The Journey Inside[SM]: Technology and Society
Background Information, Part 1

A Historical Perspective

Throughout history, people have developed tools to supplement their physical capabilities. To enhance human muscle power, early people developed simple stone tools. During the Industrial Revolution, people designed more complex tools. In our modern world, the computer is a tool that extends and enhances the human mind, and networking is a tool that enhances human communication. These electronic-based tools are having a significant impact on our society.

Other inventions have caused significant social change, as well. Looking backward to the invention of the printing press by Gutenberg, it is possible to identify ways this device has affected society.

Prior to the development of the printing press, relatively few people could afford to own books. Making handwritten books required many hours of human labor, making books scarce and expensive. Using a printing press to mass produce books changed this situation. Books became more affordable and more readily available. Learning to read became a valuable and widespread skill. This widespread literacy eventually led to major political and religious changes throughout the world.

Two hundred and fifty years ago, there were no trains (and, of course, no cars or airplanes). It took the development of steam power to bring such inventions into existence. Steam, used in a controlled way, was the fuel that drove the Industrial Revolution. A single steam-driven machine could replace the muscle power of many people. Steam-operated machines provided new approaches to manufacturing. Steam-fueled machines provided transportation of goods and people in an increasingly efficient and flexible manner.

Just 150 years ago, long-distance communications could only function at the speed of the available transportation systems—Pony Express or steam-driven engines. But curious minds were busy studying many things. As people began to understand the natural occurrence of electrical energy, new ideas for communicating emerged. With the development of the electric telegraph, communication speed immediately increased. Since only the message had to be moved, communication no longer depended on the speed of transportation systems. This made it possible to communicate over long distances almost instantaneously.

Changes in Jobs

In the late 1940s and early 1950s, more than half the labor force in the United States was working in industrial and manufacturing jobs. For the most part, these assembly line jobs required only a modest education. Many workers who lacked a high school diploma earned relatively high wages and enjoyed a good standard of living.

This situation has changed slowly but steadily. The average level of education required to qualify for many jobs has risen. At the same time, there has been a steady decline in the number of jobs requiring minimal education and technical skills, particularly in the industrial and manufacturing sector. Many of these changes can be traced to computers and information technologies.

Computer technology eliminated many traditional jobs, but it also created new jobs. People are needed to design and fabricate computer components. People are needed to design and develop computer software. People are needed to maintain and repair equipment. People are needed to train others to use computer technology.

Computer and information technology has made other changes in the job market. For your students, knowledge and skill in using computer hardware and software are important job skills. Few of them will find employment that does not involve computer technology in some form.

Changes in the job market have changed the kinds of skills that employers want and need from their workers. A steadily increasing number of jobs require employees to have the following characteristics:

- *Good communication skills.* The communication may be face-to-face, over a telephone or video phone, via email, or in writing.
- *Good group process skills.* Increasingly, workers must interact with others, both within their own workplace and at a distance, to fulfill the requirements of their jobs.
- *Good learning skills.* Constant change in technology and frequent change of jobs are factors that require workers to be able to learn new skills.

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Changes to Consider

Business and home communications are becoming increasingly dependent on online services. Consequently, today's students need to be comfortable using online services as a communications method.

The *San Jose Mercury News* addressed the topic in a series called *Consequences of the Digital Age*. As the articles illustrated, job hunting and job advertising have become online activities. This shift from more traditional methods opens a much wider market for a worker searching for a job or an employer searching for a worker. A San Jose group serving the homeless and unemployed justified to their supporters that providing a computer resource center for their clients is just as important as providing food and clothing.

According to former U. S. Labor Secretary Robert B. Reich, "Whether you work in an office, or manage the crew that cleans it, you've got to be computer literate. Even truck driving and factory work require some computer skills. If you don't have them, get them. Now." These comments reflect Reich's perspective on the present work world. There is no indication the trend will reverse by the time the students in your classrooms are joining the job market. In fact, most forecasters expect this trend to continue.

Exponential Growth

Gordon Moore, co-founder of Intel, researched the rate at which memory chips increased in capacity, size, and speed with a corresponding decrease in price. His amazing conclusion has become known as *Moore's Law* or *The Product Evolution Theory.* Moore discovered that every two years, the complexity of the memory chips being produced had doubled. This trend continues to be remarkably accurate. Moore's Law can also be applied to the microprocessor industry.

Moore's Law provided a means for predicting what future technology should or could include. This provided the motivation for making electronic devices that allowed compatibility with future devices. For people involved in the technology industry, his insight makes it possible to recognize that by focusing on one or more of performance, size, and price, you could keep your business competitive (Malone: *The Microprocessor: A Biography*).

Moore's prediction continues to have huge implications for us today. The steady increase in the power and performance of microprocessors enables new and wondrous things to be done by devices using them. The challenge for us as a society is to keep up with the dizzying rate of change brought about by all these new inventions and incorporate them intelligently into our lives.

Resources

The first three resources are annotated and are appropriate for both teachers and students:

Kelly, K. (1994). *Out Of Control.* New York: Addison-Wesley Publishing Company.

A discussion of the implications of this era of machines and systems that drive our economy and an interesting speculation on the relationship between technology and society—suitable for teachers.

Lubar, S. (1993). *InfoCulture: The Smithsonian Book of Information Age Inventions.* New York: Houghton Mifflin Co.

A book that is fun and easy to read yet covers a wide range of inventions with discussions that help you to connect the use of a particular invention with the social climate of the time while tracing the changes that resulted—suitable for older students and teachers.

Smolan, R. (1998). *One Digital Day: How the Microchip is Changing Our World.* New York: Random House.

On July 11, 1997, photojournalist Rick Smolan (creator of the best-selling "Day in the Life" photography series), sent 100 photographers around the world to document the impact of the microchip on modern life. The result was this large-format book full of photographs and essays produced in conjunction with Intel's 30th anniversary.

Logan, R. (1995). *The Fifth Language: Learning a Living in the Computer Age*. Toronto, Ontario, Canada: Stoddart.

Denning, P. & Metcalfe, R. (1997). *Beyond Calculation: The Next Fifty Years of Computing*. New York: Springer-Verlag.

Sattin, R. (Producer). (1995). *Connections 2* [Video]. New York: Ambrose Video Publishing, Inc.

WGBH & British Broadcasting Corporation. (Producers). (1992). *The Machine that Changed the World [*Video]. Princeton, NJ: Films for the Humanities & Sciences, Inc.

WQED/Pittsburgh and The National Geographic Society (Producers). (1985). *Miniature Miracle: The Computer Chip.* Stamford, CT: Vestron Video.