

PREPARING UTAH'S WORKFORCE FOR 21ST CENTURY JOBS

- Five-star jobs have the strongest employment outlook and highest wages of all the jobs included the Utah's Department of Workforce Services' list of long-term occupational projections.
- Using Workforce Services' list, Utah Foundation determined the top 25 five-star rated jobs by eliminating any job with a median wage of less than \$20.00 per hour and then selecting the 25 occupations with the highest number of projected annual openings.
- Median hourly wages of Utah Foundation's top 25 five-star jobs range from \$20.20 (electricians) to \$68.50 (chief executives). The occupation with the highest number of expected annual openings is Registered Nurse.
- The degrees required for five-star jobs vary from associate's to doctoral degrees, however the majority require at least a bachelor's degree. Long-term, on-the-job training is needed for the top 25 five-star jobs that do not require a degree. This training generally includes 12 months or more of both work experience and classroom instruction.
- This report describes each of the top 25 jobs in detail, provides information on the level of education and training needed to work in the field, and presents a short-term trend of the number of degrees attained in Utah that are necessary for each job.

The mission of Utah Foundation is to promote a thriving economy, a well-prepared workforce, and a high quality of life for Utahns by performing thorough, well-supported research that helps policymakers, business and community leaders, and citizens better understand complex issues and providing practical, well-reasoned recommendations for policy change.

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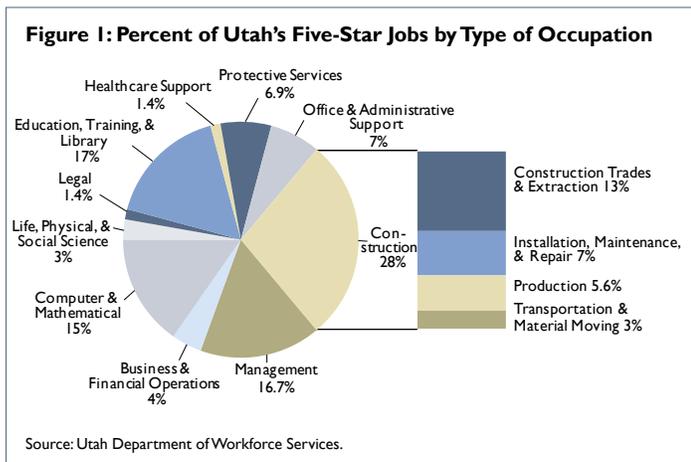
Because workforce quality is directly related to labor productivity and output, it is a key determinant of economic growth. Therefore having a well-prepared, knowledgeable, and skilled workforce is a necessary component to ensuring positive economic growth in Utah. Preparing Utah's workforce for high-growth, high-wage jobs is also critical to maintaining both the competitiveness and standard of living of Utah's workers. With the economy shifting and the presence of global competitors increasing, Utah workers must understand what occupations will provide them with an adequate wage, as well as opportunities for growth in their careers.

This report evaluates a list prepared by Utah's Department of Workforce Services of the best high-growth, high-wage jobs Utah officials expect to see in the next decade. It provides detailed information about the educational and training requirements for each of Utah's top jobs, as well as data on the current levels of attainment of the degrees or training necessary for each job. The purpose of this report is to inform current workers, future workers, employers, and policy makers about the opportunities that exist in Utah's economy and the steps that are necessary for Utah workers to take advantage of these opportunities.

FIVE STAR JOBS

In 2008, the Department of Workforce Services produced a complete list of the state's occupational projections for 2006 to 2016.¹ In this list, Workforce Services ranked the jobs using a "star" rating of one to five. The star rating is based on both employment outlook and wages, meaning *five-star* occupations have the strongest employment outlook and highest wages. The employment outlook for a given occupation is determined by both the projected annual number of Utah job openings and how fast the occupation is expected to grow between 2006 and 2016.² Median annual wages were used to determine the wage portion of the star rating.³

Median annual wages are based on an average of all wages of the workers in this occupation. This figure is an estimate of what a more experienced worker could expect to earn. Workforce Services lists inexperienced wages in its projections as well. Inexperienced wages represent



the bottom third of all wages for the occupation, and are an estimate of what a worker may expect to earn when first starting the job. The wages represented in this analysis were collected by Workforce Services in 2005.

The Department of Workforce Services includes 624 jobs in its occupation projections. Of these 624 jobs, 72 (11.5%) are rated as five star, 122 (19.6%) as four star, 144 (23.1%) as three star, 142 (22.8%) as two star, 56 (9.0%) as one star, and 88 (14.1%) as not rated. The majority of the five-star jobs are management, computer and mathematical, and education and training related occupations. Fifty-three percent require a college degree, while 36% require on-the-job training and 11% require work experience in a related field.

The degrees required for five-star jobs vary from associate's to doctoral degrees. Associate's degrees usually require at least two years of full-time academic schooling after high school. Many of these occupations are health-related, including registered nurses, respiratory therapists, dental hygienists, and cardiovascular technologists and technicians. Bachelor's degrees generally require four years of full-time academic schooling; however, because many management occupations prefer candidates with substantial work experience in addition to a bachelor's degree, it may take several years before a worker can advance to a high-paid position. Master's degrees are completed in two or more years after receiving a bachelor's degree and professional degrees, granted in fields such as dentistry, law, medicine, and pharmacy, are based on at least six years of college work. Doctoral degrees generally represent the highest level of formal study or research in a given field and are completed in four or more years of post-baccalaureate study.

The on-the-job training requirement for five-star jobs can range anywhere from just a few days or weeks training to more than 12 months of formal on-the-job training. Training can be a combination of both work experience and classroom instruction, but it often involves trainees watching experienced workers and/or being given progressively more difficult assignments until they develop the skills needed for average job performance.⁴ Workforce Services classifies on-the-job training into three categories—long term (12 or more months), moderate term (one to 12 months), or short term (a few days to several weeks). Some five-star jobs require candidates have work experience in a related occupation. Employers offering these types of jobs prefer applicants who have already received the necessary training at a previous job.

Median hourly wages of five-star jobs range from \$13.20 (industrial truck and tractor operators and court, municipal, and license clerks) to \$68.50 (chief executives). The average median wage is around \$28.00. Total annual openings range from ten per year (occupational therapist assistants and cardiovascular technologists) to 990 openings per year (heavy and tractor-trailer truck drivers). The average number of total annual openings for five-star jobs is around 200. The five-star occupation with the highest expected growth in annual openings (excluding replacements) is registered nurse, and the occupations with the highest number of replacements are truck drivers and general and operations managers.

UTAH FOUNDATION'S TOP 25 FIVE-STAR JOBS

Using the Workforce Services' list of long-term occupational projections, Utah Foundation determined the top 25 five-star rated jobs by eliminating any job with a median wage of less than \$20.00 per hour and then selecting the 25 occupations with the highest number of projected annual openings.⁵ This produces final a list that includes of a variety of job types and training levels. All of the jobs on Utah Foundation's final list have a median hourly wage of more than \$20.00 per hour and are expected to have more than 100 openings per year between now and 2016. The list is not rank-ordered and groups the jobs by type, rather than in any particular order.

The following section describes each job in detail as well as provides information on the level of education and training needed to work in the field. The job titles used by the Department of Workforce Services and in this report are consistent with the North American Industry Classification System (NAICS). This system is used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.⁶

MANAGEMENT OCCUPATIONS:

1. Chief Executives

Annual Openings: 150

Median Wage (per hour): \$68.50

Although they have a wide range of titles—chief executive officer, chief operating officer, board chair, president, superintendent, administrator, or commissioner—the main role of chief executives

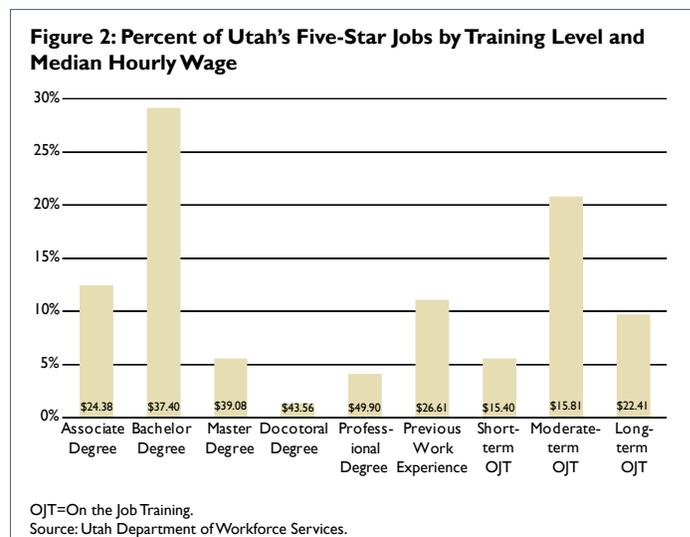


Figure 3: Utah's Top 25 Five-Star Jobs (based on wage and number of total annual openings between 2006 and 2016)

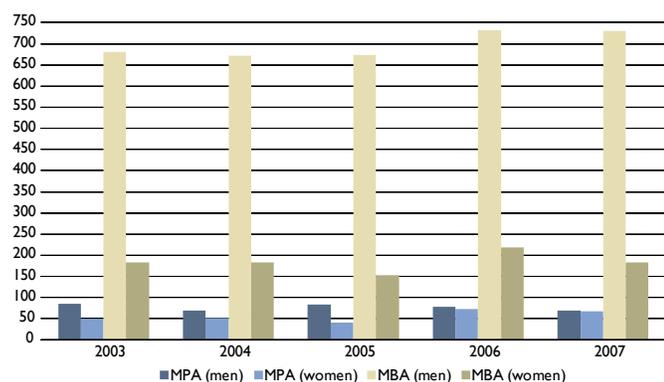
Occupation	Annual Openings			Median Wage	Training Level
	Growth	Replacements	Total		
Management Occupations					
Chief Executives	60	90	150	\$68.50	Bachelor's or higher degree, plus work experience
General and Operations Managers	250	370	620	\$35.50	Bachelor's or higher degree, plus work experience
Food Service Managers	90	70	160	\$22.50	Work experience in a related occupation
Financial Managers	100	60	160	\$39.40	Bachelor's or higher degree, plus work experience
Medical and Health Services Managers	70	50	120	\$35.50	Bachelor's or higher degree, plus work experience
Business and Financial Operations Occupations					
Management Analysts	100	70	170	\$30.10	Bachelor's or higher degree, plus work experience
Purchasing Agents, Except Wholesale, Retail, and Farm Products	60	70	130	\$22.80	Long-term on-the-job training
Computer and Mathematical Occupations					
Computer Software Engineers, Systems Software or Applications	285	70	355	\$37.20	Bachelor's degree
Computer Systems Analysts	140	80	210	\$30.90	Bachelor's degree
Computer Programmers	50	140	190	\$32.30	Bachelor's degree
Architecture and Engineering Occupations					
Civil Engineers	90	70	160	\$29.90	Bachelor's degree
Mechanical Engineers	80	60	140	\$35.20	Bachelor's degree
Industrial Engineers	100	50	140	\$34.10	Bachelor's degree
Education, Training, and Library Occupations					
Health Specialties Teachers, Postsecondary	90	40	130	\$53.90	Master's degree
Healthcare Practitioners and Technical Occupations					
Registered Nurses	700	280	980	\$26.40	Associate degree
Dentists, General	70	50	120	\$55.10	First professional degree in dentistry
Pharmacists	80	30	110	\$48.90	First professional degree in pharmacy
Sales and Related Occupations					
Sales Managers	80	60	140	\$41.60	Bachelor's or higher degree, plus work experience
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	480	370	850	\$23.40	Work experience in a related occupation
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	190	120	310	\$30.00	Work experience in a related occupation
Construction and Extraction Occupations					
Construction Managers	320	130	450	\$33.60	Bachelor's degree
Electricians	290	200	490	\$20.20	Long-term on-the-job training
Plumbers, Pipefitters, and Steamfitters	190	110	300	\$21.20	Long-term on-the-job training
Sheet Metal Workers	70	60	140	\$20.40	Long-term on-the-job training
Installation, Maintenance, and Repair Occupations					
Industrial Machinery Mechanics	100	50	150	\$20.70	Long-term on-the-job training

Source: Utah Department of Workforce Services.

is to formulate policies and provide overall direction for their organization. They establish specific objectives and devise strategies to ensure the objectives are met. Chief executives are also held accountable for the accuracy of their organization's financial reporting. The duties of chief executives can be general (responsible for the daily supervisory duties) or highly specialized (responsible for the overall performance of one aspect of the organization, such as sales or manufacturing).⁷

As a general rule, chief executives need at least a bachelor's degree and considerable work experience. However, the formal education and experience required to become a chief executive depends on the organization for which they work. For instance, college presidents typically have a doctorate in the field in which they originally taught, while brokerage office managers need a strong background in finance. Most chief executives in the public sector have a master's in public administration (MPA), and those in the private sector have master's degrees in business administration (MBA).⁸ Figure 4 shows

Figure 4: Number of Master's Degrees Awarded in Public and Business Administration in Utah Per Year, 2003-2007



Data is for the academic year, i.e. 2007 is for the 2006-2007 academic year.
Source: National Center for Education Statistics (NCES).

the number of MPA and MBA degrees awarded from Utah postsecondary schools from 2003-2007. Most major universities and colleges in Utah have an MBA program. MBA degrees can also be obtained through vocational schools such as the University of Phoenix, Stevens-Henager College, and Neumont University. Only Brigham Young University (BYU) and the University of Utah (U of U) offer MPA degrees.

Some chief executive positions are filled from within the organization by promoting experienced, lower-level managers—regardless of their educational background. This advancement can be accelerated by participating in company, local, or national training programs. However, because many companies prefer top executives who have extensive managerial experience, they tend to hire individuals who have been managers in other organizations. No license is required to be a chief executive, but the Institute of Certified Professional Managers offers the Certified Manager (CM) credential, which is earned by completing training and passing an exam.

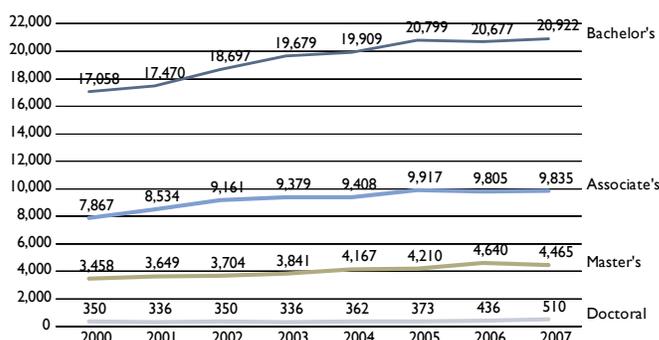
2. General and Operations Managers

Annual Openings: 620

Median Wage (per hour): \$35.50

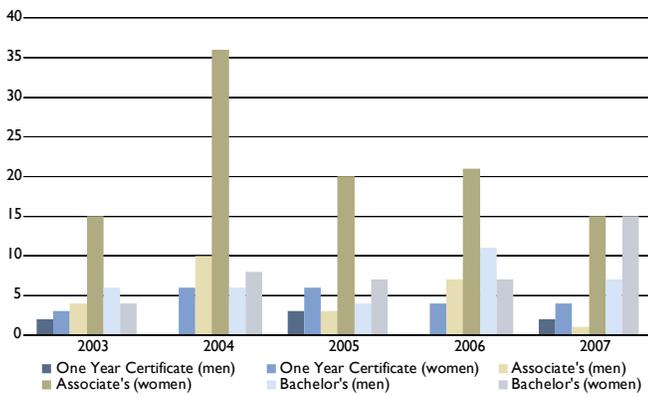
The job description and training necessary for general and operations managers is similar to that of chief executive. General and operations managers plan, direct, and coordinate their organization's operations. Their duties include formulating policies, managing daily operations, and planning the use of materials and human resources. They are responsible for purchasing, hiring, quality control, and other supervisory duties. In small organizations,

Figure 5: Number of Degrees Awarded in Utah Per Year, 2003-2007



Data is for the academic year, i.e. 2007 is for the 2006-2007 academic year.
Source: NCES.

Figure 6: Number of Hospitality Management Degrees Awarded in Utah Per Year, 2003-2007



Data is for the academic year, i.e. 2007 is for the 2006-2007 academic year.
Source: NCES.

the duties of general and operations managers overlap with those of chief executives. In large organizations, general and operations managers typically report to chief executives and are assisted by middle managers.⁹

As with chief executives, the minimum amount of training typically required for general and operations managers is a bachelor's degree and considerable work experience (Figure 5 shows the number of bachelor's and other degrees earned from Utah postsecondary schools from 2000-2007). The specific degree required depends on the type of organization, but it is possible for individuals without a college degree to advance within the company. Many workers accelerate their advancement by attending national or local training programs sponsored by industry associations. These programs teach the latest developments in management techniques. No license is required, but many candidates earn a CM to boost their credentials.

First-Line Supervisors/Managers of Production and Operating Workers

Individuals without a college degree, or who, for some other reason, are unable to advance to general and operations management positions, may consider becoming first-line supervisors/managers of production and operating workers. This position does not require a degree—only work experience in a related occupation. First-line supervisors report to operations managers and assist with the hiring, training, and daily supervisory duties of other workers. The median wage of first-line supervisors is about \$13.00 less per hour than general managers, but about \$9.00 more than the average production worker.

3. Food Service Managers

Annual Openings: 160

Median Wage (per hour): \$22.50

Food service managers plan, direct, and coordinate the activities of restaurants and other organizations that serve food and beverages. Besides coordinating activities among various departments, such as kitchen, dining room, and banquet operations, food service managers ensure customers are satisfied with their dining experience. They oversee the inventory and ordering of food, equipment, and supplies, and make sure the restaurant's equipment and facilities are

maintained. Managers in small organizations may also be responsible for the administrative and human-resource functions of the business, including recruiting new employees and monitoring employee performance and training.¹⁰

Previous work experience in the food services industry is the most common training needed for food service managers. Many food service manager positions, particularly self-service and fast-food, are filled by promoting experienced food preparation and service workers. However, some food service management companies and large restaurant chains recruit management trainees from two and four-year college hospitality management programs. This postsecondary education is preferred for many corporate positions, such as managing restaurant chains and franchises or overseeing contract food service operations. Figure 6 shows the number of hospitality management degrees awarded from Utah postsecondary schools from 2003-2007. These schools include Dixie State College (DSC), Utah Valley University (UVU), Southern Utah University (SUU), Everest College, and Provo College.

Two and four-year hospitality management programs provide instruction in subjects such as nutrition, sanitation, and food planning and preparation, as well as accounting, management, and computer science. Most programs combine classroom instruction with on-the-job experience. Some restaurant chains and food service management companies offer their own training programs for management positions. Although not a requirement for employment or advancement, the National Restaurant Association Educational Foundation awards the Foodservice Management Professional (FMP) certification to managers who achieve a qualifying score on a written examination, complete a series of food service management courses, and meet standards of work experience in the field.¹¹

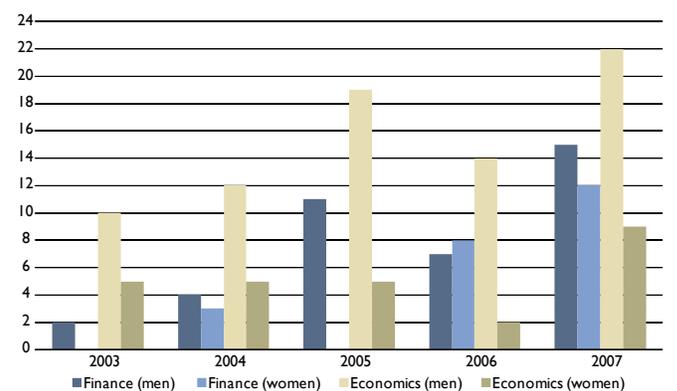
4. Financial Managers

Annual Openings: 160

Median Wage (per hour): \$39.40

The specific duties of financial managers vary with their titles, controller, treasurer, finance officer, credit manager, cash manager, or risk and insurance manager; however, it is the general duty of financial managers to oversee the preparation of financial reports and budgets, direct investment activities, and implement financial

Figure 7: Number of Master Degrees Awarded in Finance and Economics in Utah Per Year, 2003-2007



Data is for the academic year, i.e. 2007 is for the 2006-2007 academic year.
Source: NCES.

policies, procedures, and practices. Managers also develop strategies to implement long-term financial goals.¹² Financial managers who assist in mergers, consolidations, and global expansions must have extensive knowledge in risk reduction and profit maximization.

A bachelor's degree in finance, accounting, economics, or business administration is the minimum academic preparation needed for a career as a financial manager. However, many employers now seek graduates with master's degree in business administration, economics, finance, or risk management. Figure 7 shows the number of master's degrees awarded in finance and economics from Utah postsecondary schools from 2003-2007. The U of U is the only school in the state with a master of finance program. A master of economics can be earned from the U of U or Utah State University (USU).

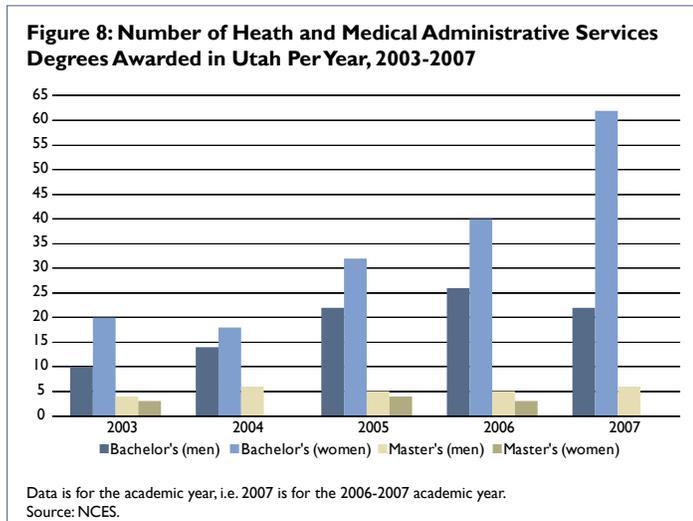
Related work experience is also necessary, and can actually be looked at more favorably than formal education. Some companies offer formal management training programs for employees who want to advance to management positions.¹³ No formal certification is necessary for financial managers, but many broaden their skills and exhibit competency by earning professional certifications such as Chartered Financial Analyst (CFA), Certified Treasury Professional (CTP), Certified Public Accountant (CPA), or Certified Management Accountant (CMA). Most of these certifications are awarded to those who have a bachelor's degree, pass the appropriate examinations, have a minimum of two-years of work experience, and fulfill the continuing education requirements.

5. Medical and Health Services Managers

Annual Openings: 120

Median Wage (per hour): \$35.50

Medical and health services managers plan, direct, coordinate, and supervise health services in hospitals or similar organizations. They can be specialists in charge of a specific clinical department or generalists who manage an entire facility or system. Managers of large facilities usually have several assistants who direct activities in clinical areas such as nursing, surgery, therapy, medical records, or health information. Managers of small facilities handle the daily operations of managing personnel, finances, and facility operations. Health information managers are responsible for the maintenance and security of all patient records.¹⁴



While a bachelor's degree is the minimum amount of training needed, a master's degree in health services administration, long-term care administration, health sciences, public health administration, or business administration is the standard credential for most positions. Clinical managers of large organizations usually have a degree and work experience in the field they manage, but also a master's degree in health services administration.¹⁵ Figure 8 shows the number of health and medical administrative services degrees awarded from Utah postsecondary schools from 2003-2007. The University of Phoenix, Stevens-Henager College, and Weber State University (WSU) offer bachelor's degrees in health and medical administrative services, but a master's degree in health administration can only be earned from the U of U.

In Utah, nursing care and assisted living facility administrators are the only occupations within the health services management field required to have a license.¹⁶ These licenses expire every two years, and each administrator must complete 40 hours of continuing education in the two-year cycle in order to renew their license.¹⁷ Health information managers who have a postsecondary degree from an approved program and who pass an exam can be certified as a Registered Health Information Administrator from the American Health Information Management Association.¹⁸

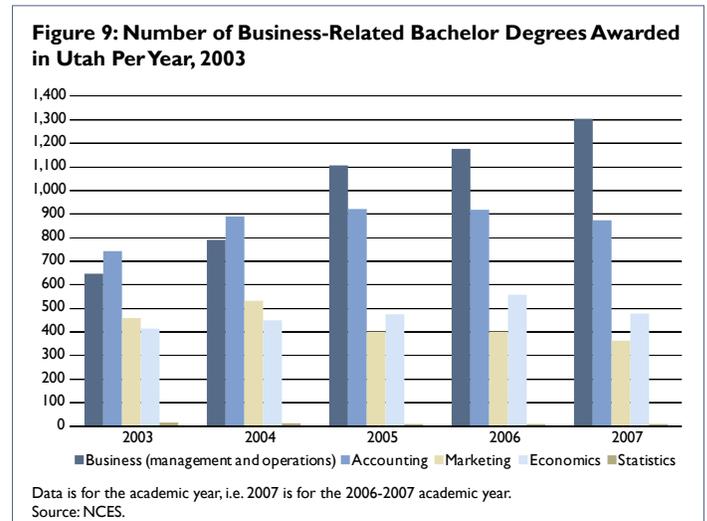
BUSINESS OCCUPATIONS

6. Management Analysts/Consultants

Annual Openings: 170

Median Wage (per hour): \$30.10

Management analysts collect, review, and analyze information in order to make recommendations to managers on ways to improve an organization's structure, efficiency, or profits. Public and private organization use analysts for a variety of reasons. Some companies hire analysts to improve inventory control, reorganize the corporate structure, or develop strategies for remaining competitive in the marketplace. Management analysts can be single practitioners or part of a large organization. Most analysts are hired on a temporary basis and compete with other analysts/firms for jobs. Some management analysts work directly for one organization to continually improve efficiency and control costs.¹⁹



Management analysts generally have at least a bachelor's degree, plus some work experience. Common fields of study include business, management, accounting, marketing, economics, statistics, or computer and information science. Figure 9 shows the number of business-related bachelor's degrees awarded from Utah postsecondary schools from 2003-2007. These degrees can be obtained from most major universities, colleges, and vocational schools located within the state. However, many employers in private industry prefer individuals with an MBA. Some employers also require the analyst have years of work experience in the field they consult, such as management, human resources, or information technology. Government agencies generally require experience, graduate education, or both, but many hire individuals with just a bachelor's degree for entry-level analyst positions.

While no formal certification or license is required to work as a consultant, the Institute of Management Consultants (IMC) offers the Certified Management Consultant (CMC) designation to those who meet minimum levels of education and experience, submit client reviews, and pass an interview and exam covering the IMC's Code of Ethics. Consultants with a CMC designation must be recertified every three years.²⁰ Management analysts must also routinely attend conferences to stay up-to-date on current developments in their field.

7. Purchasing Agents (except wholesale, retail, and farm products)

Annual Openings: 130

Median Wage (per hour): \$22.80

Purchasing agents direct and manage activities involved with purchasing machinery, equipment, or supplies necessary for an organization's operation. These activities involve negotiating contracts, analyzing proposals, preparing purchase orders, studying sales records and inventory levels, and identifying suppliers. Purchasing agents also track market conditions, price trends, and futures markets. They must know how to use word processing, spreadsheet software, and the Internet, as well as be able to analyze technical data, understand supply-chain management, and perform financial analyses.²¹

Educational and training requirements for purchasing agents vary with the size of the organization, but most individuals become purchasing agents through long-term, on-the-job training. Qualified individuals may begin as trainees, purchasing clerks, expeditors, or assistant buyers and then advance to the agent position. However, many large organizations prefer applicants who have a bachelor's degree in a business-related field (see Figure 9), and manufacturing firms general only hire applicants with a bachelor's or master's degree in engineering, business, economics, or one of the applied sciences. Regardless of academic preparation, all new employees must learn the specifics of each individual business through long-term training lasting from one to five years.

Professional certification is becoming increasingly important for purchasing agents. The Certified Professional in Supply Management (CPSM) is conferred by the Institute for Supply Management. The Certified Purchasing Professional (CPP) and Certified Professional Purchasing Manager (CPPM) are conferred by the American

Purchasing Society. The Certified Supply Chain Professional is conferred by the Association for Operations Management. The Certified Professional Public Buyer (CPPB) and Certified Public Purchasing Officer (CPPO) are also available for government workers. These certifications are awarded after work-related experience and education requirements are met and written or oral exams are successfully completed.²²

COMPUTER OCCUPATIONS

8. Computer Software Engineers

Annual Openings: 355

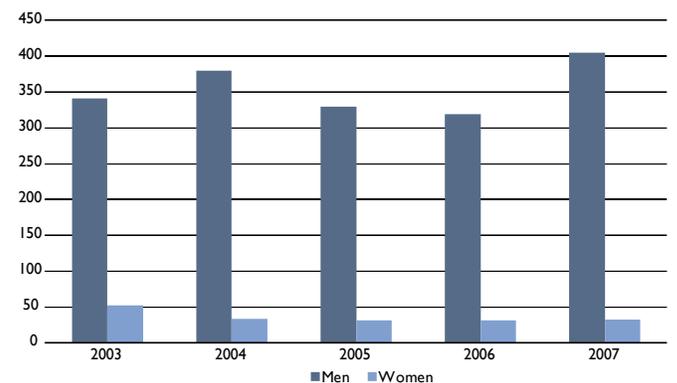
Median Wage (per hour): \$37.20

Computer software engineers use computer science and mathematical analysis to design, develop, test, and evaluate computer software and systems. They typically work in two fields: applications and systems software. Application engineers develop, create and modify general computer applications software. They use different programming languages, such as C, C++, and Java. Systems software engineers research, design, develop, and test operating system-level software, compilers, and network distribution software. They also coordinate each department's computer needs—ordering, inventory, billing, and recordkeeping—and make suggestions about its technical direction.²³

Most employers prefer applicants who have at least a bachelor's degree and experience with a variety of computer systems and technologies. The college major for most engineers is computer science or software engineering. Figure 10 shows the number of bachelor's degrees awarded in computer science from Utah postsecondary schools from 2003-2007. Bachelor's degrees in computer science are offered by most major Utah universities and colleges, as well as a few vocational schools such as Neumont University and Stevens-Henager College. Students studying to become a computer software engineer can enhance their employment opportunities by participating in internships and gaining real-world experience. Individuals with graduate degrees in mathematics and systems designs are sought after by top software developers, government agencies, and consulting firms.

Specific certification and training programs are offered by some systems software vendors; however these certifications are designed

Figure 10: Number of Bachelor Degrees in Computer Science Awarded in Utah Per Year, 2003-2007



Data is for the academic year, i.e. 2007 is for the 2006-2007 academic year.
Source: NCES.

to enhance an individual's resume, not replace their formal education.²⁴ Because technology changes so rapidly in this field, it is imperative for computer software engineers to continually learn the latest technical skills. These skills can be learned by participating in professional development seminars offered by employers, software vendors, colleges and universities, private training institutions, and professional computing societies. Systems software engineers also need some skills related to the industry in which they work; for example, financial expertise if they work in the banking industry.

9. Computer Systems Analysts

Annual Openings: 210

Median Wage (per hour): \$30.90

Computer systems analysts help organizations use technology effectively and incorporate changing technology into their existing systems. They develop procedures and coordinate the installation of appropriate computer programs and operating systems, as well as analyze business, scientific, or technical problems. In this process, analysts use techniques such as structured analysis, data modeling, information engineering, mathematical model building, sampling, and cost accounting. Most systems analysts work with specific types of computer systems: business, accounting, and financial systems or scientific and engineering systems.²⁵

Training requirements for computer systems analysts vary depending on the job, but many employers prefer applicants who have a bachelor's degree in either a technical field, such as computer science, information science, applied mathematics, and computer engineering, or a business-related field, such as management information systems (MIS). Figure 11 shows the number of computer systems analyst-related bachelor's degrees awarded from Utah postsecondary schools from 2003-2007. Bachelor's degrees in computer science and management information systems are offered by most major Utah universities and colleges, as well as some vocational schools. Degrees in information sciences are offered by USU and WSU, and degrees in computer engineering are offered by BYU, U of U, and USU. Individuals with graduate degrees are preferred for more technically complex jobs.

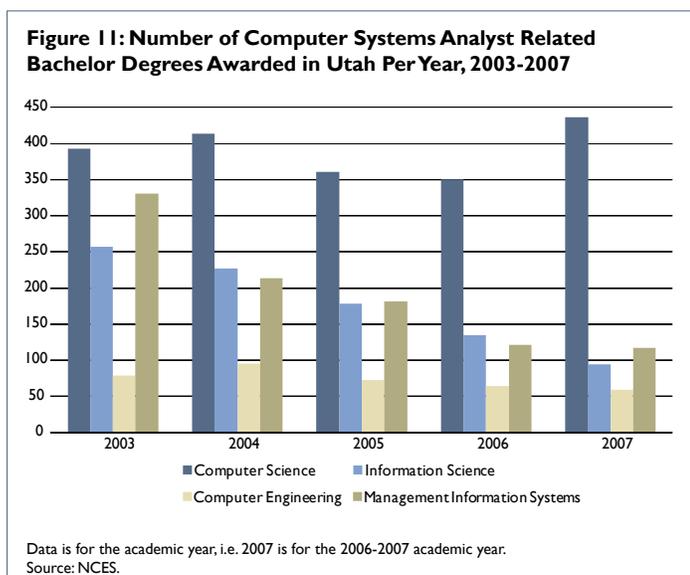
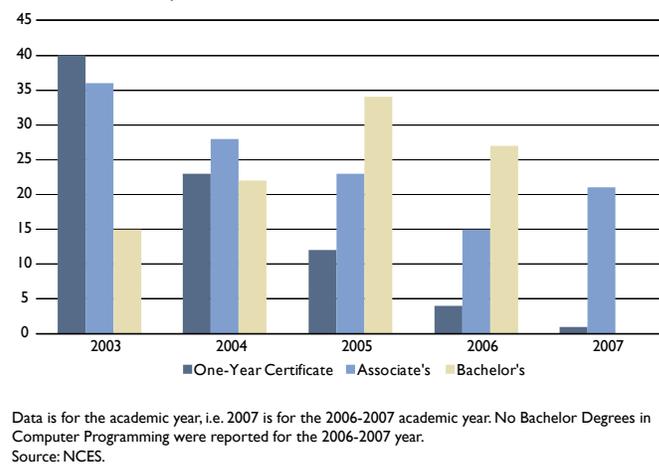


Figure 12: Number of Computer Programming Degrees Awarded in Utah Per Year, 2003-2007



Relevant work experience also is important, and people who have degrees in other areas may find employment as systems analysts if they have the appropriate technical skills. Because technology changes so rapidly in the computer industry, continuous education is necessary to remain competitive in the field. Advancement opportunities are best for those with the necessary skills and experience in the latest technology. Employers, hardware and software vendors, colleges and universities, and private training institutions offer continuing education to help workers attain the latest skills. Additional training may come from professional development seminars offered by professional computing societies. No official certification or license is necessary to work as a computer systems analyst.

10. Computer Programmer

Annual Openings: 190

Median Wage (per hour): \$32.30

Computer programmers develop and write computer programs to store, locate, and retrieve information by using work flow charts and converting raw data into coded computer language. They usually write these programs according to the specifications given by computer software engineers and systems analysts and by coding instructions into a conventional programming language such as COBOL, Java, or C++. Programmers in software development companies may work directly with experts from various fields to create specialized software ranging from games and educational software to programs for desktop publishing and financial planning.²⁶

A bachelor's degree is generally required for computer programming jobs, although a two-year degree or certificate may be adequate for some positions. Computer programmers typically have a degree in computer science, mathematics, or information systems; however, some students take courses in computer programming to supplement their business degree. A graduate degree is required for more technical jobs. Figure 12 shows the number of computer programming degrees awarded from Utah schools from 2003-2007. These degrees are offered by Eagle Gate, Provo, and Stevens-Henager College, as well as UVU and WSU.

Systems programmers must have an extensive knowledge of a variety of operating systems. This includes being able to configure

an operating system to work with different types of hardware and being able to work with database systems, such as DB2, Oracle, or Sybase. Workers who stay current with the latest technology have the best opportunities for advancement. Programmers must continually update their knowledge and skills by taking programming courses sponsored by their employer, software vendors, or offered through local colleges and universities. Language or product-specific certification is another way to demonstrate competence to an employer and gain a competitive advantage. Some vendors and firms actually require professionals who work with their products to be certified. Voluntary certification also is available through various organizations.

ENGINEERING OCCUPATIONS

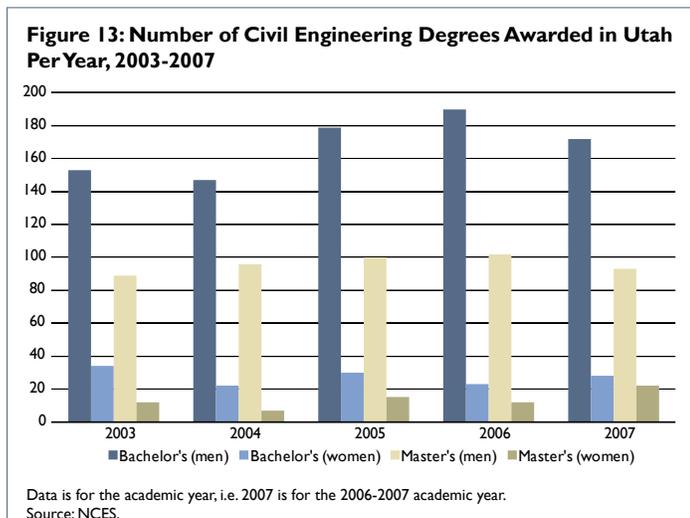
11. Civil Engineer

Annual Openings: 160

Median Wage (per hour): \$29.90

Civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, pipelines, power plants, and water sewage systems. They determine the appropriate construction costs, expected lifetime of a project, and any potential environmental hazards. Civil engineers can specialize in one or more engineering areas, including water resources, construction, environment, transportation, and geotechnical. Many civil engineers hold supervisory or administrative positions, such as construction supervisor or city engineer. Others work in design, construction, research, and teaching.²⁷ An individual with a civil engineering degree can work for engineering consulting firms, architectural firms, construction companies, and in government engineering departments.

A bachelor's degree in civil engineering from an accredited postsecondary school is required for almost all entry-level civil engineering positions. Most civil engineering programs involve taking courses in an engineering specialty area (such as environmental, water, geothermal, or transportation), along with upper-level courses in mathematics and physical science.²⁸ Undergraduate programs in engineering are typically designed to last four years, but many students find that it can take up to five to complete their studies.²⁹ Graduate training is necessary to work as college professor or in research and development. Figure 13 shows the number of civil



engineering degrees awarded from Utah postsecondary schools from 2003-2007. Both bachelor's and master's degrees are offered by BYU, U of U, and USU.

Individuals must be licensed as a professional engineer (PE) to work as civil engineers in Utah. This licensure requires a degree from an accredited engineering program, four years of relevant work experience, and successful completion of state examinations. The Fundamentals of Engineering (FE) exam is taken upon graduation. Engineers who pass this exam are known as engineers in training (EIT). After acquiring suitable work experience, EITs take the second exam, the Principles and Practice of Engineering (PE). Utah also requires that applicants complete the Utah Professional Engineer Law and Rules examination.³⁰ Utah engineering licenses expire every two years, and to renew the license engineers must complete 24 hours of continuing education in the two-year cycle.

Besides being licensed as a professional engineer, numerous certification programs are offered by professional organizations in specific fields of engineering. Civil engineers can earn certification in water resources, geotechnical, environmental, building security, and forensic engineering, as well as in management areas, such as the Certified Associate in Project Management.³¹

12. Mechanical Engineer

Annual Openings: 140

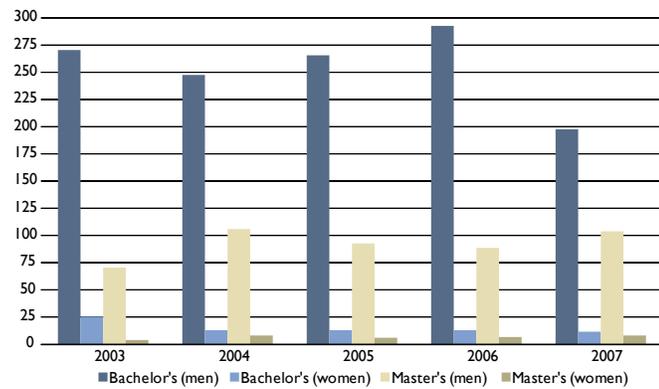
Median Wage (per hour): \$35.20

Mechanical engineers research, design, construct, manufacture, and test mechanical equipment; it is one of the broadest engineering disciplines. Mechanical engineers work on power-producing machines such as electric generators, internal combustion engines, and steam and gas turbines. They also work on power-using machines such as refrigeration and air-conditioning equipment, material handling systems, and industrial production equipment. Mechanical engineers generally work in manufacturing or agriculture production, machinery design, maintenance, or technical sales. Many mechanical engineers become administrators or managers.³²

A bachelor's degree in mechanical engineering from an accredited postsecondary school is required for entry-level mechanical engineering positions. Most mechanical engineering programs involve taking courses in an engineering specialty area (such as fluid dynamics, manufacturing, product development, or thermodynamics), along with upper-level courses in mathematics and physical science.³³ Figure 14 shows the number of mechanical engineering degrees awarded from Utah postsecondary schools from 2003-2007. Both bachelor's and master's degrees are available from BYU, U of U, and USU. For basic information on undergraduate engineering programs, see the civil engineering section above.

Like civil engineers, mechanical engineers must be licensed as professional engineers to work in Utah. This requires a degree from an accredited engineering program, four years of relevant work experience, and successful completion of the FE, PE, and Utah Professional Engineer Law and Rules exams.³⁴ For more information on the PE license, see the civil engineering section above. Numerous certification programs are offered by professional mechanical organizations as well. Mechanical engineers can receive certification

Figure 14: Number of Mechanical Engineering Degrees Awarded in Utah Per Year, 2003-2007



Data is for the academic year, i.e. 2007 is for the 2006-2007 academic year.
Source: NCES.

in geometric dimensioning and tolerancing, as well as operating hazardous waste incinerators, high capacity fossil fuel-fired plants, and municipal solid waste combustion facilities.³⁵

13. Industrial Engineer

Annual Openings: 140

Median Wage (per hour): \$34.10

Industrial engineers determine the most effective ways to use the basic factors of production. They are primarily concerned with increasing productivity through the management of people, capital, and technology. To maximize efficiency, industrial engineers use mathematical models to design manufacturing and information systems. They develop management control systems to aid in financial planning and cost analysis, and design production planning and control systems to coordinate activities and ensure product quality. They also design or improve systems for the physical distribution of goods and services and determine the most efficient plant locations. Many move into management positions because the work is closely related to the work of managers.³⁶

A bachelor's degree in industrial engineering from an accredited postsecondary school is required for almost all entry-level industrial engineering positions, although engineers trained in related branches of engineering may also work as industrial engineers. Most industrial engineering programs involve taking courses in an engineering specialty area (such as manufacturing, project management, telecommunications, or production control), along with upper-level courses in mathematics and physical science.³⁷ Data from the National Center for Education Statistics show that no postsecondary schools in Utah offer a specific degree in industrial engineering.

Unlike civil and mechanical engineers, industrial engineers do not necessarily need to be licensed to work in Utah. However, being licensed increases the opportunities for advancement and better job placements. Obtaining a PE license requires having a degree from an accredited engineering program, four years of relevant work experience, and successful completion of the FE, PE, and Utah Professional Engineer Law and Rules exams.³⁸ For more information on the PE license, see the civil engineering section above. Numerous certification programs are offered by professional industrial

organizations as well. Industrial engineers can receive certification in healthcare, management, manufacturing, government, finance, and education.³⁹

EDUCATION OCCUPATIONS

14. Postsecondary Health Specialties Instructors

Annual Openings: 130

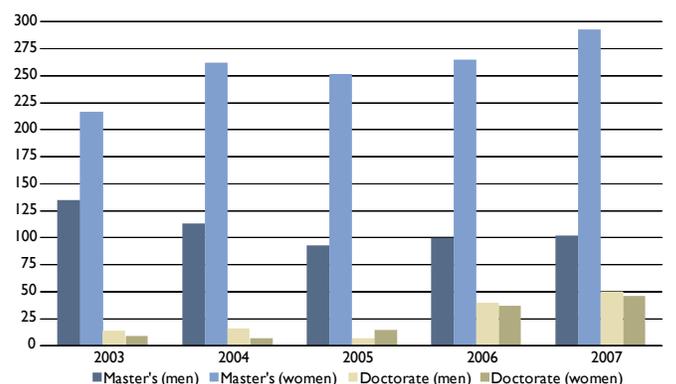
Median Wage (per hour): \$53.90

Postsecondary health specialties instructors teach college and university-level courses in health specialties, such as veterinary medicine, dentistry, pharmacy, therapy, laboratory technology, and public health. Many college and university faculty teach both undergraduate and graduate-level students, give lectures, lead seminars, and supervise students in laboratories. In addition to teaching, instructors at the university level are often required to perform a significant amount of research and consult with government, business, nonprofit, and community organizations.⁴⁰ Most full-time faculty members also serve on academic or administrative committees.

A master's degree is the minimum educational requirement for teaching health specialties topics at the postsecondary level. However, many four-year colleges and universities require a doctoral degree for full-time, tenure-track positions. Master's programs take two to three years of full-time study beyond the bachelor's degree to complete; this includes time spent completing a thesis or internship. Doctoral programs take an average of six years of full-time study; this includes time spent completing a dissertation (a written report on original research in the candidate's field of study). Figure 15 shows the number of master's and doctoral degrees awarded from Utah postsecondary schools from 2003-2007. While some vocational schools offer master's degrees in health professions and clinical sciences, most of the awards come from major universities such as BYU, the U of U, and USU.

Additional training/experience may be necessary depending on the health specialties topic. For example, those teaching medicine and dentistry must be current on the latest information and techniques used to diagnose and treat human injuries, diseases, and deformities. Those teaching laboratory technologies must have knowledge of processors, electronic equipment, and the latest computer applications and programs.⁴¹ To stay current on this information, instructors

Figure 15: Number of Master and Doctoral Degrees Awarded in Health Professions and Related Clinical Sciences in Utah Per Year, 2003-2007



Data is for the academic year, i.e. 2007 is for the 2006-2007 academic year.
Source: NCES.

read journals and participate in professional conferences. Teachers of health specialties topics have also usually worked in their industry for several years before teaching, which allows them to share their personal knowledge and experiences with students.

HEALTHCARE PRACTITIONERS AND TECHNICAL OCCUPATIONS

15. Dentists

Annual Openings: 120

Median Wage (per hour): \$55.10

Dentists diagnose and treat problems of the teeth and gums using dental instruments, x-rays, and other diagnostic equipment. They give advice and administer care to help prevent future problems and provide instruction on diet, brushing, flossing, and the use of fluorides. They remove tooth decay, fill cavities, place protective sealants on children's teeth, straighten teeth, and repair fractured teeth. They also perform corrective surgery on gums and supporting bones to treat gum disease. Dentists can also administer anesthetics and write prescriptions for antibiotics and other medications.⁴²

Dentists practicing in Utah must be licensed, which requires graduating from an accredited dental school. To be admitted to a dental school, an applicant must complete a minimum of two years of college-level pre-dental education. Most applicants have a bachelor's degree, although a few applicants are accepted after two or three years of college. Other entry requirements include taking upper-level science courses in biology and chemistry. All dental schools require applicants to take the Dental Admissions Test (DAT). There are no dental schools in Utah; however, the U of U participates in a cooperative dental education program with Creighton University School of Dentistry. Students admitted to this program attend the first year at the U of U then attend Creighton University for the next three years.

In addition to graduating from an accredited dental school, dentists must pass the National Board Dental Examination administered by the ADA, pass a regional practical examination, and be CPR certified to be licensed in Utah. Additional certifications are necessary for an Anesthesia and Analgesia permit and a Utah controlled substance license, which allows dentists to administer, possess, or prescribe prescription drugs. Dental licenses expire every two years, and each dentist must complete 30 hours of continuing education in the two-year cycle in order to renew their license.⁴³

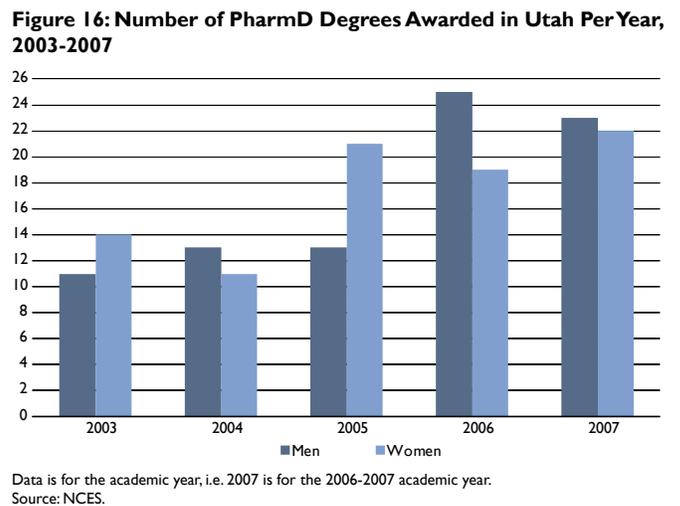
16. Pharmacists

Annual Openings: 110

Median Wage (per hour): \$48.90

Pharmacists prepare and dispense medications following prescriptions issued by physicians, dentists, and other authorized medical practitioners. They answer questions and provide information on the selection, dosages, interactions, and side effects of medications. Pharmacists monitor the health and progress of patients to ensure the safe and effective use of medications. Most pharmacists work in either retail drugstores or in healthcare facilities, such as hospitals, nursing homes, mental health institutions, or clinics.⁴⁴

All practicing pharmacists must be licensed. In order to obtain a license, pharmacists have to earn a Doctor of Pharmacy degree



(PharmD) from an accredited college or school of pharmacy and pass several examinations. Admittance to a PharmD program requires completion of at least two years of postsecondary study (although most applicants have completed three or more years), taking upper-level courses in mathematics, chemistry, biology, and physics. About 70% of pharmacy programs require applicants take the Pharmacy College Admissions Test (PCAT).⁴⁵ The U of U is the only school in Utah with an accredited PharmD program.⁴⁶

After successful completion of a PharmD program, students must pass the North American Pharmacist Licensure Exam (NAPLEX) in order to obtain a license. Pharmacists practicing in Utah must also pass the Multistate Pharmacy Jurisprudence Exam (MPJE) and meet a 1,500-hour internship requirement.⁴⁷ All pharmacist licenses in Utah expire every two years, and in order to renew the license, pharmacists must complete 30 hours of continuing education in the two-year renewal cycle. All 30 hours must be approved by the Accreditation Council on Pharmaceutical Education (ACPE) and programs accredited by other nationally recognized healthcare accrediting agencies.

17. Registered Nurses (RNs)

Annual Openings: 980

Median Wage (per hour): \$26.40

This category includes administrative, public health, industrial, private duty, and surgical nurses. Regardless of specialty, however, RNs administer nursing care to ill or injured persons by providing healthcare, first aid, and immunization in facilities such as hospitals, schools, and in private industry. RNs also educate people about medical conditions. They record patients' medical histories and symptoms, help perform diagnostic tests and analyze results, operate medical machinery, administer treatment and medications, provide emotional support to patients' families, and help with patient follow-up and rehabilitation.⁴⁸

There are three educational paths to becoming a RN: a bachelor's degree (BSN), an associate's degree (ADN), and a diploma from an approved nursing program. Most nurses have an associate's or bachelor's degree. BSN programs, offered by colleges and universities, take up to four years to complete. ADN programs, offered by community and junior colleges, take two to three years

to complete. Diploma programs, administered in hospitals, last about three years. Many RNs with an ADN or diploma later enter bachelor's programs to further their training and careers. Nursing students take courses in anatomy, physiology, microbiology, chemistry, nutrition, psychology, and nursing. All programs include classroom instruction and supervised clinical experience. Figure 17 shows the number of nursing degrees awarded from Utah postsecondary schools from 2003-2007. Associate's and bachelor's degrees in nursing are offered by most universities, colleges, and vocational schools in Utah.

After earning a degree or diploma in nursing, individuals must complete a national licensing exam (NCLEX-RN) or receive endorsement of a license issued by another state.⁴⁹ The Nurse Licensure Compact Agreement allows a nurse who is licensed and permanently resides in a member state to practice in Utah without obtaining a state-specific license. All nursing licenses in Utah expire every two years, and in order to renew their license each RN must have either worked 400 hours, worked 200 hours plus 15 hours of approved continuing education, or had 30 hours of approved continuing education within the two-year period.⁵⁰ Further training, education, and certification can qualify nurses to work in specialty areas or become clinical nurse specialists, nurse anesthetists, or nurse practitioners.

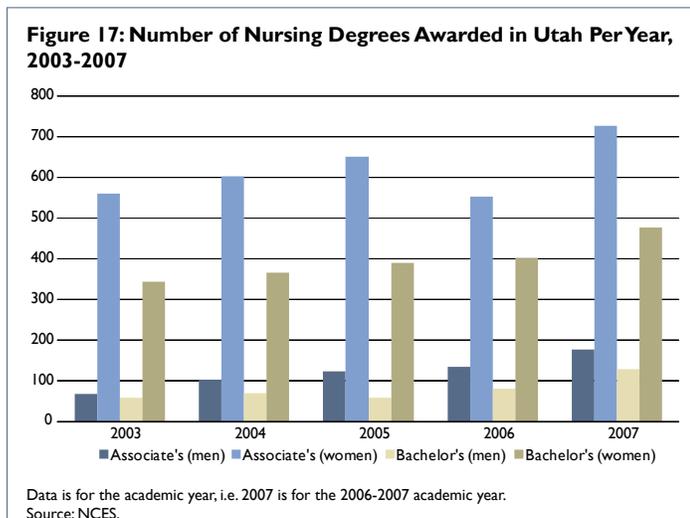
SALES AND RELATED OCCUPATIONS

18. Sales Manager

Annual Openings: 140

Median Wage (per hour): \$41.60

Sales managers plan, direct, and coordinate sales activities by establishing sales territories, quotas, and goals. They also prepare budgets, make personnel decisions, devise sales-incentive programs, and approve sales contracts. In regard to personnel, sales managers oversee the work of sales workers, either directly or with the assistance of first-line supervisors. They are responsible for interviewing, hiring, and training workers, as well as establishing training programs. In large retail companies, sales managers provide oversight of individual departments; they review inventory and sales records, develop merchandising techniques, and coordinate sales promotions. In small companies, sales managers are responsible for the operation of the entire company.⁵¹



The minimum amount of training generally required for a sales manager position is a bachelor's degree and considerable work experience. Most sales managers have degrees in the social sciences, business, or management. However, many managers begin their careers on the sales floor and gain knowledge of management practices through work experience. Regardless of whether they have a degree or not, supervisors must know how to use computers because almost all cash registers, inventory control systems, sales quotes, and contracts are computerized. Some national retail chains and companies offer formal training programs for management candidates that include both classroom instruction and on-site training.

First-Line Supervisors/Managers of Non-Retail Sales Workers

Candidates without a college degree, or who, for some other reason, are unable to advance to sales management positions, may consider becoming first-line supervisors of sales workers. First-line supervisors report to managers and oversee the work of salespersons, cashiers, and customer service representatives. They may also assist in interviewing, hiring, and training sales workers. This position does not require a degree—only work experience in a related occupation. The median wage of first-line supervisors is about \$15.00 less per hour than sales managers, but about \$5.00 more per hour than the average sales worker.

19. Sales Representatives, Wholesale and Manufacturing (Except Technical and Scientific Products)

Annual Openings: 850

Median Wage (per hour): \$23.40

Wholesale and manufacturing sales representatives sell goods or services to retail stores or manufacturing businesses. Examples of these goods or services include food, office supplies, and apparel. Sales representatives demonstrate their products and explain how using them can reduce costs and increase sales. They solicit orders from established clients and secure new customers by following leads, participating in trade shows and conferences, and visiting potential clients. They must also be available to address any clients' questions and concerns. Representatives may work for one or several distributors, and sell a single product or a line of products.

Besides selling products, sales representative must be able to analyze sales statistics, prepare reports, and handle administrative duties. Some representatives work in inside sales, where they take orders and resolve problems over the phone. Others work in outside sales, where they travel to visit with current clients and prospective buyers. To stay current on new products and the changing needs of their customers, sales representatives attend trade shows, conferences, conventions, and company-sponsored meetings, which review sales performance, product development, and profitability.

Individuals can become sales representatives with little or no on-the-job training and no formal education; they are only required to have experience in a related occupation. It is becoming increasingly common for employers to hire candidates with a college degree, but factors such as personality and the ability to sell are more essential. To stay competitive, many sales representatives attend seminars in sales techniques or take courses in marketing, economics, communication, computers, or even foreign languages. Some larger companies have

formal training programs for beginning sales representatives where new employees are trained by accompanying experienced workers on their sales calls.⁵²

While no formal license is required to become a sales representative, certifications are available. Many sales representatives either earn the Certified Professional Manufacturers' Representative (CPMR) or the Certified Sales Professional (CSP) certifications offered by the Manufacturers' Representatives Education Research Foundation. Certification typically involves completion of formal training and passing an exam.⁵³

20. Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products

Annual Openings: 310

Median Wage (per hour): \$30.00

The job description for technical and scientific product sales representatives is similar to that of wholesale and manufacturing sales representatives; however, in order to sell technical and scientific products, the representative must have technical knowledge of the product and its use. Technical and scientific products may include anything from agricultural and mechanical equipment to electrical and pharmaceutical goods. Sales representatives must be able to demonstrate the product's use and explain how the products are beneficial. Most importantly, they must be available to address any of their clients' technical and non-technical questions.

Besides selling products, sales representative must be able to analyze sales statistics, prepare reports, and handle administrative duties. While most technical and scientific sales representatives work in outside sales, inside sales is an option at larger companies. Because of the technical and scientific nature of their products, it is imperative for these representatives to stay current on new products, changing technology, and the changing needs of their customers. This requires attending trade shows, conferences, and conventions.

As mentioned above, no formal education or on-the-job training is necessary to work as a sales representative. However, due to the technical and scientific nature of their products, having a bachelor's degree is highly desirable for representative selling these products. Most technical and scientific sales representatives have obtained at least two years of post-secondary education and have taken courses in biology, engineering, chemistry, or electronics.⁵⁴ Having some postsecondary education also helps representatives understand and stay current on technological advances which result in new and more complex products. Representatives can earn the Certified Professional Manufacturers' Representative (CPMR) or the Certified Sales Professional (CSP) certifications.

CONSTRUCTION AND EXTRACTION OCCUPATIONS

The Department of Workforce Services' estimated annual number of job openings was forecasted using 2006 as a base year. This forecast was made before the economic recession began in December 2007, and in the past two years, annual growth in many of these five-star jobs did not meet Workforce Services' projections. In particular, the construction industry experienced significant losses in the number of available jobs. While hiring has slowed in almost all occupations, there are signs economic conditions are slowly improving at both the national and state level. Therefore, it is important to remember

that the occupational outlook forecast was for a 10-year period, and growth in these occupations will likely resume.

21. Construction Managers

Annual Openings: 450

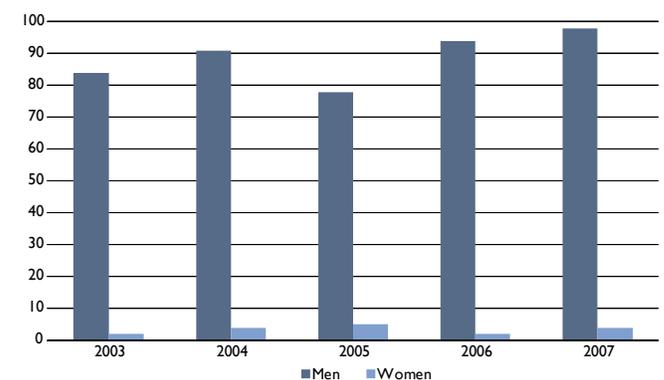
Median Wage (per hour): \$33.60

Construction managers plan, direct, and coordinate activities concerned with the construction and maintenance of residential, commercial, and industrial buildings, facilities, and systems. Managers may oversee an entire project, or be in charge of one aspect of the project's development, such as land clearing, sewage systems, or road construction. They schedule all design and construction processes from plan development through final construction, including the selection, hiring, and oversight of workers, as well as obtaining the necessary permits and licenses.⁵⁵

Employers generally only hire construction managers who have a bachelor's degree in construction science, construction management, or civil engineering. Figure 18 shows the number of bachelor's degrees in construction management awarded from Utah postsecondary schools from 2003-2007. Both BYU and ITT Technical Institute of Murray offer bachelor's degrees in construction management. Some courses in these programs include project control and development, site planning, construction methods, financial management, building codes, mathematics, and information technology. Practical construction experience is also important. Individuals are traditionally advanced to construction management positions after having substantial experience as a construction worker, having worked as a construction supervisor, or having owned an independent specialty contracting firm.

Although certification is not required to work in construction management, there is a growing movement toward being certified. The American Institute of Constructors awards the Associate Constructor (AC) and Certified Professional Constructor (CPC) certifications. The Construction Management Association of America awards the Certified Construction Manager (CCM) certification to workers who have the required experience and pass a technical exam. Applicants must also complete a self-study course that covers the professional role of a construction manager, legal issues, allocation of risk, and other topics related to construction management.

Figure 18: Number of Bachelor Degrees in Construction Management Awarded in Utah Per Year, 2003-2007



Data is for the academic year, i.e. 2007 is for the 2006-2007 academic year.
Source: NCES.

First-Line Supervisors/Managers of Construction Trades and Extraction Workers

Candidates without a college degree, or who, for some other reason, are unable to advance to construction management positions, may consider becoming first-line supervisors of construction workers. First-line supervisors report to managers and oversee the work of carpenters, plumbers, and other construction workers. They may also assist in interviewing, hiring, and training workers. This position does not require a degree—only work experience. The median wage of first-line supervisors is about \$10.00 less per hour than construction managers, but about \$7.00 more per hour than the average construction worker.

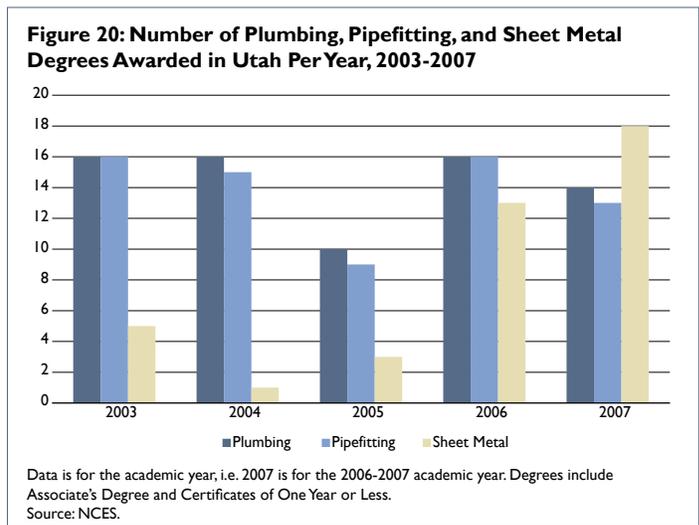
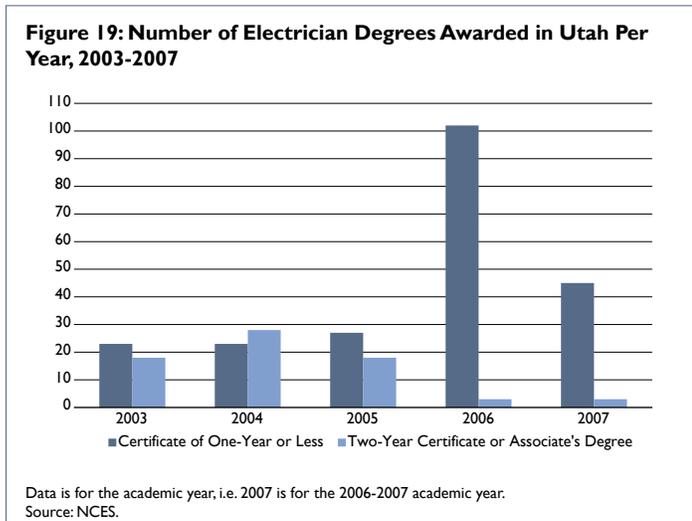
22. Electricians

Annual Openings: 490

Median Wage (per hour): \$20.20

Electricians install, maintain, and repair electrical wiring, equipment, machines and fixtures in homes and factories. Electricians generally specialize in either construction or maintenance, although many are trained to do both. Those specializing in construction primarily install wiring in factories, businesses, and new homes. Maintenance electricians fix and upgrade existing electrical systems and repair electrical equipment.⁵⁶ Some electricians also install low-voltage wiring systems for voice, data, and video equipment, and coaxial or fiber optic cable for telecommunications equipment.

No formal education is required to work as an electrician; however, most electricians learn their trade through apprenticeship programs, which combine paid, long-term, on-the-job training with classroom instruction. Apprentices must have at least a high school diploma or a General Equivalency Diploma (GED). These programs usually last four years and are sponsored by individual electrical companies or local chapters of national electrical associations. Those who complete apprenticeships are qualified for both maintenance and construction work. A number of technical schools also offer electrician training. Figure 19 shows the number of electrician degrees awarded from Utah postsecondary schools from 2003-2007. An associate’s electrician degree is offered by the Salt Lake Community College (SLCC). Certificates can be earned through Applied Technology Colleges. Students who complete these programs can start at a more advanced level in their apprenticeships.



Electricians working in Utah must be licensed. To get a Utah electrician’s license, applicants must show successful completion of an approved apprenticeship program, have at least four years experience as a licensed apprentice, and pass the Utah Electrical Licensing Examination. Licenses expire every two years and, in order to renew the license, electricians must complete 16 hours of approved continuing education within the two-year cycle.⁵⁷ Master electricians, or supervisors, need an additional license.

23. Plumbers, Pipefitters, and Steamfitters

Annual Openings: 300

Median Wage (per hour): \$21.20

Although plumbing, pipefitting, and steamfitting are often considered a single trade, workers generally specialize in one area. Plumbers install and repair the water, waste disposal, drainage, and gas systems in residential, commercial, and industrial buildings. Plumbers also install plumbing fixtures and appliances such as dishwashers and water heaters. Pipefitters install and repair both high and low-pressure pipe systems used in manufacturing, electricity generation, and the heating and cooling of buildings. Steamfitters install pipe systems that move liquids or gases under high pressure.⁵⁸

No formal education is necessary to work as a plumber, pipefitter, or steamfitter; however, most residential and industrial workers are trained in technical schools, community colleges, and through long-term, on-the-job training. Those who work for nonresidential enterprises are usually trained in formal apprenticeship programs administered by local unions or contractor organizations. These apprenticeships consist of four or five years of paid, on-the-job training and at least 100 hours of related classroom instruction per year. Figure 20 shows the number of plumbing and pipefitting degrees awarded from Utah postsecondary schools from 2003-2007. These degrees and certificates are offered by SLCC and Applied Technology Colleges.

Plumbers must be licensed to work in Utah. In order to obtain a license, workers must show successful completion of an approved apprenticeship program, have at least four years experience working as a licensed apprentice, and pass the plumbing licensing exam. Licenses expire every two years.⁵⁹ Pipefitters and steamfitters are not required to be licensed to work in Utah. In order to remain competitive,

plumbers, pipefitters, and steamfitters must continue their education by completing manufacturer-specific training courses, as well as staying current on all plumbing codes and specifications.

24. Sheet Metal Workers

Annual Openings: 140

Median Wage (per hour): \$20.40

Sheet metal workers create, assemble, install, and repair sheet metal products and equipment, such as control boxes, drainpipes, furnace casings, restaurant equipment, and railroad cars. They set up and operate machines used to cut, bend, and straighten sheet metal, as well as operate the welding equipment used to join sheet metal parts. In addition to assembling and installation, some sheet metal workers specialize in testing, balancing, adjusting, and servicing existing air-conditioning and ventilation systems. Sheet metal workers in large manufacturing plants make metal parts for industrial equipment. Most of the work in these factories is automated using computer control systems.⁶⁰

While no formal education is required, it usually takes between four and five years of both classroom instruction and on-the-job training to become a skilled sheet metal worker. Most sheet metal workers are trained by starting in entry-level positions and receiving long-term, on-the-job training through apprenticeships. Other workers attend courses at trade, vocational, or community colleges in order to receive formal training and gain a competitive edge (see Figure 20 for the number of sheet metal degrees awarded in Utah). Some large employers or local chapters of sheet metal workers' associations offer formal apprenticeships which combine paid on-the-job training with related classroom instruction.

Because sheet metal manufacturing and installation technology changes rapidly, it is necessary for experienced sheet metal workers to stay current on new technological developments, such as the use of computerized layout and laser-cutting machines. Workers must take additional training, provided by unions or their employer, to improve existing skills or to acquire new ones. No formal license is required for sheet metal workers in Utah. However, specialty certifications are offered by a variety of associations, and generally those who complete registered apprenticeships are considered to be certified sheet metal workers.

INSTALLATION, MAINTENANCE, AND REPAIR OCCUPATIONS

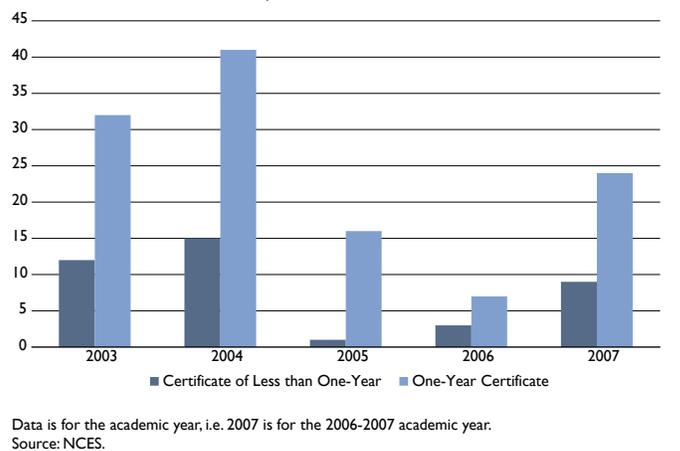
25. Industrial Machinery Mechanics

Annual Openings: 150

Median Wage (per hour): \$20.70

Industrial machinery mechanics are highly skilled workers who maintain and repair machinery in a plant or factory. They diagnose problems and then work to repair and maintain machinery and equipment. Computerized diagnostic systems and vibration analysis techniques can help determine the nature of the problem, but mechanics need years of training and experience to pinpoint the exact source of the problem. Mechanics are increasingly expected to have the all the electrical, electronics, and computer programming skills necessary to repair sophisticated equipment.⁶¹

Figure 21: Number of Industrial Machinery Mechanic Degrees Awarded in Utah Per Year, 2003-2007



A career as an industrial machinery mechanic requires long-term, on-the-job training. While most can earn this title through long-term experience working with specific machines, many employers prefer to hire those who have had formal training through an associate's degree program or an apprenticeship program. This formal training teaches candidates the growing range of mechanical and technical skills they need; including knowledge of electricity, electronics, hydraulics, and computer programming. Figure 20 shows the number of industrial machinery mechanic degrees awarded from Utah postsecondary schools from 2003-2007. These certificates are offered by Applied Technology Colleges.

First-Line Supervisors/Managers of Mechanics, Installers, and Repairers

Candidates working as industrial machinery mechanics, or in other installation, maintenance, and repair occupations, may want to consider becoming first-line supervisors. First-line supervisors oversee the work of mechanics, maintenance workers, installers, and repairers. They also assist in interviewing, hiring, and training new workers. This position does not require a degree—only work experience in a related field. The median wage of first-line supervisors is about \$6.00 more per hour than industrial machinery mechanics, and about \$9.00 more per hour than the average maintenance, installation, and repair worker.

FUTURE RESEARCH: UNDERSTANDING UTAH'S WORKFORCE

This report provides detailed information about the educational and training requirements for each of Utah's top 25 five-star jobs. While this information is useful in understanding how to prepare Utah's future workforce for such occupations, it only completes part of the picture. In order to understand how Utah's workforce can better fill the demand for these jobs, Utah Foundation will be publishing a second part to this report, analyzing where executives in these 25 occupations find their best employees, how well Utah is providing the education and training necessary for these positions, and how Utah could do better in providing a quality labor pool for these high-growth, high-wage jobs.

ENDNOTES

- ¹ Utah Department of Workforce Services (DWS), "Utah Occupational Projections 2006-2016," June 2008, <http://jobs.utah.gov/opencms/wi/pubs/outlooks/state/index.html> (accessed 12 March 2009).
- ² Employment outlook is based 90% on the projected number of total Utah job openings between 2006 and 2016 and 10% on how fast the occupation is expected to grow over that time period.
- ³ DWS, "Utah Job Outlook: A Guide for Making Informed Career Decisions," April 2009, <http://jobs.utah.gov/opencms/wi/pubs/outlooks/state/joboutlook09.pdf> (accessed 11 May 2009).
- ⁴ DWS, "Utah Job Outlook."
- ⁵ Computer systems software engineer and application engineers were combined because of similar job descriptions, training, and wages. In this case an average of employment estimates, annual openings, and hourly wages are calculated. Some supervisory positions were also listed as a subset of management positions because of similarity. In these cases, employment estimates, annual openings, and hourly wages of the management position are listed.
- ⁶ U.S. Census Bureau, North American Industry Classification System (NAICS), "Introduction," June 11, 2009, <http://www.census.gov/eos/www/naics/> (accessed September 8, 2009).
- ⁷ Bureau of Labor Statistics (BLS), *Occupational Outlook Handbook, 2008-09 Edition*, "Top Executives," 14 April 2007, <http://www.bls.gov/oco/ocos012.htm> (accessed 2 April 2009).
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