

**Charting the Road Less Traveled:  
Providing Women Access to Information Technology**

**A Guide for Workforce Professionals**

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## Introduction

### Topics Covered:

- Characteristics of Information Technology Workers
- Future Outlook of Information Technology Careers
- Why Women Need Information Technology
- Why Information Technology Needs Women
- Definition of Information Technology
- Where the Jobs Are...
- Core Competencies for Information Technology Jobs
- Career Clusters
- Common Entry and Transition Points into IT
- How to Advise Women about IT

## **Characteristics of Information Technology Workers**

- Creative problem-solvers with strong reasoning, organizational and communication skills
- Work with teams in developing, maintaining and utilizing computer systems, databases, networks and web sites that are user friendly, graphical, convenient and vital to the success of businesses, non-profits and personal lives.
- Perks may include flexible work schedules and arrangements, including working at home and job sharing.
- IT professionals work and specialize in a number of industries, including medical, financial, non-profit and retail.

## Even Dilbert Was Laid Off...

### Are You Sure We Need More IT People?

Trends indicate that despite a short-term dip in IT employment, the need for IT workers is stabilizing and will continue to grow.

- Nine out of 20 of the fastest growing jobs are IT-related.\* The projections for percentage change between 2000 and 2010 range from a 90 to 100 percent increase for the top three occupations.
- During August to October, 2002, 42 percent of IT hires were technical support workers.\*\*
- Jobs for Web and database developers climbed five percent since January 2002.\*\*
- IT managers indicate that they plan to hire 1.1 million workers in the months ahead.\*\*
- The computer-savvy 16-24 age group is growing more rapidly than the rest of the population and will drive the development of new products and services.\*

\*U.S. Department of Labor, Bureau of Labor Statistics, Occupational Outlook Handbook, 2002/03 Edition, Bulletin 2540.

\*\*"Computer workers need new skills, experience to beat tough job market," Chicago Tribune, February 23, 2003, Section 6, Page 1.

## Why Women Need Information Technology...

- Provides a means for economic self-sufficiency. Narrows the digital divide - people without computer experience and internet access are being left behind economically, socially and intellectually
  
- Provides access to better-paying jobs.
  
- Prepares women for the future.
  - New services such as Distance Learning Applications, Text Messaging, Always-On Internet, Nanotech and Biotech will drive job growth.
  - IT provides the foundation women need to reinvent themselves in a continuously changing job market.
  - The median annual earnings of women employed full-time in IT is more than \$38,000, 60 percent higher than the \$23,900 earned by women outside of IT.\*
  - In 2001, the median weekly earnings for workers in technology-oriented occupations ranged between \$712-\$1,174, compared to \$597 for the median of all occupations.\*\*

\*\* Employment and Earnings, U.S. Department of Labor, Bureau of Labor Statistics, January 2001, pages 210-211.

\* Opportunities and Gender Pay Equity in New Economy Occupations, The Council of Economic Advisors, May 11, 2000.

## Why Information Technology Needs Women

- Too many jobs for men alone to fill.
  - Men are leaving jobs faster than they are coming in. Women are entering the workforce faster than they are leaving.
    - ITAA (Information Technology Association of America) studies predict labor shortages in IT areas.
    - If the number of women in the IT workforce were increased to equal the number of men, this shortage would be avoided.
    - Estimates indicate that women will make up 57% of the workforce by 2005.\*
  - Women are earning the majority of advanced degrees.
    - 57 percent of all bachelor's and 59 percent of all master's degrees obtained by women.\*
    - However, only 1.1% of undergraduate women are majoring in IT-related disciplines.\*\*
- Need diversity of thought in product design and development.
  - To make products profitable and with better marketability to 50 percent of the consumers.
  - Make products that avert harm to women.

**Women receive less than 28% of the computer science bachelor's degrees—down from a high of 37% in 1984. Computer science is the only field in which women's participation has actually decreased over time.**

\* Kleinman, Carol, "Gender Trends Demand Some Preparation, Chicago Tribune, February 25, 2003, Section 3, page 1.

\*\* The Supply of Information Technology Workers in the United States, "Chapter 7: Women, Minorities, and Older Workers," Computing Research Association.

## Definition of Information Technology

Information Technology (IT) is the study, design, development, implementation, support and management of computer-based systems. The term "computer-based systems" is defined broadly to include the full gamut of technological considerations including the:

- Design and production of chips
- Design and creation of complex, computer-based systems including the design and development of the software and hardware systems, the creation and management of network systems and databases and the consideration of appropriate human factors
- End-use of such systems

"Computer Literacy" is most concerned with the end-use of computer systems. The distinction in literacy vs. career is that the class of workers whose jobs are enabled by information technology is much larger than the class of workers considered "IT workers."

## **Where the Jobs Are...**

### **Two Types of Information Technology Companies**

#### Users of Information Technology

- Companies use IT to support other business goals
- For example, hospitals, retail stores, non-profits, etc.

#### IT Providers

- Companies that focus on providing IT products and services for others
- For example, software development companies, hardware manufacturers, consultants

## Users of Information Technology

Most organizations must perform the following services:

- Provide necessary business applications for people (Programming/Software Engineering)
- Maintain and provide access to organization information (Database Dev/Adm)
- Develop and maintain the companies computing environment (Enterprise Systems)
- Ensure PCs can interact with each other (Network Design/Adm)
- Support their people in using applications and technology (Technical Support)
- Develop the company's web presence and maintain a secure environment (Web Dev/Adm)
- Develop online training or marketing information (Digital Media)
- Develop Documentation and Marketing Materials (Tech Writing)

## **Providers of Information Technology**

Companies that provide Information Technology services can be large and multi-national or they may be home-based and independent.

Examples include the following:

- Software Application Developers
  - Microsoft
  - Database companies
- Hardware Manufacturers
  - Intel
  - Dell
- Consulting and On-Site Project Support
- Interactive Media, Video Editing, Graphics
- Customer Support
- Training/Documentation Developers
- Telecommunications
- Internet Service Providers

## Core Competencies: Certifications

- Technical or Professional Certification:
  - Absolutely essential for candidates without an IT degree.
  - May help for those with degrees but not necessary.
  - Differentiator for advancement and salary increases.
- *According to the Brainbench "2002 IT Salary Survey Report" February, 2003, those receiving certifications are more likely to achieve salary increases above the industry average of one to three percent.*
- By vendor:
  - Cisco, CompTIA, Microsoft, Novell, Oracle, Prosoft, Sun
- 
- By job type:
  - Data Management, Help Desk, Networking and Telecommunications, Project Management, Software Development, System Administration, Web and Internet
- 
- By professional institute:
  - Institute for Certification of Computing Professionals
  - Institute of Electrical and Electronics Engineers
  - Computing Society

## Core Competencies: Formal Education

- Associate's degree
  - Generally more occupation-specific than a bachelor's degree. Can be an entry level for the Programming and Tech Support clusters.
- Bachelor's degree:
  - Computer Science
  - Information Science
  - Information Technology and Management
  - Management Information Systems (MIS)
  - Mathematics
  - Engineering
  - Physical Sciences
- Graduate Degrees
  - Master's in above fields
  - MBA - Masters in Business Administration
- Doctoral degree in Computer Science or Computer Engineering

## **Core Competencies: People Skills**

The following core competencies are required for a career in computers.

- Computer competency
- Ability to work with little or no supervision
- Interpersonal skills
- Ability to work well in teams
- Strong communication skills (written and verbal)
- Excellent critical thinking skills
- Creative, "Out-of-the-box" thinking
- Knowledge-seeking with a love for continuing education

## **Career Clusters:**

### **Applying Core Competencies to the Job Market**

The following eight Career Clusters were developed by the National Workforce Center for Emerging Technologies (NWCET):

- Programming and Software Engineering
- Network Design and Administration
- Database Development and Administration
- Enterprise Systems
- Web Development and Administration
- Technical Support
- Digital Media
- Technical Writing

## **Programming and Software Engineering**

### **Sample Job Titles:**

- Software Engineer
- Software Tester
- Software Development Engineer
- Programmer/Analyst

□

### **Description:**

- Conceive, design, and test logical structures for solving problems by computer
- Write, test and maintain the detailed instructions, called programs, that computers must follow to perform their functions
- Write programs according to specifications determined primarily by computer software engineers and systems analysts
- Use conventional programming languages (e.g. COBOL), artificial intelligence languages (e.g. Prolog), or object-oriented languages (e.g. Java, C++, Smalltalk)
- Update, repair, modify, and expand existing programs
- Test and debug programs

### **Training Requirements:**

- Certifications in programming language
- Degree

□

**Skills:**

- Think logically
- attention to detail
- Patience
- Persistence
- Ability to work on exacting analytical work
- Ingenuity
- Imagination
- Work with abstract concepts and do technical analysis
- Good communication skills

## Database Development and Administration

### Sample Job Titles:

- Database Administrator
- Database Developer
- Database Analyst
- Knowledge Architect

### Description:

- Work with database management systems software and determine ways to organize and store data
- Determine user requirements
- Set up computer databases
- Test and coordinate changes
- Ensure performance, understand the platform the database runs on and add new users

### Training Requirements:

- Certification in programming language
- Degree

### Skills:

- Thinks about how parts fit together to make the whole work better
- Likes puzzles
- Tests constantly
- Keeps things organized and in order
- Gives careful attention to organization, procedure, and structure

### **Enterprise Systems Sample Job Titles:**

- E-business Specialist
- Information Systems Architect
- Information Systems Planner
- Systems Integrator

### **Description:**

- Use problem-solving to help an organization realize the maximum benefit from its investment in equipment, personnel and business processes
- Most work with a specific type of system that varies with the type of organization they work for (e.g., business, accounting, or financial systems, or scientific and engineering systems)
- Specify the inputs, design the processing steps and format the output
- May prepare cost-benefit and return-on-investment analyses

### **Training Requirements:**

- Product vendor certification
- Continuous study due to rapid changes in technology

### **Skills:**

- think logically
- good communication skills
- multi-tasking
- ability to concentrate
- pay close attention to detail
- able to see the "big picture"
- work in teams
- gathering technical information and presenting ideas
- strong analytical skills

## **Network Design and Administration**

### **Sample Job Titles:**

- Information Systems Administrator
- Network Administrator
- Network Analyst
- Network Technician
- Systems Administrator

### **Description:**

- Design, install, and support an organization's LAN, WAN, network segment, Internet or Intranet system
- Day-to-day onsite administrative support for software users in a variety of work environments
- Maintain network hardware and software, analyze problems and monitor the network to ensure availability to system users
- Gather data to identify customer needs and then identify, interpret and evaluate system and network requirements
- Plan, coordinate and implement network security measures

### **Training Requirements:**

- Certification recommended
  - CompTIA's A+ certification
  - CompTIA's Network +
  - Network Management
  - one or more network operation systems

### **Skills:**

- Mechanical
- People skills
- Communication skills
- Problem-solving skills

- Patience
- Flexibility

## **Web Development and Administration**

### **Sample Job Titles:**

- Web Administrator
- Web Designer
- Web Page Developer
- Webmaster

### **Description:**

- Design, develop and maintain websites
- Develop websites using web development software or building from scratch using HTML
- Develop interactive forms using computer programming languages like Java or Visual Basic

### **Training Requirements:**

- A bachelor's degree in graphic design is a plus
- Formal training in Web or graphic design

### **Skills:**

- Good communication skills
- Translate user needs into the web environment
- Natural artistry

## **Technical Support**

### **Sample Job Titles:**

- Technical Support Representative
- Customer Service Representative
- Help Desk Technician
- PC Support Specialist
- Sales Support Technician
- Maintenance Technician

### **Description:**

- Provide technical assistance, support and advice to customers and other users
- Interpret problems and provide technical support for hardware, software and systems
- Analyze problems using automated diagnostic programs, and resolve recurrent difficulties
- Install, modify, clean and repair computer hardware and software
- Field phone calls and e-mail messages from customers seeking guidance on technical problems
- Assist remote web site and network users in accessing files and maintaining proper user connections

### **Training Requirements:**

- Certifications Recommended
  - CompTIA's A+ certification
  - Help Desk Analyst certification (relatively new)

### **Skills:**

- Problem-solving
- Analytical

- Communication skills (paper, e-mail, in person)
- Listening and Investigating skills
- Writing skills
- Patience
- Flexibility
- Knowledge of the software and hardware the customers use

## **Digital Media**

### **Sample Job Titles:**

- Multimedia Author
- Multimedia Specialist
- Multimedia Developer
- Audio/Video Engineer
- Animator

### **Description:**

- Produce multimedia and digital film projects
- Design graphics and layout
- Produce interactive media which combines sound and animation with user prompts

### **Training Requirements:**

- A bachelor's degree in graphic design is a plus
- Keep up with the latest technologies to produce the best images and animations.

### **Skills:**

- Teamwork skills
- Communication skills
- Visionary
- Artistic
- Creative

## **Technical Writing**

### **Sample Job Titles:**

- Technical Writer
- Technical Editor
- Instructional Designer
- Electronic Publisher

### **Description:**

- Write user documentation and context-sensitive help systems for computer users
- Produce instructional content for websites and other electronic formats
- Make training information and documentation understandable and easy to read

### **Training Requirements:**

- A bachelor's degree in English, Journalism or a technical degree with proven communication skills
- A degree in Instructional Design or Education

### **Skills:**

- Teamwork skills
- Communication skills
- Ability to see both the big picture and the details
- Persistence
- Creative

## How to Advise Women about IT

When advising women about IT, keep the following considerations in mind:

- Discuss the increased earning potential.
- Highlight the true job requirements, not the stereotypical ones.
- Highlight the people orientated and social aspects of the job over the perception of the isolated code developer.
- Be cautious of gender stereotypes—your own and your clients.
- Use the Entry and Transition Points chart to find short-term employment opportunities for people interested in IT.
- Emphasize the ability to specialize in key industries like the medical or non-profit fields that tend to appeal to women.
- Highlight the variety of options once inside the field—there's always something new to do.
- Stress that certification allows people to build on existing degrees to transition into IT careers.

**There are several computer aptitude tests available, including the following:**

- The IT Careers Interest Inventory
  - [www.cybercareers.org](http://www.cybercareers.org)

### **Future Opportunities in IT:**

- Nanotech
- Biotech (possibilities for nurses, physical therapists, etc.)
- Forensic Computer Science

### **Mentoring and Professional Resources**

The following organizations provide professional support and networking opportunities for women interested in IT careers:

- WITI (Women in Technology International)  
([www.witi.com](http://www.witi.com))
- AAUW (American Association of University Women)  
([www.aauw.org](http://www.aauw.org))
- ChicWIT (Chicago Women in Technology) and other WIT organizations in major cities around the world  
([www.witi.com](http://www.witi.com))
- Society of Women Engineers (SWE) ([www.swe.org](http://www.swe.org))
- US Department of Labor, Women's Bureau  
([www.dol.gov/wb](http://www.dol.gov/wb))
- Women Employed ([www.womenemployed.org](http://www.womenemployed.org))
- Association of Women in Science ([www.awis.org](http://www.awis.org))
- Institute for Women in Technology (IWT)  
([www.iwt.org](http://www.iwt.org))

On-line Mentoring provided by the following organization:

- MentorNet: for undergrad students in science, technology, engineering and math

### **Scholarships**

The following organizations are possible resources for financial support for women entering IT fields:

- Women in Technology International (WITI)
- American Association of University Women (AAUW) local branches—varies; national AAUW Education Foundation for fellowships
- Soroptomist International
- Zonta International
- Illinois Institute of Technology (women and men transferring from a community college)
- UIC (women and men)
- Rotary, Kiwanis (women and men, not necessarily focused on IT)

## **Conclusion:**

### **“And that Has Made All the Difference”**

- Whenever possible, encourage women to explore IT.
- Help women understand that IT is more than programming in “dark corners” and math-centric. IT is a huge field, requiring diversity in training and skills. There are many common entry and transition points.
- Many of the most sought-after traits for IT professionals (teamwork, communication, and problem-solving) are skills in which women excel.
- While every industry has experienced a downturn, trends indicate IT is still one of the fastest growing careers. We must continue to encourage women to explore IT.
- We all benefit from having women at the design table of new products and services.