Unit 5: Ethical Decision in Software Development and Ethics of IT Organizations

Syllabus:

Unit 5: Ethical Decision in Software Development and Ethics of IT Organizations (8 Hrs.)
Software Quality and its Importance; Strategies for Developing Quality Software; Use of Contingent Workers; H-1B Workers; Outsourcing; Whistle-Blowing; Green Computing

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Software Quality and its Importance

High-quality software systems are systems that are easy to learn and use because they perform quickly and efficiently, they meet their users' needs, and they operate safely and reliably so that system downtime is kept to a minimum. Computers and software are integral parts of almost every business, and the demand for high-quality software in a variety of industries is increasing. End users cannot afford system crashes, lost work, or lower productivity. Nor can they tolerate security holes through which intruders can spread viruses, steal data, or shut down websites. Software manufacturers face economic, ethical, and organizational challenges associated with improving the quality of their software.

A software defect is any error that, if not removed, could cause a software system to fail to meet its users' needs. The impact of these defects can be trivial; for example, a computerized sensor in a refrigerator's ice cube maker might fail to recognize that the tray is full and, therefore, continue to make ice.

Here are some notable software bugs:

- The Nest thermostat is a clever device that enables users to monitor and adjust their thermostats using their smartphones. However, during a recent cold spell, a software glitch caused the devices to shut down or go offline for many customers. Temperatures in their homes plunged over night, threatening to freeze pipes and causing potentially serious health issues for the elderly and ill and those with infants.

- Functional magnetic resonance imaging (fMRI) is used to create images that are intended to show how various areas of our brains react when we are in REM sleep, playing a game of chess, or exercising strenuously, for example. These pictures have served as the basis of tens of thousands of scientific papers and books. However, flaws in the software used to analyze fMRI data were recently uncovered by scientists who studied the results of many different brain studies over the last 15 years. According to the new report, the software flaw frequently caused false positives, suggesting brain activity where there was none. This has raised considerable controversy between critics who have long said fMRI is nothing more than high-tech pseudo medicine and brain-imaging researchers who claim that the software problems are not as serious or widespread as reported.

Software quality is the degree to which a software product meets the needs of its users. Quality management focuses on defining, measuring, and refining the quality of the development process and the products developed during its various stages. These products—including statements of requirements, flowcharts, and user documentation— are known as a deliverable.

The objective of quality management is to help developers deliver high-quality systems that meet the needs of their users. Unfortunately, the first release of any software rarely meets all its users' expectations. A software product does not usually work as well as its users would like it to until it has been used for a while, found lacking in some ways, and then corrected or upgraded.

One cause of poor software quality is that many developers do not know how to design quality into software from the very start; others simply do not take the time to do so. To develop high-quality software, developers must define and follow a set of rigorous software engineering principles and be committed to learning from past mistakes. In addition, they must understand the environment in which their systems will operate and design systems that are as immune to human error as possible.

The Importance of Software Quality

A business information system is a set of interrelated components—including hardware, software, databases, networks, people, and procedures—that collects and processes data and disseminates the output. A common type of business system is one that captures and records business transactions.

For example,

- a manufacturer's order-processing system captures order information, processes it to update inventory and accounts receivable, and ensures that the order is filled and shipped on time to the customer.
- Other examples are an airline's online ticket reservation system and an electronic funds transfer system that moves money among banks.

The accurate, thorough, and timely processing of business transactions is a key requirement for such systems. A software defect can be devastating, resulting in lost customers and reduced revenue.

- Another type of business information system is the decision support system (DSS), which is used to improve decision making in a variety of industries. A DSS can be used to develop accurate forecasts of customer demand, recommend stocks and bonds for an investment portfolio, or schedule shift workers in such a way as to minimize cost while meeting customer service goals. A software defect in a DSS can result in significant negative consequences for an organization and its customers.

Software is also used to control many industrial processes in an effort to reduce costs, eliminate human error, improve quality, and shorten the time it takes to manufacture products.

- ⇨ For example, steel manufacturers use process-control software to capture data from sensors about the equipment that rolls steel into bars and about the furnace that heats the steel before it is rolled. Without process-control computers, workers could react to defects only after the fact and would have to guess at the adjustments needed to correct the process. Process-control computers enable the process to be monitored for variations from operating standards (e.g., a low furnace temperature or incorrect levels of iron ore) and to eliminate product defects before they affect product quality. Any defect in this software can lead to decreased product quality, increased waste and costs, or even unsafe operating conditions for employees.

As a result of the increasing use of computers and software in business, many companies are now in the software business whether they like it or not. The quality of software, its usability, and its timely development are critical to almost everything businesses do. The speed with which an organization develops quality software can put it ahead of or behind its competitors. Mismanaged software can be fatal to a business, causing it to miss product delivery dates, incur increased product development costs, and deliver products that have poor quality.

Business executives frequently face ethical questions of how much money and effort they should invest to ensure the development of high-quality software. A manager who takes a short-term, profit-oriented view may feel that any additional time and money spent on quality assurance will only delay a new product's release, resulting in a delay in sales revenue and profits. However, a different manager may consider it unethical not to fix all known problems before putting a product on the market and charging customers for it.

Other key questions for executives are whether their products could cause damage and what their legal exposure would be if they did. Fortunately, software defects are rarely lethal, and few personal injuries are related to software failures. However, the increasing use of software to control critical functions in vehicles as well as manage the operation of medical devices introduces product liability issues that concern many executives.

Software Product Liability

The liability of manufacturers, sellers, lessors, and others for injuries caused by defective products is commonly referred to as product liability. There is no federal product liability law; instead, product liability in the United States is mainly covered by common law (made by state judges) and Article 2 of the Uniform Commercial Code, which deals with the sale of goods.

If a software defect causes injury or loss to purchasers, lessees, or users of the product, the injured parties may be able to sue as a result. Injury or loss can come in the form of physical mishaps and death, loss of revenue, or an increase in expenses due to a business disruption

caused by a software failure. Numerous product liability claims may well be in the future for the self-driving car based upon product liability claims against the vehicle manufacturer or a supplier of a component. This would come about if there was a malfunction in the electronics or software of the vehicle that lead to injuries or property damage.

Software product liability claims are typically based on strict liability, negligence, breach of warranty, or misrepresentation—sometimes in combination with one another.

Strict liability means that the defendant is held responsible for injuring another person, regardless of negligence or intent. The plaintiff must prove only that the software product is defective or unreasonably dangerous and that the defect caused the injury. There is no requirement to prove that the manufacturer was careless or negligent, or to prove who caused the defect. All parties in the chain of distribution—the manufacturer, subcontractors, and distributors —are strictly liable for injuries caused by the product and may be sued.

Under the doctrine of supervening event, the original seller is not liable if the software was materially altered after it left the seller's possession and the alteration caused the injury. To establish the government contractor defense, a contractor must prove that the precise software specifications were provided by the government, that the software conformed to the specifications, and that the contractor warned the government of any known defects in the software. Finally, there are statutes of limitations for claims of liability, which means that an injured party must file suit within a certain amount of time after the injury occurs.

Negligence is the failure to do what a reasonable person would do, or doing something that a reasonable person would not do. When sued for negligence, a software supplier is not held responsible for every product defect that causes customer or third-party loss. Instead, responsibility is limited to harmful defects that could have been detected and corrected through "reasonable" software development practices. Contracts written expressly to limit claims of supplier negligence may be disregarded by the courts as unreasonable. Software manufacturers and organizations with software-intensive products are frequently sued for negligence and must be prepared to defend themselves.

A **warranty** assures buyers or lessees that a product meets certain standards of quality. A warranty of quality may be either expressly stated or implied by law. Express warranties can be oral, written, or inferred from the seller's conduct. For example, sales contracts contain an implied warranty of merchantability, which requires that the following standards be met:

- The goods must be fit for the ordinary purpose for which they are used.
- The goods must be adequately contained, packaged, and labelled.
- The goods must be of an even kind, quality, and quantity within each unit.
- The goods must conform to any promise or affirmation of fact made on the container or label.

- The quality of the goods must pass without objection in the trade.
- The goods must meet a fair average or middle range of quality.

If the product fails to meet the terms of its warranty, the buyer or lessee can sue for breach of warranty. Of course, most dissatisfied customers will first seek a replacement, a substitute product, or a refund before filing a lawsuit.

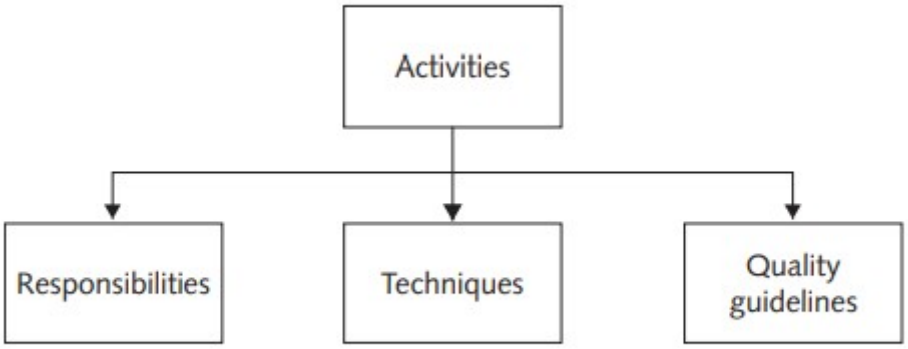
Strategies for Developing Quality Software

As individuals and organizations have come to increasing rely on software, developers have identified multiple strategies for ensuring the quality of their software. These include the use of tools such as software development methodologies, the Capability Maturity Model Integration (CMMI) process-improvement model, special techniques for safety-critical systems, risk management processes, and quality management standards.

Software Development Methodologies

Developing information system software is not a simple process; it requires completing many complex activities, with many dependencies among the various activities. System analysts, programmers, hardware engineers, infrastructure architects, database specialists, project managers, documentation specialists, trainers, and testers are all involved in large software projects. Each of these groups of workers has a role to play, with specific responsibilities and tasks. In addition, each group makes decisions that can affect the software's quality and the ability of an organization or an individual to use it effectively.

Most software companies have adopted a specific software development methodology— a standard, proven work process that enables systems analysts, programmers, project managers, and others to make controlled and orderly progress in developing high-quality software. A methodology defines activities in the software development process as well as the individual and group responsibilities for accomplishing these activities. Each methodology recommends specific techniques for accomplishing the various activities, such as using a flowchart to document the logic of a computer program. A methodology also offers guidelines for managing the quality of software during the various stages of development. If an organization has developed such a methodology, it is typically applied to any software development that the company undertakes.



Components of a software development methodology

Waterfall system development model

The waterfall system development model is a sequential, multistage system development process in which development of the next stage of the system cannot begin until the results of the current stage are approved or modified as necessary. This approach is referred to as a waterfall process because progress is seen as flowing steadily downward (through the various stages of the development. The stages of development can vary from one organization to the next, with many organizations using an approach with six stages as shown in Figure 7-2.

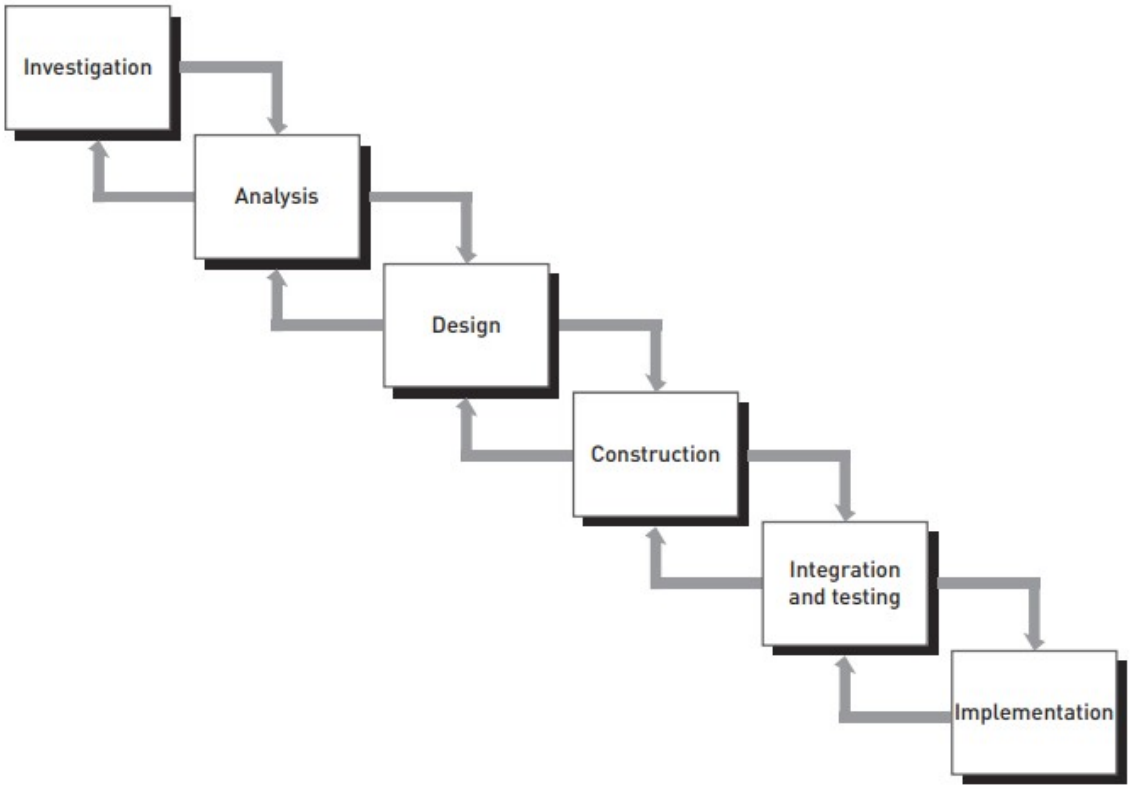


FIGURE 7-2 Waterfall system development model

Agile development methodology

Under the agile development methodology, a system is developed in iterations (often called sprints) lasting from one to four weeks, as illustrated in Figure 7-3. Unlike the waterfall system development model, agile development accepts the fact that system requirements are evolving and cannot be fully understood or defined at the start of the project. Agile development concentrates instead on maximizing the team's ability to deliver quickly and respond to emerging requirements—hence the name agile. In an agile development project, the team evaluates the system every one to four weeks, giving it ample opportunity to identify and implement new requirements.

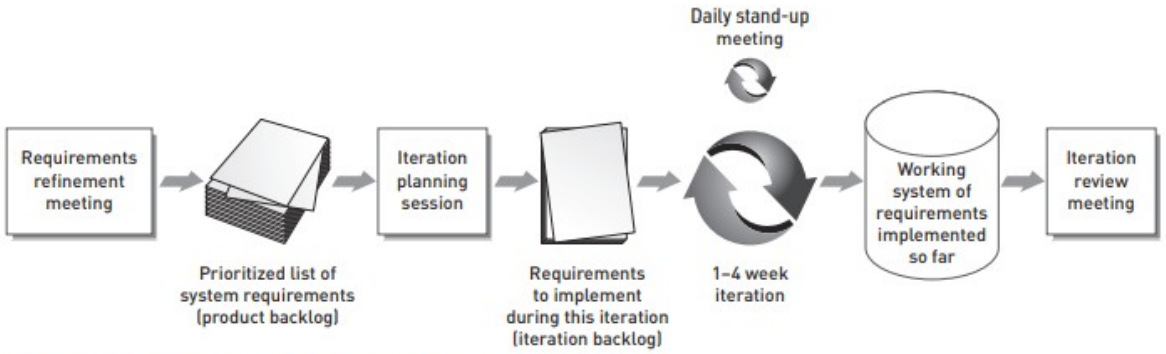


FIGURE 7-3 Agile system development methodology

Table 7-1 summarizes the pros and cons of these two approaches to system development.

TABLE 7-1 Pros and cons of waterfall and agile

Waterfall		Agile	
Pros	**Cons**	**Pros**	**Cons**
Formal review at end of each stage allows maximum management control.	Often, users' needs go unstated or are miscommunicated or misunderstood. Users may end up with a system that meets those needs as understood by the developers; however, this might not be what the users really needed.	For appropriate projects, this approach puts an application into production sooner.	It is an intense process that takes considerable time and effort on the part of project members and can result in burnout for system developers and other project participants.
Structured processes produce many intermediate products that can be used to measure progress toward developing the system.	Users can't easily review intermediate products and evaluate whether a particular product will lead to a system that meets their business requirements.	Forces teamwork and lots of interaction between users and project stakeholders so that users are more likely to get a system that meets their needs.	Requires stakeholders and users to spend more time working together on the project.

The Manifesto for Agile Software Development (https://www.agilealliance.org/agile101/the-agile-manifesto) was developed by a group of software practitioners. The manifesto is built around a set of 4 values and 12 principles that help agile project teams make ethical decisions in the development of quality software.

As with most things, it is usually easier and cheaper to avoid software problems at the beginning than to attempt to fix the damages after the fact. Studies have shown that the cost to identify and remove a defect in an early stage of software development can be up to 100 times less than removing a defect in a piece of software that has been distributed to customers (see Figure 7-4). (Although these studies were conducted several years ago, their results still hold true today.)

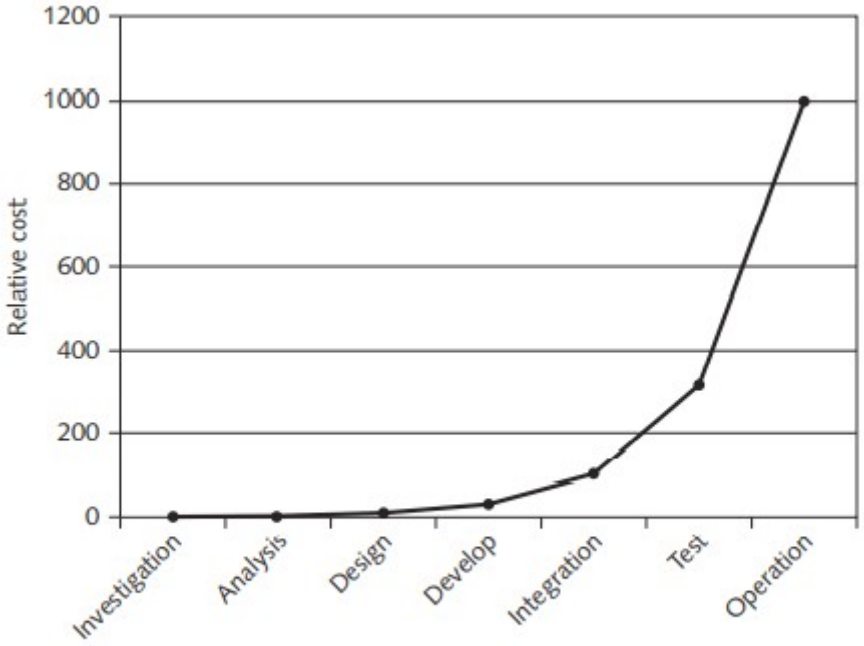


FIGURE 7-4 The cost of removing defects

Source: Used with permission from LKP Consulting Group.

If a defect is uncovered during a later stage of development, some rework of the deliverables produced in preceding stages will be necessary. The later the error is detected, the greater the number of people who will be affected by the error; thus, the greater the costs will be to communicate and fix the error. Consider the cost to communicate the details of a defect, distribute and apply software fixes, and possibly retrain end users for a software product that has been sold to hundreds or thousands of customers. Thus, most software developers try to identify and remove errors early in the development process not only as a cost-saving measure but also as the most efficient way to improve software quality.

A product containing inherent defects that harm the user may be the subject of a product liability suit. The use of an effective methodology can protect software manufacturers from legal liability in two ways. First, an effective methodology reduces the number of software errors that might occur. Second, if an organization follows widely accepted development methods, negligence on its part is harder to prove. However, even a successful defence against a product liability case can cost hundreds of thousands of dollars in legal fees. Thus, failure to develop software carefully and consistently can have serious consequences in terms of liability exposure.

Quality assurance (QA)

Quality assurance (QA) refers to methods within the development process that are designed to guarantee reliable operation of a product. Ideally, these methods are applied at each stage of the development cycle. However, some software manufacturing organizations without a

formal, standard approach to QA consider testing to be their only QA method. Instead of checking for errors throughout the development process, such companies rely primarily on testing just before the product is shipped to ensure some degree of quality.

Several types of tests are used in software development, as discussed as follows.

Software Testing

Software is developed in units called subroutines or programs. These units, in turn, are combined to form large systems. One approach to QA is to test the code for a completed unit of software by actually entering test data and comparing the results to the expected results in a process called dynamic testing. There are two forms of dynamic testing:

- **Black-box** testing involves viewing the software unit as a device that has expected input and output behaviours but whose internal workings are unknown (a black box). If the unit demonstrates the expected behaviors for all the input data in the test suite, it passes the test. Black-box testing takes place without the tester having any knowledge of the structure or nature of the actual code. For this reason, it is often done by someone other than the person who wrote the code.
- White-box testing treats the software unit as a device that has expected input and output behaviors but whose internal workings, unlike the unit in blackbox testing, are known. White-box testing involves testing all possible logic paths through the software unit with thorough knowledge of its logic. The test data must be carefully constructed so that each program statement executes at least once. For example, if a developer creates a program to calculate an employee's gross pay, the tester would develop data to test cases in which the employee worked less than 40 hours, exactly 40 hours, and more than 40 hours (to check the calculation of overtime pay).

Other forms of software testing include the following:

- **Static testing—**

  This is a software-testing technique in which software is tested without actually executing the code. It consists of two steps—review and static analysis. During the review step, analysts and/or programmers review pertinent documentation to find and eliminate any errors in system requirements or design specifications. They also read the code that has been written. There are several types of review—informal, walk-through, peer review, and inspection—in increasing order of effort and thoroughness.

  During the static analysis step, special software programs called static analyzers are run against the code. Rather than reviewing input and output, the static analyzer looks for suspicious patterns in programs that might indicate a defect. Static analyzers can identify the following types of errors: a variable with an undefined value, variables that are declared but never used, unreachable code that can never be executed, programming standards violations, and potential system security vulnerabilities. Static testing can be

performed while the code is being written, prior to any other type of testing, which gives static testing an important advantage in that it can detect and eliminate defects early in the software development process when they are easier and less costly to fix.

- **Unit testing—**
  This involves testing individual components of code (subroutines, modules, and programs) to verify that each unit performs as intended. Unit testing is accomplished by developing test data that ideally force the code to execute all of its various functions and user features. As testers find problems, they modify the code to work correctly.

- **Integration testing—**
  After successful unit testing, the software units are combined into an integrated subsystem that undergoes rigorous testing to ensure that the linkages among the various subsystems work successfully.
- **System testing—**
  After successful integration testing, the various subsystems are combined to test the entire system as a complete entity.

- **User acceptance testing—**
  Trained end users conduct independent user acceptance testing to ensure that the system operates as they expect.

Capability Maturity Model Integration

Capability Maturity Model Integration (CMMI) models are collections of best practices that help organizations improve their processes. A best practice is a method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark within a particular industry.

CMMI models are developed by product teams with members from industry, government, and the Carnegie Mellon Software Engineering Institute (SEI). The models are general enough to be used to evaluate and improve almost any process, and a specific application of CMMI—CMMI-Development (CMMI-DEV)—is frequently used to assess and improve software development practices. There are additional CMMI applications for the acquisition and delivery of products and services. CMMI defines five levels of software development maturity (see Table 7-2) and identifies the issues that are most critical to software quality and process improvement. A maturity level consists of practices for a set of process areas that improve an organization's overall performance. Identifying an organization's current maturity level enables it to specify necessary actions to improve the organization's future performance. The model also enables an organization to track, evaluate, and demonstrate its progress over the years. From 2007 to June 2016, more than 13,700 CMMI appraisals of organizations have been performed. Of these, only 11 percent were determined to be high-maturity (level 4 or 5) organizations.

TABLE 7-2 Definition of CMMI maturity levels

Maturity level	Description
Initial	Process is ad hoc and chaotic; organization tends to overcommit and processes are often abandoned during times of crisis.
Managed	Projects employ processes and skilled people; status of work products is visible to management at defined points.
Defined	Processes are well defined and understood and are described in standards, procedures, tools, and methods; processes are consistent across the organization.
Quantitatively managed	Quantitative objectives for quality and process performance are established and are used as criteria in managing projects; specific measures of process performance are collected and statistically analyzed.
Optimizing	Organization continually improves its processes; changes are based on a quantitative understanding of its business objectives and performance needs.

Source: Used with permission from Carnegie Mellon University.

CMMI-DEV is a set of guidelines for 22 process areas related specifically to systems development. The premise of the model is that those organizations that do these 22 things well will have an outstanding software development process. After an organization decides to adopt CMMI-DEV, it must conduct an assessment of its software development practices (using trained, outside assessors to ensure objectivity) to determine where the organization fits in the capability model. The assessment identifies areas for improvement and establishes action plans needed to upgrade the development process. Over the course of a few years, the organization can improve its maturity level by executing the action plan.

CMMI-DEV can also be used as a benchmark for comparing organizations. In the awarding of software contracts—particularly by the federal government—organizations that bid on a contract may be required to have adopted CMMI and to be performing at a certain level.

Achieving Maturity Level 5—the highest possible rating—is a significant accomplishment for any organization, and it can lead to substantial business benefits. It means that the organization is able to statistically evaluate the performance of its software development processes. This in turn leads to better control and continual improvement in the processes, making it possible to deliver software products of high quality on time and on budget.

Honeywell is a Fortune 100 company that provides aerospace products and services, control technologies for homes and businesses, turbochargers, and performance materials to customers around the world. Quality software development is a critical part of Honeywell's commitment to produce high-quality, software-enabled products. The company has achieved CMMI Maturity Level 5 in 100 percent of its global software divisions, enabling its software teams to develop better products, faster and at a lower cost—providing Honeywell with an important competitive

advantage. According to Honeywell chairman and CEO Dave Cote, "Like total quality management, a best practice widely adopted in Western manufacturing companies, CMMI is a similar best practice in software engineering."

USE OF CONTINGENT WORKERS

The Bureau of Labor Statistics defines contingent work as a job situation in which an individual does not have an explicit or implicit contract for long-term employment. A firm is likely to use contingent IT workers if it experiences pronounced fluctuations in its technical staffing needs. For example, contingent workers may be hired as consultants on an organizational restructuring project, as technical experts on a product development team, and as supplemental staff for many other short-term projects, such as the design and installation of a new information system. Typically, these workers join a blended team of full-time employees and other contingent workers for the life of the project and then move on to their next assignment. Whether they work, when they work, and how much they work depends on the company's need for them. They have neither an explicit nor an implicit contract for continuing employment. Organizations can obtain contingent workers through temporary staffing firms, employee leasing organizations, and professional employer organizations (PEOs).

Temporary staffing firms recruit, train, and test job seekers in a wide range of job categories and skill levels, and then assign them to clients as needed. Temporary employees are often used to fill in during staff vacations and illnesses, handle seasonal workloads, and help staff special projects. However, they are not employees of the client company, so they are not eligible for company benefits such as vacation, sick pay, and medical insurance. Temporary working arrangements may appeal to people who want maximum flexibility in their work schedules, as well as a variety of work experiences. Other workers take temporary work assignments because they are unable to find more permanent work. In employee leasing, a business (called the subscribing firm) transfers all or part of its workforce to another firm (called the leasing firm), which handles all human resource-related activities and costs, such as payroll, training, and the administration of employee benefits. The subscribing firm leases these workers, but they remain employees of the leasing firm.

Employee leasing creates a employment relationship, in which two employers have actual or potential legal rights and duties with respect to the same employee or group of employees. Employee leasing firms are subject to special regulations regarding workers' compensation and unemployment insurance. Because the workers are technically employees of the leasing firm, they may be eligible for some company benefits through the leasing firm. Once the relationship between the employee leasing firm and its client ends, the leased employees remain with the leasing firm and move on to other projects with new clients.

A professional employer organization (PEO) is a business entity that coemploys the employees of its clients and typically assumes responsibility for all human resource management functions. The PEO typically remits wages and withholdings of the worksite employees and reports, collects, and deposits employment taxes with local, state, and federal authorities. The

PEO also issues the Form W-2 for the compensation paid by it under its EIN (Employer Identification Number). The client company remains responsible for directing and controlling the daily activities of the employees, tracking actual hours worked and reporting them to the PEO for payment processing, and ensuring that payroll funds are paid to the PEO. The exact terms of the arrangement are specified in a client service agreement.

The client maintains a long-term investment and commitment to the employees, but uses the PEO as a means to outsource the human resource activities. If the agreement between the client company and the PEO is terminated, the workers continue to be employed by the client. By assigning the nonrevenue-producing administrative tasks to the PEO, the client company can focus on managing and growing its business while letting administrative tasks be handled by human resource experts, ideally at a lower total cost.

The Gig Economy

The term gig, which originated in the entertainment business, refers to a short-term job. The Bureau of Labor Statistics refers to a gig as a "a single project or task for which a worker is hired—often through a digital marketplace—to work on demand." The gig economy refers to a work environment in which temporary positions are common and organizations contract with independent workers for short-term engagements. In the gig economy, instead of earning a regular hourly wage, workers get paid for specific gigs, such as complete testing of a unit of software code, writing end user documentation, or delivering a training class via webinar.

Employers are desperate for highly qualified workers with specialized skills. And thanks to the power of the Internet and the nature of much IT work, those individuals may be located anywhere in the world. Many of those workers are willing to work a gig for highly competitive rates. Online staffing websites such as 99 Designs, Freelancer, Guru, Toptal, Witmart, and over a dozen others can help organizations find these workers. Some of these websites draw from a database of over one million professionals, enabling organizations to find the talent they need with just a few clicks. Organizations can post their project and have contractors bid on it, or they can search for workers and contact those they are interested in directly. Some sites vet the workers to some degree, or at least let potential employers view feedback and ratings of prior clients. The sites typically handle all payment services.

Independent Contractors

An independent contractor is an individual who provides services to another individual or organization according to terms defined in a written contract or within a verbal agreement. A study by Intuit predicted that by 2020, more than 40 percent of American workers would be

independent contractors. There are many factors driving this trend toward the use of independent contractors, as shown in Table 10-1.

TABLE 10-1 Factors behind the trend toward independent contractors

From the employee's perspective	From the employer's perspective
Freedom to select from among temporary jobs and projects around the world	Ability to choose the best individuals for a specific project from a larger pool of candidates than that available in a given geographic area
Opportunity to change "jobs" frequently	Financial pressure to reduce staff and associated costs, such as payroll and benefits as well as costs associated with office space and training
Greater flexibility in terms of work hours and location where work is performed	Enables organization to focus on its core functions and on building its business

Organizations that use contingent workers must be extremely careful how they pay and treat those workers, or they run the risk of getting dragged into a class action lawsuit over misclassification of workers. Table 10-2 details some of the factors that come into play in classifying a worker as either an employee or an independent contractor.

TABLE 10-2 Factors that are considered in classifying a worker as either an employee or an independent contractor

Employee	Independent contractor
Receives net salary after employer has withheld income, Social Security, and Medicare taxes	No income, Social Security, or Medicare taxes are withheld from paycheck; worker must make arrangements to pay his or her own taxes
Receives a W-2 form from the employer for the purposes of filing federal, state, and local taxes	Receives a form 1099-MISC for amounts exceeding $599 of nonemployee income for the purposes of filing federal, state, and local income taxes
Eligible for employment benefits, such as health and disability insurance, vacation and holiday pay, and contributions to an employee-sponsored retirement account	Receives no employment benefits from the employer
Eligible to receive unemployment compensation after layoff or termination	Not eligible for unemployment compensation benefits
Covered by federal and state wage and hour laws, such as those related to minimum wage and overtime	Paid according to the terms of the contract, typically does not receive overtime pay
Can receive worker's compensation benefits for any workplace injury	Not eligible for worker's compensation benefits
Protected by workplace safety and employment antidiscrimination laws	Not protected by employment antidiscrimination and workplace safety laws
Unless employment is "at will," can be terminated by the employer only for just cause and with prior notice	Unless the consulting contract is for a specified term, can be let go by the employer for any reason, at any time
Employer has right to control or direct not only the result of the work but also how it will be done and when	Client has the right to control or direct only the result of the work; other than that, worker operates independently and decides what will be done and how the work will be accomplished
Works hours set by the employer	Sets own work hours
All equipment, materials, and tools are provided to perform the work	Provides his or her own equipment, materials, and tools

Advantages of Using Contingent Workers

When a firm employs a contingent worker, it does not usually have to provide benefits such as insurance, paid time off, and contributions to a retirement plan. A company can easily adjust the number of contingent workers it uses to meet its business needs and can release contingent workers when they are no longer needed. An organization cannot usually do the same with full-time employees without creating a great deal of ill will and negatively impacting employee morale. Moreover, because many contingent workers are already specialists in a particular task, a firm does not customarily incur training costs for contingent workers. Therefore, the use of contingent workers can enable a firm to meet its staffing needs more efficiently, lower its labor costs, and respond more quickly to changing market conditions.

Disadvantages of Using Contingent Workers

One downside to using contingent workers is that those workers may not feel a strong connection to the company for which they are working. This can result in a low commitment to the company and its projects, along with a high turnover rate. Although contingent workers may already have the necessary technical training for a temporary job, many contingent workers gain additional skills and knowledge while working for a particular company; those assets are lost to the company when a contingent worker departs at a project's completion.

Deciding When to Use Contingent Workers

When an organization decides to use contingent workers for a project, it should recognize the trade-off it is making between completing a single project quickly and cheaply versus developing people within its own organization. If the project requires unique skills that are probably not necessary for future projects, there may be little reason to invest the additional time and costs required to develop those skills in full-time employees. Or, if a particular project requires only temporary help that will not be needed for future projects, the use of contingent workers is a good approach. In such a situation, using contingent workers avoids the need to hire new employees and then fire them when staffing needs decrease.

However, organizations should carefully consider whether or not to use contingent workers when those workers are likely to learn corporate processes and strategies that are key to the company's success. It is next to impossible to prevent contingent workers from passing on such information to subsequent employers. This can be damaging if the worker's next employer is a major competitor.

Although using contingent workers is often the most flexible and cost-effective way to get a job done, their use can raise ethical and legal issues about the relationships among the staffing firm, its employees, and its customers—including the potential liability of a staffing firm's clients for withholding payroll taxes, payment of employee retirement benefits and health insurance premiums, and administration of workers' compensation to the staffing firm's employees. Depending on how closely workers are supervised and how the job is structured, contingent workers may be viewed as permanent employees by the Internal Revenue Service, the Department of Labor, or a state's workers' compensation and unemployment agencies.

Review the manager's checklist in Table 10-3 for questions that pertain to the use of contingent workers. The preferred answer to each question is yes. Recognize, however, that worker classification rules are extremely difficult to apply. Each major labor and employment statue—the National Labor Relations Act, the Civil Rights Act, the Fair Labor Standards Act, and the Employee Retirement Income Security Act has its own definition of "employee" and its own way of distinguishing between employees and independent contractors. Adding to the complication is the fact that there are different rules promulgated by the Department of Labor, the Internal Revenue Service, and the Office of Workers' Compensation Programs.

TABLE 10-3 Manager's checklist for the use of contingent employees

Question	Yes	No
Have you reviewed the definition of an employee in your company's policies and pension plan documents to ensure it is not so broad that it encompasses contingent workers, thus entitling them to benefits?		
Are you careful not to use the same contingent workers on an extended basis? Do you make sure the assignments are finite, with break periods in between?		
Do you use contracts that specifically designate workers as contingent workers?		
Are you aware that the actual circumstances of the working relationship determine whether a worker is considered an employee in various contexts, and that a company's definition of a contingent worker may not be accepted as accurate by a government agency or court?		
Are you and other managers and workers aware that staffing firm employees are covered by antidiscrimination laws and therefore you cannot discriminate against them on the basis of race, color, religion, sex, national origin, or disability?		
Do you avoid telling contingent workers where, when, and how to do their jobs and instead work through the contingent worker's manager to communicate job requirements?		
Do you request that contingent workers use their own equipment and resources, such as computers and email accounts?		
Do you avoid training your contingent workers?		
When leasing employees from an agency, do you let the agency do its job? Do you avoid asking to see résumés and getting involved with compensation, performance feedback, counseling, or day-to-day supervision?		
If you lease employees, do you use a leasing firm that offers its own benefits plan, deducts payroll taxes, and provides required insurance?		

The cost of misclassifying workers can run into the millions. For example, a worker that was classified as an independent contractor may sue a company claiming that he or she is actually a legal employee and, as such, is entitled to various additional compensation and benefits, such as overtime or profit sharing. For large organizations, an individual worker's lawsuit can easily turn into a class action lawsuit involving dozens or even hundreds of workers.

H-1B WORKERS

A H-1B visa is a temporary work visa granted by the U.S. Citizenship and Immigration Services (USCIS) for people who work in specialty occupations—jobs that require at least a four-year bachelor's degree in a specific field, or equivalent experience. People working in the United States on H-1B visa are referred to as "nonimmigrant workers" because they are in the country on a temporary work visa; they are not being granted a visa to immigrate to the United States. Many companies turn to H-1B workers to meet critical business needs or to obtain essential technical skills and knowledge that they claim cannot be readily found in the United States. An individual can work for a U.S. employer as an H-1B employee for a maximum continuous period of six years. The top countries of birth for H-1B workers in 2015 were India with 70.9 percent of all approved H-1B petitions and China with 9.7 percent. Table 10-4 shows the cities with the most H-1B workers in 2016.

TABLE 10-4 Cities with the most H-1B workers

City	H-1B visas certified 2016
New York City, NY	36,122
Houston, TX	17,432
San Francisco, CA	14,355
Atlanta, GA	11,507
San Jose, CA	10,955
Chicago, IL	10,278
Sunnyvale, CA	8,344
Charlotte, SC	6,942
Irving, TX	6,695
Dallas, TX	6,591

Source: "2016 H-1B Visa Report: Top H-1b Visa Work City," myvisajobs.com, http://www.myvisajobs.com /Reports/2016-H1B-Visa-Category.aspx?T=WC.

Each year the U.S. Congress sets an annual cap on the number of H-1B visas to be granted—although the number of visas actually issued often varies greatly from this cap. Since 2004, the cap has been set at 65,000, with an additional 20,000 visas available for foreign graduates of U.S. universities with advanced degrees. The cap only applies to certain IT professionals, such as programmers and engineers at private technology companies. A petition to extend an H-1B nonimmigrant's period of stay, change the conditions of the H-1B nonimmigrant's current employment, or request new H-1B employment for an H-1B worker already in the United States does not count against the H-1B fiscal year cap. In addition, a large number of foreign workers are exempt from the cap, including scientists hired to teach at American universities, work in government research labs, or work for nonprofit organizations.

Foreign professionals can convert their H-1B visas into permanent green cards, which grants them authorization to live and work in the United States on a permanent basis, provided their employers file the necessary paperwork. This process can take a few years to complete, but the federal government allows H-1B professionals to obtain additional oneyear H-1B visas to remain in their jobs until they get approval for their green card. This process also results in an increase of the total number of H-1B visas above the 85,000 cap.

In 2015, USGIS approved a total of 275,317 H-1B petitions submitted on behalf of alien workers. Of these, 70,902 initial employment H-1B petitions plus an additional 112,174 petitions for continuing employment were approved for workers in computer-related occupations.14

Using H-1B Workers Instead of U.S. Workers

In order to compete in the global economy, U.S. firms must be able to attract the best and brightest workers from all over the world. Most H-1B workers are brought to the United States to fill a legitimate gap that cannot be filled from the existing pool of workers. However, there are some managers who reason that as long as skilled foreign workers can be found to fill critical positions, why invest thousands of dollars and months of training to develop the available pool of U.S. workers? Although such logic may appear sound for shortterm hiring decisions, it does nothing to develop the strong core of permanent IT workers that the United States will need in the future. Heavy reliance on the use of H-1B workers can lessen the incentive for U.S. companies to educate and develop their own workforces.

Companies using H-1B workers, as well as the workers themselves, must also consider what will happen at the end of the six-year H-1B visa term. The stopgap nature of the visa program can be challenging for both sponsoring companies and applicants. If a worker is not granted a green card, the firm can lose a worker without having developed a permanent employee. Many of these foreign workers, finding that they are suddenly unemployed, are forced to uproot their families and return home.

Gaming the H-1B Visa Program

Even though companies applying for H-1B visas must offer a wage that is at least 95 percent of the average salary for the occupation, some companies use H-1B visas as a way to lower salaries. Because wages in the IT field vary substantially, unethical companies can get around the average salary requirement. Determining an appropriate wage is an imprecise science at best. For example, an H-1B worker may be classified as an entry-level IT employee and yet fill a position of an experienced worker who would make $10,000 to $30,000 more per year.

Companies that employ H-1B workers are required to declare that they will not displace American workers. But companies are exempt from that requirement if 15 percent or more of their workers are on H-1B visas and the H-1B workers are paid at least $60,000 a year. Thus, H-1B workers at outsourcing firms often receive wages slightly above $60,000—below what similarly skilled American technology professionals earn, allowing those firms to offer services to U.S. companies at a lower cost, undercutting U.S. workers.15 The majority of people hired with H-1B visas in 2015 were hired primarily as computer programmers and systems analysts, and were paid a median salary of between $61,131 and $71,150.16 However, the median salary for all U.S. computer programmers was $79,840, and for systems analysts, the median salary was $87,220. Table 10-5 shows the employers who received approval for the most H-1B visas in 2015.

TABLE 10-5 Top H-1B visa employers in 2015

Company	Approved H-1B petitions	Median salary paid H-1B workers
Cognizant Technical Solutions	15,680	$61,131
Infosys	8,991	$65,631
Tata Consultancy Services	6,339	$65,600
Accenture	5,793	$67,100
Wipro Ltd.	4,803	$64,522
HCL America	2,776	$67,350
Tech Mahindra	2,657	$65,437
IBM India	2,500	$71,150

Source: Dawn Kawamoto, "8 Biggest H-1B Employers in 2015," InformationWeek, March 24, 2016, www.informationweek.com/government/8-biggest-h-1b-employers-in-2015/d/d-id/1324807?image_number=9.

The Need for H-1B Workers

The heads of many U.S. companies complain that they have trouble finding enough qualified IT employees and have urged the USGIS to loosen restrictions on visas for qualified workers. Meanwhile, unemployed and displaced IT workers in the United States, as well as other critics, challenge whether the United States needs to continue importing tens of thousands of H-1B workers every year.

The Bureau of Labor Statistics (BLS) estimates that as of 2014, there were 4.3 million people employed in the United States in the IT-related positions shown in Table 10-6. The BLS expects this sector to add close to 532,000 new jobs between 2014 and 2024—or an average of about 53,000 new jobs per year over the decade

TABLE 10-6 IT jobs: 10-year forecast

Position	Employment 2014 (000)	Employment 2024 (000)	Employment change (000)	2016 Median wage ($)
Computer & information system managers	348.5	402.2	53.7	$135,800
Computer & information research scientist	25.6	28.3	+2.7	$111,840
Computer hardware engineer	77.7	80.1	2.4	$115,080
Computer network architect	146.2	158.9	+12.7	$101,210
Computer programmer	328.6	302.1	–26.5	$79,840
Computer user support specialist	585.9	661.0	75.1	$49,390
Computer network support specialist	181.0	194.6	13.6	$62,670
Computer operator	61.1	49.5	–11.6	$42,270
Computer, automated teller, and office machine repairers	131.6	134.8	3.2	$37,100
Computer systems analyst	567.8	686.4	+118.6	$87,220
Computer science teachers, postsecondary	43.4	47.2	3.8	$77,570
Database administrator	120.0	133.4	+13.4	$84,950
Information security analyst	82.9	97.7	+14.8	$92,600
Network and computer systems administrator	382.6	412.8	+30.2	$79,700
Software developer, applications	718.4	853.7	135.3	$100,080
Software developer, systems software	395.6	447.0	51.3	$106,860
Web developer	148.5	188.0	+39.5	$66,130
Total	**4,345.4**	**4,877.7**	**+532.3**	

Source: "Computer and Information Technology Occupations," Bureau of Labor Statistics, https://www.bls.gov/ooh/computer-and-information-technology/mobile/home.htm, accessed April 20, 2017.

Figure 10-1 shows the forecasted number of new job openings by 2024 for selected IT positions, as well as the median 2016 salaries associated with these positions.17 (Of course, it must be recognized that any 10-year forecast is subject to a wide range of uncertainty). Not shown in BLS labor forecasts are the number of workers to fill new positions such as artificial intelligence/machine learning architect, big data scientist, and cloud services engineer. The demand for workers to fill these positions is expected to be high.

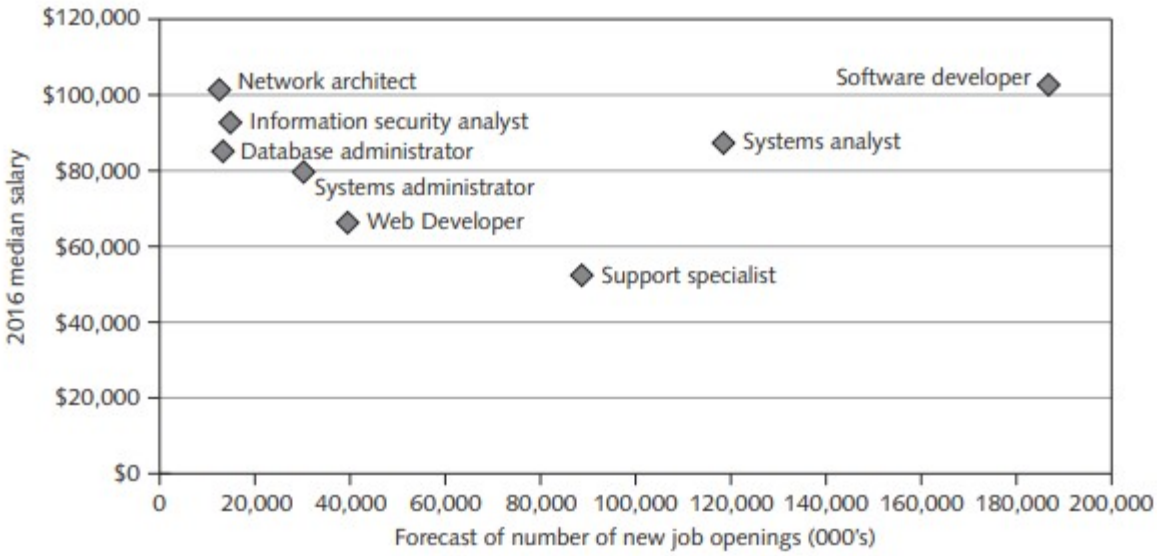


FIGURE 10-1 Occupational outlook for selected IT positions

Source: "Computer and Information Technology Occupations," Bureau of Labor Statistics

IT firms and many other organizations cite concerns about a shortfall in the number of skilled U.S. workers as justification for hiring H-1B workers, and many tech companies have advocated for an increase in the H-1B hiring cap. However, based on the data from the National Center for Education Statistics (shown in Figure 10-2), there are some 130,000 new computer and information science graduates each year18 to fill what the BLS projects as a need of roughly 53,000 new U.S. tech job openings per year. The supply of graduates is substantially larger than the demand. Indeed, in surveys of recent computer science graduates, 32 percent of those graduates not entering the IT workforce say it is because IT jobs are unavailable, while 53 percent say they found better job opportunities outside of IT occupations.19

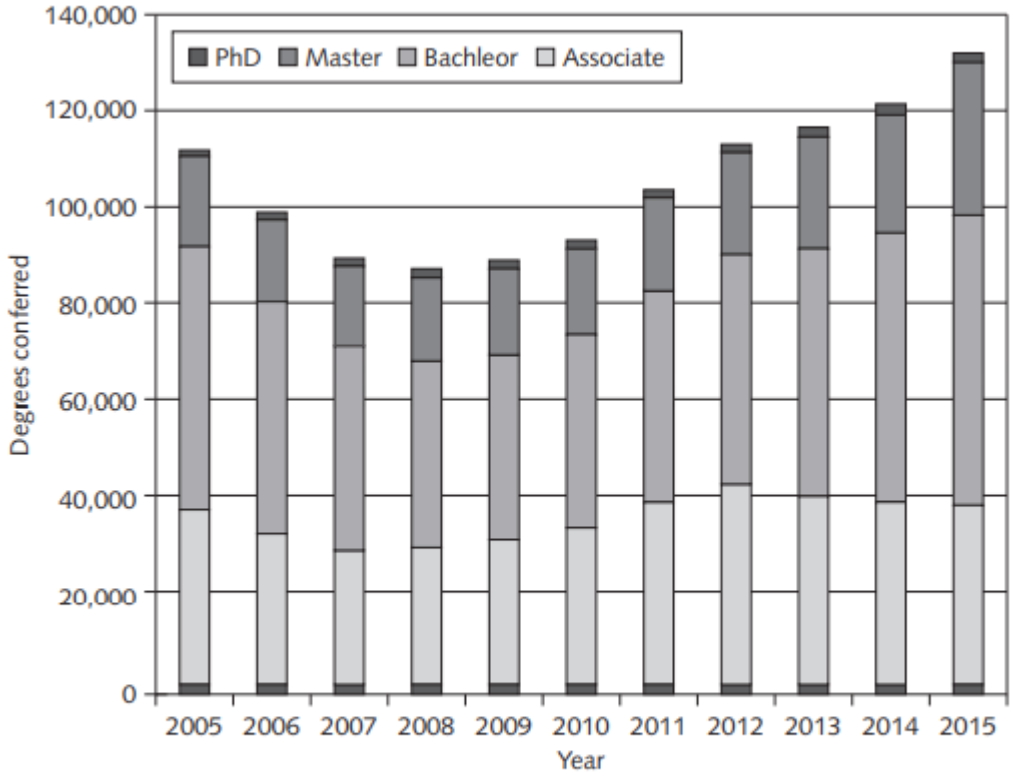


FIGURE 10-2 Number of computer and information science degrees granted by year

Source: "Digest of Education Statistics," National Center for Education Statistics

Opinions vary as to whether or not hiring of H-1B workers affects job opportunities and wages for U.S. workers. Many factors affect an individual's salary, including age, education, experience, citizenship status, race, sex, and employment location. Determining the impact of H-1B visas on employment opportunities and wages would require taking all these factors into account. However, the law of supply and demand makes clear that where the supply of workers exceeds the demand for workers for a specific job classification in a specific geographic area, one can expect unemployment and a decrease in salaries.

One recent study concluded that without H-1B visa workers, wages for U.S. computer scientists would have been 2.6 percent to 5.1 percent higher and employment in the computer science field for U.S. workers would have been 6.1 percent to 10.8 percent higher in 2001.20 Critics of this study, however, point out that its conclusions are based on data nearly a decade old and that circumstances have changed.

Another study used salary data from 2016 for 10 large U.S. cities and found that when comparing workers in the same jobs, in the same cities, H-1B workers earn on average 2.8 percent more than their U.S. counterparts. Jobs where H-1B workers often earn more than U.S. workers include professor, program manager, project manager, and risk manager. Jobs where

they typically earn less include data scientist, financial analyst, programmer analyst, and software engineer.

OUTSOURCING

Outsourcing is another approach for meeting staffing needs. Outsourcing is a long-term business arrangement in which a company contracts for services with an outside organization that has expertise in providing a specific function. A company may contract with an organization to provide services such as operating a data center, supporting a telecommunications network, developing software, or staffing a computer help desk.

Stonewood Financial Tools, a privately held financial services company with headquarters in Louisville, Kentucky, provides investment tools that enable people to make well-informed financial decisions. Recently, Stonewood decided it wanted to develop a custom application that could recommend the best retirement income products for its clients based on a broad set of criteria. With fewer than 50 employees, Stonewood did not have sufficient software development expertise in-house, so it outsourced the work to GlowTouch, an outsourcing firm with 1,200 employees that provides small and mid-sized companies with fast, scalable, responsive IT services. Stonewood and GlowTouch worked together to define and implement an application that meets the needs and provides real-time retirement estimates to Stonewood's clients.22

Coemployment legal problems with outsourcing are minimal because the company that contracts for the services does not generally supervise or control the contractor's employees. The primary rationale for outsourcing is to lower costs, but companies also use it to obtain strategic flexibility and to keep their staff focused on the company's core competencies.

Offshore Outsourcing

Offshore outsourcing is a form of outsourcing in which services are provided by an organization whose employees are in a foreign country. Any work done at a relatively high cost in the United States may become a candidate for offshore outsourcing—not just IT work. However, IT professionals in particular can do much of their work anywhere—on a company's premises or thousands of miles away in a foreign country. In addition, companies can reap large financial benefits by reducing labor costs through offshore outsourcing. As a result, and because a large supply of experienced IT professionals is readily available in certain foreign countries, the use of offshore outsourcing in the IT field is common.

Outsourcing is not a recent phenomenon. Accenture, Cap Gemini, Hewlett Packard, and IBM have sent thousands of jobs offshore since the mid-1990s.23 However, the use of offshore outsourcing has been declining in recent years. While 20 percent of leading tech firms employed offshore outsourcing in 2015, this was down from 27 percent in 2014 and 37 percent in 2013.

Many U.S. software firms set up development centers in low-cost foreign countries where they have access to a large pool of well-trained candidates. Intuit—maker of the Quicken tax

preparation software—currently has software development facilities in California and India. Accenture, IBM, and Microsoft all maintain large development centers in India. Cognizant Technology Solutions is headquartered in Teaneck, New Jersey, but operates primarily from technology centers in India.

Because of the high salaries earned by application developers in the United States and the ease with which customers and suppliers can communicate, it is now quite common to use offshore outsourcing for major programming projects. India, with its rich talent pool (a high percentage of whom speak English) and low labor costs, is considered one of the best sources of programming skills outside Europe and North America. Other sources of skilled contract programmers are China, Russia, Poland, Switzerland, and Hungary.25

Organizations must consider many factors when deciding where to locate outsourcing activities. For example, political unrest and violence in Egypt reduced the attractiveness of that country as a source of IT outsourcing, particularly after the government there temporarily blocked all Internet and cell phone service in early 2011.26

Table 10-7 lists the top IT outsourcing firms for 2016, according to the outsourcing consultancy and research firm Everest Group. The rankings are based on an evaluation of each company's performance in 26 different categories, including key business lines, geographies, and technologies, with a particular emphasis on innovation, intellectual property, and emerging technology capabilities.

TABLE 10-7 Top-rated IT outsourcing firms

Firm	Headquarters location
Cognizant Technology Solutions	Teaneck, New Jersey
Accenture	Dublin, Ireland
IBM	Armonk, New York
Tata Consulting Services	Mumbai, India
Wipro Technologies	Bangalore, India
HCL	Noida, India
Dell	Round Rock, Texas
Infosys Technologies	Bangalore, India
Capgemini+IGATE	Paris, France
CSC	Falls Church, Virginia

Source: Stephanie Overby, "The Top 10 IT Outsourcing Service Providers of the Year," CIO, February 8, 2016, www.cio.com/article/3030989/outsourcing/the-top-10-it-outsourcing-service-providers-of-the-year.html.

Pros and Cons of Offshore Outsourcing

Wages that an American worker might consider low represent an excellent salary in many other parts of the world, and some companies feel they would be foolish not to exploit such an opportunity. Why pay a U.S. IT worker a six-figure salary, they reason, when they can use offshore outsourcing to hire three India-based workers for the same cost? However, this attitude might represent a short-term point of view—offshore demand is driving up salaries in India by roughly 15 percent per year. Because of this, Indian offshore suppliers have begun to charge more for their services. The cost advantage for offshore outsourcing to India used to be 6:1 or more—you could hire six Indian IT workers for the cost of one U.S. IT worker. The cost advantage is shrinking, and once it reaches about 1.5:1, the cost savings will no longer be much of an incentive for U.S. offshore outsourcing to India.

Another benefit of offshore outsourcing is its potential to dramatically speed up software development efforts. For example, FirstBest Systems, a leading provider of insurance software solutions and services, contracted the integration and implementation of an underwriting management system to Syntel, one of the first U.S. firms to successfully launch a global delivery model that enables workers to work on a project around the clock.27 With technical teams working from networked facilities in different time zones, Syntel executes a virtual "24-hour workday" that saves its customers money, speeds projects to completion, and provides continuous support for key software applications.

While offshore outsourcing can save a company in terms of labor costs, it will also result in other expenses. In determining how much money and time a company will save with offshore outsourcing, the firm must take into account the additional time that will be required to select an offshore vendor as well as the additional costs that will be incurred for travel and communications. In addition, organizations often find it takes years of ongoing effort and a large up-front investment to develop a good working relationship with an offshore outsourcing firm. Finding a reputable vendor can be especially difficult for a small or midsized firm that lacks experience in identifying and vetting contractors.

Many of the ethical issues that arise when considering whether to use H-1B and contingent workers also apply to outsourcing and offshore outsourcing. For example, managers must consider the trade-offs between using offshore outsourcing firms and devoting money and time to retain and develop their own staff. Often, companies that begin offshoring also lay off portions of their own staff as part of that move.

Cultural and language differences can cause misunderstandings among project members in different countries. For example, in some cultures, shaking one's head up and down simply means "Yes, I understand what you are saying." It does not necessarily mean "Yes, I agree with what you are saying." And the difficulty of communicating directly with people over long

distances can make offshore outsourcing perilous, especially when key team members speak English as their second language.

The compromising of customer data is yet another potential outsourcing issue. In a study to understand the risks associated with services outsourcing, researchers at Arizona State University analyzed 146 customer data breaches between 2005 and 2010. Of those, 25 were breaches for which the outsourced service provider was responsible.28 Clearly, organizations that outsource must take precautions to protect private data, regardless of where it is stored or processed.

Another downside to offshore outsourcing is that a company loses the knowledge and experience gained by outsourced workers when those workers are reassigned after a project's completion. Finally, offshore outsourcing does not advance the development of permanent IT workers in the United States, which increases its dependency on foreign workers to build the IT infrastructure of the future. Many of the jobs that go overseas are entry-level positions that help develop employees for future, more responsible positions.

Strategies for Successful Offshore Outsourcing Successful projects require day-to-day interaction between software development and business teams, so it is essential for the hiring company to take a hands-on approach to project management. Companies cannot afford to outsource responsibility and accountability.

To improve the chances that an offshore outsourcing project will succeed, a company must carefully evaluate whether an outsourcing firm can provide the following:

- Employees with the required expertise in the technologies involved in the project
- A project manager who speaks the employer company's native language
- A pool of staff large enough to meet the needs of the project
- A reliable, state-of-the-art communications network
- High-quality, on-site managers and supervisors

To ensure that company data is protected in an outsourcing arrangement, companies can use the Statement on Standards for Attestation Engagements (SSAE) No. 16, Reporting on Controls at a Service Organization issued by the Auditing Standards Board of the American Institute of Certified Public Accountants (AICPA). A successful SSAE No. 16 audit report demonstrates that an outsourcing firm has effective internal controls in accordance with the Sarbanes-Oxley Act of 2002. The International Standard on Assurance Engagements (ISAE) No. 3402, Assurance Reports on Controls at a Service Organization, was issued by the International Auditing and Assurance Standards Board (IAASB) and is the international counterpart to SSAE No. 16.

The following list provides several tips for companies that are considering offshore outsourcing:

- Set clear, firm business specifications for the work to be done.
- Assess the probability of political upheavals or factors that might interfere with information flow, and ensure the risks are acceptable.
- Assess the basic stability and economic soundness of the outsourcing vendor and what might occur if the vendor encounters a severe financial downturn.
- Establish reliable satellite or broadband communications between your site and the outsourcer's location.
- Implement a formal version-control process, coordinated through a quality assurance person.
- Develop and use a dictionary of terms to encourage a common understanding of technical jargon.
- Require vendors to have project managers at the client site to overcome cultural barriers and facilitate communication with offshore programmers.
- Require a network manager at the vendor site to coordinate the logistics of using several communications providers around the world.
- Agree in advance on the structure and content of documentation to ensure that manuals explain how the system was built, as well as how to maintain it.
- Carefully review a current copy of the outsourcing firm's SSAE No. 16 or ISAE No. 3402 audit report to ascertain its level of control over information technology and related processes.

WHISTLE-BLOWING

Whistle-blowing is an effort to attract public attention to a negligent, illegal, unethical, abusive, or dangerous act by an individual or organization. In some cases, whistle-blowers are employees who act as informants on their company, revealing information to enrich themselves or to gain revenge for a perceived wrong. In most cases, however, whistleblowers act ethically in an attempt to correct what they think is a major wrongdoing, often at great personal risk.

A whistle-blower usually has personal knowledge of what is happening inside the offending organization because of his or her role as an employee of the organization. Sometimes the whistle-blower is not an employee but a person with special knowledge gained from a position as an auditor or business partner.

In going public with the information they have, whistle-blowers often risk their own careers and sometimes even affect the lives of their friends and family. In extreme situations, whistle-blowers must choose between protecting society and remaining silent.

A senior finance manager at Oracle alleged she was fired for refusing to follow what she thought were unlawful accounting practices designed to boost sales revenue figures for the IT company's software-as-a-service and cloud computing services. In a whistle-blower lawsuit filed against the

company, the former Oracle employee claimed she was instructed to add millions of dollars of accruals for anticipated business that had not yet materialized. Oracle stock dropped almost 4 percent the day following the filing of the lawsuit.29 Oracle countered that the employee had worked there for under a year and was fired because she failed to fulfill the responsibilities of her role. Furthermore, Oracle claimed that she had never raised any allegations about unlawful accounting practices internally. The lawsuit between the employee and Oracle was settled in February 2017 but no details were released.

Protection for Whistle-Blowers

Whistle-blower protection laws allow employees to alert the proper authorities to employer actions that are unethical, illegal, or unsafe, or that violate specific public policies.

Unfortunately, no comprehensive federal law protects all whistle-blowers from retaliatory acts. Instead, numerous laws protect a certain class of specific whistle-blowing acts in various industries. To make things even more complicated, each law has different filing provisions, administrative and judicial remedies, and statutes of limitations (which set time limits for legal action). Thus, the first step in reviewing a whistle-blower's claim of retaliation is for an experienced attorney to analyze the various laws and determine if and how the employee is protected. Once that is known, the attorney can determine what procedures to follow in filing a claim.

From the whistle-blower's perspective, a short statute of limitations is a major weakness of many whistle-blower protection laws. Failure to comply with the statute of limitations is a favorite defense of firms accused of wrongdoing in whistle-blower cases.

The False Claims Act, also known as the Lincoln Law, was enacted during the U.S. Civil War to combat fraud by companies that sold supplies to the Union Army. War profiteers sometimes shipped boxes of sawdust instead of guns, for instance, and some swindled the Union Army into purchasing the same cavalry horses several times. When it was enacted, the act's goal was to entice whistle-blowers to come forward by offering them a share of the money recovered.

The qui tam ("who sues on behalf of the king as well as for himself") provision of the False Claims Act allows a private citizen to file a suit in the name of the U.S. government, charging fraud by government contractors and other entities who receive or use government funds. In qui tam actions, the government has the right to intervene and join the legal proceedings. If the government declines, the private plaintiff may proceed alone. Some states have passed similar laws concerning fraud in state government contracts.

Qui tam actions can be based on a variety of charges, including mischarging for services, product and service substitution, false certification of entitlement for benefits, and false negotiation to justify an inflated contract. Mischarging is the most common charge in qui tam cases.32 For example, an IT contractor might overcharge hundreds of hours of programming time as part of a

government contract, or a physician might charge the government for medical services that a nurse actually performed.

Violators of the False Claims Act are liable for three times the dollar amount for which the government was defrauded. They can also be fined civil penalties of $5,000 to $10,000 for each instance of a false claim. A qui tam plaintiff can receive between 15 and 30 percent of the total recovery from the defendant, depending on how helpful the person was to the success of the case.

The Department of Justice obtained more than $4.7 billion in settlements and judgments from civil cases involving fraud and false claims against the government in fiscal year 2016. Whistle-blowers filed 702 qui tam suits in fiscal year 2016. During the same period, the Department of Justice recovered $2.9 billion in connection with qui tam suits, while also awarding whistle-blowers close to $520 million.

The False Claims Act provides strong whistle-blower protection. Any person who is discharged, demoted, harassed, or otherwise discriminated against because of lawful acts of whistle-blowing is entitled to all relief necessary "to make the employee whole." Such relief may include job reinstatement; double back pay; and compensation for any special damages, including litigation costs and reasonable attorney's fees.35

The provisions of the False Claims Act are complicated, so it is unwise to pursue a claim without legal counsel. However, because the potential for significant financial recovery is good, attorneys are generally willing to assist.

Whistle-Blowing Protection for Private-Sector Workers Under state law, an employee could traditionally be terminated for any reason, or no reason, in the absence of an employment contract. However, many states have created laws that prevent workers from being fired because of an employee's participation in "protected" activities. One such activity is the filing of a qui tam lawsuit under the provisions of the False Claims Act. States that recognize the public benefit of such cases offer protection to whistle-blowers; for example, whistle-blowers may be able to file claims against their employers for retaliatory termination and may be entitled to a jury trial. If successful, they may receive punitive damage awards.

Dealing with a Whistle-Blowing Situation

Each potential whistle-blowing case involves different circumstances, issues, and personalities. Two people working together in the same company may have different values and concerns that

cause them to react in different ways to a particular situation—and both reactions might be ethical. It is impossible to outline a definitive step-by-step procedure of how to behave in a whistle-blowing situation. This section provides a general sequence of events and highlights key issues that a potential whistle-blower should consider. Anyone considering becoming a whistle-blower is strongly advised to seek legal counsel.

Assess the Seriousness of the Situation

Before considering whistle-blowing, a person should have specific knowledge that his or her company or a coworker is acting unethically and that the action represents a serious threat to the public interest. The employee should carefully and informally seek trusted resources outside the company and ask for their assessment. Do they also see the situation as serious? Their point of view may help the employee see the situation from a different perspective and alleviate concerns. On the other hand, the outside resources may reinforce the employee's initial suspicions, forcing a series of difficult ethical decisions.

Begin Documentation

An employee who identifies an illegal or unethical practice should begin to compile adequate documentation to establish wrongdoing. The documentation should record all events and facts as well as the employee's insights about the situation. This record helps construct a chronology of events if legal testimony is required in the future. An employee should identify and copy all supporting memos, correspondence, manuals, and other documents before taking the next step. Otherwise, records may disappear and become inaccessible. The employee should maintain documentation and keep it up to date throughout the process.

Attempt to Address the Situation Internally

An employee should next attempt to address the problem internally by providing a written summary to the appropriate managers. Ideally, the employee can expose the problem and deal with it from inside the organization. The focus should be on disclosing the facts and how the situation affects others. The employee's goal should be to fix the problem, not to place blame. Given the potential negative impact of whistle-blowing on the employee's future, this step should not be dismissed or taken lightly.

Fortunately, many problems are solved at this point, and further, more drastic actions by the employee are unnecessary. The appropriate managers get involved and resolve the issue that initiated the whistle-blower's action.

On the other hand, managers who are engaged in unethical or illegal behavior might not welcome an employee's questions or concerns. In such cases, the whistle-blower can expect to be strongly discouraged from taking further action. Employee demotion or termination on false

or exaggerated claims can occur. Attempts at discrediting the employee can also be expected. As an extreme example, Dr. Jeffrey Wigand, former vice president of research and development at Brown & Williamson, disclosed wrongdoings involving the use of cancercausing ingredients in the tobacco industry. As a result, he received several anonymous death threats; however, none of the threats could be traced back to its source.36

Consider Escalating the Situation Within the Company

The employee's initial attempt to deal with a situation internally may be unsuccessful. At this point, the employee may rationalize that he or she has done all that is required by raising the issue. Others may feel so strongly about the situation that they are compelled to take further action. Thus, a determined and conscientious employee may feel forced to choose between escalating the problem and going over the manager's head, or going outside the organization to deal with the problem. The employee may feel obligated to sound the alarm on the company because there appears to be no chance to solve the problem internally.

Going over an immediate manager's head can put one's career in jeopardy. Supervisors may retaliate against a challenge to their management, although some organizations may have an effective corporate ethics officer who can be trusted to give the employee a fair and objective hearing. Alternatively, a senior manager with a reputation for fairness and some responsibility for the area of concern might step in. However, in many work environments, the challenger may be fired, demoted, or reassigned to a less desirable position or job location. Such actions send a loud signal throughout an organization that loyalty is highly valued and that challengers will be dealt with harshly. Whether reprisal is ethical depends in large part on the legitimacy of the employee's issue. If the employee is truly overreacting to a minor issue, then the employee may deserve some sort of reprimand for exercising poor judgment.

If senior managers refuse to deal with a legitimate problem, the employee can decide to drop the matter or go outside the organization to try to remedy the situation. Even if a senior manager agrees with the employee's position and overrules the employee's immediate supervisor, the employee may want to request a transfer to avoid working for the same person.

Assess the Implications of Becoming a Whistle-Blower

If whistle-blowers feel they have made a strong attempt to resolve the problem internally without results, they must stop and fully assess whether they are prepared to go forward and blow the whistle on the company. Depending on the situation, an employee may incur significant legal fees in order to bring charges against an agency or company that may have access to an array of legal resources as well as a lot more money than the individual employee. An employee who chooses to proceed might be accused of having a grievance with the employer or of trying to profit from the accusations. The employee may be fired and may lose the confidence of coworkers, friends, and even family members.

A potential whistle-blower must attempt to answer many ethical questions before making a decision on how to proceed:

• Given the potentially high price, do I really want to proceed?
• Have I exhausted all means of dealing with the problem? Is whistle-blowing all that is left?
• Am I violating an obligation to be loyal to my employer and work for its best interests?
• Will the public exposure of corruption and mismanagement in the organization really correct the underlying cause of these problems and protect others from harm?

From the moment an employee becomes known as a whistle-blower, a public battle may ensue. Whistle-blowers can expect attacks on their personal integrity and character as well as negative publicity in the media. Friends and family members will hear these accusations, and ideally, they should be notified beforehand and consulted for advice before the whistle-blower goes public. This notification helps prevent friends and family members from being surprised at future actions by the whistle-blower or the employer.

The whistle-blower should also consider consulting support groups, elected officials, and professional organizations. For example, the National Whistleblowers Center provides referrals for legal counseling and education about the rights of whistle-blowers.

Use Experienced Resources to Develop an Action Plan

A whistle-blower should consult with competent legal counsel who has experience in whistleblowing cases. He or she will determine which statutes and laws apply, depending on the agency, the employer, the state involved, and on the nature of the case. Counsel should also know the statute of limitations for reporting the offense, as well as the whistle-blower's protection under the law. Before blowing the whistle publicly, the employee should get an honest assessment of the soundness of his or her legal position and an estimate of the costs of a lawsuit.

Execute the Action Plan

A whistle-blower who chooses to pursue a matter legally should do so based on the research and guidance of legal counsel. If the whistle-blower wants to remain unknown, the safest course of action is to leak information anonymously to the press. The problem with this approach, however, is that anonymous claims are often not taken seriously. In most cases, working directly with appropriate regulatory agencies and legal authorities is more likely to get results, including the imposition of fines, the halting of operations, or other actions that draw the offending organization's immediate attention.

Live with the Consequences

Whistle-blowers must be on guard against retaliation, such as being discredited by coworkers, threatened, or set up; for example, management may attempt to have the whistle-blower transferred, demoted, or fired for breaking some minor rule, such as arriving late to work or leaving early. To justify their actions, management may argue that such behavior has been ongoing. The whistle-blower might need a good strategy and a good attorney to counteract such actions and take recourse under the law.

A massive computer-data breach at TJX (the parent company of T.J. Maxx, Marshalls, and other stores) affecting 94 million Visa and MasterCard accounts occurred in June 2005.37 A college student who was an hourly worker at TJX noticed many computer-related security problems at the firm prior to the data breach. He reported these verbally to TJX managers and also posted information about the breaches on an online security forum. In the forum, he revealed serious security weaknesses with sufficient detail that the information could be of use to hackers. The employee spoke to store managers and the district loss prevention manager before the data breach occurred, but nothing was done. Eventually the worker was fired over the public disclosures and violation of his nondisclosure agreement.38 This is a perfect example of how not to be a whistle-blower.

GREEN COMPUTING

Electronic devices such as computers and smartphones contain hundreds—or even thousands—of components, which are, in turn, composed of many different materials, including some (such as beryllium, cadmium, lead, mercury, brominated flame retardants (BFRs), selenium, and polyvinyl chloride) that are known to be potentially harmful to humans and the environment.39 Electronics manufacturing employees and suppliers at all steps along the supply chain and manufacturing process are at risk of unhealthy exposure to these raw materials. Users of these products can also be exposed to these materials when using poorly designed or improperly manufactured devices. Care must also be taken when recycling or destroying these devices to avoid contaminating the environment.

Green computing is concerned with the efficient and environmentally responsible design, manufacture, operation, and disposal of IT-related products, including all types of computing devices (from smartphones to supercomputers), printers, printer materials such as cartridges and toner, and storage devices. Green computing has three goals: (1) reduce the use of hazardous material, (2) allow companies to lower their power-related costs, and (3) enable the safe disposal or recycling of computers and computer-related equipment. Many business organizations recognize that going green is in their best interests in terms of public relations, employee safety, and the community at large. These organizations also recognize that green computing presents an opportunity to substantially reduce total costs over the life cycle of their IT equipment.

It is estimated that in the United States, 51.9 million computers, 35.8 million monitors, and 33.6 million hard copy devices (printers, faxes, etc.)—representing a total of 1.3 million tons of waste—were disposed of in 2010 alone.40 E-waste is the fastest growing municipal waste stream in the United States, according to the EPA. Because it is impossible for manufacturers to ensure safe recycling or disposal, the best practice would be for them to eliminate the use of toxic substances, particularly since recycling of used computers, monitors, and printers has raised concerns about toxicity and carcinogenicity of some of the substances. However, until manufacturers stop using these toxic substances, safe disposal and reclamation operations must be carried out carefully to avoid exposure in recycling operations and leaching of materials, such as heavy metals, from landfills and incinerator ashes. In many cases, recycling companies export large quantities of used electronics to companies in undeveloped countries. Unfortunately, many

of these countries do not have strong environmental laws, and they sometimes fail to recognize the potential dangers of dealing with hazardous materials. In their defense, these countries point out that the United States and other first-world countries were allowed to develop robust economies and rise up out of poverty without the restrictions of strict environmental policies.

Electronic Product Environmental Assessment Tool (EPEAT)

Electronic Product Environmental Assessment Tool (EPEAT) is a system that enables purchasers to evaluate, compare, and select electronic products based on a total of 51 environmental criteria. Products are ranked in EPEAT according to three tiers of environmental performance: Bronze (meets all 23 required criteria), Silver (meets all 23 of the required criteria plus at least 50 percent of the optional criteria), and Gold (meets all 23 required criteria plus at least 75 percent of the optional criteria), as shown in Table 10.8. EPEAT was first implemented in 2006 with Computer and Displays (IEEE 1680.1 standard) and has now expanded to Imaging Equipment, under the IEEE 1680.2 standard from January 2013. EPEAT is managed by the Green Electronics Council and currently evaluates more than 4,400 products from more than 60 manufacturers across 43 countries.

TABLE 10-8 EPEAT product tiers for computers

Tier	Number of required criteria that must be met	Number of optional criteria that must be met
Bronze	All 23	None
Silver	All 23	At least 50%
Gold	All 23	At least 75%

Source: "EPEAT Criteria," EPEAT, June 23, 2011, www.epeat.net/resources/criteria-2/, accessed May 31, 2017.

Individual purchasers as well as corporate purchasers of computers, printers, scanners, and multifunction devices can use the EPEAT website (www.epeat.net) to screen manufacturers and models based on environmental attributes.42 Since 2007, U.S. Federal agency purchasers have been directed to meet an annual commitment of 95 percent or higher EPEAT purchasing in all covered product categories, first by Presidential Executive Order and then by regulatory requirement.43

The European Union's Restriction of Hazardous Substances Directive, which took effect in 2006, restricts the use of many hazardous materials in computer manufacturing. The directive also requires manufacturers to use at least 65 percent reusable or recyclable components, implement a plan to manage products at the end of their life cycle in an environmentally safe manner, and reduce or eliminate toxic material in their packaging. The state of California has passed a similar law, called the Electronic Waste Recycling Act. Because of these two acts, manufacturers had a strong motivation to remove brominated flame retardants from their PC casings. By the start of 2010, the Apple iPad was free of arsenic, mercury, PVC (polyvinyl

chloride), and BFRs. In addition, according to Apple, the iPad's aluminum and glass enclosure is "highly recyclable."44

Lenovo is a Chinese manufacturer of personal computers, tablets, smartphones, workstations, servers, electronic storage devices, and printers. Since 2007, the company's product development teams have been using increasing amounts of recycled plastics to meet new customer requirements, satisfy corporate environmental objectives and targets, and achieve EPEAT Gold registrations for its products. The company's efforts have resulted in the avoidance of up to 248 million pounds of CO2 emissions since 2007.

========== End of Unit-5 ==========

Unit 5: Ethical Decision in Software Development and Ethics of IT Organizations (8 Hrs.)
Software Quality and its Importance; Strategies for Developing Quality Software; Use of Contingent Workers; H-1B Workers; Outsourcing; Whistle-Blowing; Green Computing