Chapter I

Today's
IT Environment

A competitive advantage comes only with superior IT.

(Aetna Healthcare Chairman/CEO Richard Huber)

In the last few years, information technology (IT) has significantly impacted the operation of most businesses, and even though most corporations still spend only 3% to 8% of their revenue on IT, businesses depend upon IT for their day-to-day operations. For many businesses, IT is a, if not the*, key factor in their competitive strategy.* Due to IT, we have all experienced many changes, some good some bad, in our personal lives. In fact, probably not since the industrial revolution have people all over the world experienced such dramatic life-style changes. One is reminded of the opening sentence from *A Tale of Two Cities,* by Charles Dickens: "It was the best of times, it was the worst of times." Dickens was referring to the French Revolution, but in the 21st century we are well into the "IT Revolution." In regard to project management, there are two IT related matters: the utilization of IT in managing all types of projects and the management of IT projects. Before we further discuss these project management matters in this modern IT dominated world, we need to consider the technical and business forces that are shaping this new environment.

The Information Revolution

According to the RAND organization (Hundley, 2004),

Advances in information technology are affecting most segments of business, society, and governments today in many if not most regions of the world. The changes that IT is bringing about in various aspects of life are often collectively called the "information revolution."

The current IT revolution is not the first of its kind. Historians and nations may debate the exact time and place of previous information revolutions, but they are as follows:

*   Invention of writing, first in Mesopotamia or China, around 3000 BC
*   Invention of the written book in China or Greece, around 1000 BC
*   Gutenberg's printing press and engraving, around AD 1450

Major revolutions help some people and some organizations, and, therefore, for them it is the "best of times;" but revolutions also hurt some people and organizations, and for them it is the "worst of times." With big revolutions, there always will be big winners and big losers. As an example, when the printing press was invented, the largest occupation in Europe was the hand copying of books in thousands of monasteries, each of which was home to hundreds of monks; 50 years later, the monks had been completely displaced. The impact to society was enormous, not because of the displacement of monks by other craftsmen and machines, but because the price of books dropped so drastically that common men could now afford to educate themselves.

For many, this new IT revolution is bringing great things with unprecedented improvements in the quality and efficiency of all we do as organizations and as individuals. For others, however, IT is a two-edged sword, bringing about many problems, disturbances, and unresolved issues. A great digital divide is being created, and this divide has three dimensions: income, age, and education. This divide will further separate the *haves* from the *have-nots* as manufacturing operations move to lesser developed countries, where over 1 billion low-paid workers will be available in a few years. In the future, for developed countries, workers may be divided into InfoWorkers and McWorkers. In addition IT security and privacy problems are getting out of control, as evidenced by computer viruses, worms, e-mail fraud and spam, compromise of personal and private digital information, spyware, piracy of intellectual property, ID theft, hacking, and other computer crimes. Today, there are major and numerous security "holes" in most software that corporations and individuals use every day.

The most important technology of this information revolution has to be the Internet, which is the combination of several underlying technologies. Consider the penetration

rate (in the time to reach 50 million users) of recent milestone information technologies compared to the Internet:

- It took the telephone 40 years to reach 50 million users.
- It took radio 38 years to reach 50 million users.
- It took cable TV 10 years to reach 50 million users.
- It only took the Internet only 5 years to reach 50 million users!

The Internet and related technologies are, however, beginning to cause significant industrial disruptions:

- Internet shopping is disrupting traditional sales channels for hard goods.
- Internet sharing and distribution is disrupting traditional intellectual property rights and sales of soft goods (print, audio, video, multimedia).
- Voice Over IP combined with ultra-high-speed optical and wireless media will start to disrupt traditional telecommunications.
- Open source software with community online support will start to disrupt the traditional software marketplace.
- Separation of work from workplace will disrupt corporate and personal real estate and related business sectors.
- As national barriers (political, physical, economic, and temporal) are removed, massive globalization will allow the free flow of both work and product.
- The need for retraining and lifetime learning, coupled with distance education, is transforming the traditional higher education landscape.

The process and results of these disruptions has been called "creative destruction" by the RAND corporation, and this results in the "economic eclipse" of organizations not embracing the new IT world. Traditional mechanisms of government (i.e., jurisdiction, taxation, regulation, permits, and licenses, etc.) will also significantly be disrupted in response to these other disruptions, as will the insurance and finance industries. Likewise this process of creative disruption will result in the career destruction of managers (including project managers) not embracing modern IT.

In his essay on this modern information revolution, business guru Peter Drucker (2004) noted, "This revolution will surely engulf all major institutions of modern society," and "[t]his revolution will force us to redefine what the business enterprise actually is—the creation of value and wealth."

Furthermore, he questioned whether management is prepared for the full impact of this revolution, and he saw no sign of it at that time.

Better, Cheaper, Faster

The battle cry of the 1990s, what with the advent of client-server technology to replace mainframes, was

> Better!
> Cheaper!
> Faster!

These themes are still dominant in the 21st century. That battle cry continues from the board room down through the management chain, because these themes are the crux of market positioning (quality, cost, and time to market), as illustrated in Figure 1.1.

To produce better and cheaper products or services and get them to market quicker requires better, cheaper, faster processes, as is illustrated in Figure 1.2. In today's world, information systems play a key role and an ever-increasing role in the overall process of producing and delivering products or providing services. Today, almost every aspect in the design, creation, delivery, and support of products or services depends strongly on IT.

As Tom Cruise said in the movie *Top Gun* (Paramount Pictures, 1986), "I feel a need, a need for speed." Upper management emphasizes that need for speed to IT project managers and software development teams. Many managers and technologists see speed as a solution to the problem illustrated in Figure 1.3. The world is changing so fast that, by the time we develop an IT solution for a business problem, the shape of that problem has changed.

Newer and faster project management and software engineering methods can address a portion of this problem. Speed, however, is not the only way to address the problem shown in Figure 1.3 (as this book will show). Compounding the problem is the fact that too many in IT and general management have though that better-cheaper-faster processes are obtained primarily by better-cheaper-faster people. Thus management methods as exporting work to cheaper locations, importing cheaper workers, or dismissing (or buying out) older workers have become common. Another management misconception is that better and faster is obtained by using better and faster tools; but better-faster tools without better practices and methods simply allow one to build the wrong product even faster.

A basic premise of this book is that the best long-term solution to better-cheaper-faster IT products and services involves a number of modern project management and software engineering practices and methods that can be collectively called "IT project management maturity." Three important basic project management and software engineering themes are embodied in this maturity model:

1.   Do it right the first time
2.   Do only manageable portions at a time
3.   Do it in a reusable and adaptable manner
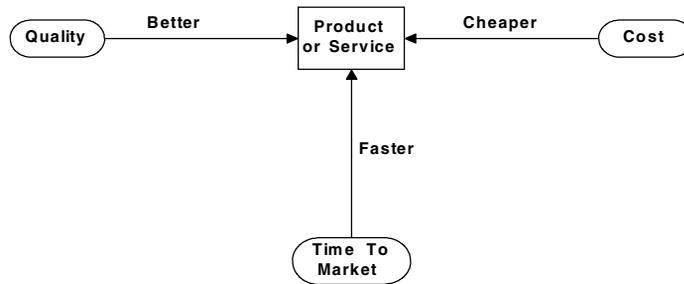
Figure 1.1. Marketing dimensions
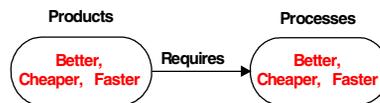

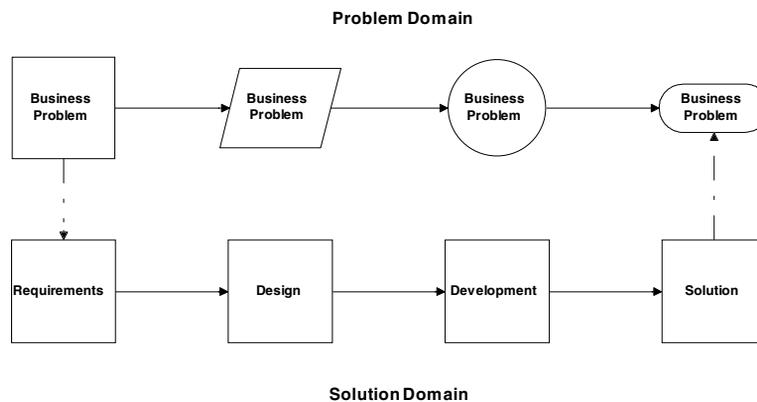*Figure 1.2. Products and processes*

Figure 1.3. Changing shape of IT problems

This method is illustrated in Figure 1.4, and each of these components will be discussed later in this book.

The project management processes, practices, and methods that are the key to this IT maturity model are based upon critical success factors. All too often in IT, project and line management do not allocate enough time to do the project work right the first time, but later they are forced to find the time and resources to do it over again. Completing

Figure 1.4. IT Project management maturity
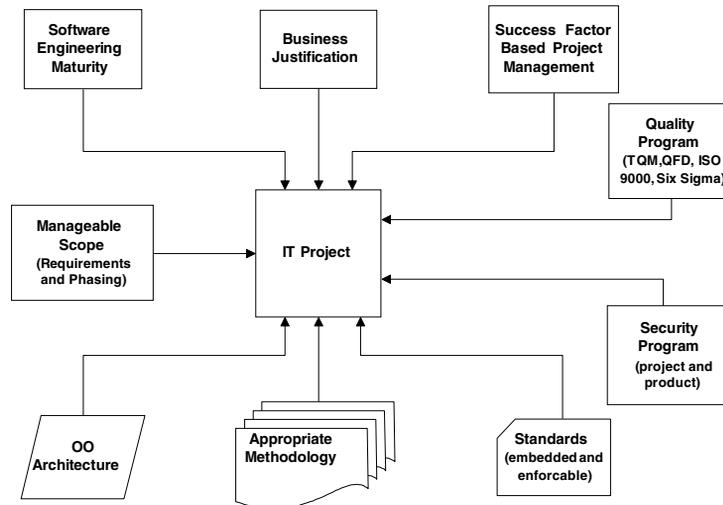
IT projects successfully the first time requires the identification and understanding of all the critical success factors of such projects. Once these factors are itemized and fully appreciated, then effective management and technical methods and metrics can be formulated for project performance, risk, and quality control.

Theoretically and statistically, project success probability decreases as the size of an IT project grows. Many factors, such as the interaction of project stakeholders and the interaction of technical components, increase in complexity in ratio to the square of the number of such items. Therefore, subdividing large IT projects into smaller parts decreases complexity and thus increases the likelihood of success; however, this subdivision needs to be consistent with the metrics and methods to monitor and control all identified critical success factors. In the next chapter, critical success factors for IT projects are identified and defined and, in later chapters, effective management and technical techniques for the measurement and control of these factors are presented.

Teamed-Based Workplaces

In the 20th century, management methods were largely based upon "command and control" techniques. These techniques evolved from ancient autocratic societies and military environments in which relatively few educated people lead large numbers of uneducated people. Management structures were developed to take much detailed information and to summarize that information up through a number of middle manage-

ment levels so that decisions could be made in regard to different scopes and time horizons. Several management levels were formed at each of the business operational, tactical, and strategic decision points.

Today, however, in developed countries, management structures have changed and evolved due to a number of factors. One is that the economies of developed countries continue to shift from a manufacturing economy to a service economy. Another factor is that most corporate workers have become knowledge workers, where a computer or computer interface is an integral part of their job. And the other major factor is that IT is used extensively to gather and summarize the information flow from the point of origin to the eventual decision maker; IT is now often part of the decision process itself through decision support systems.

This evolution of management structures has resulted in a reduction of the number of middle management layers and the creation of team-based work at the lower levels. It used to be that a corporate organization chart might have management positions for supervisors (or foremen), unit managers, section managers, department managers, division managers, directors, and vice presidents. In a modern organization, there are much fewer levels, such as team leader (or project manager), director, and vice president (or CIO). Teams are given not only the work assignment(s) but also are given the responsibility (at least partially) for the work results. Management used to monitor employee performance by observing work activity and work results, hence the old expression *MBWA* (managing by walking around). But in the team environment, it is becoming the responsibility of teammates to observe *work activity* and the team leader to monitor *work results*. This creation of teams at the lower levels of the organization has proven very effective for maximizing employee performance, and where the nature of the work is the completion of projects, the team leader is called the project manager (PM).

IT has also shown that productivity is not necessarily related to proximity and, thus, work is being separated from the workplace. Many knowledge workers can do much of their work from places other that the company facility including working from home, or while traveling, or while at a customer or vendor location. In many cases, IT has made it possible for an individual to work for an organization and live anywhere.

Due to the tearing down of national barriers, the work of many companies and individuals is now on a global scale. Furthermore, IT has permitted the team based workplace to be extended to a global scale by the facilitation of virtual teams using electronic communication and collaboration tools such as e-mail, interactive Web sites with electronic forms, chat rooms, bulletin boards, instant messaging, and other forms of groupware. Even business processes, both intracorporate and intercorporate, have become Web-enabled. Virtual teams may be assembled quickly with the right mix of skills to address a particular problem or project, and then they may be disassembled just as quickly when the job is done. It is not atypical for an individual to be a part of many virtual teams simultaneously. In a virtual environment, managers only monitor work results and the old concept of managing work activity has almost disappeared. This does not mean that managers no longer interact with their staff, it is just that the mode of interaction has often become digital instead of face to face.

Some organizations have gone a step further and created the virtual organization, in which extensive use of IT is used to create an extremely flexible team- and project- based

organization, which may need no physical facilities at all. A related concept is embedded in the term *virtual corporation,* which refers to a business strategy for allying complementary businesses via IT into a "symbiotic network" and allowing them to respond to customers as a single entity. The complete integration of IT into the work and virtual workplace is creating a number of strategies that include the word (or synonym) *instant* (Pearlson & Saunders, 2004, pp. 76-77):

- **Instant Value Alignment:** Understanding the customer so well that the customer's needs are anticipated.
- **Instant Learning:** Building learning directly into each employees work process and/or schedule ("just in time training").
- **Instant Involvement:** Using IT to communicate all needed information to vendors, employees, and so forth ("just in time inventory" and "supply chain automation").
- **Instant Adaptation:** Creating an environment enabling all teams to act instantly and to make timely decisions.
- **Instant Execution:** Designing business processes so that they have as few people involved as possible and reduce cycle times so that these processes appear to execute instantly.

To successfully function in this new IT-enabled instant world and workplace, managers must adapt and obtain the necessary knowledge and skills. Several years ago, The Gartner Group researched this topic, and their list of these management skills follow (York, 1999):

- *Understand project management*
- *Manage for results*
- Speak the language of business
- *Improvise with grace and harmony*
- Understand IT processes and business processes
- Make informed business decisions quickly
- *Know how and when to measure performance*
- Cultivate an environment of risk tolerance
- Communicate clearly, appropriately, and relentlessly

Computerworld also investigated this topic and called the new breed of IT team leaders "business technologists" and listed their ideal characteristics as (Brandel, 2001):

- Business and financial acumen
- *Understand tension between budget, operations, capital, expense, and head count*

- *Sensitivity to all the dimensions that influence a project*
- Both written and oral communication skills
- An understanding of relationship management
- *Project planning skills*
- *Performance monitoring skills*
- An understanding of the value of coaching
- A customer focused approach

In the preceding lists, those items that specifically deal with project management (as opposed to management in general) have been italicized; however, all these traits are necessary for effective project managers.

Projects and Project Management

A *project* is defined as "a temporary endeavor undertaken to create a unique product or service" (PMI, 2000). A project is undertaken when work is best accomplished through methods that fundamentally differ from those of everyday operations. A list of the key characteristics of a project can further clarify that definition:

- Temporary endeavor with a beginning and an end
- Often broken into subprojects (or phases)
- Creates a unique product or service
- Done for a purpose
- Has interrelated activities (tasks)
- Is an instrument of change

A project usually has certain aspects or key components which include project-related management, a common vocabulary, project-related methods and tools, teamwork, a plan, trade-offs (involving scope/deliverables, time, cost, and quality), identified require-ments (needs) and unidentified requirements (wants or expectations), and stakeholders.

The *stakeholders* involved with a project may be many and possibly diverse in several respects including interests, needs, expectations, and priorities. Satisfying the stake-holders is one of the key objectives of the project and the project manager. Key stakeholders include the organization and people doing the work, who are called the "performing organization," and the people or organization benefiting from the work (and also usually paying for the work), who are called the "benefiting organization." These two organizations may or may not belong to the same corporation. This is illustrated in Figure 1.5. The benefiting organization, customer, and end user also may or may not be

part of the same organization. The project manager is a key stakeholder, and this individual is almost always part of the performing organization. Another key stakeholder is the project sponsor (sometimes called the project champion), and this individual usually initiates or formalizes the idea of the project. It is extremely helpful if a project has support from high up in an organization, and the project sponsor is often part of upper management. Usually the project sponsor does not (and should not) play an active role in the day-to-day management of the project. Other stakeholders (shown in the diagram as "S") may be in either organization or be external to both.

Project management is "the application of knowledge, skills, tools, and techniques to the project activities in order to meet or exceed stakeholder needs and expectations from a project" (PMI, 2000). It involves the planning, organization, monitoring, and control of all aspects of a project and also the management, leadership, and motivation of all involved parties to achieve the project objectives within agreed time, cost, quality, safety, and performance criteria.

Project management in some form has existed for thousands of years, and it was likely used in the construction of the wonders of the ancient world. Modern project management, including the use of the engineering and management disciplines, started around the turn of the 20th century. "Around that time, managers of such projects faced pressure from proponents of scientific management to organize in a centralized way and control not just what was done but the details of how and when it was done" (Yates, 2000). Henry Gantt developed the Gantt Chart in World War I, and it was used in huge projects like the construction of the Hoover Dam in the 1930s. IT project management appears to go back to the 1950s, when the Critical Path Method (CPM) was developed by DuPont and Remington Rand/Univac.

However, it is not always necessary to use formal project management methods for important temporarily endeavors, and the British Computer Society (in the spirit of David Letterman's Top Ten List) itemizes the top 10 reasons **not** to use such formality:

10.   Our customers really love us, so they don't care if our products are late and don't work.

9.   I know there is a well-developed project management body of knowledge, but I can't find it under this mess on my desk.

8.   All our projects are easy, and they don't have cost, schedule, and technical risks anyway.

7.   Organizing to manage projects isn't compatible with our culture, and the last thing we need around this place is change.

6.   We aren't smart enough to implement project management without stifling creativity and offending our technical geniuses.

5.   We might have to understand our customers' requirements and document a lot of stuff, and that is such a bother.

4.   Project management requires integrity and courage, so they would have to pay me extra.

3.   Our bosses won't provide the support needed for project management; they want us to get better results through magic.

2.   We'd have to apply project management blindly to all projects regardless of size and complexity, and that would be stupid.

1.   We figure it's more profitable to have 50% overruns than to spend 10% on project management to fix them.

The Project Manager

The project manager (PM) is the leader of a team performing a project. The project manager and his team must identify the stakeholders, determine their needs, and manage and influence those needs to ensure a successful project. A key to stakeholder satisfaction is the diligent and accurate analysis of the stakeholders themselves as well as their stated needs and unstated expectations. A project manager should not just be handed a statement of work from upper management and then try to complete it; rather the PM should be deeply involved with the development of that statement of work. The roles of a PM are many, some of which include the following:

• Identifying the requirements and risks

• Making plans and organizing the effort

• Qualifying and possibly selecting project team, vendors, and other participants

• Communication among team, management, stakeholders

• Assessing the probability of occurrence of problems

• Developing solutions to problems (both in advance and on the spot)

• Ensuring that progress occurs according to the plan

• Deliverable management

Figure 1.5. Project stakeholders
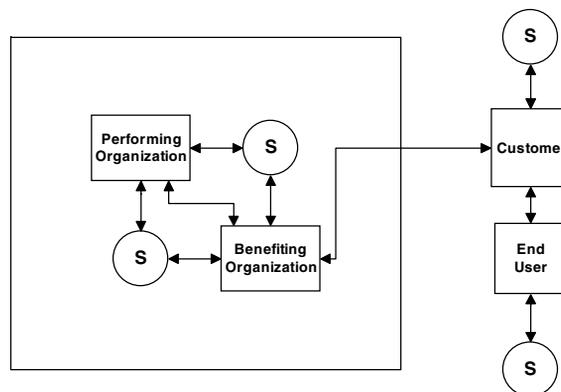
- •   Running meetings
- •   Acquiring resources for the project
- •   Influencing the organization
- •   Leading and team building
- •   Negotiation (external and internal)

The many elements of a PM's work were expressed in the "PM's Worldview," as shown in Figure 1.6 (Cooke-Davies, 2004).

It is the role of the project team members to do their assigned duties, complete their assigned tasks, and help each other. It is the role of upper management to define the goals of the project, support the project, and protect it from disruptive influences. Other project matters fall to the PM; thus, the prime role of the PM is as the integrator, communicator, and problem solver for the project team, upper management, the customer, and all other stakeholders. Project managers need a host of skills and knowledge of both business and technical matters, and this is particularly true in IT. Computerworld states:

Shouldering project management responsibilities isn't for the average Joe or the fainthearted. It requires people who have a relentless, or one might say obsessive-compulsive, attention to detail. They must also be thick-skinned individuals, willing to withstand verbal barbs, insults to their genealogy and possibly some old-fashioned assault and battery from people tired of being prompted for their part of the project. (Hall, 2004)

"It's a tough job with long hours and stress that needs someone who's a cross between a ballet dancer and a drill sergeant" (Murch, 2000). A well-known story (but of unknown origin) about PMs emphasizes their role:

A project manager, his chief software engineer, and lead network analyst were having a lunchtime stroll in the woods when they happened on a small brass lamp. They picked it up and rubbed it and a grateful genie appeared. When confronted with three of them, the genie granted the traditional three wishes, but only one wish to each of them.

The eager analyst went first and requested a South Sea Island with sweet music, swaying palm trees with a matching supply of lei-clad girls delivering endless Tequila Sunrises. "No problem" said the Genie, and with a quick flash and a cloud of smoke, the analyst disappeared.

Next came the software engineer, who merely wished to be locked in the sample room of the Coors Brewery with a guarantee of a self-regenerating liver. "No problem" said the Genie, and with a quick flash and a cloud of smoke the software engineer disappeared.

Then came the project manager. "No problem!" he said. "I want those other two back at their desks by 1:15."

IT Project Management

The evolution of flatter and team-based workplaces has progressed quicker and deeper in IT organizations than in the general corporate world. In addition, IT project management has some key differences and distinctions from project management in other fields. Some of these differences have to do with visibility, and this aspect alone makes IT projects more difficult that projects in other industries (McDonald, 2001). For example, the scope is hard to see—one cannot count the bricks, and quality is hard to see—it is not apparent if parts do not fit, do not work, cannot handle loads, cannot handle extensions, and are not compliant with standards. Here are other major differences and difficulties:

- The major cost is labor with high degrees of specializations
- There is a large difference in productivity rates of the human resources even in same job category
- There are multiple quality dimensions and criteria
- Cost and time estimation is more complex
- There are multiple architectures, methodologies, tools, et cetera, and these are constantly changing
- Projects have a high degree of complexity
- Projects may effect the entire organization or beyond
- Projects have a large amount of changes to requirements
- Projects usually have a high degree of significant risks, including
- New features
- New algorithms and methods
- New languages, platforms, architectures, and supporting tools
- New operating systems, telecommunications, interfaces
- New technology in general
- Measurement of return on investment (ROI) and other business metrics is difficult
- There are often unrealistic goals and pressures placed upon project managers and project teams to deliver software products better-cheaper-faster
- Today, IT projects often involve many outside parties as consultants and vendors
- Today, IT projects often involve offshore resources

Despite ongoing advances and innovations in project management, many projects fail; in IT, most projects still do not succeed. The Standish Group has been performing a study called CHAOS for about a decade. In 1994, their study found that only 16% of all IT projects come in on time and within budget (Cafasso, 1994); projects that are completely

abandoned represent about 15% of the failures. The problem is so widespread that many IT professionals accept project failure as inevitable (Cale, Curley, & Curley, 1987; Hildebrand, 1998). In 2004, the IT project success rate in the CHAOS report was 28%, down from 34% in 2003, and IT projects were getting more expensive (Hayes, 2004).

The failure rate goes up as the size of the IT project increases; projects over $10 million have success rates of only 2%, projects between $3 and $10 million have success rates from 23% to 11%, and projects under $3 million have success rates from 33% to 46%. Even relatively small IT projects succeed only half of the time. However, the definition of success used here may be too restrictive and this is the topic of the next chapter.

The CHAOS report also lists the major causes of IT project failure, and over the years the top causes have been lack of end-use involvement; lack of executive support; poor project management and/or planning; unclear business justification; and problems with requirements, scope, methodology, and estimation (Standish Group, 2004). All of these issues (and other problem areas) are discussed in this book, and methods to mitigate such problems are illustrated.

Due to the difficulties in delivering successful IT projects, project management is viewed as one of the most valuable skills for IT professionals. The Project Management Institute (PMI) has a certification program for the project management discipline, and the highest level of certification therein is the project management professional (PMP). Citing a 2002 Foote Partners Study, Computerworld listed the certifications obtained by IT professionals, and which certifications were the most valuable in terms of percentage pay increases after certification (King, 2003). The three most valuable certifications in IT were

- PMI Project Management Professional (PMP): 15%
- GIAC Certified Intrusion Analyst: 12%
- Microsoft Certified Trainer: 12%

Figure 1.6. PM's worldview
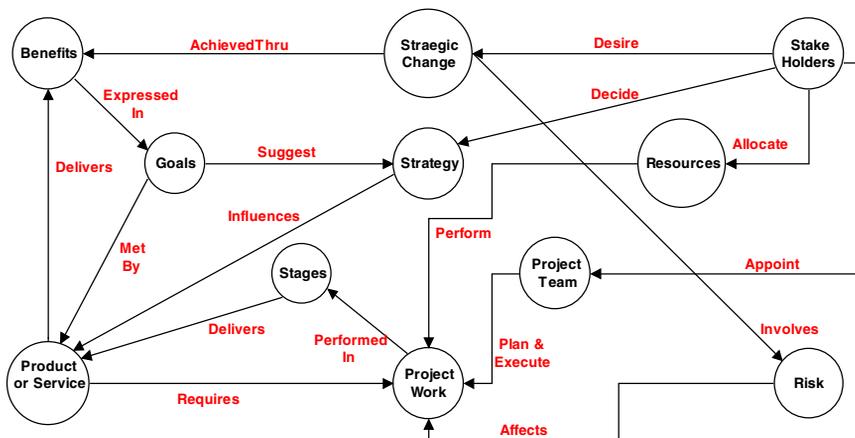
According to Sommerville (2003), there are three challenges to software engineering projects in the 21st century:

1. *The Heterogeneity Challenge:* Flexibility to operate on and integrate with multiple hardware and software platforms from legacy mainframe environments to the landscape of the global Web.
2. *The Delivery Challenge:* Ability to develop and integrate IT systems rapidly in response to rapidly changing and evolving global business needs.
3. *The Trust Challenge:* Being able to create vital (mission and/or life critical) software that is trustworthy in terms of both security and quality.

These are also three of the most critical issues for IT project management in general, and these issues are addressed throughout this book. Being able to build flexible and adaptable systems to address the heterogeneity and delivery challenge is crucial because more IT and related environmental matters are changing, and they are changing in an ever faster rate. In a similar vein, Computerworld's 2005 Executive Panel described an "evil triad" that has become the predominant future IT concern. That evil triad is poor security, unreliability, and increased complexity (Anthes, 2005).

With more powerful tools comes the potential for greater benefits including productivity increases, better cost and performance, and improved quality. However that power also brings a higher cost and damage potential when the tool is misused either accidentally or intentionally. IT is such a powerful tool, and that power in terms of computational speed is still doubling about every 18 months. Many other IT advances are also facilitating the possible misuse of IT, including,

- Price for computational resources has dropped so low that even the smallest of organizations and countries can obtain massive power
- Advances in data storage technology mean that huge amounts of data can be stored cheaply
- Advances in data mining techniques mean that huge amounts of data can be analyzed in many ways
- Advances in data networking mean that the cost and time of moving and accessing data has become very low, and that computers both inside and outside of an organization are increasingly connected

As a result of these advances which facilitate IT misuse, computer security incidents are growing rapidly. The number of domestic U.S. computer security incidents published by the CERT Coordination Center at Carnegie Mellon University has increased dramatically in recent years, as is shown in Figure 1.7. The number of these incidents has increased so much that CERT is no longer keeping detail information thereon.

Figure 1.7. Reported security incidents
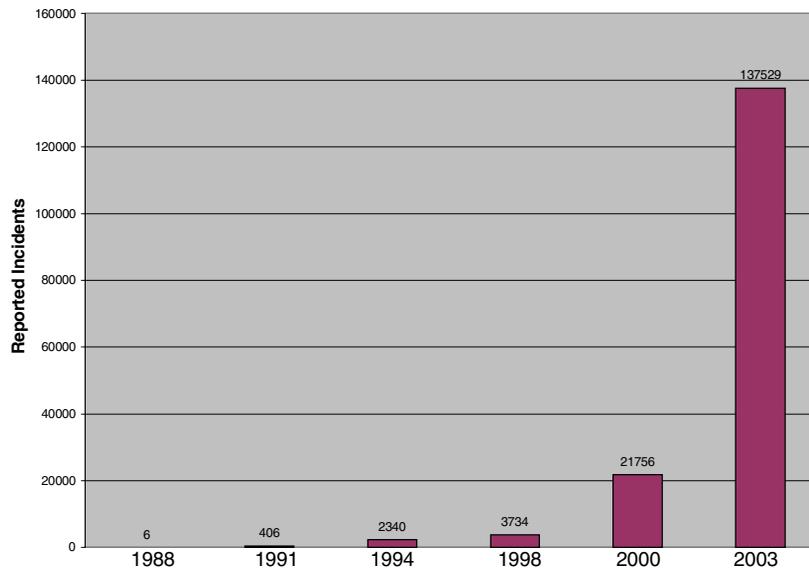
These are just the security incidents that have been reported. Because IT is so prevalent in all the products and services that organizations offer today and so prevalent in everything we do as individuals, the impact of these security problems is also quickly increasing. This problem could become enormous in the years ahead, and security breaches such as *Trojan horses* and *back doors* may already be in place within key software used by corporations and governments. The security issue in IT project management is twofold:

• Being able to shield the project work, project team, and other resources from security threats
• Being able to build adequate security protection into the product that is the subject of the project

In the future, the last of Sommerville's (2003) challenges previously listed may become as, or even more, important than the first two. Being able to run projects and build systems that are impervious to both internal and external security threats will become vital to the success of organizations and survival of free world governments.

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