. And in any case, where do we draw the lines between ourselves and our tools? Is someone using a power screwdriver not really

turning the screws, or someone driving a car not really moving along the highway? With a power screwdriver anyone can drive the hardest screw; with a calculator, anyone can get the numbers right; with an aircraft anyone can fly to Paris; and with Deep Blue, anyone can beat the world chess champion. Cognitive prostheses undermine the exclusiveness of expertise by giving non-experts equivalent capacities. As with any good tool, the effect is to make all of us more productive, more skillful, more equal.

One day last year one of our fathers, Joe Glymour, told us with mixed pleasure and anxiety that he was beginning a game of post-card chess against a team of younger relatives in California; he feared he stood little chance. We solved his problem with a trip to Radio Shack, where for seventy dollars he could become one of the best post-card chess players in the world.

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