

Cost Estimators

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Significant Points

- Over half work in the construction industry and another 20 percent are employed in manufacturing industries.
- Growth of the construction industry will be the driving force behind the demand for cost estimators.
- In construction and manufacturing, job prospects should be best for those with industry work experience and a bachelor's degree in a related field.

Nature of the Work

Accurately forecasting the cost of future projects is vital to the survival of any business. Cost estimators develop the cost information that business owners or managers need to make a bid for a contract or to determine if a proposed new product will be profitable. They also determine which endeavors are making a profit.

Regardless of the industry in which they work, estimators compile and analyze data on all of the factors that can influence costs—such as materials, labor, location, and special machinery requirements, including computer hardware and software. Job duties vary widely depending on the type and size of the project.

The methods of and motivations for estimating costs can differ greatly by industry. On a construction project, for example, the estimating process begins with the decision to submit a bid. After reviewing various preliminary drawings and specifications, the estimator visits the site of the proposed project. The estimator needs to gather information on access to the site and availability of electricity, water, and other services, as well as on surface topography and drainage. The information developed during the site visit usually is recorded in a signed report that is included in the final project estimate.

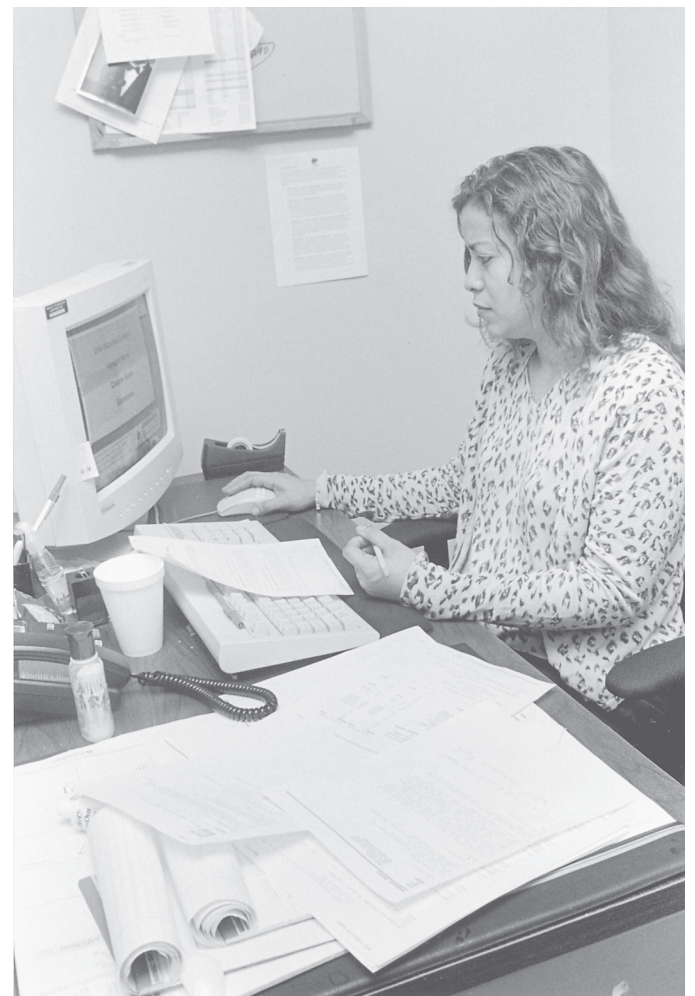
After the site visit is completed, the estimator determines the quantity of materials and labor the firm will need to furnish. This process, called the quantity survey or “takeoff,” involves completing standard estimating forms, filling in dimensions, number of units, and other information. A cost estimator working for a general contractor, for example, will estimate the costs of all items the contractor must provide. Although subcontractors will estimate their costs as part of their own bidding process, the general contractor's cost estimator often analyzes bids made by subcontractors as well. Also during the takeoff process, the estimator must make decisions concerning equipment needs, sequence of operations, crew size, and physical constraints at the site. Allowances for the waste of materials, inclement weather, shipping delays, and other factors that may increase costs also must be incorporated in the estimate.

On completion of the quantity surveys, the estimator prepares a cost summary for the entire project, including the costs of labor, equipment, materials, subcontracts, overhead, taxes, insurance, markup, and any other costs that may affect the project. The chief estimator then prepares the bid proposal for submission to the owner.

Construction cost estimators also may be employed by the project's architect or owner to estimate costs or to track actual costs relative to bid specifications as the project develops. In large construction companies employing more than one estimator, it is common practice for estimators to specialize. For example, one may estimate only electrical work and another may concentrate on excavation, concrete, and forms.

In manufacturing and other firms, cost estimators usually are assigned to the engineering, cost, or pricing departments. The estimators' goal in manufacturing is to accurately estimate the costs associated with making products. The job may begin when management requests an estimate of the costs associated with a major redesign of an existing product or the development of a new product or production process. When estimating the cost of developing a new product, for example, the estimator works with engineers, first reviewing blueprints or conceptual drawings to determine the machining operations, tools, gauges, and materials that would be required for the job. The estimator then prepares a parts list and determines whether it is more efficient to produce or to purchase the parts. To do this, the estimator must initiate inquiries for price information from potential suppliers. The next step is to determine the cost of manufacturing each component of the product. Some high-technology products require a tremendous amount of computer programming during the design phase. The cost of software development is one of the fastest growing and most difficult activities to estimate. Some cost estimators now specialize in estimating only computer software development and related costs.

The cost estimator then prepares time-phase charts and learning curves. Time-phase charts indicate the time required for tool design and fabrication, tool “debugging”—finding and correcting all problems—manufacturing of parts, assembly, and testing. Learning curves graphically represent the rate at which performance im-



Cost estimators develop and analyze data on factors that influence costs in order to determine whether a proposed new product or contract will be profitable.

proves with practice. These curves are commonly called “cost reduction” curves because many problems—such as engineering changes, rework, parts shortages, and lack of operator skills—diminish as the number of parts produced increases, resulting in lower unit costs.

Using all of this information, the estimator then calculates the standard labor hours necessary to produce a predetermined number of units. Standard labor hours are then converted to dollar values, to which are added factors for waste, overhead, and profit to yield the unit cost in dollars. The estimator then compares the cost of purchasing parts with the firm’s cost of manufacturing them to determine which is cheaper.

Computers play an integral role in cost estimation because estimating often involves complex mathematical calculations and requires advanced mathematical techniques. For example, to undertake a parametric analysis (a process used to estimate project costs on a per unit basis, subject to the specific requirements of a project), cost estimators use a computer database containing information on costs and conditions of many other similar projects. Although computers cannot be used for the entire estimating process, they can relieve estimators of much of the drudgery associated with routine, repetitive, and time-consuming calculations. Computers also are used to produce all of the necessary documentation with the help of word-processing and spreadsheet software, leaving estimators more time to study and analyze projects.

Operations research, production control, cost, and price analysts who work for government agencies may do significant amounts of cost estimating in the course of their regular duties. In addition, the duties of construction managers also may include estimating costs. (For more information, see the statements on operations research analysts and construction managers elsewhere in the *Handbook*.)

Working Conditions

Although estimators spend most of their time in an office, construction estimators must make visits to project worksites that can be dusty, dirty, and occasionally hazardous. Likewise, estimators in manufacturing must spend time on the factory floor where it also can be noisy and dirty. In some industries, frequent travel between a firm’s headquarters and its subsidiaries or subcontractors may be required.

Although estimators normally work a 40-hour week, overtime is common. Cost estimators often work under pressure and stress, especially when facing bid deadlines. Inaccurate estimating can cause a firm to lose out on a bid or to lose money on a job that was not accurately estimated.

Employment

Cost estimators held about 188,000 jobs in 2002. About 53 percent were in the construction industry, and another 20 percent were in manufacturing industries. The remainder worked in a wide range of other industries.

Cost estimators work throughout the country, usually in or near major industrial, commercial, and government centers, and in cities and suburban areas undergoing rapid change or development.

Training, Other Qualifications, and Advancement

Job entry requirements for cost estimators vary by industry. In the construction industry, employers increasingly prefer individuals with a degree in building construction, construction management, construction science, engineering, or architecture. However, most con-

struction estimators also have considerable construction experience, gained through work in the industry, internships, or cooperative education programs. Applicants with a thorough knowledge of construction materials, costs, and procedures in areas ranging from heavy construction to electrical work, plumbing systems, or masonry work have a competitive edge.

In manufacturing industries, employers prefer to hire individuals with a degree in engineering, physical science, operations research, mathematics, or statistics; or in accounting, finance, business, economics, or a related subject. In most industries, great emphasis is placed on experience involving quantitative techniques.

Cost estimators should have an aptitude for mathematics, be able to quickly analyze, compare, and interpret detailed and sometimes poorly defined information, and be able to make sound and accurate judgments based on this knowledge. Assertiveness and self-confidence in presenting and supporting their conclusions are important, as are strong communications and interpersonal skills, because estimators may work as part of a project team alongside managers, owners, engineers, and design professionals. Cost estimators also need knowledge of computers, including word-processing and spreadsheet packages. In some instances, familiarity with special estimation software or programming skills also may be required.

Regardless of their background, estimators receive much training on the job because every company has its own way of handling estimates. Working with an experienced estimator, they become familiar with each step in the process. Those with no experience reading construction specifications or blueprints first learn that aspect of the work. They then may accompany an experienced estimator to the construction site or shop floor, where they observe the work being done, take measurements, or perform other routine tasks. As they become more knowledgeable, estimators learn how to tabulate quantities and dimensions from drawings and how to select the appropriate material prices.

For most estimators, advancement takes the form of higher pay and prestige. Some move into management positions, such as project manager for a construction firm or manager of the industrial engineering department for a manufacturer. Others may go into business for themselves as consultants, providing estimating services for a fee to government or to construction or manufacturing firms.

Many colleges and universities include cost estimating as part of bachelor’s and associate degree curriculums in civil engineering, industrial engineering, and construction management or construction engineering technology. In addition, cost estimating is a significant part of many master’s degree programs in construction science or construction management. Organizations representing cost estimators, such as the Association for the Advancement of Cost Engineering (AACE International) and the Society of Cost Estimating and Analysis (SCEA), also sponsor educational and professional development programs. These programs help students, estimators-in-training, and experienced estimators stay abreast of changes affecting the profession. Specialized courses and programs in cost estimating techniques and procedures also are offered by many technical schools, community colleges, and universities.

Voluntary certification can be valuable to cost estimators because it provides professional recognition of the estimator’s competence and experience. In some instances, individual employers may even require professional certification for employment. Both AACE International and SCEA administer certification programs. To become certified, estimators usually must have between 2 and 8 years of estimating experience and must pass an examination. In

addition, certification requirements may include publication of at least one article or paper in the field.

Job Outlook

Overall employment of cost estimators is expected to grow about as fast as the average for all occupations through the year 2012. In addition to openings created by growth, some job openings will arise from the need to replace workers who transfer to other occupations or leave the labor force. In construction and manufacturing—the primary employers of cost estimators—job prospects should be best for those with industry work experience and a bachelor’s degree in a related field.

Growth of the construction industry, in which 53 percent of all cost estimators are employed, will be the driving force behind the demand for these workers. Construction and repair of highways, streets, and bridges, as well as construction of more subway systems, airports, water and sewage systems, and electric power plants and transmission lines, will stimulate demand for many more cost estimators. The increasing population and its changing demographics that will boost the demand for residential construction and remodeling also will spur demand for cost estimators. As the population ages, the demand for nursing and extended care facilities will increase. School construction and repair also will add to the demand for cost estimators. Job prospects in construction should be best for cost estimators with a degree in construction management or construction science, engineering, or architecture, and who have practical experience in various phases of construction or in a specialty craft area.

Employment of cost estimators in manufacturing will also grow, but not as fast as in construction as firms continue to use their services to identify and control operating costs. Experienced estimators with degrees in engineering, science, mathematics, business administration, or economics should have the best job prospects in manufacturing.

Earnings

Salaries of cost estimators vary widely by experience, education, size of firm, and industry. Median annual earnings of cost estimators in 2002 were \$47,550. The middle 50 percent earned between \$36,440 and \$62,040. The lowest 10 percent earned less than \$28,670, and the highest 10 percent earned more than \$79,240. Median annual earnings in the industries employing the largest numbers of cost estimators in 2002 were:

Nonresidential building construction	\$53,820
Building equipment contractors	50,240
Foundation, structure, and building exterior contractors	47,630
Residential building construction	47,180
Building finishing contractors	45,630

College graduates with degrees in fields that provide a strong background in cost estimating, such as engineering or construction management, could start at a higher level. According to a 2003 salary survey by the National Association of Colleges and Employers, bachelor’s degree candidates with degrees in construction science/management received job offers averaging \$42,229 a year.

Related Occupations

Other workers who quantitatively analyze information include accountants and auditors; budget analysts; claims adjusters, appraisers, examiners, and investigators; economists; financial analysts and personal financial advisors; insurance underwriters; loan counselors and officers; market and survey researchers; and operations research analysts. In addition, the duties of industrial production

managers and construction managers also may involve analyzing costs.

Sources of Additional Information

Information about career opportunities, certification, educational programs, and cost estimating techniques may be obtained from:

- Association for the Advancement of Cost Engineering (AACE International), 209 Prairie Ave., Suite 100, Morgantown, WV 26501. Internet: <http://www.aacei.org>
- Society of Cost Estimating and Analysis, 101 S. Whiting St., Suite 201, Alexandria, VA 22304. Internet: <http://www.sceaonline.net>