

IT Workforce Composition and Characteristics

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INTRODUCTION

Women are under represented in the information technology (IT) workforce. In the United States, although women make up about 45% of the overall labor force they make up only about 35% of the IT workforce. (Information Technology Association of America, 2003, p. 11). Within IT, women's representation declines as one moves up to higher-level occupations. While women are relatively more numerous among data entry keyers and computer operators, they are relatively less likely to be found in high-level occupations like systems analysts and computer programmers.

The relatively low representation of women in IT fields parallels a broader pattern of gender differentials in other scientific and technical fields. In all science, technology, engineering, and mathematics fields combined, women held 25.9% of jobs in 2003. Women's representation varies widely by sub-fields, however; 65.8% of psychologists and 54.6% of social scientists are women, but only 10.4% of engineers, and 37.4% of natural scientists (Commission on Professionals in Science and Technology, 2004, p. 2).

Over the course of the past 100 years, there has been a dramatic change in women's economic role. In 1900, only one in five adult women worked outside the home, and most of these were young and unmarried (Goldin, 1990). Since then, male and female labor force participation rates have tended to converge. Between 1900 and 1950 there was a gradual expansion of women's labor force participation.

After World War II the pace of change accelerated sharply as more married women entered the labor force. During the 1960s and early 1970s a series of legal changes significantly broadened protection of women's rights ending essentially all forms of overt discrimination (Fuchs, 1988; Long, 2001, p. 9-10). The removal of these barriers in combination with the availability of cheap and reliable birth control technology greatly facilitated the entry of women into higher education, and technical and professional positions (Goldin & Katz, 2002).

Nevertheless, as the figures cited at the outset reveal, women's participation in IT and other technical fields has not increased as rapidly as it has in less technical fields. And in striking contrast to the general trend toward increasing female participation in most areas of the workforce, women's share of the IT workforce in the United States has actually declined over the past two decades. Any effort to explain gender differences in IT must begin with an understanding of how the number, characteristics, and pay of women in IT have evolved over time, and across different sub-fields within IT. This chapter provides a foundation for this analysis by documenting recent changes in the number of women employed in IT, their demographic characteristics, and relative pay.

BACKGROUND

A discussion of the gender composition and characteristics of the IT workforce must begin by clarifying

what is meant by IT. This is difficult because IT encompasses a broad array of products and activities related to computing and communications in the modern economy (Freeman & Aspray, 1999, p. 29-31). Although many workers make use of IT in their jobs, most studies agree that only those workers who are responsible for creating IT hardware and software should be included in the IT workforce, while those who are primarily users of these products should be excluded (In addition to Freeman & Aspray, see Ellis & Lowell, 1999, p. 1; National Research Council 2001, p. 44-54).

Whatever conceptual definition one adopts, however, its application is limited by the classification schemes used by agencies engaged in collecting data on different elements of the workforce. In what follows we will focus on those IT occupations that are enumerated in the Bureau of Labor Statistics' Current Population Survey (CPS). The CPS data cover computer systems analysts, computer programmers, operations and systems researchers, computer operators, and computer operators supervisors. These occupations constitute more or less what the National Research Council (2001, p. 48) has termed "Category 1" IT occupations: those involved with the creation of new products, services and applications. CPS data do not permit us to measure or describe the characteristics of the National Research Council's "Category 2" occupations: those involved in the application, adaptation, configuration, support or implementation of IT products or services (National Research Council 2001, p. 49). Because occupational titles do not adequately capture the IT content of the support activities of many of the technicians and other occupations included in this group it is more difficult to adequately measure its size or demographic characteristics.

THE SIZE, COMPOSITION, AND CHARACTERISTICS OF THE IT WORKFORCE

An Overview of IT Labor Market Conditions

The rapid and sustained decline in the cost of computers over the past two decades has been a

prominent factor in the reorganization of work in the United States. Between 1984, near the beginning of the personal computer era, and 2001 the quality-adjusted price of computers fell at an average annual rate of 16%, resulting in an 18-fold drop in price (U.S. Department of Commerce; cited in Weil, 2005, p. 263). As personal computers diffused into widespread use, mini-computers vanished from the market, and sales of large corporate mainframes languished. Shifting markets and the changing needs of users resulted in significant shifts in the software industry. Growing consumer markets fostered growth of the packaged software industry, and created whole new categories of software. Since the early 1990s, the spread of the internet and the increasing importance of networked computing have initiated a new round of changes in the IT industry (Mowery & Rosenberg, 1998). Adding to demand pressures during the late 1990s was global concerns about the Y2K problem.

Strong demand for IT professionals contributed to a rapid expansion of the IT workforce and rising relative pay. From 1983 to the peak of the technology boom in 2000, the IT workforce more than doubled in size, increasing from 1.47 million to 3.13 million persons. To put this in perspective, during this same period the total U.S. labor force increased by just 34%, from 99.5 million persons to 132.2 million persons (these figures and all the subsequent statistics are derived from the authors' computations based on data from the Current Population Survey's merged outgoing rotation groups). Despite the loss of more than 200 thousand IT jobs in the next two years, the IT labor force in 2002 was still 96% larger than it had been in 1983. To draw more workers into IT jobs relative pay had to rise substantially. In 1983 the median hourly wage of full-time IT professionals was about 20% above that for all non-IT occupations. By the late 1990s the wage gap had more than tripled, so that IT professionals earned more than 60% more than did workers outside of IT.

The growth of IT employment coincided with important changes in the type of jobs performed by IT professionals. Most obviously, as the importance of mainframe computers diminished, the number of computer operators fell substantially. From a peak of 962 thousand computer operators in 1986, the number of computer operators had fallen to just over 300 thousand by 2002. From being close to half of all

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