THE NEW DIVISION OF LABOR

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We are coming out of a slow economic recovery, much like the “jobless recovery” of 1992–94. As in that recovery, we will eventually return to full employment. But it will be full employment with a different set of jobs—the jobs lost to computerization and to other countries are not coming back. That is the essence of our recent book—how computers are driving long-term change in the U.S. job market and in the skills the job market now demands.

The book begins by explaining where computers substitute most easily for human labor. Begin with the fact that all work involves the processing of information—a financial analyst reading a spreadsheet, a chef tasting a sauce, a sales-person reading the expression on a customer’s face, are all processing information in deciding what to do next. Computers excel at those tasks in which the information processing can be described as a series of logical rules (“rules-based” processing) or as the recognition of simple patterns. An example of a rules-based task is the job of issuing a boarding pass to an airline passenger:

- Identify the passenger by reading the account number on her credit card.
- Does the number on the credit card match a reservation in the database (yes/no)?
- If no, reject the request.
- If yes, does the passenger have a seat assignment in the database (yes/no)?
- If no, show her the available seats and prompt the customer to choose one.
- If yes, complete the transaction.

Because the information can be handled by rules, boarding passes increasingly are issued by self-service kiosks rather than by desk agents.

In the current economy, there is one more piece to this story. When a job can largely (but not completely) be described by rules, it is a good candidate for sending offshore because it can be described to another person with minimal risk of misunderstanding. In manufacturing, an extreme example is Boeing’s design of aircraft modules using CATIA, computer-assisted design software. CATIA’s output is a set of instructions, “rules,” for computer-controlled machine tools. Some of these machine tools are located in China and Japan and Italy, because Boeing knows the parts will fit when they are returned for final assembly.

Similarly, a call-center interchange is largely described in rules when all relevant information can be written down in scripts but the interchange requires the flexibility of human conversation. (If the interchange does not require the flexibility of conversation, the call can be handled by speech-recognition software.) The point is that with notable exceptions—e.g., software programming—offshoring is largely accelerating what technology was already doing.

Of course, many jobs require information processing that cannot be described in rules, processing that is more accurately described as complex pattern recognition. Surprisingly, these jobs fall at both ends of the wage spectrum. The lowest-paid service jobs require processing optical information and executing physical movements that are very easy for most human beings but very hard to program—e.g., walking across an unfamiliar room that is filled with furniture. Similarly, higher-wage sales, professional, and managerial jobs require one or both of a pair of cognitive skills that computers cannot replicate.
One of these cognitive skills is expert thinking, the ability to solve new problems that cannot be solved by rules. (If the problem could be solved by rules, a computer could do it.) New problems run the gamut from doing research to fixing a new problem in a car (not covered in the manual) to creating a new dish in a restaurant.

The second cognitive skill is complex communication, the ability not only to transmit information, but to convey a particular interpretation of information to others in jobs like teaching, selling, and negotiation. If a student gets a calculus lesson from the Internet, the student will literally have the information. But there is no guarantee that the student will understand the information she is receiving. It takes a good teacher to present the information in a way that allows the student to translate the information into knowledge she can apply.

Complex communication is equally important in sales. Customers who know exactly what they want can order from a Web site without human intervention. But a customer who requires convincing needs subtle human contact. A good salesperson is constantly modifying his argument as he reads the customer’s facial expression, and listens to the customer’s questions and the tone of voice the customer uses. That kind of selling is very hard to express in rules and so it remains a human endeavor.

When these ideas are put together—i.e., where computers can and cannot substitute—it becomes easier to understand why the occupational distribution is being hollowed out (as demonstrated in figure 1).

The biggest relative losses are occurring in the lower middle of the distribution: assembly-line work, clerical jobs typically held by high-school graduates, and jobs that are relatively easy to describe in rules.

Lower-paid service jobs like janitors require extensive optical recognition that is very hard to program—e.g., making sense of what you see when you enter a new room. Sales occupations continue to grow because the act of selling involves complex human interaction. But the greatest job growth will continue to be concentrated in higher-skilled technical, professional, and managerial occupations, work where the required problem solving and human interaction cannot be described in rules. Not all of those higher-skilled occupations will be immune from competition, but that is where the major job growth has been and will continue to be.

In educational terms, the evolving job distribution underlines the need to learn not just facts but the relationships that connect the facts. When many people have access to Google, knowing who signed the Declaration of Independence is not highly valued. Knowing the Declaration of Independence’s history is highly valued because it enables a deeper understanding of governmental institutions. Compared to many other states, the Massachusetts MCAS tests are more geared to understanding relationships among facts rather than listing facts per se. In this sense, it appears that state educational reforms are moving in the right direction to prepare students to work in a computerized world.

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