Chapter

1

PROJECT MANAGEMENT FRAMEWORK

PROJECT CHARACTERISTICS

- Have a specific objective (which may be unique or one-of-a-kind) to be completed within certain specifications

- Have defined start and end dates

- Have funding limits (if applicable)

- Have quality limits (if applicable)

- Consume human and nonhuman resources (i.e., money, people, equipment)

- Be multifunctional (cut across several functional lines)

We must begin with the definition of a project. Projects are most often unique endeavors that have not been attempted before and might never be attempted again. Projects have specific start and end dates. In some cases, projects may be very similar or identical and repetitive in nature, but those situations would be an exception rather than the norm. Because of the uniqueness of projects and their associated activities, estimating the work required to complete the project may be very difficult and the resulting estimates may not be very reliable. This may create a number of problems and challenges for the functional manager.

Projects have constraints or limitations. Typical constraints include time frames with predetermined milestones, financial limitations, and limitations regarding quality as identified in the specifications. Another typical constraint may be the tolerance for risk and the amount of risk that the project team or owner can accept. There may also be limitations on the quality and skill levels of the resources needed to accomplish the tasks.

Projects consume resources. Resources are defined as human—people providing the labor and support; and nonhuman—equipment, facilities, and money, for example.

Projects are also considered to be multifunctional, which means that projects are integrated and cut across multiple functional areas and business entities. One of the primary roles of the project manager is to manage the integration of project activities. The larger the project, and the greater the number of boundaries to be crossed, the more complex the integration becomes.

THE COMPLEXITY OF DEFINING *COMPLEXITY*

Projects are usually defined as being complex according to one or more of the following elements interacting together:

- ■ Size
- ■ Dollar value
- ■ Uncertain requirements
- ■ Uncertain scope
- ■ Uncertain deliverables
- ■ Complex interactions
- ■ Uncertain credentials of labor pool
- ■ Geographic separation across multiple time zones
- ■ Other factors

Complex projects differ from traditional projects for a multitude of reasons, many of which are shown in the following feature. There are numerous definitions of a complex project. The projects that you manage within your own company can be regarded as a complex project if the scope is large and the statement of work only partially complete.

Some people believe that research and development (R&D) projects are always complex because, if you can lay out a plan for R&D, then you probably do not have R&D. R&D is when you are not 100 percent sure where you are heading, you do not know what it will cost, and you do not know when you will get there.

Complexity can also be defined according to the number of interactions that must take place for the work to be executed. The greater the number of functional units that must interact, the harder it is to perform the integration. The situation becomes more difficult if the functional units are dispersed across the globe and if cultural differences makes integration difficult.

Complexity can also be defined according to size and length. The larger the project in scope and cost, and the greater the time frame, the more likely it is that scope changes will occur affecting the budget and schedule. Large, complex projects tend to have large cost overruns and schedule slippages. Good examples of this are Denver International Airport, the Chunnel between England and France, and the "Big Dig" in Boston.

COMPONENTS OF COMPLEX PROJECTS

Interactions

Size and Cost

Multiple Stake-holders

Uncertainty

Cultural Implications
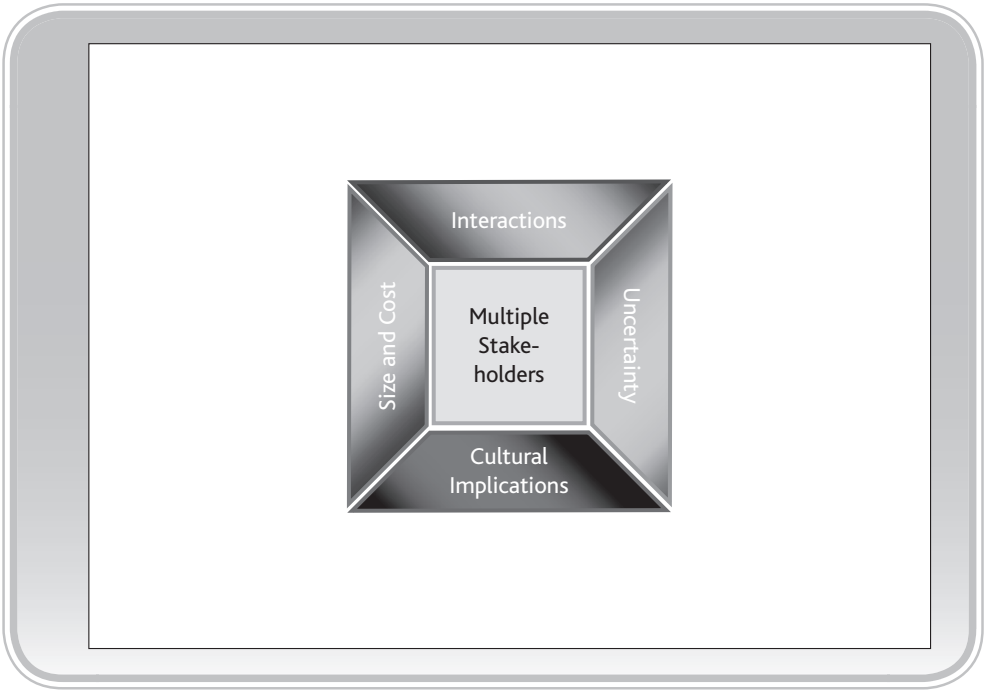
For the purposes of this book, we will consider complex projects to be defined according to the five elements shown in the preceding feature:

- *Size and cost*. According to size, we shall assume that this project is possibly one of the largest and most costly projects that you have ever worked on. The budget could be in hundreds of millions or, if your company works on projects up to $5 million, then this project might be $20 million. Furthermore, the project is being accomplished for a client external to your company.

- *Interactions*. You must interface with several subcontractors or suppliers, and many of them may be in different time zones. You are most likely using a virtual team concept for all or part of the people you must interface with.

- *Cultural implications*. Because some or all of your team members may come from various locations around the globe, cultural differences can have a severe effect on the management of the project.

- *Uncertainty*. This project is unlike any other project you have managed, and there is a great deal of uncertainty. The uncertainty deals with not only the scope and the deliverables, but also with the size of the project team and the cultural differences.

- *Stakeholders*. There are several stakeholders that you must interface with, and getting them all to agree on the scope, the deliverables, and the approval of change requests will be difficult. Stakeholders may have their own agendas for the project, and each stakeholder may have funded part of the project.

THE TRIPLE CONSTRAINT

Within Good Customer Relations

Time

Cost

Resources

**Performance/Technology
or Scope**
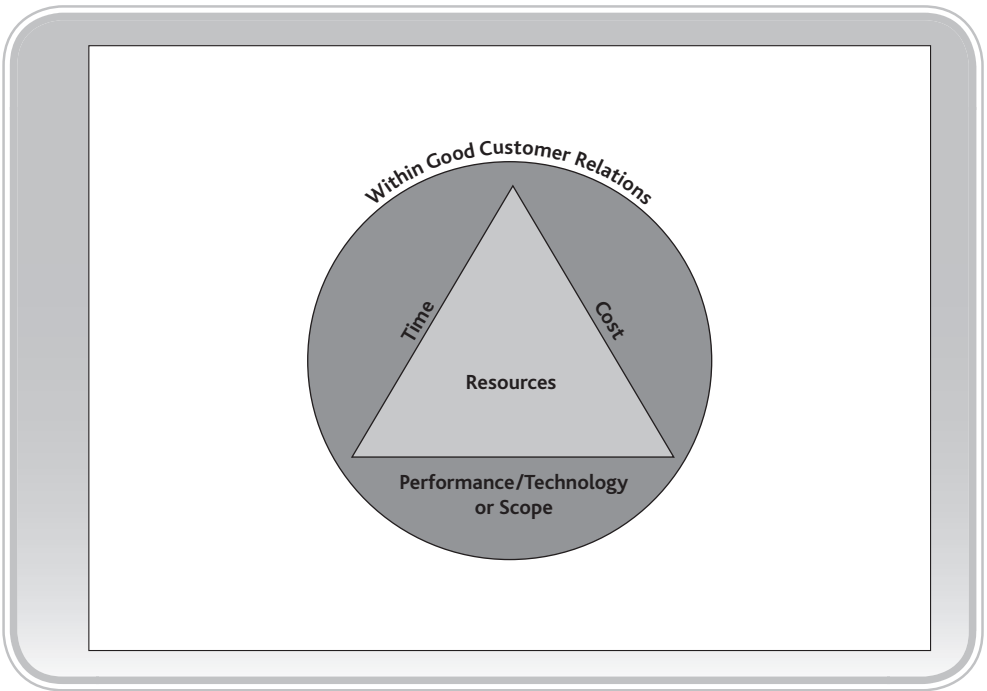
Project management is an attempt to improve efficiency and effectiveness in the use of resources by getting work to flow multidirectionally through an organization. This holds true for both traditional projects and complex projects. Initially, this might seem easy to accomplish, but there are typically a number of constraints imposed on a project. The most common constraints are time, cost, and performance (also referred to as scope or quality), known as the triple constraints.[1]

From an executive management perspective, the preceding feature is the goal of project management, namely, meeting the triple constraints of time, cost, and performance while maintaining good customer relations. Unfortunately, because most projects have some unique characteristics, highly accurate estimates may not be possible, and trade-offs among the triple constraints may be necessary. Executive management and functional management must be involved in almost all trade-off discussions to ensure that the final decision is made in the best interest of both the project and the company. If multiple stakeholders are involved, as there are on complex projects, then agreement from all of the stakeholders may be necessary. Project managers may possess sufficient knowledge for some technical decision making, but may not have sufficient business or technical knowledge to adequately determine the best course of action to address interests of the company as well as the project.

The preceding feature shows that resources are consumed on a project. Typical traditional resources include money, manpower, information, equipment, facilities, and materials. Assuming that the project manager and functional manager are separate roles assigned to different people, the resources are generally administratively under the control of the functional managers. The project managers must

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[1]Please note that in the *PMBOK® Guide*—Fourth Edition, the triple constraints have been replaced by the concept of "competing demands" or "competing constraints." The new demands/constraints add risk, resources, and quality to the original set.

therefore negotiate with the functional managers for some degree of control over these resources. It is not uncommon for project managers to have minimal or no direct control over project resources and to rely heavily on the functional managers for resource-related issues. The resources may be in a solid line type of reporting relationship to their functional manager and dotted line or indirect reporting to the project manager. The solid-dotted line relationship can become quite difficult to manage if the resources are under the control of functional managers geographically separated from the project manager.

Some people argue that project managers have direct control over all budgets associated with a project. The truth of the matter is that project managers have the right to open and close charge numbers or cost accounts for a project. But once the charge numbers are opened, the team members performing the work and their respective functional managers are actually in control of how the money is being spent as long as the charge number limits are not exceeded. With geographically dispersed teams, the problem of monitoring and controlling funds can create monumental headaches. Currency exchange rates also add to the complexity.

SECONDARY SUCCESS FACTORS

Secondary Factors

- Customer reference
- Commercialization
- Follow-on work
- Financial success
- Technical superiority
- Strategic alignment
- Regulatory agency relationships
- Health and safety
- Environmental protection
- Corporate reputation
- Employee alignment
- Ethical conduct (Sarbanes-Oxley law)

In the previous features, we discussed that time, cost, and performance were the primary components to the triple constraint. Project success is usually measured by how well we perform within the triple constraint. While that is true, there are secondary constraints that can be of greater importance to stakeholders than the primary constraints. As an example, a company agreed to execute a contract for a client at a contract price that was 40 percent below their own cost of doing the work. When asked why they bid on the contract at such a low price and knew full well that they would be losing money, an executive said: "We are doing this only once. We need to the client's name on our resume of clients that we have serviced." In this case, the contractor's definition of success was customer reference.

In another example, the R&D group of a manufacturer of paint products stated that their definition of success was measured by product commercialization. Any R&D project that eventually gets commercialized is viewed as a success. While this definition seems plausible, there may be a problem if marketing and sales cannot find customers for the product. In other words, we can have project success but product/program failure. It is better if both project and program success are achieved.

In a third example, an aerospace company underbid the initial contract to develop a complex product for the Department of Defense. When asked why the R&D effort was bid at a loss, the company responded that they would make up the difference when they were awarded the follow-on contract. In this case, success was measured by the amount of work to be received in the future.

OTHER SUCCESS FACTORS

Other Factors

- ■ With minimum or mutually agreed upon scope changes
- ■ Without disturbing the normal flow of work within the business
- ■ Without changing the corporate culture
- ■ Without a disruption to organizational governance

There are many components of project success. Most components of success involve the deliverables provided at the end of the project. However, for large, possibly long-term complex projects, there can also exist components of success related to changes that occurred in the company in the way the project was executed. On complex projects with multiple stakeholders and possibly several contractors, each company involved in the project can be impacted differently.

First, complex projects have complex scope change approval processes. In an ideal situation, all stakeholders will be in agreement with the scope changes. But if some stakeholders are not in agreement with the scope changes, then the project may have an impact on the way the company does business. This could easily disturb the normal flow of work in a company. As an example, in one company, the approval of a scope change could mandate that the company assign their best employees to the project. This could create a problem if the employees must be removed from other assignments that are critical to the ongoing success of the company.

Another example could involve the corporate culture. Some cultures are heavily oriented around power and authority relationships and may not want to support virtual teams or empower project teams. The approval of certain scope changes could require that the team perform in a manner different from the existing culture. This could also cause a dramatic change in the governance structure of a company.

THE MODIFIED TRIPLE CONSTRAINT
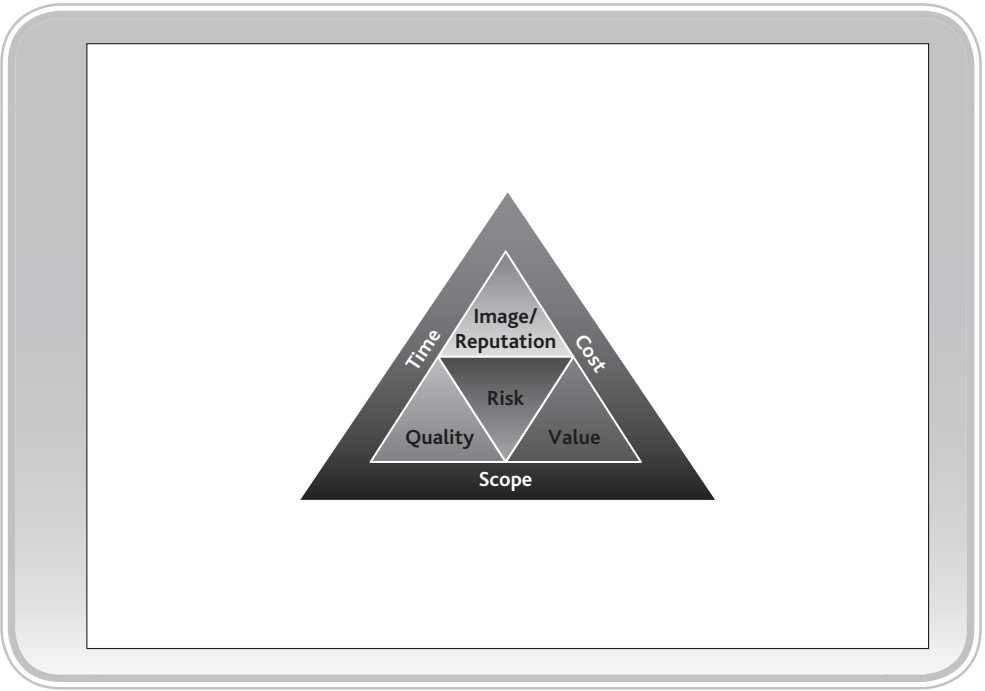
The preceding feature shows the modified triple constraint. The traditional triple constraint that has been used for decades includes time, cost, and scope. Some practitioners prefer to use performance instead of scope, where performance can be scope, quality, or technology. However, for complex projects involving multiple stakeholders as discussed previously, there can be more than three constraints that are considered to be important.
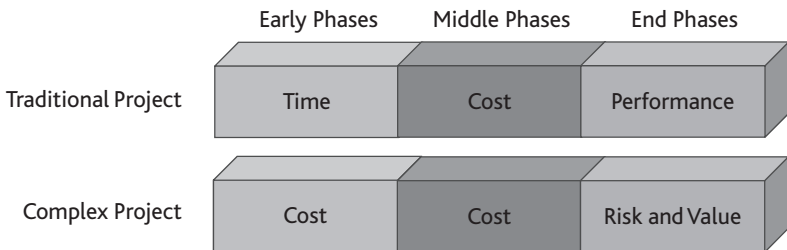
For complex projects, quality, risk, image/reputation, and value can carry a great deal of importance. But the exact degree of importance can vary from stakeholder to stakeholder and from country to country. As an example, a project manager was given an assignment to manage a project from the construction of a large hospital in a developing nation. The project manager's focus was on quality, whereas the host country's priority was simply having the hospital built regardless of cost overruns and schedule slippages. The people would be happy with a hospital, and excessive quality was not important to them.

In some host countries, the project's risk is extremely important, especially if the failure of the project can damage the host country's image or reputation. Risks and politics may go hand in hand in some host countries to the point where the early cancellation of a project may be necessary rather than incurring added risks that could damage one's image.

Some people define value and what the quality is worth. Value may be seen as being more important than cost or schedule. In some cases, such as Denver International Airport and the Opera House in Sydney, Australia, the focus on value allowed for cost overruns and schedule slippages. This is common on large, complex projects.

PRIORITIZATION OF CONSTRAINTS

Over the life cycle of a project, the prioritization of the constraints can change. As an example:

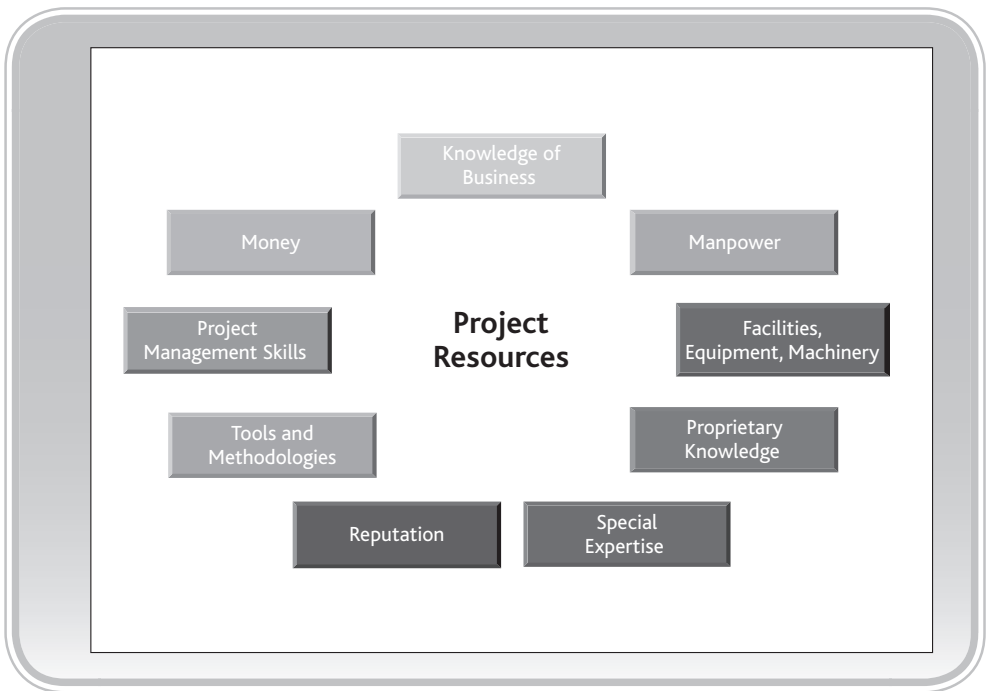|	Early Phases	Middle Phases	End Phases
Traditional Project	Time	Cost	Performance
Complex Project	Cost	Cost	Risk and Value

We have talked thus far about the fact that the constraints on a project can be prioritized differently by each of the stakeholders and from project to project. In some companies, the prioritization is almost always the same. For example, years ago Walt Disney had six constraints on the projects involving the development of new attractions at their theme parks: time, cost quality, aesthetic value, safety and scope. The three constraints of safety, aesthetic value, and quality were considered "untouchable" constraints, never to be deviated from. If trade-offs had to take place, they were always on time, cost, and scope.

As can be seen in the preceding feature, the relative importance of each constraint can change from life-cycle phase to life-cycle phase. As an example, in a traditional project, time is critical when planning the project to make sure that we can meet the customer's end-date expectations. In the middle phases, where most of the money is spent, cost becomes important. As we approach the end of the project, performance takes center stage.

For nontraditional or highly complex projects, cost is an issue until we approach the end of the project. At this point, risk and final value become important. However, this is just an example. In large, complex projects, the priorities in each life-cycle phase can change based on stakeholder interests and needs.

TYPES OF PROJECT RESOURCES

Knowledge of Business

Money

Manpower

Project Management Skills

Project Resources

Facilities, Equipment, Machinery

Tools and Methodologies

Proprietary Knowledge

Reputation

Special Expertise

The preceding feature shows the various project resources that project managers may or may not have under their direct control. On complex projects, very few of these are directly under the control of the project manager. Some of these resources require additional comment.

- *Money*. Once budgets are established and charge numbers are opened, project managers focus more on project monitoring of the budget rather than management of the budget. Once the charge numbers are opened, the performers or workers and their respective line managers control how the budgets for each work package will be used. This can be a severe problem for the project manager if the work is being accomplished at a location geographically distant from the project manager.

- *Resources*. Resources are usually "owned" by the functional managers and may be directly controlled by the functional managers for the duration of the project. Also, even though the employees are assigned to a project team, functional managers may not authorize them to make decisions without review and approval of the functional managers.

- *Business knowledge*. Project managers are expected to make business decisions as well as project decisions. This is why executives must become involved with projects and interface with project managers to provide project managers with the necessary business information for decision making.

SKILL SET

All project managers have skills, but not necessarily the right skill set for the projects at hand.

All project managers have skills, but not all project managers will have the right skills for the right jobs. For projects internal to a company, it may be possible to develop a company-specific universal skill set or company-specific body of knowledge. Specific training courses can be established to support company-based knowledge requirements.

For complex projects with a multitude of stakeholders, all from different countries with different cultures, finding the perfect project manager may be an impossible task. Today, we are in the infancy stages of understanding complex projects and being able to determine the ideal skill set for managing complex projects. We must remember that project management existed for more than three decades before we created the first *Guide to the Project Management Body of Knowledge* (*PMBOK® Guide*), and even now with the fourth edition of the *PMBOK® Guide*, it is still referred to as a "guide."

We can, however, conclude that there are certain skills required to manage complex projects. Some additional skills might include how to manage virtual teams, understanding cultural differences; managing multiple stakeholders, each of whom may have a different agenda; and understanding the impact of politics on project management.

THREE CRITICAL REQUIREMENTS

The three critical requirements for successful execution of a complex project include:

- Clear understanding of the goals and objectives
- User involvement from cradle to grave
- Clear governance

I n the previous features, we discussed the importance of understanding the environment in which the complex project will be executed in order to determine the skills needed by the project manager. Although there are several factors that can have a major influence on the project environment, three of these are identified in the preceding features. With multiple stakeholders and possible cultural barriers, it is important that the project manager and all stakeholders have a unified agreement and understanding of the project's goals and objectives.

Cradle-to-grave user involvement in complex projects is essential. What is unfortunate is that user involvement can change based on politics and the length of the project. It is not always possible to have the same user community attached to the project from beginning to end. Promotions, changes in power and authority positions due to political elections, and retirements can cause a shift in user involvement.

Governance is the process of decision making. On large complex projects, governance will appear in the hands of the many rather than in the hands of the few. Each stakeholder will either expect or demand to be part of all critical decisions on the project. The channels for governance must be clearly defined at the beginning of the project, possibly before the project manager is assigned. Changes in governance, which is expected the longer the project takes, can have a serious impact on the way the project is managed.

PROBLEM IDENTIFICATION AND SOLUTION
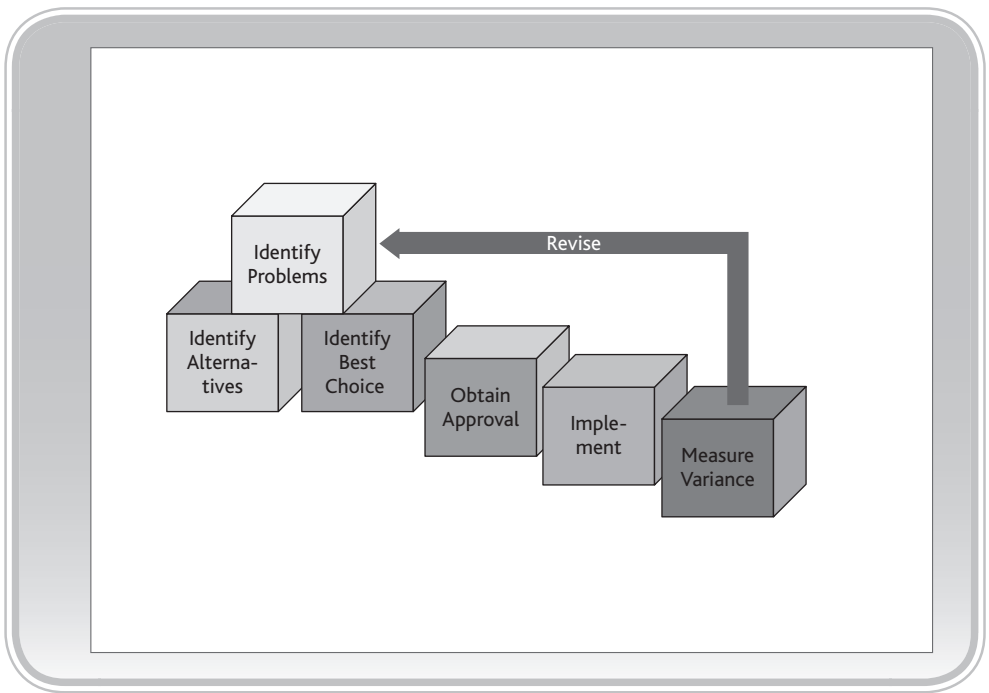
All problems have solutions, but not all solutions are good or even practical. Also, the solution to some problems is more costly than other solutions. The preceding feature illustrates a simplistic approach to problem solving. This approach applies to traditional as well as complex projects, but is more difficult to implement with complex projects.

Identifying a problem is usually easy. Identifying alternatives may require the involvement of many stakeholders, and each stakeholder may have a different view of the actual problem and the possible alternatives. To complicate matters, some host countries have very long decision-making cycles even for the identification of the problem as well as for the selection of the best alternative. Each stakeholder may select an alternative that is in the best interest of a particular stakeholder rather than in the best interest of the project.

Obtaining approval can take just as long, especially if the solution requires that additional capital be raised and if politics take an active role. In some emerging countries, every complex project may require the signature of all of the ministers and senior leaders. Decisions may be based on politics and religion as well.

THE "TRADITIONAL" PROJECT

- The project has a time duration of 6 to 18 months.

- The assumptions are not expected to change over the duration of the project.

- Technology is known and will not change over the duration of the project.

- People who start on the project will remain through to completion (the team and the sponsor).

- The statement of work is reasonably well defined.

- The target is stationary.

I n the past several features, we discussed both traditional and complex projects. We will now show the differences between them. The traditional project that most people manage is usually less than 18 months in duration. In some companies, the traditional project might be six months or less. The length of the project is usually dependent on the industry. In the auto industry, for example, a traditional project is three years.

With projects that are 18 months or less, we assume that technology is known with some degree of assuredness and will undergo little change over the life of the project. The same holds true for the assumptions. We tend to believe that the assumptions made at the beginning of the project will remain intact for the duration of the project unless a crisis occurs.

People who are assigned to the project will most likely stay on board the project from beginning to end. The people may be full time or part time. This includes the project sponsor as well as the team members.

Because the project is 18 months or less, the statement of work is usually reasonably well defined and the project plan is based on reasonably well understood and proven estimates. Cost overruns and schedule slippages can occur, but not to the degree that they will happen on complex projects. The objectives to the project, as well as critical dates, are reasonably stationary and not expected to change unless a crisis occurs.

THE "NONTRADITIONAL" (COMPLEX) PROJECT

- Time duration can be over several years.
- The assumptions can and will change over the duration of the project.
- Technology will change over the duration of the project.
- People who approved the project (and are part of the governance) may not be there at completion.
- The statement of work is ill defined and subject to numerous changes.
- The target may be moving.

The complexities of nontraditional projects seem to be driven by time and cost. Complex projects may be as long as 10 years or even longer. Because of the long time duration, the assumptions made at the initiation of the project will most likely not be valid at the end of the project. The assumptions will have to be revalidated throughout the project.

Likewise, technology can be expected to change throughout the project. Changes in technology can create significant and costly scope changes to the point where the final deliverable does not resemble the initial planned deliverable.

People on the governance committee and in decision-making roles most likely are senior people and may be close to retirement. Based on the actual length of the project, the governance structure can be expected to change through the project if the project is 10 years or longer in duration.

Because of scope changes, the statement of work may undergo several revisions over the life cycle of the project. New governance groups and new stakeholders can have their own hidden agendas and demand that the scope be changed or else they might even cancel their financial participation in the project. Finally, whenever you have a long-term complex project where continuous scope changes are expected, the final target may be moving. In other words, the project plan must be constructed to hit a moving target.

WHY TRADITIONAL PROJECT MANAGEMENT MUST CHANGE

New projects have become:

- Highly complex and with greater acceptance of risks that may not be fully understood during project approval

- More uncertain in the outcomes of the projects with no guarantee of value at the end

- Pressed for speed-to-market irrespective of the risks

Traditional project management works well when the direction of the project is clearly understood, the target is stationary, the scope is clearly defined, everyone agrees on the objectives and expectations, the risks are considered low and well understood, and there exists a high probability of project success. But for companies that wish to be innovative and become market leaders rather than market followers, the type of projects approved can be fuzzy and not follow these criteria. This is especially true for complex projects.

More and more projects are highly complex and may require a technical breakthrough. In addition, the risks in achieving the breakthrough are high, and we have no guarantee that we will be successful and that the expected value at the end of the project will be achieved. If a market leadership position is desired, then the projects are further complicated by the requirement to compress the schedule further for an early introduction into the marketplace.

Today's projects are not necessarily as well defined and understood as the traditional projects of the past. As a result, the traditional theories of project management may not work well on these new, complex types of projects. We may need to change the way we manage and make decisions on these projects. Business decisions may very well override technical decisions on projects.

The statement of work (SOW) is:

- Not always well defined, especially on long-term projects

- Based on possibly flawed, irrational, or unrealistic assumptions

- Inconsiderate of unknown and rapidly changing economic and environmental conditions

- Based on a stationary rather than moving target for final business value

As projects become more complex, the statements of work (SOWs) become less well defined and possibly ill defined. With all SOWs, assumptions are made. On long-term projects, realistic assumptions about politics, environmental conditions, and the economy are almost impossible to make. In such cases, the value achieved in the deliverable can be expected to become more important. Also, the achieved value may not have been fully understood initially, and may have changed over the life of the project. Therefore, the final value of the project may be a moving target rather than a stationary target, and we may have to accept a final value that is quite different from our initial expectations. The longer the project, the greater the chance that the final result will be significantly different than our initial expectations.

Given our premise that project managers are now more actively involved in the business, we must track the assumptions the same way that we track budgets and schedules. If the assumptions are wrong or no longer valid, then we may need to either change the SOW or even consider canceling the project. We should also track the expected value at the end of the project because unacceptable changes in the final value may be another reason for project cancellation.

The management cost and control systems (enterprise project management methodologies [EPM]) focus on:

- An ideal situation (as in the *PMBOK® Guide*)
- Theories rather than the understanding of the work flow
- Inflexible processes
- Periodically reporting time at completion and cost at completion, but not value (or benefits) at completion
- Project continuation rather than canceling projects with limited or no value

Most companies either have or are in the process of developing an enterprise project management (EPM) methodology. EPM systems are usually rigid processes designed around policies and procedures, and work efficiently when the SOW is well defined. But with the new type of projects expected over the next decade, these rigid and inflexible processes may be more of a hindrance.

EPM systems must become more flexible in order to satisfy business needs. The criteria for good systems will lean toward forms, guidelines, templates, and checklists rather than policies and procedures. Project managers will be given more flexibility in order to make decisions necessary to satisfy the business needs of the project. The situation is further complicated in that all active stakeholders may need to use the methodology and having multiple methodologies on the same project is never a good idea. Some host countries may be quite knowledgeable in project management, whereas others may have just cursory knowledge.

In the future, the assumption that the original plan is correct may be a poor assumption. As the project's business needs change, the need to change the plan will also be evident. Also, decision making based entirely on the triple constraint, with little regard for the final value of the project, may be a poor decision.

Simply stated, today's view of project management is quite different than the views in the past, and this is partially the result of having recognized the incremental benefits of project management over the past two decades.

TRADITIONAL VERSUS COMPLEX PROJECTS

Managing Traditional Projects	Managing Nontraditional Projects
Single-person sponsorship	Governance by committee
Possibly a single stakeholder	Multiple stakeholders
Project decision making	Both project and business decision making
Inflexible project management methodology	Flexible or "fluid" project management methodology
Periodic reporting	Real-time reporting
Success is defined by the triple constraint	Success is defined by the triple constraint and business value
Key performance indicators (KPIs) are derived from earned value measurement (EVM)	Unique value-driven KPIs can exist on every project

We can now summarize some of the differences between managing traditional versus complex projects. Perhaps the primary difference is with whom the project manager must interface on a daily basis. With traditional projects, the project manager interfaces with the sponsor and the client, both of whom may be the only governance on the project. With complex projects, governance is by committee, and there can be multiple stakeholders whose concerns need to be addressed.

With complex projects, the project manager needs a fluid or flexible project management methodology capable of interfacing with multiple stakeholders. The methodology may need to be more aligned with business processes than with project management processes since the project manager may need to make business decisions as well as project decisions. Complex projects seem to be dictated more by business decisions than by pure project decisions.

Complex projects are driven more by the project's end value than by the triple constraint. Complex projects tend to take longer than anticipated and cost more than originally budgeted in order to guarantee that the final result will have the value desired by the customers and stakeholders. Simply stated, complex projects tend to be value driven rather than driven by the triple constraint. The reason is simple: completing a project within the triple constraint is not necessarily success if the value is not there at the conclusion of the project.

THE NEED FOR "VALUE" AS A DRIVER

Factors promoting value-driven project management include:

- ■ Identifying the value of business opportunities that do not yet exist

- ■ Identifying better ways of selecting projects with the greatest potential value

- ■ Identifying better ways of measuring the value of projects once they begin and/or end

- ■ Making better decisions in turbulent and highly dynamic markets

- ■ Measuring value has become a competitive necessity

- ■ Implementing client-value programs

In the previous features, we stated that the criteria for project success must have a value component. Projects are not approved or funded based on the triple constraint. Rather, they are selected based on the value that is expected at the end of the project. Simply stated, complex projects appear to be value driven rather than being driven by time or cost.

We are just beginning to find ways to measure value on projects. Traditional forecast reports provide information on the time and cost expected at the completion of the project. This data can be calculated from extrapolation of trends or formulas. Unfortunately, this data may not be sufficient to provide management with the necessary information to make effective business decisions and to decide whether to continue on with the project or consider termination based on the value expected at the end. Most earned value measurement (EVM) systems in use today do not report value at completion of expected benefits at completion, probably because there are no standard formulas for them.

The benefits and value at completion must be calculated periodically throughout the life cycle of the project. However, based on which life-cycle phase a project is in, there may be insufficient data to perform the calculation quantitatively. In such cases, a qualitative assessment of benefits and value at completion may be necessary, assuming, of course, that information exists to support the assessment. Expected benefits and value are more appropriate for business decision making and usually provide a strong basis for continuation or cancellation of the project.

THE BENEFITS OF "VALUE" AS A DRIVER

Value-driven project management leads to:

■ Better decision making, especially when considering nonfinancial (intangible) benefits

■ Better analysis of options, especially when considering scope changes and trade-offs

■ Better alignment of projects to corporate objectives during business case development

■ Easier to get stakeholder consensus on value than on just the triple constraint

■ Better persuasive and defendable justification for funding during portfolio project selection activities

■ Expectation of an increase of 30 percent or higher in total portfolio value, but can be industry-specific
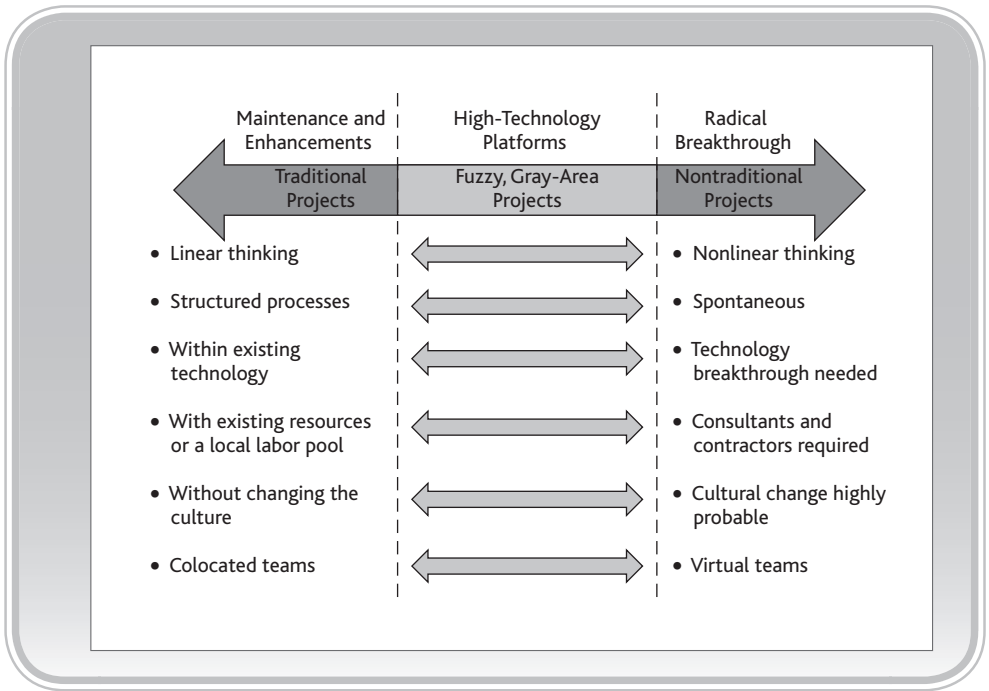
There are significant benefits to using the value component of success as a driver. Value can be measured either quantitatively or qualitatively and provides valuable information at the gate reviews for the continuation of the project, redirection of the project, or simply project termination. Project trade-offs are easier to perform if the decisions are based on value rather than time or cost.

Project stakeholders can be expected to argue over time and cost decisions, but it is usually easier to get consensus when discussing value. Also, during project selection and approval, it is easier to get authorization for funding when the decisions are based on value.

There must exist some form of reevaluation or reexamination process to determine if we are still on track to produce the value expected at completion. However, there may be roadblocks that discourage a reexamination process. As an example, an executive may have funded a "pet" project and may be afraid of the realities that would be discovered during the reexamination process.

Reexamination processes need not be accomplished at the same time as the end-of-phase review meetings that are part of an EPM methodology. They may be accomplished monthly, based on availability of information, at the discretion of specific stakeholder requests, or when a significant change occurs in the political, business, or economic environment.

ELEMENTS OF COMPLEXITY

Maintenance and Enhancements	High-Technology Platforms	Radical Breakthrough
Traditional Projects	Fuzzy, Gray-Area Projects	Nontraditional Projects

• Linear thinking	⟷	• Nonlinear thinking
• Structured processes	⟷	• Spontaneous
• Within existing technology	⟷	• Technology breakthrough needed
• With existing resources or a local labor pool	⟷	• Consultants and contractors required
• Without changing the culture	⟷	• Cultural change highly probable
• Colocated teams	⟷	• Virtual teams

The preceding feature is a summary of what we have discussed thus far about the differences in managing traditional projects. It is important to emphasize that not all projects are easily classified as traditional or complex. There is no fine line between them. Rather, it is a gray area where we have some fuzzy projects that can go either way and be classified as complex or traditional.

As an example, small complex projects are generally managed by co-located teams where all of the team members are removed from their line organization and physically reside in the same location, usually under the supervision of the project manager. This type of project generally does not fall under our definition of a complex project, but for the company needing to perform the work, it could be seen as a complex project.

Most complex projects maximize the use of virtual teams. It is quite uncommon for a company to work on a complex project and discover that all of the employees needed for the project already reside within the company. Virtual project teams allow a company to tap into highly qualified resources elsewhere in the world. The difficulty is that the project manager may not physically interface with these people but may need to rely heavily upon conference calls, web-based meetings, and other media. Superior communication skills are needed for virtual project management teams to be successful.

TYPES OF VIRTUAL TEAMS

Types of Teams	Description
Network	Team membership is diffused and fluid; members come and go as needed. Team lacks clear boundaries with the organization.
Parallel	Team has clear boundaries and distinct membership. Team works in short term to develop recommendations for an improvement in a process or system.
Project or Product Development	Team has fluid membership, clear boundaries and a defined customer, technical requirement and output. Longer-term team task is nonroutine, and team has decision-making authority.
Work, Functional, or Production	Team has distinct membership and clear boundaries. Members perform regular and ongoing work, usually in one functional area.
Service	Team has distinct membership and supports ongoing customer, network activity.
Management	Team has distinct membership and works on a regular basis to lead corporate activities.
Action	Team deals with immediate action, usually in an emergency situation. Membership may be fluid or distinct.

Adapted from Deborah L. Duarte and Nancy Tennant Snyder, *Mastering Virtual Teams*, 3rd ed. Hoboken, NJ: John Wiley & Sons, 2006, p. 9.

I t is not our intent to leave the reader with the impression that all complex projects require virtual teams. As can be seen from the above slide, there are numerous applications to virtual teams and therefore several types of virtual teams. Reading through the description of the types of teams, we can identify some critical issues with virtual teams that may affect complex projects:

- Parts of the virtual team may not feel any membership with the project team.

- Each part of the virtual team may possess their own unique project management tools and methodology, and they may not be compatible with the project manager's methodology.

- Loyalty of virtual team members is always a challenge.

- Each portion of the virtual team may have its own governance structure for decision making, and each may have an elongated process for decision making.

- In time of crisis, decision making may be slow.

- Virtual team members may have other duties in their parent company that are a higher priority than your project.

- Virtual team members may be working on multiple virtual teams.

VIRTUAL TEAM COMPETENCIES

- Project management techniques

- Networking across functional, hierarchical, and organizational boundaries

- Using electronic communication and collaboration technology effectively

- Setting personal boundaries and being assertive about being included

- Managing one's time and one's career

- Working across cultural and functional boundaries

- A high level of interpersonal awareness

Adapted from Deborah L. Duarte and Nancy Tennant Snyder, *Mastering Virtual Teams*, 3rd ed. Hoboken, NJ: John Wiley & Sons, 2006, p. 23.

The preceding feature shows some of the additional challenges facing virtual teams. First, not all virtual team members understand project management, nor do they all have the same project management tools. This may be particularly true if part of the team resides in an emerging country.

Not all virtual teams understand how to communicate across organizational boundaries or continents. In some countries, virtual team members must follow the hierarchical chain of command for all communication, even though they are told that they are part of a complex project team. To complicate matters, not all virtual project team members will possess the same technology for communications.

The *PMBOK*® *Guide* encourages project managers to take an active role in helping project team members become better employees in hopes of achieving rewards, promotion, or advancement opportunities. With virtual project teams, this may be quite a challenge for the project manager. The project manager may never physically see the team members, know whether they are being assisted by their line manager in the performance of their project responsibilities, or know if they are performing up to their capacity. Without physical interfacing, the project manager's participation in a wage and salary administration program is meaningless.

VIRTUAL TEAM MYTHS

- Myth 1: Virtual team members don't need attention.

- Myth 2: The added complexity of using technology to mediate communication and collaboration over time, distance, and organization is greatly exaggerated.

- Myth 3: The leader of a cross-functional virtual team needs to speak several languages, have lived in other countries, and have worked in different functions.

- Myth 4: When you can't see people on a regular basis, it is difficult to help them with current assignments and career progression.

- Myth 5: Building trust is unimportant in virtual teams.

- Myth 6: Networking matters less in a virtual environment; it is only about results.

- Myth 7: Every aspect of virtual teams should be planned, organized, and controlled so that there are no surprises.

Adapted from Deborah L. Duarte and Nancy Tennant Snyder, *Mastering Virtual Teams*, 3rd ed. Hoboken, NJ: John Wiley & Sons, 2006, pp. 76–87.

All too often, virtual teams are formed and the team members have a relatively poor understanding of how virtual teams should function. This occurs because management cannot or does not want to invest in training related to virtual teams. The result is that people end up with myths concerning virtual teams. The preceding feature illustrates some of the myths.

Some project managers erroneously believe that helping team members become better workers does not apply to virtual team members who are remotely located. Project managers should be responsible to help all team members perform to their limits.

Not every aspect of a virtual team can be planned for. Each virtual team can be impacted by their company's culture, politics, governance structure, ability to take risks, and available technology for project communications. Most of the time, virtual team members neglect to inform the project manager about these complexities. These complexities usually become apparent when problems occur and decisions must be made. Project managers need to be aware of the risks associated with managing virtual teams and take steps to avoid or mitigate these risks whenever possible.

CUSTOMER RFP REQUIREMENTS

- Contractors must have Project Management Professionals (PMP®s).

- Contractors must have an EPM system, and it may have to be qualified or approved by the client.

- Contractors must capture best practices and share intellectual property with the client.

- Contractors must identify a reasonable maturity level in project management.

The growth of project management is heavily customer driven. By this we mean that customers possess the ability to pressure the suppliers to make improvements to their project management capability in order to win the contract. This pressure for improvement appears in the customer's request for proposal (RFP). As an example, customers are now demanding that suppliers identify in their proposal the number of Project Management Professionals (PMP®s) they have in their company and also identify which PMP® will be managing the project.

Customers are requiring that the supplier clearly identify their EPM methodology and its capability. This is a necessity because the customer expects to be interfacing with the methodology. The supplier may also be informed that the customer must certify that the methodology meets the customer's standards of performance. The alternative would be for the supplier to agree to use the customer's methodology.

Historically, at the end of a project, customers were pleased simply to receive the required deliverables from the project. The supplier would walk away with all of the project management intellectual property that was paid for by the customer. Now the customers are asking for all of the project management best practices and lessons learned that the customer funded.

Customers are now demanding that suppliers identify their maturity level in project management. There are several project management maturity models that can be used to do this. Suppliers can usually select the model most appropriate for their use.

THE NEED FOR BUSINESS SOLUTION PARTNERS

- Not all companies have the ability to manage complexity.

- Solution providers must learn while managing the project.

- Solution providers can bring years of history to the table.

- Solution providers have a greater understanding of cultural change and the ability to work within almost any culture.

Very few companies have sufficient resources such that they can manage a large, complex project by themselves without seeking out external support. As such, contractors are often hired to provide turnkey solutions to complex projects.

Experienced contractors can bring years of experience to the table, as well as an abundance of lessons learned on other project and best practices. These types of contractors pride themselves on being solution providers rather than just contractors. They will promise you a solution to your business problems.

Solution providers generally have sufficiently more project management intellectual capital than the ultimate customer. Solution providers are also more knowledgeable in the use of virtual teams and working within a multitude of different cultures. Solution providers also have the experience in how to accelerate decision-making processes.

A project, by definition, is a unique endeavor that may never have been attempted in the past. As such, managing this type of complex project is a learning experience for both the customer and the solution providers. Both parties must be willing to learn from the successes and failures on a project. It is wishful thinking to believe that new, complex projects will always go as planned without any mistakes or partial failures.

"ENGAGEMENT" EXPECTATIONS

Customer's
Expectations
Business
Solutions

Contractor's
Expectations
Long-Term
Strategic
Partnerships
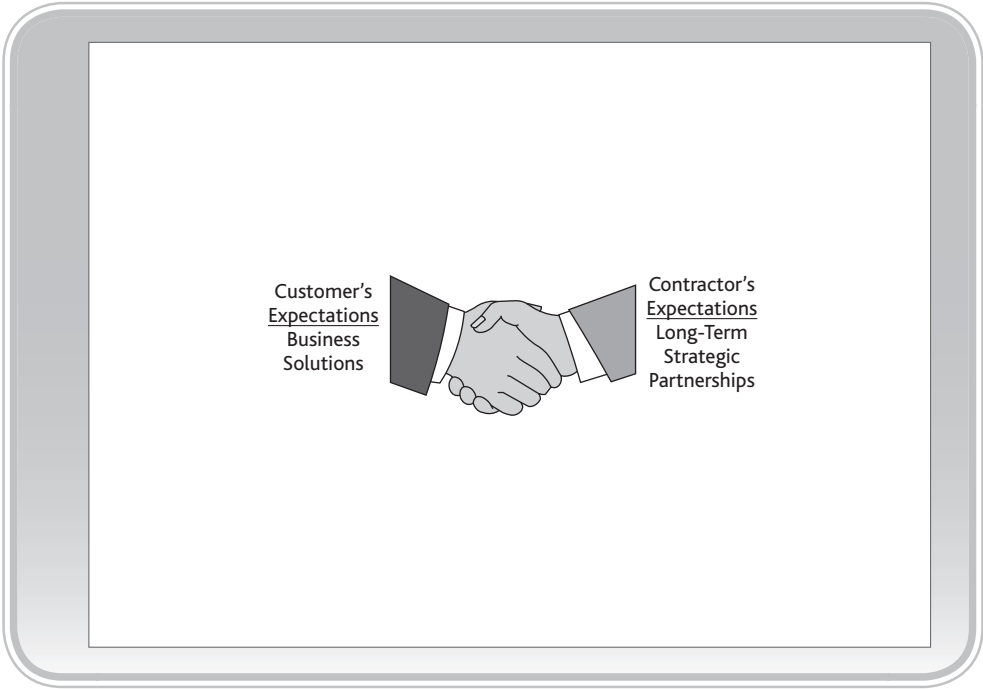
Complex projects have been in existence for decades. But only recently has the term *engagement project management* or *engagement selling* been used, especially for complex projects. In the past, the salesperson would sell products or services to a potential client, and after the sale is completed, the salesperson would move on to the next client. Today, salespeople are encouraged to maintain relationships with clients to see what other products or services can be provided.

In a courtship that leads to marriage, an engagement can be viewed as the beginning of a lifelong relationship. The same holds true for engagement selling. Customers are undertaking more complex projects each year and must rely heavily on contractors for support. What customers want is someone to provide them with solutions to their business problems.

Contractors, however, are willing to develop superior project management capability to become a solution provider and want to remain a strategic partner with the customer forever. In other words, the customer wants a solution provider, and the solution provider wants a long-term partnership arrangement. Just like in marriage, finding the right partner can satisfy each one's needs.

Solution providers are usually willing to custom-design their project management systems, forms, guidelines, templates, and checklists for a particular client in hopes of a long-term strategic relationship. The solution provider can assist the customer in the strategic planning activities for the next complex project.

BEFORE AND AFTER ENGAGEMENT PROJECT MANAGEMENT

| Before Engagement Project Management	After Engagement Project Management
Continuous competitive bidding	Sole-source or single-source contracting (fewer suppliers to deal with)
Focus on near-term value of the deliverable	Focus on lifetime value of the deliverable
Contractor provides minimal support for client with their customers	Support client with their customer value analyses (CVAs) and customer value measurements (CVMs)
Utilize one inflexible, linear EPM system	Access to contractor's many nonlinear systems

As mentioned previously, successful engagement project management can be a win-win position for both parties. Perhaps the greatest advantage to engagement project management is that the cost of competitive bidding is minimized. The solution provider is treated as a single-source or sole-source provider and, because of the strategic partnership, may not be required to submit formal proposals for the next complex project.

Unlike traditional project management, where the prime concern is the deliverable handed to the customer in the short term, solution providers have a long-term relationship with the client and are interested in the long-term value of the complex project's deliverables. Long-term rather than short-term support is provided. In addition, new forms of strategic relationships, such as build-operate-transfer (BOT) and collaborative working arrangements (CWAs) are emerging to meet these needs. Undoubtedly, additional forms of these arrangements will develop over time.[2]

Previously, we mentioned the importance of value as a driver for success. Customers are now implementing value analysis and value measurement programs not only internally, but also to support their own customers. In this regard, the business solution provider can provide support to the customer for a variety of value programs.

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[2] See Chapter 7 for further discussions of various strategic alliances (e.g., BOT, CWA).

PERCENTAGE OF PROJECTS USING PROJECT MANAGEMENT

Current use of
project management

■ Traditional
■ Nontraditional
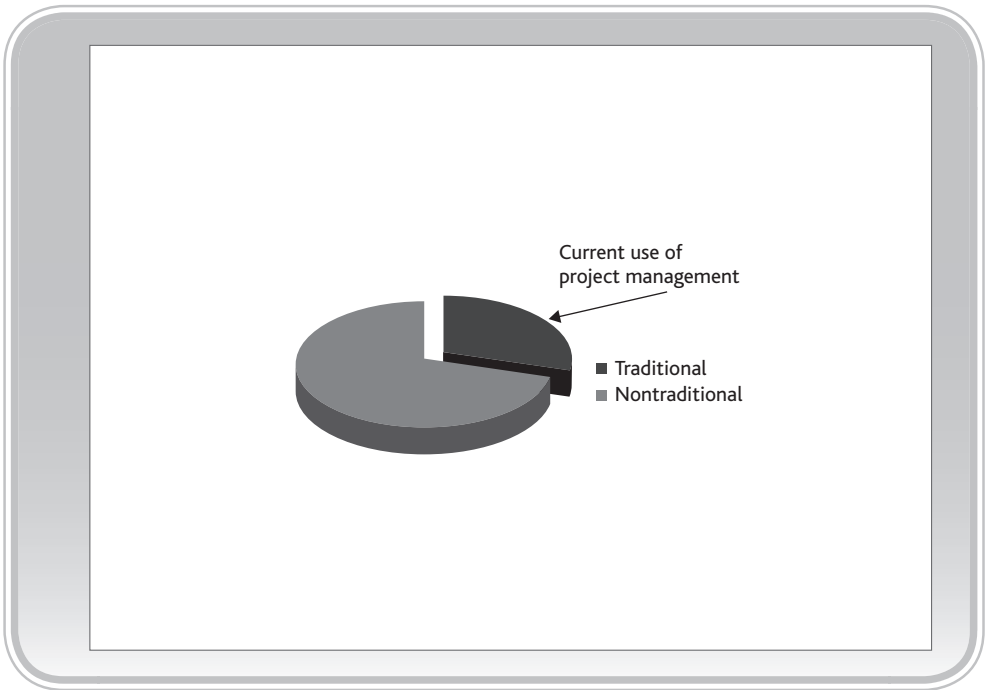
For more three decades, project management has been used to support traditional projects. Previously, we discussed the difference between traditional and nontraditional or complex projects. Traditional projects are heavily based on linear thinking; we have well-structured life-cycle phases and templates, forms, guidelines, and checklists for each phase. As long as the scope is reasonably well defined, traditional project management works well.

Unfortunately, only a small percentage of all of the projects within a company fall into this category. The larger percentage of nontraditional or complex projects use seat-of-the-pants management because they are largely based on business scenarios where the outcome or expectations can change from day to day. As such, project management techniques were neither required nor used on these complex projects that were more business oriented and aligned to 5-year or 10-year strategic plans that were constantly updated.

Now, we are finally realizing that project management can be used on these complex projects, but the traditional project management processes or techniques may be inappropriate or must be modified. The leadership style for complex projects may not be the same as with traditional projects. Risk management is significantly more difficult on complex projects, and the involvement of more participants and stakeholders is necessary.

POSSIBLE COMPLEX PROJECT OUTCOMES

Ability to Manage Complex Projects		Possible Results
Client	Seller	
Good	Good	This is the best of both worlds. The projects have a high probability of success through a strong partnership.
Good	Poor	Client must provide close governance. Seller may not have an appropriate EPM system.
Poor	Good	This can lead to possibly disastrous consequences if the client tries to micromanage the seller.
Poor	Poor	Chances of success are very limited. Significant cost overruns will occur.

I s it possible that both the customer and the solution provider have the same degree of knowledge about how to manage complex projects? It is possible but highly unlikely. In the preceding feature, you can see the four possible scenarios related to the buyer's and seller's knowledge. Although four scenarios are possible, it is unlikely that a customer would ever select a contractor or solution provider that did not possess the capability and experience to manage complex projects. The exception is when a customer in a developing nation is mandated by politics to use a local firm to take the lead as the project manager. While less frequent, this problem can occur in an industrialized nation as well.

Not all customers have expertise in managing complex projects. If the customer did have such expertise, then why would the customer need the contractor? Customers must trust solution provider contractors to do the job effectively. Without such trust, the chances of success are diminished.

The greater the complexity of a project, the greater the number of complex systems that must interact. If mistrust prevails, the interactions among the complex systems can be prolonged. Complex projects must be managed in an atmosphere of trust. This is particularly important if virtual teams are needed.

LONG-TERM GLOBALIZATION PROJECT MANAGEMENT STRATEGY
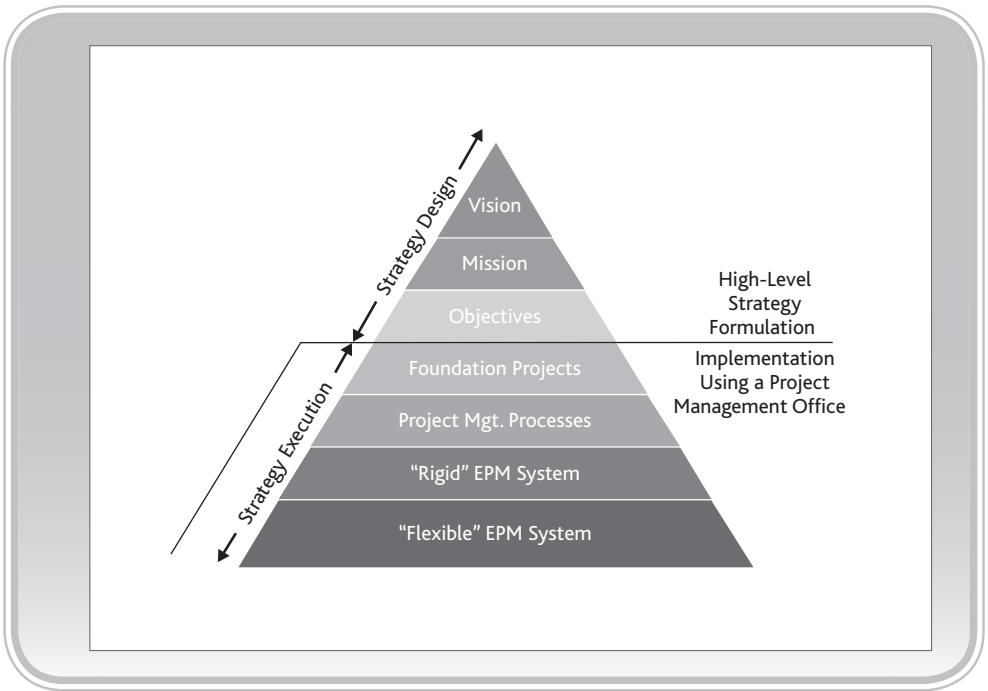
It is important to understand what types of companies function as solution providers for complex projects. In the preceding feature, you can see the evolution of project management in a solution provider. The importance of project management must be recognized at the executive levels. The result is a vision, mission, and objectives for project management implementation.

In the next step, the foundational or traditional projects in which project management will be used are identified. These may be small or breakthrough projects where people can actually see project management in action.

The next step is the development of project management processes to support each phase of the project. Once sufficient processes are created, they are combined into a rigid EPM methodology to support the management of traditional projects. It is at this point where we separate the average company with the solution providers.

Solution providers understand that one methodology will not satisfy all clients, especially if a long-term partnership is desired. Solution providers must employ highly flexible methodologies that can be adapted and custom-designed to a particular client. There can be a distinct methodology for each client. As best practices and lessons learned are obtained from the completion of a complex project, processes are undated through a continuous improvement practice. The flexible methodology can have key performance indicators (KPIs) that are unique to that customer or that particular complex project. The closer that the methodology is aligned to the customer's business processes, the more likely it is that the customer will see the value in the strategic partnership relationship.

GLOBAL VERSUS NONGLOBAL COMPANIES

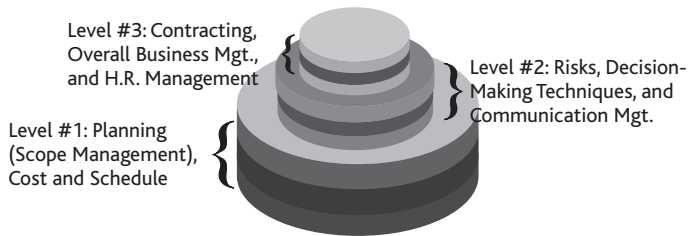| Factor	Nonglobal	Global
Core business	Sell products and services	Sell business solutions (value)
Project management satisfaction level	Must be good at project management	Must excel at project management
Project management methodology	Rigid	A framework with flexibility
Type of team	Co-located	Virtual
Supporting tools	Minimal	Extensive
Continuous improvement	Follow the leader	A necessity for survival

Every country in the world has complex projects, but not every country has resources qualified to manage these complex projects. Therefore, those companies that have taken the time and effort to develop flexible project management methodologies and become solution providers are companies that are competing in the global marketplace. Although these companies may have products and services that they can provide as part of their core business, they view their future as being a global solution provider for the management of complex projects.

For these companies, being good at project management is not enough; they must excel at project management. They must be innovative in their processes to the point that all processes and methodologies are highly fluid. They have an extensive library of tools to support the project management processes. Most of the tools were created internally with ideas discovered through the capturing of lessons learned and best practices. They have a robust improvement and innovation process in place—where lessons learned are shared among the entire organization in a planned, effective manner. They must make a significant investment in knowledge management to facilitate the instantaneous collection of these lessons learned data and their equally rapid distribution among all project teams.

QUANTITY OF TOOLS

Quantity of Tools

Areas Where Multinational Companies Are
Developing Supporting Tools for Managing
Complex Projects

Level #3: Contracting,
Overall Business Mgt.,
and H.R. Management

Level #2: Risks, Decision-
Making Techniques, and
Communication Mgt.

Level #1: Planning
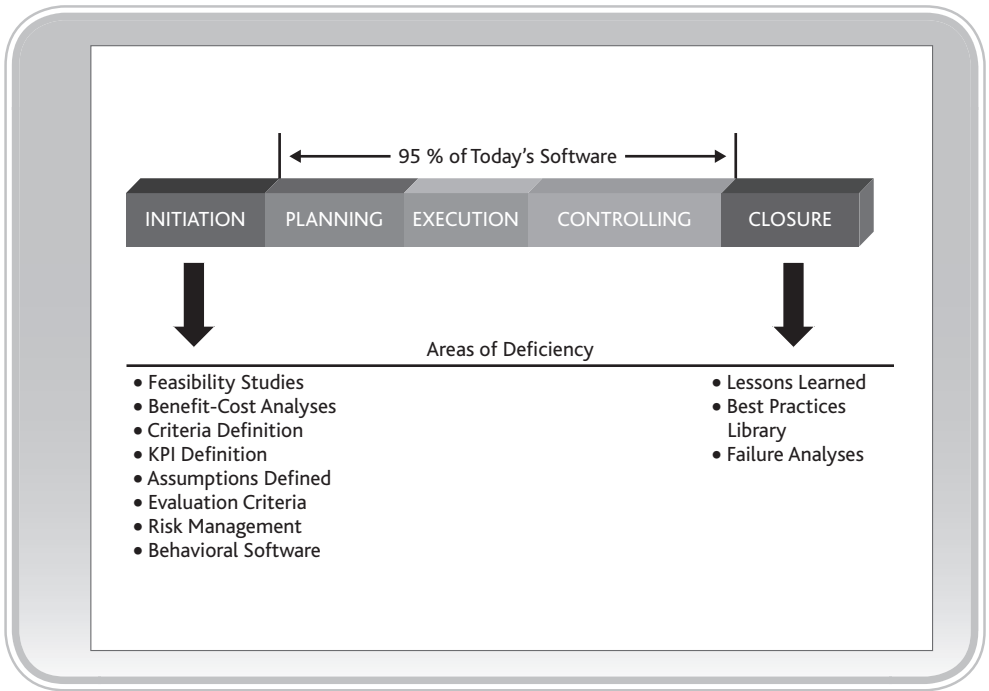(Scope Management),
Cost and Schedule

In the previous feature, we stated that solution providers for complex projects have a vast library of tools to support each and every complex project. The preceding feature shows the three levels of tools that are being developed for the management of complex projects.

Level 1 is the traditional level that almost all companies possess. These are the tools for the planning, scheduling, and cost control of projects. What differentiates the solution providers of complex projects is that they use project dashboards with real-time status reporting. This is highly advantageous to the customer. Cost and schedule reporting is done through report generators where the information will be presented in a form desired by the customer.

Level 2 contains tools appropriate for communicating with virtual teams, risk management, and decision making. Once again, these tools are custom-designed for the particular risks with which a customer must deal and the types of decisions appropriate to that customer.

Level 3 tools can be both specific and general. Contracting tools may be generic. However, it is not uncommon for a solution provider to create business-related tools to support the customer, especially if the solution provider sees a long-term relationship with the customer.

PROJECT MANAGEMENT SOFTWARE

95 % of Today's Software

| INITIATION | PLANNING | EXECUTION | CONTROLLING | CLOSURE |

Areas of Deficiency

- Feasibility Studies
- Benefit-Cost Analyses
- Criteria Definition
- KPI Definition
- Assumptions Defined
- Evaluation Criteria
- Risk Management
- Behavioral Software

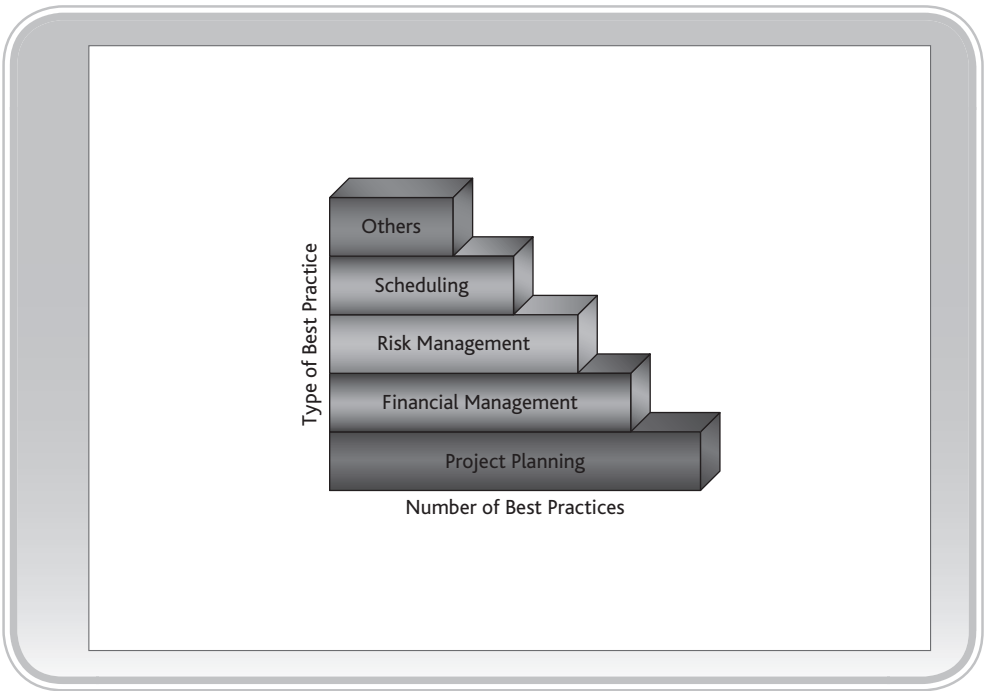- Lessons Learned
- Best Practices Library
- Failure Analyses

The preceding feature shows the breakdown of project management software. Today, perhaps as much as 95 percent of the project management software is designed around the planning, scheduling, and cost control of projects. While much of this software is also applicable to complex projects, it is the other 5 percent that may be crucial for complex projects.

There is a shortage of project management software for project initiation and project closure. For complex projects, project initiation may very well be the most important life-cycle phase. Solution providers for complex project are creating their own software for the initiation phase and the closure phase. They are also creating behavioral software for the evaluation of people that may be well suited to work on virtual project teams.

In the past few years, integrated project management tool sets have been appearing on the market. Instead of a project management team having to figure out how to integrate the data and methods of several tools from different software development manufacturers, these new tools provide for integrated data and methods, thereby facilitating the collection, analysis, distribution, and reporting of project management indicators among team members, management, and other key stakeholders in a relatively secure web-based environment (if such an environment indeed exists).

AREAS OF BEST PRACTICES

Others

Scheduling

Risk Management

Financial Management

Project Planning

Type of Best Practice

Number of Best Practices

Complex projects undergo debriefings for best practices the same way traditional projects do. The difference is that the best practices discovered may be applicable just to this type of complex project and/or client rather than being generic in nature.

As seen in the preceding features, most of the captured best practices seem to be related to the planning activities. The best practices are most likely related to the forms, guidelines, templates, and checklists associated with the planning processes.

The debriefing of complex projects can be heavily focused on financial management and risk management. This is to be expected. The debriefing session will most likely address the identification of all of the risks that impacted this complex project. It is unlikely that all of these risks were known at project initiation.

Furthermore, on complex projects, it may no longer be acceptable to wait until the end of a phase or for project closing to collect best practices. As mentioned previously, all of these activities associated with project practices (planning, risk management, etc.) are performed iteratively throughout the project. And because of the extended duration of many complex projects, it's imperative that these emerging best practices be captured as soon as they are identified, codified, and rapidly distributed to the appropriate project stakeholders so they can be implemented as quickly as possible on the current project.

THE COLLECTIVE BELIEF

- Inability or refusal to recognize failure
- Refusing to see the early warning signs of possible disaster
- Seeing only what you want to see
- Fearful of exposing mistakes
- Viewing bad news as a personal failure
- Viewing failure as a sign of weakness
- Viewing failure as damage to one's career
- Viewing failure as damage to one's reputation

Long-term, highly complex projects often mandate that a collective belief exists. The collective belief is a fervent, and perhaps blind, desire to achieve that can permeate the entire team, the project sponsor, the stakeholders, and the most senior levels of management. The collective belief can make a rational organization act irrationally by refusing to hear bad news, refusing to be willing to cancel a project, and other such faulty arguments.

When a collective belief exists, people are often selected for the complex project teams based on their willingness to support the collective belief. People are not allowed to challenge results, and bad news is often hidden. As the collective belief grows, nonbelievers are trampled and eventually forced off of the project.

The collective belief often makes it difficult to cancel projects. However, there are other reasons why some projects are difficult to cancel. These items are shown in the preceding feature. Not all complex projects will be successful. Some must be canceled, and the earlier they are canceled, the quicker resources can be assigned to projects that offer a greater opportunity for organizational success.