Practical Project Management

A User's Guide to Getting Things Done

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Introduction

Welcome to the world of project management! Today, project management is one of the fastest-growing, most in-demand professions. The purpose of this book is to help you navigate the mountains of information surrounding the profession and leave you with a robust set of tools and techniques necessary to manage projects well.

Successful project management begins with the understanding that there is significantly more to being a project manager than simply acting as an administrator or taskmaster. True project management skills go beyond the use of the formulas, tools, or techniques discussed here. It defines the core skills any manager must have to be successful in today's business environment. This means successful project managers are first and foremost managers within their organizations. Being a successful manager requires strong skills in the areas of communication, leadership, and teamwork. The unique combination of core management and technical skills makes project management one of the strongest areas from which future new executives are drawn.

Another major reason for the growing influence of project management is the ever-increasing number of projects ongoing around the globe. The statistics below provide an indication of the significance of project management throughout the world:

- PMI® estimates the size of the project management profession globally at 16 million people.
- 4.5 million people are involved in project management within the US alone.
- Nearly 25 percent of the world's gross domestic product is spent annually on projects.
- Worldwide, over $10 trillion is spent annually on projects.[1]

All the money being spent and all the people focusing their energies on project management have forced many organizations to examine how practitioners prove their abilities in this burgeoning profession. For other organizations, the increased focus on the profession has raised questions about standardization. Simply put, what are the rules for project management? Rarely has such a simple question led to such a diversity of answers. It seems everyone has the ONE answer to this question. Which process, tools, or templates should you use? The answer often depends on whom you ask, but the truth is even more complicated. The truth is that successful project managers know they must mix and match methods, processes, tools, and techniques depending on the specifics of the projects they lead. There is no such thing as a single standard for how to execute a project. For many students of the profession, this last statement will border on heresy as many find religion in one process or another. Just ask your neighborhood ScrumMaster if you want an example.

As organizations strive to compete, they often invest significant time and money to improve the delivery of projects. These forces cause organizations to look to both tested and untested methods in an attempt to improve results. Many of these methods meet with only short-lived success, and I refer to them as the "Flavors of the Month." Initiatives such as Total Quality Management (TQM), Six Sigma, Agile Six Sigma, Lean Thinking, Agile Development, the Rational Unified Process, the Capability Maturity Model (CMM) or Capability Maturity Model Integration (CMMI) each represent such methods. Let me be clear though: There is nothing wrong with these tools. In fact, many offer power capabilities every project manager should have in their toolbox. The issue usually comes from unfairly high expectations. The key, therefore, is understanding how the various tools and processes fit into the greater context of delivering business results, and then being able to communicate that understanding.

To ensure project management does not succumb to the same fate, advocates must ensure that senior management understands and fully supports the concept that project management is a core competency that must be in place before you can have long-term success with any other tool, methodology, or process. Great organizations know they must excel at BOTH operations and the management of new initiatives. Project management should never be in competition with these ideas. Project management is supported by or itself supports these ideas, but either way it is a partnership. Professional project managers should have a strong working knowledge of these processes. Senior management must also clearly understand the basics of project management.

For many senior executives, project management is singularly an administrative function. For them, a project manager is an administrative assistant or coordinator rather than an organizational leader. To be successful, a project manager must be a critical member of the management team and must be supported by executive leadership. This is not some fantasy to lift project managers to an unearned, higher level in the organization. The reality is that this is an issue of strategy.

Imagine for a moment an organization whose strategy is singularly focused on operational efficiency. "We will be the most efficient organization in the world," they might say. How long do you think that organization would last? They might make it through one or even two market cycles. In the end, the absence of new products or ideas would lead to others taking market share and the world just passing them by. As someone with more than twenty years of senior leadership experience, I can tell you that great organizations rely on their strategy, and that strategy has two components: an operational component and a project or new initiative one. If your strategy does not include a significant nod to the new ideas that will drive the organization into the future, your business life expectancy is very short. Your business success is fundamentally about your ability to deliver new ideas better than your competition, and that requires project managers who understand the organization's strategy. This means project managers must clearly understand the vision and strategy of the organization in ways administrators and taskmasters cannot.

Developing project management as an organizational competence takes time, but if the expectations are managed well, the results can be impressive. There are not a lot of trusted statistics on the performance of projects. The most trusted (albeit with reservations) are those from Jim Johnson and his Standish Group published as the *Chaos Chronicles*. This research shows the field of project management steadily improving its performance, but still with a long way to go (*figure 1*).

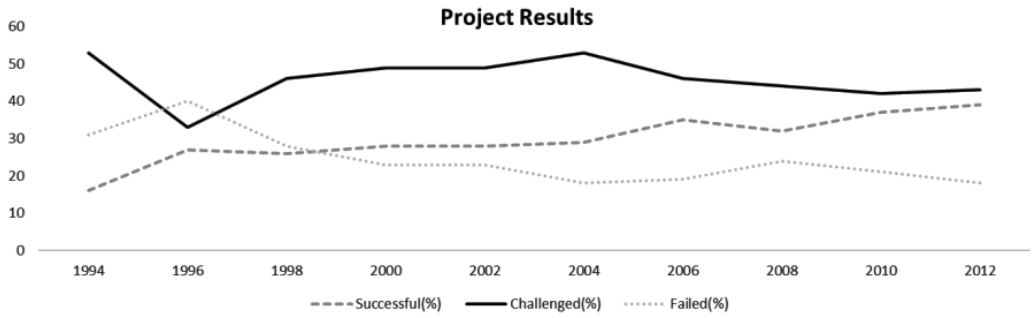


Figure 1: Standish Group, Jim Johnson Chair, Chaos Chronicles, 2013.

Led by the Standish Group over the last two decades, many organizations began looking at the performance of IT projects in the mid-1990s. On average, the Standish Group's *Chaos Chronicles* found that projects were either failing or challenged more than 60 percent of the time, were taking almost twice as a long as forecast, and costing almost twice the baseline budget. Although these numbers have been slowly improving, one of the most interesting points found in the data is the reduction in completed requirements. At first glance, this might appear to be a negative result. However, several studies have shown that approximately only 50 percent of features are regularly used, and around 30 percent are never used at all. Presuming, and this is a big presumption, that organizations are focused on completing the used features, the rate of requirements completion is a positive sign (*figure 2*).

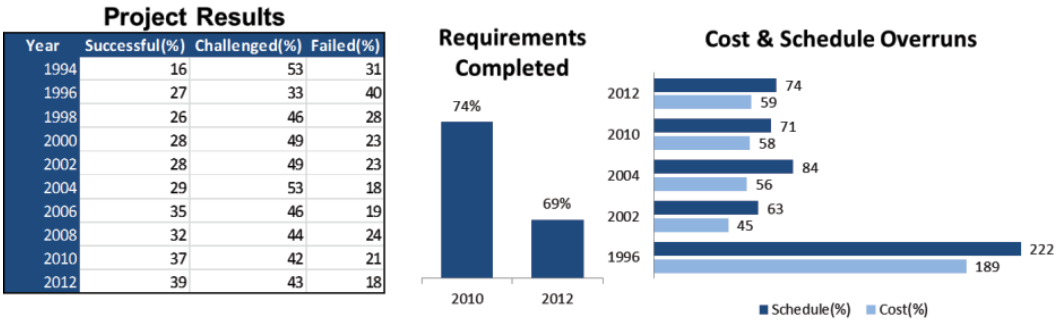


Figure 2: Standish Group, Jim Johnson Chair, Chaos Chronicles, 2013.

To some this might not make sense, but it points to the fact that most organizations are doing more with less. Project management provides one of the few disciplines that can help in this area.

So what skills and knowledge are necessary to be a successful project manager? In the 2004 *PMBOK Guide*™, the Project Management Institute (PMI™) attempted to define the skill set with a series of interconnected ovals. These areas included:

- Interpersonal Skills
- General Management Knowledge and Skills
- Application Area Knowledge, Standards & Regulations
- Understanding the Project Environment
- Project Management Specific Knowledge & Skills

Works that are more recent have attempted to quantify what truly influences project success. The *Chaos Manifesto* in 2013 created a 100-point system that weighed the major success drivers. *Figure 3* below shows the outcome from that research.

Factors of Success	Points
Executive Management Support	20
User Involvement	15
Optimization	15
Skilled Resources	13
Project Management Expertise	12
Agile Process	10
Clear Business Objectives	6
Emotional Maturity	5
Execution	3
Tools & Infrastructure	1

Figure 3: Chaos Manifesto, 2013 p. 3.

A key aspect of these results is the high degree of top-heaviness in the results. The top three items account for 50 percent of the weighting, and the top five account for 75 percent.

Because so many organizations are beginning to look to the project management field to improve their organizational performance, a key element for many is the ability of their project managers to prove they have the knowledge necessary for success in each of these areas. A common method of proving knowledge in project management is through one of the many project management certifications now available.

The single-most important thing to remember about certification is that although many are using it to prove qualification, no certificate can prove that someone is a "good" project manager. All any certificate can prove is that the person has met the certification requirements. However, many organizations are relying on certifications, and they remain a good place to start toward understanding the field of project management.

PMI's internationally accepted standards and more than 300,000 members and 600,000 certificate holders help explain why more than 60 percent of the Fortune 1000 – along with many national, state, and local governments – now mandate the PMP for their project managers. Although PMI™ maintains the internationally accepted standards for the profession and owns the most widely accepted certification for professional project management, PMI™ is not the only association engaged in the profession. In fact, there are many other associations actively engaged in the field. Each of these associations also offers varying degrees of certification. The major associations and certifications involved in project management include:

- Project Management Institute (PMI)
  - Certified Associate in Project Management (CAPM)
  - Project Management Professional (PMP)
  - Program Management Professional (PgMP)
  - Agile Certified Professional (ACP)
- The Scrum Alliance
  - The Certified ScrumMaster (CSM)
  - Certified Scrum Product Owner (CSPO)
  - Certified Scrum Developer (CSD)
  - Certified Scrum Professional (CSP)
- Scrum.org
  - Professional ScrumMaster (PSM I & II)
  - Professional Scrum Developer (PSD)
  - Professional Scrum Product Owner (PSPO)
- The International Project Management Association
  - Offers four tiered certifications: A, B, C & D
  - A is the highest certification for Portfolio Directors
- The Association for Project Management (APM)
  - Prince 2
- The American Academy of Project Managers
  - Master Project Manager (MPM)
- CompTIA
  - IT Project +
- The International Association of Project & Program Management (IAPMM)
  - Certified Project Manager

This book focuses on the standards found in PMI's certifications because they are the most popular in the world. The most important of these include:

- **CAPM®** – The Certified Associate in Project Management. This is PMI's junior certification. The requirements for the CAPM® are:

- A high school diploma and 1,500 hours of experience working on projects OR
- 23 hours of project management training (contact hours)
- Pass a 150-question multiple-choice exam
- Pay a fee of $225 if a PMI member or $300 if not a member

- **PMP®** – The Project Management Professional. This is PMI's premier certification, and currently well over 200,000 people hold this credential. It is required by approximately 65 percent of the Fortune 500 and a growing number of governments. The qualifications for the PMP® are:
  - 35 hours of project management specific education (contact hours)
  - Pass a 200-question, four-hour exam
  - A four-year college degree with 4,500 hours of experience leading projects OR
  - A high school diploma and 7,500 hours of experience leading projects
  - Pay a fee of $405 if a PMI member or $555 if not a PMI® member
- **PgMP®** – The Program Management Professional targets people who are managing programs and is PMI's most senior credential. The requirements for the PgMP® include:
  - A four-year college degree and, within the last fifteen years, both four years (6,000 hours) of project management experience and four years (6,000 hours) of program management experience OR
  - A high school diploma and, within the last fifteen years, both four years (6,000 hours) of project management experience and seven years (10,500 hours) of program management experience
  - Completion of a 170-question, four-hour exam
  - Complete a multi-rater assessment
  - Pay a fee of $1,500 if a PMI® member or $1,800 if not a member

If you are looking for a way to move your career ahead in the field of project management, one or more of these certifications represent a great place to start.

This book has two major sections. The first section focuses on the soft skills of project management, which differ little from the same skills found in any other discussion of leadership and represent 90 percent of what causes success in the real world. Unfortunately, many of these skills are hard to quantify and even more difficult to perfect, but that does not make them less important. In fact, most experienced leaders would argue the exact opposite. The leadership skills we will discuss represent some of the most important and difficult skills you will ever have to master. The second half of this book focuses on the tools and techniques that are specific to the field of project management.

As we conclude our introduction, I ask a simple question: what is the primary goal of project management? Did you say it is to deliver great products and services? Maybe you said managing the organization's new initiatives, or providing leadership. What about managing stakeholders? Each of these notions has a role in project management, but they do not represent the primary purpose of the discipline. Many project managers have fallen on their sword arguing their project delivered fantastic products or services to the organization. Unfortunately, project managers who are about to be fired make this argument. If you doubt me, just ask a ScrumMaster who is looking for work. These people fail because they miss one critical lesson. While delivering a great product or service, providing leadership, and managing stakeholders are all very important, they are NOT the primary purpose of project management.

Project management requires you to deliver on time, on budget what you promise. That is it. At the end of the day, project management is all about managing expectations. If you deliver a fantastic product for twice the price and take twice as long to get it done, your career will be short-lived – although those who come after you will appreciate the fruits of your labor. To succeed you MUST constantly communicate with your stakeholders in ways they understand, and you must put them in a position to make the hard choices. If this is not clear enough, let me say it another way. In project management, everything is negotiable because project management is a game of expectation management. One of the simplest ways to manage expectations is to use consistent processes, tools, and techniques whenever possible. That is where the science of project management comes in. Yet before we can get to the details of the discipline, we must first address the harder soft skills that enable us to engage with our sponsors, stakeholders, customers and team members.

1 Teams & Leadership

As has been stated, successful project management requires a unique combination of both art and science. The most important skill that a potential project manager must bring to the table is leadership. This chapter will focus on leadership and the development of a successful team. Let us begin with a quick look at any project. The product, service, or result of the project does not matter; they all have one thing in common. Every project, no matter how big or small, is at its core changing something for someone. This fact is what distinguishes project from operations. At their heart, operations deal with repeatable processes, and great operations managers focus on squeezing every inefficiency or variance out of those repeatable processes. Projects deal with that which is new and different. They are all about creating something that has not existed before. By their very nature, projects are about variances and unpredictability. Project are about change. Unfortunately, we do not all respond to change in the same way. Some of us love the excitement and unpredictability change brings. Others find angst in its throws. Neither viewpoint is right or wrong, but you must manage both. How well the various stakeholders accept the new product, service, or result of the project defines the project's perceived level of success.

Effectively managing change takes a clear understanding of the four-stage process that all people go through. The length of time spent in each stage of the process is dependent on how well the manager leads people through the process. Successful managers are able to transition people through these phases more quickly and enable increased productivity, quality, and efficiency.

Claes Janssen developed the Four Room Model to describe the process people go through when impacted by change. This model argues that with every change, people experience four quadrants or rooms. The four rooms are comfort, denial, confusion, and renewal. Progress through these rooms is linear as each person must go through each room. However, the amount of time spent in each room varies based on the individual. The goal of the project manager is to move stakeholders through the denial and confusion rooms as quickly as possible. Only then can the stakeholders begin to accept that the change is actually going to occur and to focus on how the change will affect them.

The first room is comfort. Comfort represents the room where most stakeholders begin the project process. In most cases, it also represents the room where most individuals spend a majority of their time. In this room, the individual is used to and accepts the processes and conditions with which they find themselves. They are not interested in anything new even if they are not completely happy with current conditions. Failure to get key stakeholders to move out of this room is often a cause of project failure. If the project stakeholders are comfortable with their current circumstances, they are simply unwilling to change, yet this is exactly what they must do for the project to succeed.

The second room is denial. Denial represents the first room in the model where the stakeholder recognizes that something different, a change is happening. However, in this room the person does not believe that the change will really occur. An individual in this room will consistently resist even the discussion of the change because they simply do not believe it is really going to happen. For a project manager to be successful, they must get their stakeholders out of this room as quickly as possible. Stakeholders who are stuck in this room struggle to see the real impacts or benefits of the change.

The next room is confusion. This is the first point where the stakeholder actually believes the change will occur and begins to explore how the change will ultimately affect them. It is critical that everyone recognizes this stage as a positive condition because it is at this point when the impacts of the project are evaluated and understood. Once we see confusion as a normal reaction to change, we can quickly move beyond it.

The final room is renewal. When the stakeholder reaches the renewal stage, they accept the change and are energized by the potential it offers. It is important for the project manager to get their stakeholders to this stage as quickly as possible and to do everything possible to ensure this stage lasts as long as possible. When these two conditions are met, the transition to the new product, service, or result has the greatest chance of success. Eventually the excitement found in renewal is lost, and the stakeholder community slips back into the state of comfort. Through each of these stages, the project manager's role is to shepherd the stakeholders through the change.

In organizations where change occurs frequently, a leadership style that produces the best results is one that motivates followers to identify with the organizational vision of the future and to sacrifice self-interests for the benefit of the organization as a whole. This type of leader is a transformational leader.

Transformational leaders engage in a process that includes recognizing the need for change, creating a new vision, and then institutionalizing the change. By creating a vision and properly communicating group goals, leaders can change the basic values, beliefs, and attitudes of employees so that they become willing to perform beyond the minimum levels required by the organization. Part of being a great transformational leader is understanding the second cycle most individuals go through when they are evaluating their own ideas necessary to deliver projects. This process is called the Panic Elation Panic (*PEP*) Cycle, and it represents the level of confidence a team member has in their own ideas. Included in this process are:

- **Panic** – Initially, each member goes through a state of panic when faced with the project and the role that they will play within the team.
- **Elation** – The team member becomes elated by the ideas they have for resolving the problem with which the team is faced.
- **Panic** – The team member then panics because they are unsure that the devised solution will meet the need or that others will accept it.

This cycle repeats throughout the lifespan of the project. Understanding this cycle is important for project managers because it ensures the project moves to the next stage in the life cycle. The PM must work to ensure the project never is stuck in paralysis by analysis. In addition to the two models presented here, every project manager has to deal with the issue of balance.

"Balance" is a simple term with deep meaning. It deals with the core makeup of the team. In most organizations, teams come together one of several ways:

- Senior management creates the team.
- The project manager picks the team.
- Department heads decide who is available.

The middle option is what every project manager dreams of doing, but it is a fantasy. Rarely do project managers get to pick their team. It is far more likely that departmental managers or senior leaders will pick the resources you must lead. Even then, it is uncommon for the project manager to have formal authority over their resources. In most cases, those resources are still reporting to departmental managers, but this does not change the role of the project manager. The PM still must deliver on time, on budget, what was promised. Unfortunately, any of these scenarios can create a real problem in team composition.

The problem occurs when leaders do not consider personality types in team construction or when poor conclusions are drawn. The goal is to build a team that provides balanced perspectives. However, a balance in perspectives often causes conflict, which can be frustrating at best. The result is often teams that are comprised of individuals of similar viewpoints, which enables the team to get along but prevents those significant breakthroughs germinating from differing viewpoints. Great leaders know they must have a healthy amount of conflict to succeed and that requires differing personalities; however, how often in the real world have you seen teams selected by personality? If you are like most, the answer is never! Psychometric instruments such as a DISC® or Team Dimensions Profile by Wiley offer one method of addressing this problem.

These profiles define four personality types or roles that exist on any team. These roles include:

- Creators
- Advancers
- Refiners
- Executors

The Creator role represents an individual who uses a combination of the conceptual and spontaneous approaches to address change. They often serve as the early leader of a project. However, the longer a project continues, the more likely a Creator is to get bored with the project and lose focus. So how do you know if you are a Creator? A Creator is someone who:

- Generates fresh original concepts and ideas, often outside generally accepted norms
- Recognizes alternatives to the current solution
- Perceives the "big picture"

The next role is an Advancer. Advancers are individuals that use a combination of the spontaneous and normative approaches in addressing change. Advancers often work with Creators in the generation of new ideas, but they are not the same. Although Advancers do sometimes generate new ideas, that is not their primary function. The primary function of an Advancer is to sell the rest of the organization on the team's idea(s). Advancers are the people who get everyone behind the effort and keep motivation high. Sadly, only about 5 percent of most team members are natural Advancers. Compare this with over 30 percent of the population who are Creators, and it is easy to see the potentially huge problem. How does a project manager maintain a team's motivation when few are gifted in this area? The answer is focus. It does not matter whether or not you have gifts in this area; every day you must focus on it. Every day you must remind your stakeholders why your project is important.

The third role is that of the Refiner. Refiners move the organization way from idea generation and motivation toward an examination of the details. Refiners are individuals who use a combination of the conceptual and methodical approaches. A more common description of these individuals is "detail people." These people are generally not very good at coming up with new ideas, but they are critical to ensure steps or requirements are not missed. A Refiner is someone who:

- Challenges the concept (devil's advocate)
- Analyzes things in an orderly manner
- Detects flaws and identifies potential problems (details)

The challenge with Refiners is that they have an oil-and-water relationship with Creators. Creators are fantastic at idea generation and often would like nothing better than to white-board and brainstorm all day. Refiners want to drill down into the specifics of an idea. Another way of thinking about this difference is that Creators often want to go horizontal and examine as many ideas as possible. Refiners usually want to go vertical and deeply understand a single idea. This difference often leads to frustration felt by both personalities.

The key is respect, understanding, and timing. First, both individuals must respect each other and their different points of view. If they do not, nothing else will matter. Secondly, both parties must agree that each individual is working to make the project successful. In other words, assume positive intent. Finally, there is the issue of timing. Timing refers to when each role should take the lead in the project timeline. At the beginning of a project, the team needs to focus on idea generation. Only once a particular solution is selected can the Refiners take the lead and examine all the details required to execute the project successfully.

The fourth major role is the Executor. An Executor is someone that uses a combination of the methodical and normative approaches. Don't expect an Executor to come up with the next big idea or be able to get the organization excited about the proposed solution. Executors are the people who actually get the work done. They lay critical groundwork for implementation and focus primarily on ensuring the implementation process moves forward in an orderly manner.

The final role is the Flexor, which represents the natural project manager. Unfortunately, very few people are naturally gifted in this way. The natural project manager equally combines the four other roles and can easily shift from one to another depending on the demands of the project. Key to this personality role is the ability to monitor the contributions of all the other team members and then ensure that all the tasks move to the appropriate team member at the various stages of the process.

It is critical to have each role represented on the team. If the project team is not properly balanced, it will likely fail to achieve the desired project results. Unfortunately, most teams are not evenly balanced. When the project manager sees the team lacking a particular role, they must act to fill the void. Additionally, if you are fortunate enough to have a diversity of roles, it will increase the amount of conflict on the team. When those conflicts arise, it is important to remember:

- Without Creators you will be unable to create new concepts for the project
- Without Advancers the project will stall
- Without Refiners the critical details of the project will be overlooked
- Without Executors there will be no implementation
- Without Project Management there will be stress among the team members

2 Project Communication

Successful projects require clear, strong communication. If the right stakeholders do not obtain the right information at the right time, the right decisions cannot be made. Unfortunately, far too many project managers believe the needed level of communication can be obtained by simply sending another e-mail. As you will soon learn, e-mail is not real communication. However, e-mail is a technology that can either improve or impede communication. As with all the possible channels of communication, the effectiveness of e-mail is largely based on the individuals involved and the way in which it is used.

Being an effective communicator takes time, practice, and most of all, patience. Being patient with others who have differing natural roles will enable you to become a more effective communicator. This chapter will explore many of the nuances of communication to help develop the skills needed to become a successful project manager.

The purpose of communication is to ensure understanding by various stakeholders. The method and language you select for your message is critical to ensuring that all recipients understand the intended meaning. Using unclear language or jargon can cause unnecessary confusion and is counterproductive within the team. It is critical that everyone on the team feels connected in a way that creates a common understanding of the project goals and objectives. Solid communication is crucial to your success as a project manager and to the success of the project because:

- 90 percent of project management is communication.
- There is a high correlation between the perception of good communication and the perception of project success.
- Stakeholders must understand the implications of scope, cost, and time changes.
- Project team members must fully understand expectations.

The most important of these is the high correlation between the perception of good communication and the perception of project success. Notice this is only the *perception* of good communication and project performance. This is a very important distinction. If stakeholders believe you are a good communicator, they will also likely believe your project is successful.

When communicating with different stakeholders, your methods of communication need to adapt to ensure that *their* needs are met. These needs include the full, understood disclosure of all relevant project information so that the stakeholders can make fully informed decisions about the project. Your ability to communicate clearly to all levels of the organization will define your ability to properly and effectively achieve project success. Some of the people you will communicate with during a project include:

- Project sponsors
- Customers
- System users
- Team members
- Partners
- The public

In most real-world situations, the project manager does not have the formal authority to make decisions on their own, but the project manager can be a significant influencer. The project manager's focus should always be on providing recommendations with justification and alternatives.

Listening is one of the most difficult skills for any team member to develop. It is a skill that must be continually practiced to be mastered. The first step in being a good listener is to understand the difference between listening and hearing.

- **Listening** occurs when the recipient understands the message sent. It involves concentrating on both the message and the messenger. When you listen, you both hear and process the verbal and nonverbal messages sent so that you clearly understand the thoughts of the sender.
- **Hearing** is the process whereby the ear intercepts the sound waves, converts them to electronic signals, and transfers those signals to the brain. Hearing is an involuntary act that your body does all the time.

Most people hear reasonably well but are poor listeners. The key differentiator is whether the recipient understands the intended message. Therefore, it is critical that the successful project manager does not assume stakeholders are necessarily good listeners. It is the project manager's responsibility to ensure the desired message is actually received and interpreted correctly. The goal of every project manager is to see active listening used by all stakeholders. In many cases, this can be extremely difficult because the project manager rarely has any formal control over most project stakeholders. To promote active listening consistently, practice it yourself. People will follow a good example.

Active listening involves engaging with the sender and the message to ensure the correct understanding of the message. Probing and questioning represent great techniques to further the conversation or to gather additional information about the topics discussed. Acknowledging what you heard and responding appropriately provide assurance to the speaker that you have internalized the intended message. The specific practices used will largely depend on the channel of communication used to deliver the message.

The channels of communication we choose dramatically impact the success of our message. Unfortunately, we often make our channel selection based more on convenience rather than what will be most effective. The September 2007 edition of *PM Network* magazine highlights this concern when it notes that 65 percent of project communication is done through e-mail when working on a non-collocated project. As shown in figure 4, only 2 percent of project communication is done face-to-face.

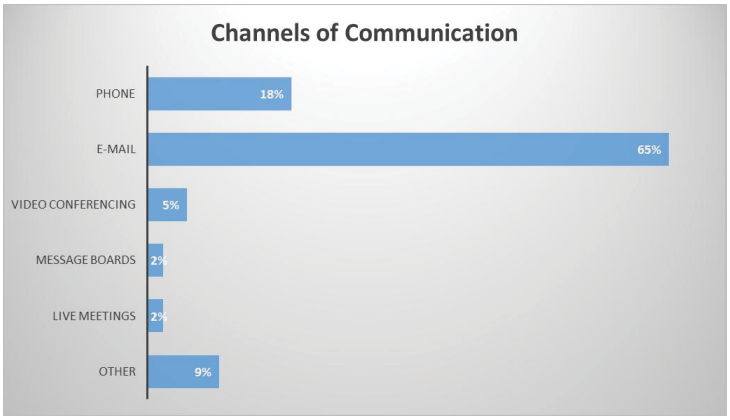


Figure 4: Frequency of Channel Usage on Global Project PM Network Vol. 21 No. 9 Sept. 2007 p. 14

For many, e-mail has become the dominant channel of communication, and often e-mail initially seems to be an incredible time-saving tool. Almost every professional has access to e-mail. It also provides rapid documentation and traceability. Just send an e-mail and make sure to copy everyone in the organization. Everyone will see all the hard work you have put into the project and how a few stupid people have sidetracked the team. Unfortunately, this notion fails to represent the way things really work.

Successful project managers know the importance of servant leadership. Real project leaders invert the pyramid. This means successful project managers know that the higher they go within the organization, the lower they really are. For a project to be successful, its leader must focus on elevating every member of the team and organization. This means NOT sending out a plethora of e-mails, but instead getting up and going to where the team is and engaging them.

Most people have received an e-mail where everyone and their brother is on the distribution list. The purpose of the message is to berate the recipient or manipulate them into action by shining a spotlight on them. Can you recall how you felt the last time one of those e-mails targeted you? If you are like many others, the e-mail caused something between frustration and anger. The only redeeming feature from these e-mails is the fact that almost everyone besides the sender recognizes they are an attempt to save face or put a burden on the receiver. Alternatively, how often have you sent an e-mail just to get something off your plate only to see it boomerang back, causing you to write three, four, or more additional e-mails to clear up the miscommunication caused by the first e-mail? In the end, how effective was e-mail in either of these situations? Sadly, these are just two of many examples where e-mail is ineffective.

A recent communications study found that only 7 percent of our understanding from any message comes from the words spoken or written. Thirty-eight percent of the understanding comes from our tone, and a full 55 percent of understanding comes from nonverbal cues. When we use e-mail, only 7 percent of understanding gets to the recipient, which means that 93 percent of the meaning of the message is lost! Does e-mail still look like the best communication alternative in most situations?

If more than 90 percent of project success is communication, does it not make sense to ensure clear understanding actually happens? To ensure e-mail is an effective communication tool, use it primarily for simple communications, such as providing agendas, or as a confirmation tool for communication that has happened through other channels. Avoid using e-mail as a protection tool. Rarely will you succeed if you use e-mail or berate or embarrass someone else. Also, avoid using e-mail to push back on a stakeholder unwilling to engage in conversations regarding scope. If you must use e-mail, make sure you always provide at least two other communication channels to ensure your message is correctly received. Finally, always confirm correct understanding of any important message using a different channel than the one used to present the original message.

Hallway meetings and lunches might seem like a good way to catch up on outstanding issues or progress reports for the project. However, try to avoid informal communication without all affected team members present. This will ensure that everyone affected hears the same information and that everyone is sharing information freely across the entire project team. This does not mean you should completely exclude these methods of communications. Instead, just make sure to think about how informal communication often negatively affects your project. To understand why hallway and side conversations are dangerous let us review the formula for didactic communication. This formula describes the number of discrete channels of communication on a team.

One of the easiest ways to understand this formula is to remember the old children's game called "telephone." In the game, a string is tied through a hole at the bottom of two tin cans connecting them. If one child talks into one can, as long as the string is kept taut, the other child can hear what is being said by holding the second can up to their ear. Imagine you have a project team of five people and one of these simple telephone connections exists between every resource. Each project resource would have four of these simple telephone strings connecting them with every other team member. With a project team of five individuals, you would have ten strings or lines of communication, considering the basic formula for Didactic Communication is:

$$\frac{N(N-1)}{2}$$

Where N = the number of people in the group.

As the project team grows, the strings or channels of communication grow geometrically. Imagine if our five-person project team picks up two additional resources. The formula would then be:

$$7(7-1) / 2 = 21$$

Going from five to seven team members causes the number of channels to increase to twenty-one from ten. Simply adding two resources to the team more than doubles the channels of communication! This simple formula offers a scientific explanation for a truth most people know: small project teams are typically easier to manage than large teams. As the size of the team increases, the complexity and frequency of communication also increase. This is why it usually makes sense to have your first experience as a project manager be on a smaller effort.

Have you ever been in a meeting where the attendees struggled to focus on the discussion as they worked on e-mails on their laptops, text messages on their smart phones, or had to take calls? How often do your meetings start late or run significantly over the schedule? How often do you find topics or discussions repeated because important players are not present? For many project resources, the most common complaint is that too much time is wasted in meetings. It is one of the biggest reasons most people believe project management is nothing more than "administrivia" that adds nothing to the organization.

According to Patrick Lencioni, the best-selling author of *Death By Meeting,* most people dread meetings and find them ineffective because:

- Meetings lack drama or conflict
- Meetings often lack contextual structure
- The "right" people are not in the meeting
- People have a perception that they simply have too many meetings

To improve project performance you must improve the performance of your meetings. The following tips will help.

First, recognize the real purpose of your meeting. In most organizations, project meetings fall into one of two broad categories:

- updates on project status, or
- informational/problem-solving sessions

The first type of meeting is the status meeting, a common meeting that usually reoccurs on a weekly, bimonthly, or monthly basis depending on the type of project. In most cases, these meetings take between sixty and ninety minutes. These meetings also usually represent the primary communication point for the project team. During this session several major topics are usually discussed by the team, the project manager makes any needed team announcements, and the project manager collects status information. In most cases, the project manager collects the team's status by having each team member or lead report the percent completed on each assigned task. The most common answer to this question is either, "We are 90 percent complete" or "We are right on track." Project managers are then shocked when it takes twice as long to complete the last 10 percent of the task as it did to complete first 90 percent. Why is it that so many projects collapse so close to the finish line? Some would argue the last 10 percent of any task is the most difficult to complete; therefore, it takes the longest. However, if this were true, would not the estimate of completeness simply adjust to reflect this level of difficulty?

The truth is that most status reports are subjective and therefore exaggerated. The reason most project resources inflate the level of completion is that the project manager puts the resource in a disadvantageous position during the status meeting. That is right. The project manager is the cause of most inaccurate project reporting. However, the project manager is also the solution. This is fundamentally a process problem. Having a great status meeting requires focus. Successful status meetings do not have more than one purpose. You cannot get accurate status reports at the same time you problem solve. Resources will suddenly feel the need to justify their answers or, worse, exaggerate them.

Imagine being in a status meeting. The person reporting two resources before you reports that they are 90 percent complete with a task that you know is only 50 percent done. The next resource reports honestly that they are 50 percent done even though the task should be done. After hearing this second report, the project manager berates the resource for being behind schedule. Now it is your turn. You are also 50 percent done with a task that is past its completion date. What do you report? Most people report 90 percent. After all, everyone else is doing it! This creates huge problems for the project manager. First, they are taking these numbers and reporting up the chain of command and then not delivering, which destroys their credibility. Secondly, false reporting prevents the project manager from getting any future predictability on performance, plus the team will always be late because everyone's 90 percent means something a little different.

To prevent this problem use a couple tricks from the agile world. First, always report on deliverables not tasks. Second, never have those deliverables take longer than a single reporting period. If the status meeting is held once a week, then no deliverable should take longer than a week to complete. This means things must be broken up, and in every status meeting the goal is for each resource to complete something. Finally, don't make the entire team be present when you are solving a single resource's problems. Status meetings are for status and nothing else.

In addition to asking the wrong questions, most project managers struggle with status meetings because of their length. This is usually because the PM is attempting to do too many things at once. Status meetings are called "status meetings" for a reason. They attempt to answer one and only one question, "Will the team deliver on time, on budget, what they promised?" The "whys" and "what to do about it" are important, but the first step is to figure out where you really are. The project status meeting should never be longer than ten minutes. If you struggle to get your resources to limit their status updates, hold the meeting while standing, and limit the team to answering three questions:

- What did they get accomplished since the last reporting period?
- What are they going to accomplish in the next reporting period?
- What impediments do they have?

The second type of meetings are informational or problem-solving meetings. The purpose of these meetings is usually to address a specific issue or problem and not to determine the current project status. In these meetings, make sure to follow these basic rules:

- Always have an agenda out twenty-four hours in advance.
- Always keep minutes.
- Always start and end on time.
- Do not read presentations to people and have material out twenty-four hours in advance.
- If the "right" people are not in the room, cancel the meeting.
- Single-topic all meetings.
- Manage the meeting, not the presentation.

In addition to having better managed meetings, excelling at project management requires an active and complete project communication plan. A communication plan establishes the rules you and the team use to communicate internally and externally about the project. This plan does not need to be three inches thick; rather it needs to answer three basic questions:

- When and/or how often will you communicate?
- How will you communicate?
- What will be included in the communication (charts, reports, graphs)?

Once these three questions are answered, the basis of an effective communication plan exists. This plan includes the purpose of communication, what will be included in project communication, and samples of each report or communication used throughout the project. As you communicate throughout the project, be sure to:

- Use a consistent template each time you communicate to your team, stakeholders, and sponsors so that they can compare one message to the next.
- Store reporting information in a database for comparative analysis throughout the project.
- Determine and disclose the key measurements the team intends to provide as the basis for reporting, and disclose them for comment before implementation.
- Make sure your plan meets the communication and reporting needs of all major stakeholders and sponsors.
- Get the stakeholders and sponsors to physically sign off on the communication plan, metrics, and the reports being used throughout the project.

3 Stakeholder Management

Stakeholder management includes all the tools and techniques used to guide those who exert influence over the project. Stakeholder management is a critical aspect of a successful project. Many projects fail because the project manager fails to engage the team and stakeholders effectively. To be successful, the project team must first determine who their stakeholders really are. This requires a consistent investigative and management process.

According to the PMBOK Guide®, a stakeholder is "a person or organization that is actively involved in the project, or whose interests may be positively or negatively affected by execution or completion of the project. A stakeholder may also exert influence over the project and its deliverables." This definition can create some concern for project leaders because it makes it clear that anyone who has a vested interest in the outcome of the project is a stakeholder. Here are some of the people or groups who might be stakeholders on your projects:

- Senior Leadership
- Your Boss
- Shareholders
- Customers
- Coworkers
- Your Team
- Partners
- Suppliers
- Government
- The Community

The formal process of project management begins with the initiating process group with a process called "Identify Stakeholders." This is a process formally called out in the PMBOK Guide®, 5th edition, "Stakeholder Management Knowledge Area." The primary output of the identify stakeholder process is the stakeholder register, which is part of the "collect requirements" process to define the specific individuals from whom the project team must collect information. It is quite common to have a long list of people and groups that have legitimate interests in the project. When it comes to defining your stakeholders, it is important to remember that stakeholders are people who both positively and negatively influence the project. To be successful in stakeholder management is to carefully follow a three-phased approach. The three phases of stakeholder management include:

- Defining and categorizing the stakeholders
- Prioritizing the stakeholders
- Dealing with negative stakeholders

The first step in the process of stakeholder management is to define the stakeholders and then categorize them into one of four specific categories. Although there are many tools and techniques used to define stakeholders, often the most successful approach is a simple brainstorming process with other members of the project team. However, the ordering of this process is not an absolute. Do not be surprised if the categorization of stakeholders leads to uncovering additional stakeholders who need categorization, or if the process of stakeholder identification leads to the creation of more categories. Once the team believes most stakeholders are identified, it is time to move to the categorization process. This involves placing the stakeholders into stakeholder super-groups. The groups include:

- People who already know the project exists and have expressed an interest in its outcome
- People who know the project exists, but do not know how it will benefit them
- People who are unaware of the project
- People who oppose the project

To manage the expectations of each stakeholder super-group, different tools are required. For those who already know about the project and have expressed an interest, you must constantly provide engagement using a variety of techniques. Remember, they are your strongest advocates. This level of engagement requires daily activity. Stakeholders who are aware of the project but unaware of how it can benefit them must be convinced that the project affords them significant gains. In dealing with these stakeholders, and the stakeholders who are completely unaware of the project, it is important to remember the role of the Advancer described previously. Few are truly skilled at motivating and selling the team on the idea, but it still must an area of focus. However, even with the best skills, a project manager should not be surprised if a few people from either of these groups choose not to support the project. The last of the four super-groups is those who oppose the project. These people are often the most difficult to manage and require special attention if they cannot be converted to one of the other groups.

The second step in the stakeholder management process is to prioritize the stakeholders. The prioritization of stakeholders is very important because of time limitations. In the real world, most of us simply do not have the time to give equal attention to all stakeholders. Successful project managers know they must give priority to those stakeholders who can have the greatest impact and influence on the success or failure of the project. Simply put, not all stakeholders are created equal.

The most difficult of the super-groups is those who oppose the project. When dealing with stakeholders who oppose the project, using a simple process can dramatically increase your success. Part of the reason this process works is that it creates a formal, structured process that makes it extremely difficult for those opposing the project to appear reasonable.

When a stakeholder is opposed to the project, begin by examining the project. It might be possible to address their concerns with a few minor changes. If the project may be changed without affecting the major deliverables, do it. Do not be afraid to change the project to bring more players into the fold. However, be careful to never make changes that create more problems than they solve. If it is not possible to address their concerns with minor changes, try to convince the stakeholder that they will gain significant advantages from the project even if their concerns turn out to be true. The goal of this step is to have the stakeholder believe they are gaining more than they are giving up. If this does not work, proceed to the third step and attempt to represent the stakeholder's objection in the project's risk register.

In this step, it is important that the project manager does not minimize the stakeholder's objection. Instead, work to represent the issue the way the stakeholder would state the issue if given the opportunity. Once you document the issue, take it to the stakeholder and ask if the written objection fairly represents their concern. If the stakeholder agrees with the way the objection is written, ask for a signature to that effect. The project manager should not be surprised if the stakeholder says the objection is not fairly represented. If this happens, ask the stakeholder to take a few minutes to document the objection themselves. If they are willing to do so, let the stakeholder document the risk any way they choose. Do not alter their objection in any way. If the stakeholder states they are unwilling to document the objection, do not attempt to force compliance. Instead, simply move on to the next step in the process.

When the project manager finds a stakeholder who has gone through each of these steps and is unwilling to document their objection, the project manager has just learned a critical piece of information. Simply put, the project manager does not know what the real objection is, but more than likely the real objection to the project is political. Even in these extreme situations, the project manager has gained a significant advantage by following this process.

Imagine being the project manager. You have worked through this process for your project and have several stakeholders who are objecting to the project. One day your boss calls you into her office because she just finished a meeting with one of those disgruntled stakeholders who spent the entire meeting criticizing your project. If you have not followed any structured process, then this conversation does not go well because now the stakeholder's concerns sound justified. If, however, you have used the structured process described here, the meeting goes very differently. You are able to explain to your boss that you first examined the possibility of changing the project to address the objection. Upon discovering that changing the project to address the concern was not possible, you discussed the advantages the stakeholder would receive from the completion of the project in return for accepting the risk. This did not satisfy the stakeholder, so you attempted to document their concern in the project risk register. You then asked the stakeholder to review the written objection and confirm you understood it correctly. The stakeholder stated you had not correctly identified their concern, so you asked them to write out their issue in the risk register themselves and they refused. At that point, you informed the stakeholder that you understood they were very busy and you would simply document they had been given a chance to further define the objection and had refused. Upon hearing this process, most managers believe the project manager has followed a reasonable course of action and supports their efforts. Furthermore, if the manager knows ahead of time that the project manager is using this process, they can defend the project manager in the conversation with the stakeholder.

One final note: This process provides the project manager with the opportunity to gain an early indicator that there is a significant issue with a specific stakeholder. If the project manager follows this process and discovers a stakeholder who is unwilling to document their issue, they should consider this an early warning sign. The project manager is likely dealing with a stakeholder who has a political issue that cannot easily be addressed. Project success dictates that stakeholder be watched carefully.

Being successful with stakeholder management takes more than just being able to identify those who support the project and those who do not. You must understand how much influence the stakeholder has on the project and what motivates the stakeholder. Here are some questions that will help you understand your stakeholders:

- What financial or emotional interest do they have in the outcome of your work? Is it positive or negative?
- What motivates the stakeholder most of all?
- What information do they want from you?

- How do they want to receive information from you? What is the best way of communicating your message to them?
- What is the stakeholder's current opinion of your work? Is that opinion based on good information?
- Who influences their opinions generally, and who influences their opinion of you? Do some of these influencers then become important stakeholders in their own right?
- If they are not likely to be positive, what will win them over to support your project?
- If you do not think you will be able to convince them to support you, how will you manage their opposition?
- Who else might be influenced by their opinions? Do these people become stakeholders in their own right?

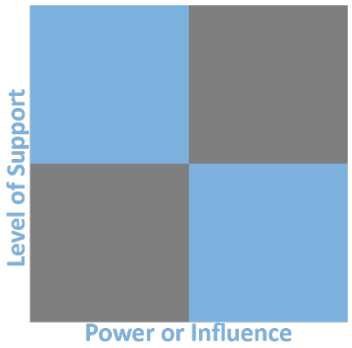


Figure 5: Stakeholder Prioritization Map

The best way to answer these questions is to talk to your stakeholders directly and in person if possible. Most people are open with their opinions if they feel safe. Part of the project manager's job is to make the stakeholders feel safe so that they can deliver the best results. That requires a strong focus on listening. You can summarize the understanding you gain from the interviews on a stakeholder prioritization map. Once you gain valuable insights from your stakeholders, you need to divide your time effectively to meet their needs. Not everyone needs the same amount of attention or communication during the project, so it is important to prioritize each of the stakeholders based on their level of support, power, or influence within the organization. Use the stakeholder prioritization map to assist you in dividing your time and effort during a project. When using the stakeholder prioritization map, analyze each of the stakeholders and map them according to the amount of effort that will be required to ensure project communications meet their individual needs.

To plot each of the shareholders on the map, think about the following:

- High-power, high-support, and high-influence stakeholders: These are the people you must fully engage and make the greatest efforts to satisfy.
- High-power, low-support, and low-influence stakeholders: Put enough work in with these people to keep them satisfied but not so much that they become bored with your message.
- Low-power, high-support, and high-influence stakeholders: Keep these people adequately informed, and talk to them to ensure that no major issues are arising. These people can often be very helpful with the details of your project.
- Low-power, low-support, and low-influence stakeholders: Monitor these people but do not bore them with excessive communication.

4 The Basics of Project Management

It is now time to move away from the soft skills of communication, people management, and team interaction and toward the hard skills of project management. The formulas and approaches demonstrated within this chapter are the foundational skills you need to manage a successful project. However, it is critical that you remember the most common mistakes that a project manager makes are not in the formal, technical areas of project management but in the soft skills. To become a successful project manager, no matter how technically skilled you are, you must focus on the soft skills, starting with communication, leadership, and the natural roles of your team.

The first rule of project management is that there are no absolutes, just generally accepted principles. Great project managers use processes, but they do not allow the processes to use them. No matter what rules or process is given, there are always exceptions. The key is to use the process and rules 85 percent of the time and good judgment to account for the rest. Successful project managers are always cognizant of the fact that project management is mostly about people and only a little bit about formal processes. This does not mean there is no process. In fact, the rest of this book focuses on the processes used to deliver projects of all sizes and types. Rather, take this as a reminder that people will make you successful, not your processes! Know and use your processes to make it easier for your people to deliver. If the process doesn't make it easier for people to get work done, do not use it.

A strong understanding of the basic processes around project management begins with a definition of the field. The PMBOK Guide® defines project management as "the management of a temporary endeavor undertaken to create a unique project or service." It requires the project team to deliver the agreed-upon service or product with the agreed-upon functionality on time and on budget with the agreed-upon level of quality. This definition leads to a core principle of project management, often referred to as Dempster's Triangle, the "Iron Triangle," or the "Triple Constraints of Project Management." This principle establishes a foundational link between the three major drivers on every project. These drivers are:

- Time
- Cost
- Quality/Scope

The analogy of a triangle argues that the three drivers are permanently linked and that changes to one driver will always impact the others. Most project managers have experienced the dangers of this linkage when stakeholders ask for scope changes on a project. Invariably, the project becomes delayed or over budget. This typical experience leads to the next rule of project management. As a project manager, you can deliver any two of the three constraints. At some point in every project, reality dictates the making of hard decisions, and one of the three legs is sacrificed. Most project managers are ill prepared for this hard reality. To be successful, a project manager must ensure they understand both the sponsor and key stakeholders' prioritization of the triangle. Often, the easiest way to do this occurs at the very beginning of the project. Simply sit down with your project sponsors and ask them to help you prioritize the three legs. Begin by asking the question: "All else being equal, which of these is most important to you?" However, do not be surprised when your sponsor answers they want all three equally. This is the usual answer when first asked. It is the project manager's responsibility not to accept this answer, to manage expectations, and to guide the key stakeholders in providing a true prioritization.

It is very common to talk about products, projects, and businesses in the general terms of life cycles. These references often lead to confusion, especially around the differences among the three major life cycles. These life cycles are:

- Corporate or Business Life Cycle
- Product Life Cycle
- Project Life Cycle

The business life cycle defines the normal cycle an organization goes through with its many different products, operations, and projects. Within the corporate or business life cycle are five main phases that make up the overall cycle:

- **Policy Planning** – The organization identifies its core purpose.
- **Identify Needs** – The organization identifies what it needs to do to stay competitive within the marketplace or fulfill its core purpose.
- **Project Conception** – The business identifies a project or projects that meet the core purpose and needs. These can be products, services, or results.
- **Realization** – The project is realized, developed, and delivered to market.
- **Portfolio Management** – The organization focuses on the operation of the product or service and continually identifies if and when the product or service becomes obsolete within the market.

The product life cycle fits into the last four phases of the corporate or business life cycle and addresses what happens with a single product or service. The product life cycle assumes the organization is already in place, and it is simply a matter of managing the desired products or services.

- **Feasibility** – Focuses on answering the question, "Can we really deliver this idea that we have to market?"
- **Development** – Develop the product or service that was defined within the feasibility process.
- **Operations** – The organization or business uses the product or service that was developed.
- **Product Obsolescence** – The product or service at some point becomes obsolete. Processes must be in place to ensure that the product or service is removed from operations once it has become obsolete.

The project life cycle is contained within only the first two of the four stages of the product life cycle. This cycle is all about getting the product or service to the operations stage. It is commonly defined by PMI's five process groups of project management.

- **The Initiating Process Group** – This phase is all about recognizing that a project exists or is needed. It has two primary outputs: a project charter and a preliminary scope statement.
- **The Planning Process Group** – In the planning process group, the project manager and project team determine how to best deliver the project with input from other stakeholders.

- **The Execution Process Group** – This is the stage where the product or service is developed and delivered.
- **The Monitoring and Controlling Process Group** – The monitoring and controlling process group tells the project manager and project team how they are doing and what needs to be done to produce the envisioned goal.
- **The Closing Process Group** – In the closing process group are two types of deliverables: project deliverables (the real product or service) and process assets (forms, templates, or processes that can be used on future projects).

Upon completion of the closing process group, the project is complete. If this were the product life cycle, the effort would then continue with the operation of the product and eventually product obsolescence.

These five process groups do not occur in a purely linear fashion. Just as in the real world, the project management process groups interconnect in a complex web. In the real world, projects often skip steps or have to go backwards and forwards multiple times. The project management process model allows for such changes easily. The only processes that are not directly connected are the initiating and closing process groups.

Most projects begin as a business problem or opportunity. However, a business need alone does not create a project. Successful projects take the extra step of evaluating the opportunity or problem against all the other needs of the organization, the current organizational resources, and the prioritization of those needs. If management believes the idea is important enough, the idea becomes a project and a project charter is created. It is at this point that the need becomes a project, and it is formally recognized.

In the PMI® Process Model, the project enters a series of loops between planning and execution after completing initiation. The development methodology used by the project determines the number of loops or cycles the project takes. The iterating stops when the team decides the project is complete or that it cannot further be completed. It is at this point that the project enters the closing process group.

Within the closing process group are two different types of deliverables. The first are the project deliverables that go to the end user. These deliverables represent the entire reason for doing the project. The second type of deliverables are the project records that show what was completed and how the team completed the work. These documents usually have little or no value to the end user as they care little about how the work was done. However, these documents are invaluable for the project team to learn how to create predictable, consistent, controllable results.

The basic model for project management finds its roots in Deming's PDCA Cycle. PDCA stands for the model's four phases. Almost every major iterative process created in the last twenty years – including RUP, Agile Development, Spiral Development, CMM, ITIL, Six Sigma, and many others – have used this fundamental model. The components of this model include:

- **Plan** – You must first plan to the fullest extent possible. This area covers the initiate and planning process groups of the PMBOK Guide® model.
- **Do** – In the do phase, work is actually completed. It aligns with the execution process group in the PMBOK® Guide.
- **Check** – The check phase calls on the project team to evaluate the results from the do phase against the plan. This is one half of the monitoring and controlling process group found in the PMBOK® Guide.
- **Act** – In the act phase, actions are taken to correct variances found in the check phase. The PMBOK Guide® defines the act process in two ways. It might be part of the monitoring and controlling process group, or the act process might appear as a loop between planning and execution.

The project team may go through this PDCA cycle as many times as necessary during a project to fulfill the project's charter. However, there is a problem with the basic framework described by PMI®. Unfortunately, neither the PDCA Cycle nor the PMI five process group framework represent processes that can be followed systematically. These frameworks establish the basic rules every methodology follows. The team still has to choose the methodology they want or are required to use. Later in this book, we will spend an entire chapter discussing methodologies, but the fact that there are so many different ways to do the work of a project creates a major problem.

How do project teams from different parts of the world complete a project when there are so many different ways to get the work done? The industry is fortunate because there are internationally accepted standards for the profession of project management. PMI® or the Project Management Institute® manages these standards. Founded in 1969 and based in Newtown Square, Pennsylvania, PMI® has codified a number of standards accepted in more than 170 countries and by a large number of industries. With more than 500,000 members, PMI® is the world's largest professional association dedicated to the advancement of project management. The PMBOK® Guide is the most well known of these standards.

The PMBOK® Guide provides a basic outline of the processes, skills, tools, and techniques for managing a project professionally. The PMBOK® Guide is only a guide to the overall body of knowledge for the project management field. Most of the information within the standards provides limited information. To gain a full understanding of the various topics you must read the other works that make up the body of knowledge and understand its content. The fifth edition of the PMBOK Guide® is broken into ten "Knowledge Areas," beginning with chapter four. Below is a listing of these areas and the basic information covered in each.

1. **Integration Management** – This is where PMI® brings all the other components together and where real project results occur.
2. **Scope Management** – This is where PMI® defines the product or service of the project and how the project scope is managed and defined throughout the project.
3. **Time Management** – This is where PMI® defines the project schedule and how that schedule is managed and defined throughout the project.
4. **Cost Management** – This is where PMI® defines the project budget and how that budget is managed and defined throughout the project.
5. **Quality Management** – This is where PMI® defines both the quality and the grade for the project, how they are defined, and how they are managed throughout the project.
6. **Human Resource Management** – This is where the acquisition, development, maintenance, and management of the project team is defined.
7. **Communications Management** – This is where the tools and techniques used for communicating with all the project stakeholders is defined.
8. **Risk Management** – This is where the definition for the project risks and the plan for managing those risks is created.
9. **Procurement Management** – This is where the acquisition of project resources and materials is defined and managed.
10. **Stakeholder Management** – This is a new knowledge area not seen in previous editions covering the management of those parties with a vested interest in the project.

Project management is a very large field that includes almost every industry. It is unreasonable to expect that a single process, series of documents, or a series of steps are sufficient for every project. However, it is possible to establish some practical artifacts that almost every project should have. These documents represent the basis for a successful project and include the following:

- **A central location for all information** – A central location for all information represents a location that is accessible to all stakeholders that also provides context. More often than not, a shared network drive fails this last test. Most project stakeholders receive no understanding from the myriad of files contained in a shared network space. In most organizations, files do not have a common naming convention or order, and it is usually impossible to tell how any of the files relate to one another. Modern collaboration systems provide a better solution to this issue by providing access to documents, version histories, and context for how the documents relate.
- **A project charter** – A project charter formally names the project manager and authorizes him or her to spend time and resources on the project. Therefore, a charter must be created prior to beginning work on the project and is signed by the project sponsor. In addition to naming the project manager and providing their level of authority, the project charter also documents the business need and might include a formal needs assessment, feasibility study, or a preliminary plan. For speed and convenience, the charter is often combined with other documents.
- **A statement of work (SOW)** – A SOW defines what the project is. In its simplest form, it is the high-level view of the project. It provides a narrative description of the project's product or service, includes basic constraints and assumptions, and describes how the project fits into the organization's strategic plan. Often the SOW is combined with the project charter to create a project initiation document.
- **A work breakdown structure (WBS)** – A WBS is a hierarchical picture of the product or service of the project along with any project management or technical items. It focuses on deliverables and includes three components: the graphical image, the WBS dictionary and an optional code of accounts. A well-formed WBS is one of the most important documents used in project management to ensure project success.
- **A communication plan** – A project communication plan clearly describes how the project team is going to communicate, what will be communicated, when it will be communicated, and any key metrics or indicators the team will provide.
- **A change management plan** – The change management plan addresses the processes and tools you will use to manage change throughout the project. Although change can happen in any area of the project, the most important and most difficult area to manage is scope change.
- **A risk management plan** – A risk management plan documents your processes for defining and managing project risks. It also includes the risk register where the project risks are maintained and monitored. The risk register also contains a tracking of various trigger events for the defined risks and the risk responses or contingencies.
- **A project management plan** – A project management plan is much more than a project schedule. It includes the plans from the eight major knowledge areas outside integration management.

A common practice in many organizations is the e-mailing of Microsoft Project® files to stakeholders and project sponsors to convey project information. This is a very poor way of communicating. Don't do it! Most project discussions with sponsors and/or stakeholders are better handled with a combination of five documents:

- A Project Datasheet or PDS
- A Portfolio Dashboard
- A Status Report
- A Work Breakdown Structure (WBS)
- A Milestone Chart

These five documents create a critical element for good project management. It represents a basic reporting structure fundamental to the discipline.

The first of these documents is a project datasheet or PDS. The PDS is a single-page document used in conjunction with a work breakdown structure to communicate critical information about the project. The project datasheet is a single-page description of how the team intends to deliver the project. It is broken into thirteen different sections, including the header.

The top section provides basic status information about the project. It contains everything from the project and project manager name to the estimated project duration and budget. The top section also includes a number of calculated values tied to a discipline known as earned value. These calculations are part of the time and cost chapter.

The next row contains two boxes. The first contains a series of rows for the listing of primary project stakeholders. The right side contains the second box. It shows a three-lined chart with the X-axis representing months and the Y-axis representing cumulative project costs. This earned value graph is discussed in the time and cost chapter. The key at this point is that the graph provides a visual for the entire life of the project.

The next row contains the project scope statement and the project success criteria. These are two of the most important pieces of information. A project scope statement represents an extension of the project charter. It defines what work the team will and will NOT do. Depending on the development methodology the team is using, the scope statement might be as small as two sentences or as large as many pages. The key is doing what is appropriate for the selected methodology. In cases where a sentence or two is simply not enough, use this space to provide an introductory statement and then point to the larger document.

The project success criteria represents the single-most important field on the PDS. It is also the most commonly missed information for inexperienced project managers. The project success criteria answers the question, "How will the project sponsor know when the project is done?" The answer to this question must be both quantifiable and objective. Quantifiable and objective are critical because if you ask 100 different people what they want out of a project, you will get 100 different answers. When that happens, how does the team know when the project is complete? In most cases, the answer is, "The sponsor and key stakeholders will tell you when the project is complete." Unfortunately, a stakeholder usually expected one additional requirement that the team did not know about. In this scenario, what usually happens is the project is a failure and it is the team's fault! Quantitative and objective success criteria prevent this from happening. Good success criteria establish a target that everyone recognizes and agrees to. Typically, even though most projects experience significant changes, only in rare situations does the success criteria change.

The next row of the PDS contains project key performance indicators and key constraints and assumptions. The PDS already provides a ton of quantitative measures. These measures are standardized, which enables portfolio leaders to compare performance across projects. However, often project managers or project sponsors have metrics that are specific to their project alone. The KPI box allows a PM to define those specific measures. In this way, the PDS affords project managers both the standardization executives desire along with the flexibility they want. Constraints and assumptions potentially cover a lot of ground. Deadlines, budget constraints, key requirements, stakeholder approvals, existing software or hardware, and even the resources used represent potential constraints. Assumptions are items believed to be true without actually being fact. Unfortunately, far too many projects get derailed by assumptions. Simply documenting the key constraints and assumptions forces the team to have hard conversations with the sponsor and key stakeholders, which can prevent many of these issues.

Beneath the KPIs and key constraints and assumptions are boxes for pyramid management and project justification. Pyramid management represents the practical implementation of the triple constraints. The triple constraints represent the relationship between time, cost, scope, and quality. In this relationship, scope and quality are grouped together on a single leg of the triangle. However, this relationship ignores the real-world problem many projects face where testing is unfortunately the last thing done. In these scenarios, the amount of testing done is often significantly less than what was originally planned. This has the effect of reducing quality even though the scope is unchanged. A better way of representing this relationship, therefore, is a pyramid where each variable is a separate leg. That is exactly what is done in the pyramid management box. In addition to the four legs, this box presents users with a series of checkboxes. The checkboxes allow the user to define how the project sponsor sees the particular variable. The project sponsor decides if each variable is fixed, meaning it cannot move at all. Usually, only one variable per project is fixed. Every project manager must be wary of a project that has multiple legs of its triangle that are fixed. In most of these cases, the project is destined to fail. Flexible variables are variables where the sponsor is willing to accept some change but is unwilling to accept significant change. Variables marked "Accept" represent legs where the sponsor is willing to accept whatever outcome the team achieves. In addition, the grid contains a column that requires the sponsor to rank the pyramid from one to four. The final piece of information in this box is the project prioritization, which requires the sponsor to rank the project against all the other projects in the portfolio. This information is critical when resources are tight and the project team needs help from the rest of the organization.

To the right of pyramid management is the project justification box. This box is all about linking the project to the organization's strategy and is broken into two sections. These are simply samples and represent the major groupings the imaginary organization uses to structure their major strategic drivers. The individual checkboxes represent the specific major strategic drivers for the organization. This box is critical because of the rule that no project is ever completed that does not advance the organization's strategy. This box forces sponsors to really think about the strategy and how the particular project links to it.

The next row contain the project's major milestones or phases and primary risks. Project milestone or phases provide an area for the team to highlight the major markers for the project. These become critical in managing the sponsor's and key stakeholders' expectations. Milestones represent the completion of major components with expected delivery dates. Failing to deliver the expected result by the target date means a missed milestone. Phases typically reference major life cycle divisions within the project timeline. The primary risks section provides a small area where the team can highlight the most important project risks. This is another opportunity to carefully manage the expectations of the project stakeholders and sponsor.

The last two boxes in the PDS require the project manager to define the project's change management process and the communication and reporting process. For most project managers, they use the same processes repeatedly. To save time, many project managers therefore leave the same text in these fields for multiple projects. The change management process defines the steps needed to request or require, approve, and execute a change. The change in question can be for any area in the project. It is key to keep this process as simple as possible. Too many project managers make the mistake of creating change management processes that are complicated and time-consuming. It is important to always remember that you must be willing to follow the process as well. If you find the process tiresome and difficult, so will everyone else, and no one will use it. Change management processes do not prevent change. Their goal is to ensure that positive changes happen quickly and negative changes are stopped. The communication and reporting process is equally simple. Its goal it to define how the team intends to communicate with stakeholders, how often that communication happens, and what is included.

It is critical to remember that the project datasheet is a living document. It is updated on a regular basis to ensure that it reflects the project's most current information. Figure 6 shows the PDS template that you can download on the Looking Glass Development's website at www.lookingglassdev.com/LGDWeb/ViewTemplates.aspx.

The next document is the portfolio dashboard. The dashboard provides senior leaders with an overview of the status for all the projects in their portfolio by providing information about each project's major drivers. Figure 7 shows a sample dashboard. The top of the dashboard provides visual indicators for each of the triple constraints in the form of arrows. Each arrow appears in one of three directions (up, down, or sideways). The direction of the arrow shows how the project has done since the last reporting period. If the performance has gotten better, the arrow points up. If the performance has gotten worse, the arrow points down. And if the project's performance is the same, the arrow goes side to side. The color of the arrow conveys important information as well. There are two common color schemes used with the arrows. The first simply uses red, yellow, and green to denote performance. Most people are familiar with the concept of red being bad or meaning stop, yellow meaning caution or warning, and green meaning go or good. This makes using the red, yellow, green color scheme easy. The problem with this scheme is that approximately 10 percent of readers are colorblind. To those individuals red and green look the same. Considering one color means the best variance and the other means the worst variance, this is likely not something project managers want confused. The other common alternative is to use the organization's color scheme. In this scenario, the project manager selects three colors. The lightest color indicates an overall project variance of less than 10 percent. The second color represents a variance of less than 20 percent, and the final color represents a variance of 20 percent or greater. The dashboard also provides leaders with forecasts of where the project is likely to end in terms of both cost and schedule by showing the original budget and scheduling information beside the forecasted total project costs and estimated completion date. It is also important to note that the projects are listed in order of priority. This enables leaders to examine the projects based on how important they are to the organization.

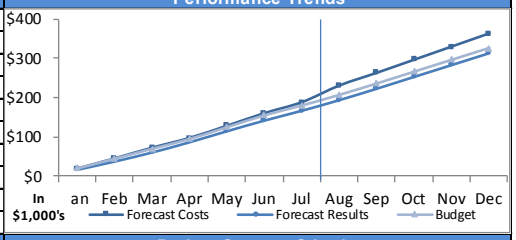
Project Datasheet

Schedule Status/Trend:		**CV:**	-$21,000	**CPI:**	0.90
Cost Status/Trend:		**SV:**	-$13,000	**SPI:**	0.93
Actual Costs:	$188,000	**Cost EAC:**	$362,852	**Sch. EAC:**	56.05 Weeks
Project Start Date:	10/22/2010			**Project ID:**	1234
Project Name:	Sample Project	**Target Dt:**	10/21/2011	**Project Manager:**	Joe Smith
Project Duration Est.:	52 Weeks	**Forecast Dt:**	11/18/2011	**Product Manager:**	
Project Budget Est.:	$326,000			**Executive Sponsor:**	The Big Boss

Development Methodology: ☐ Waterfall ☐ Spiral ☐ XP/Scrum **Earned Value Reporting:** ☐ Yes ☐ No **Stage Gate Mgmt:** ☐ Yes ☐ No

Primary Stakeholders:

Performance Trends



Project Scope Statement

Project Success Criteria

Project Key Performance Indicators (KPIs)

Key Constraints / Assumptions

Pyramid Management

	Fixed	Flexible	Accept	Priority
Scope	☐	☐	☐	
Quality	☐	☐	☐	
Schedule	☐	☐	☐	
Costs	☐	☐	☐	

Project Prioritization (# out of # for org.):
1 **out of** 10

Project Justification

Business Benefit
- Increased Revenue ☐
- Operational Efficiency ☐
- Reduced Costs ☐
- Regulatory / Mandate ☐

Portfolio Fit
- Tranform ☐
- Grow ☐
- Run ☐

Major Project Milestones and/or Phases

Primary Risks

Change Management Process

Communication & Reporting Process

Sponsor Approval: _____ **Date:** _____

PM Approval: _____ **Date:** _____

Figure 6: A Project Datasheet (PDS)

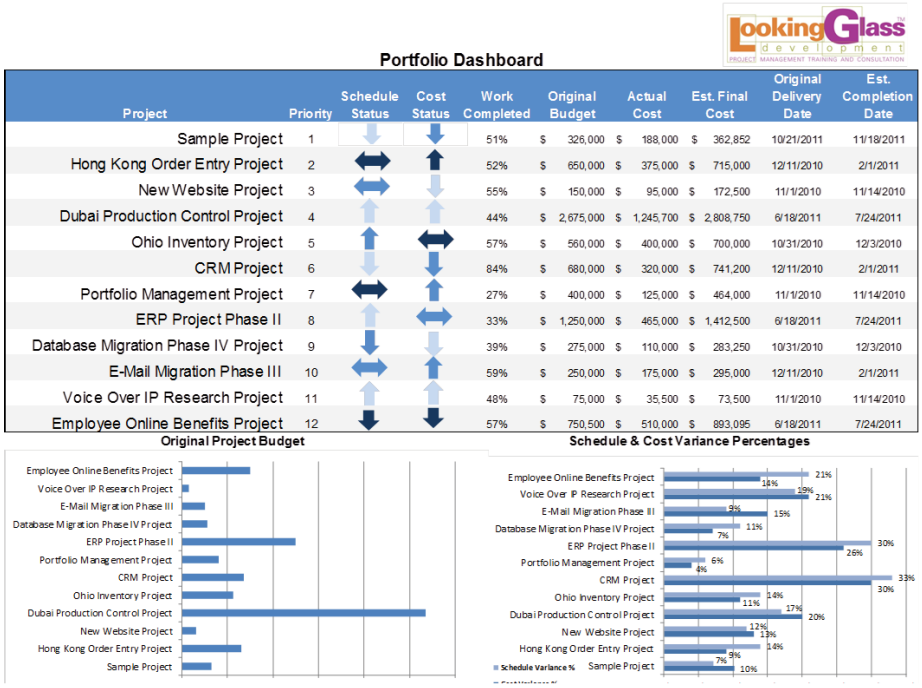


Figure 7: Portfolio Dashboard

The next report is the project status report (fig. 8). The project status report is useful for organizations that use manual reporting. Using this tool, it is easy to create a complete reporting package on a weekly basis. Imagine a package where the portfolio report is the top sheet and then each project receives half of a page. This report uses the same indicators and reporting style as both the PDS and the portfolio report. This consistency is important for quality reporting and ease of understanding. In automated environments, these three reports are automatically linked together and presented using the latest web-based tools.

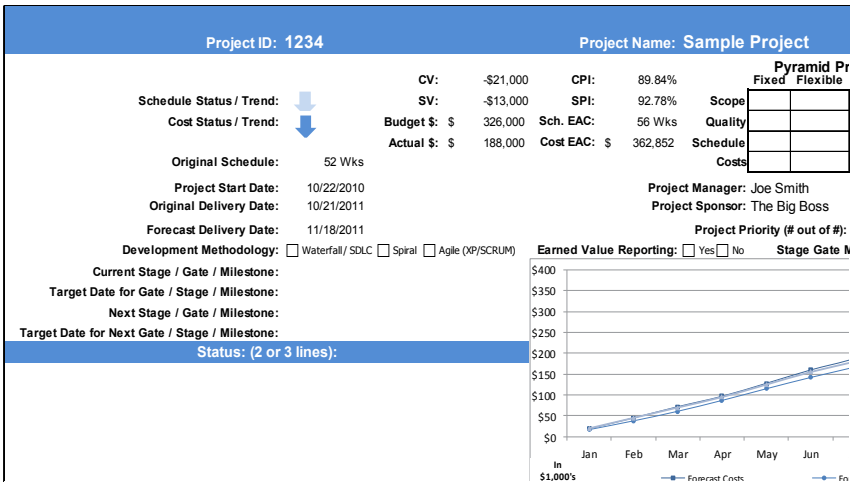


Figure 8: Project Status Report

The final sample image is a project milestone report (fig. 9). The milestone report is the correct level for senior management when they ask to understand the project schedule. A milestone report aggregates the deliverables, tasks, activities, and milestones of the project and only presents the major items. A milestone report may also be used to present actuals against targets.

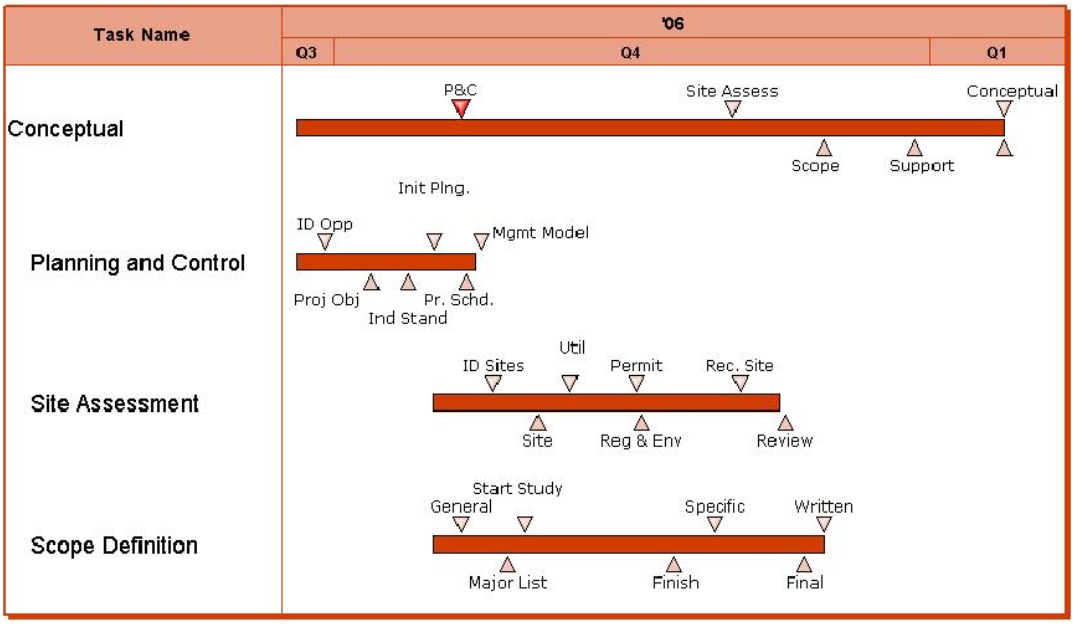


Figure 9: Milestone Report

Often people new to project managers want a simple, step-by-step process that provides them with project management. I often refer to this as "project management in a box." Project management is not a simple paint-by-numbers process. Project management is mostly about managing people. This is why organizations who try to just implement a series of templates, forms, processes, and/or rules almost always fail. Successful project managers do not spend most of their time in front of their keyboards. Successful project managers spend most of their time working with and supporting their team. To succeed, an organization must train their leaders to focus on the team while providing them with the processes and tools they need to make the job easier. Processes that do not make it easier to deliver business results must be avoided at all costs. However, that does not mean there is no need for process. In fact, some process is critical. You just have to make sure it is the right process.

Begin by understanding there is no such thing as a perfect process. There will always be exceptions, but if set up correctly, a basic set of steps will work for 85 percent of the projects out there. It is up to the project manager to use the gray matter between their ears to figure out what to do in those other cases. Below are the basic steps for most projects. The rest of this book is about walking through these steps in detail for the real world. Notice that halfway through the process, the steps break apart depending on the methodology the project uses. Not every project is the same and those steps do matter. To make this process work, a project manager has to know several different methodologies so that they can pick the appropriate one for the conditions they face.

Imagine you work at a fictitious company called the Acme Widget Factory as a project manager. You work for the information technology organization in the PMO. Here is the process Acme uses to execute their projects:

- Acme uses a project governance committee made up of five people to evaluate all potential projects and provide guidance for the PMO. Two members of the committee are power users. Their job is to represent the needs of Acme's user community. Two other members of the committee are senior vice presidents of the organization. Their role is to represent the strategic direction of the company. The final member of the project governance committee is the vice president of the project management office. This individual chairs the committee and represents the PMO.
- Every project begins as a single-page request to the project governance committee. Anyone in the organization can submit a request, but every request must be signed by a director or above to be considered by the committee. The request form is easily recognized by anyone with project management experience as a project charter, or a five line. It requires the submitter to provide five key pieces of information: a business need, a justification, quantifiable and objective success criteria, prioritization of the triple constraints, and any constraints or assumptions.

- The project governance committee determines the idea warrants further investigation, prioritizes the project's investigation against all the other projects, and assigns a project leader to begin work. This is NOT an approved project yet. It represents just a potential project. This approval allows the project leader to procure the resources and spend the time to investigate what it would take to actually execute the project.
- The project leader completes the PDS if it has not already been done.
- The project leader and team, if known, hold the initial kickoff meeting (always started by the sponsor), complete a vision box exercise, build an initial WBS, and prioritize the deliverables using a product backlog.
- The project leader and team hold a technical kickoff meeting immediately after the initial kickoff to further define the WBS with technical deliverables, and T-shirt size the major deliverables.
- The project leader and team elect a development methodology based on observed considerations.
- Depending on the methodology, the project manager and team either arrange the deliverables into a network diagram with cost estimates or conduct a release planning meeting.
- At this point, the project leader and team have created both budget and schedule estimates based upon the methodology recommendation. These are submitted to the governance committee after negotiating with the sponsor and key stakeholders.
- Negotiate any required changes to the basic project plan with the project sponsor and key stakeholders.
- The governance committee either approves the project and methodology or decides the project should not be completed. If the committee decides the project should not move forward, it dies here without repercussions.
- Deliver the product or service according to the selected methodology.

Waterfall Methodology

- Establish major milestones or stage gates to provide checkpoints for effective management of the project.
- Define and assign resources to the major deliverables.
- Have the assigned resources create a detailed work estimate for each work package.
- Initiate the requirements development stage.
- Develop the project requirements.
- Test the deliverables.
- Deploy the finished product, service, or result of the project.

Scrum

- Enter the sprint planning meeting.
  - Groom the product backlog.
  - Define the features for the sprint.
  - Define the tasks for the sprint's features.
- Proceed with defining sprint work holding daily Scrums.
- Hold the sprint review meeting.
- Hold the sprint retrospective.
- Conduct the next sprint planning meeting and begin the next sprint.

5 Scope & Requirements

Project management is all about delivering what the team promises on time and on budget, but how do you determine what to promise your stakeholders? Teams that commit to everything the stakeholders want without significant planning inevitably fail. This does not, however, mean all the planning is done at the beginning of the project. Instead, project managers must ensure there is a balanced process in place that forces the sponsor, key stakeholders, project manager, and team to constantly evaluate the trade-offs between the triple constraints. Most methodologies provide a mechanism for this process, but few make use of it effectively. The key is focusing on short cycles and providing highly visible, easy-to-understand, constant communication that explains the hard choices.

Projects are about delivering features or requirements to stakeholders. All the effort required to deliver the requirements is called the **project scope**. The first thing you have to determine are the major requirements the stakeholders must receive to consider the project successful. Typically, teams must also understand the requirements strongly desired or wanted by stakeholders and those that are nice to have. Only then can the team determine the work that must be done to deliver those requirements. Two issues make requirements and scope development incredibly difficult. First, project managers and teams struggle to get their stakeholders to participate in the requirements development process. Secondly, many stakeholders position all requirements as having the same priority.

Stakeholders often assume the project manager already knows and understands the project requirements. Unfortunately, this is rarely the case. It is never in the project manager's or the team's best interest to assume they understand the desires of their stakeholders. Many otherwise successful projects fail because of assumptions like this. Never allow a stakeholder, even a project sponsor, to limit their participation in a project by stating, "You should know what I want." Successful project managers always place a strong, early focus on stakeholder involvement in the scope and requirements process, and having a well-formed process is key to getting that involvement.

In addition to increasing the likelihood of stakeholder satisfaction, good scope and requirements management can dramatically reduce the errors in the final product. Consider the following statistics from a recent survey:

- Approximately 56 percent of software defects can be traced back to scope- or requirements-related issues.
- Approximately 82 percent of the effort to fix bugs can be traced to scope- or requirements-related issues.

Be very careful with these statistics. Some read them and conclude that it is critical to have all the project scope determined prior to entering the execution phase. However, this is simply not true. The issues expressed by these statistics highlight the importance of having the entire project team and the project stakeholders working in concert to ensure a good requirements definition.

According to the PMBOK® Guide, scope represents the sum of the products, services, and results provided as the output of the project. This is a much more encompassing definition than previously discussed and is bifurcated into two components of scope:

- **Product Scope** – the features and functions that characterize a product, service, or result
- **Project Scope** – the work that must be performed to deliver a product, service, or result with the specified features and functions

In looking at these two terms, it is critical to clearly understand what each represents. Product scope is what you are going to produce. We often refer to this simply as the "What." Project scope defines all the tasks, activities, and non-product-related deliverables that are completed to deliver the project product, service, or result. This is sometimes referred to as the "How."

To successfully manage a project, you must first focus on product scope and then define the work required to produce the desired product, service, or result (project scope).

Scope management represents one of the ten knowledge areas found in PMI's PMBOK Guide®. According to this internationally accepted standard for the profession of project management, "Project scope management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully" (PMI 2012). Simply put, project scope management is concerned with making sure you are only doing work that helps deliver the exact product, service, or result desired by the stakeholders. As part of this definition, there is a strong effort to avoid adding any extra features or functionality that is not specifically approved by the project sponsor. The act of adding additional features and functionality is referred to as "gold plating" and is considered a failure of the project manager.

When we move past the basic standards into the practical application, scope management has two basic levels. The first level is the definition of the overall scope for the project. Think of this as the high-level view of the deliverables. It is often incomplete and missing key components, but it represents all the features the stakeholders can enunciate at that point and time. This level should include a definition of the business need, the justification for the project, and any constraints or assumptions. Remember, this is only a high-level definition. At this point, the project scope should not be expected to have a significant amount of detail. That detail will come in the second level of scope management. Unfortunately, this is not always the case. In many cases either the team or the stakeholders expect all the requirements to be visible at this early point. It rarely works out that way.

The second level of scope management is the definition of detailed project requirements. Level two provides the exact specifications the project resources require to know what work they must complete. If these specifications are unclear in any way, the team members will likely fail to produce the desired deliverables because they will do the wrong work. This creates a problem for most projects. If you do not know all the high-level requirements, how are you ever going to get the right details? The answer is, you won't! Projects fail all the time because of this issue, but not in the way you might think. Most project managers go through a similar development cycle that is built on experience. Often this experience should be called the "School of Hard Knocks" because new project managers frequently struggle to deliver and are forced to learn by making mistakes. Mistakes managing scope are just some of the most common.

The first lesson project managers take from these scope issues is that projects must spend more time developing requirements. This attitude leads to processes with very long requirements development phases requiring sponsor approval that then undergo significant change in the execution and testing phases of the waterfall methodology. Each time a project manager struggles with scope management they take away the lesson that they did not spend enough time developing their requirements, so the amount of time spent on the next project increases. Eventually, the project manager comes to the realization this isn't working, or the practice of project management collapses under the weight of this stage. It is a case of the project manager understanding the problem and taking the wrong lesson. A better lesson is to spend more time managing requirements throughout the project. Simply put, great project managers know they must constantly work to develop the project's scope and requirements.

Success with scope definition largely depends on your ability to internalize this fundamental concept. Scope definition is by its very nature an iterative process. This means rarely do you or the stakeholders clearly understand the requirements fully at the early stages of the project. It often takes a lot of time and more than one iteration to identify the project's real requirements. Therefore, it is critical the team carefully manage the stakeholders' expectations about how the process of scope definition will proceed.

The best project managers begin the process of scope management even before the project has started. Developing a well-formed project charter and preliminary scope statement is a critical element of scope development. The charter and preliminary scope statement then become part of the project management plan. At this point in the process, the project management plan is just a shell for all the various project documents and processes. After creating the charter and preliminary scope statement, the team creates the process used to define the project scope. There is no single methodology most effective at managing project scope. Any number of methodologies can be equally effective. It is all about aligning the best methodology with what the project must achieve. To be successful, you simply must clearly define the processes you intend to use and ensure your stakeholders have agreed to it.

This book will recommend a specific process that provides enough flexibility to work with almost any methodology and still deliver the necessary consistency and predictability to provide senior leaders comfort. Although it is just one of many processes to choose from, I have found it highly effective across a wide range of project types. To understand the process, let us take a few steps back.

The first step in the process is to obtain a signed project charter from the governance committee. In many cases, the project manager himself writes the charter and then gets the sponsor to submit it to the governance committee, and that is okay. In other cases, the charter is not a separate document, but rather embedded in another document like a project datasheet. So long as the project manager is named, their level of authority defined, the business need defined, alignment to the organizational strategy provided, and any constraints and assumptions defined, the intent of the charter has been met.

The next step is for the project manager to get two key questions answered:

First, how will everyone in the organization know when this need is met? In asking this question, the project manager is looking for quantifiable, objective metrics. Getting quantifiable, objective metrics defined at the beginning of the project enables the project manager to determine if the goals are achievable. Sometimes the right answer is for the project manager to run away scared from a project that is unrealistic, but only after working diligently to manage the stakeholders' expectations. To be fair, the project manager needs to have some influence over the metrics by which they are evaluated. Second, how does the project sponsor prioritize the triple constraints? This will enable the project manager to offer better recommendations as the project goes through its various stages. All of these questions are answered on the PDS. Once these two questions are answered, it is time to hold the project kickoff meeting. This is when the project actually begins.

Having a successful project kickoff is critical to the overall success of the project. A project that starts badly will likely end the same way. A successful kickoff meeting begins with a clear understanding of the core purpose of the meeting. What is it you hope to accomplish? There are five goals for a quality kickoff:

- Transfer authority from the project sponsor to the project manager
- Ensure all key stakeholders and project team members understand the envisioned goal(s) of the project
- Develop the initial project work breakdown structure (WBS)
- Energize the team for the project
- Have fun

To deliver on these five objectives, here are the steps for a typical project kickoff meeting.

If you are like many project managers, the first question you might ask is who should be present at the meeting? It is essential that you have all the project's key stakeholders in the room. Additionally, it is a good idea to have the project team present as well. However, be very careful inviting the project team. Their role in this meeting is to listen. This is the team's primary opportunity to get off on the right foot by listening to stakeholders. When the project team dominates the kickoff meeting, project stakeholders often shut down and refuse to participate. The net result is a project with poorly understood requirements and success criteria. Always remember, good project execution comes down to understanding the stakeholders' needs and then meeting them.

Once the team decides who needs to be present at the kickoff, the team must decide when to hold the meeting. Here too some basic rules provide guidance. Never hold a kickoff on a Monday or Friday because weekends and travel get in the way. Both stakeholders and team members are most focused on Tuesday, Wednesday, and Thursday. It is important to hold the kickoff only between the hours of 9:00 a.m. and 11:00 a.m. as they represent the two most productive hours of the day. Begin the kickoff by serving food. It is always easier to get people to show up if they know food is served. Also, assure the participants that the meeting will be ninety minutes or less. Far too many stakeholders have experienced the dreaded all-day kickoff! They are a complete waste of time! Then have your sponsor start the meeting. It is very, very important the sponsor do this. You need the project sponsor in the meeting for only about fifteen to thirty minutes, but that time is critical. If the project sponsor is not willing to participate for this short amount of time, the project manager has a strong indication of how unimportant the project really is to the sponsor.

In starting the meeting, the sponsor has two tasks. First, they need explain to the group their vision of the business need and how that need fits into the strategy of the organization. Second, the sponsor needs to introduce the project manager. For very small projects, this is not necessary, but for most projects, this introduction is an important step because it creates a visual empowerment of the project manager by the project sponsor. Once the sponsor introduces the project manager, they take charge of the meeting. The first thing the project manager does is get the group to break into teams of three to five people and complete a game called the vision box.

In the vision box game, each team is given a cereal box that has been covered with blank construction paper. The project manager then instructs each team to imagine the product, service, or result the sponsor has just described to be in the cereal box to be sold like any other box of cereal. At this point, it often helps to ask some pointed questions about a typical cereal box, such as what is on the front, back, and sides of the boxes of cereal the people in the room normally purchase. If they are like most people, they will tell you the front of the box has a picture of the cereal and some representative trying to market the product. On the back of the box is some kind of engagement. The engagement is usually some type of game or a way to entertain the person as they eat the cereal. On one side panel are usually the ingredients and nutritional information. On the other side panel are special offers. Give the teams ten to fifteen minutes to prepare their boxes. At the end of that time, each team will present their creation along with a timed thirty-second presentation describing their vision of the product, service, or result of the project.

The project team uses the vision box to provide three elements to the project. First, most people will have fun with the exercise regardless of their artistic skills. This is important. Having structured fun establishes an environment we want to carry throughout the project. Second, the vision box provides a subtle way for the project manager to determine if anyone clearly understood the purpose of the project as presented by the project sponsor. Finally, it helps each team member gain a visual picture for how his or her work fits into the strategic mission of the organization. This goes a long way toward achieving team commitment. Once the vision box exercise is complete, it is time to proceed to a more detailed definition of the project scope by completing the initial WBS in the kickoff meeting.

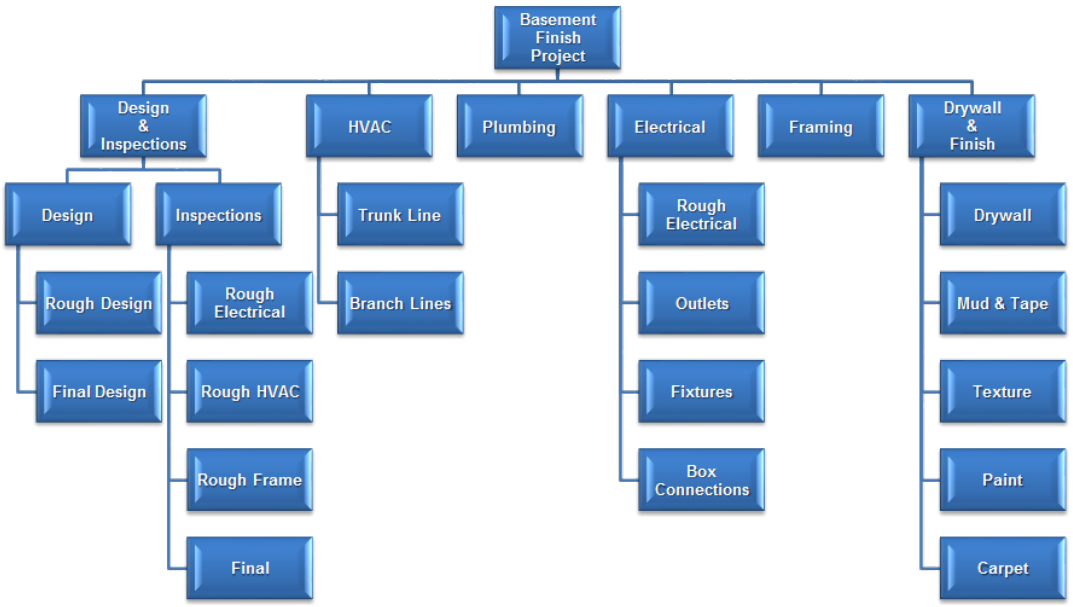


Figure 10: Sample Work Breakdown Structure

Decomposition is the process of breaking the major deliverables into smaller, more manageable components. The net result of this process is the work breakdown structure. The work breakdown structure or WBS is a hierarchical structure that logically subdivides all the work into a graphical representation. A WBS looks similar to an organizational chart. However, the elements that make up the chart are the deliverables of the project. There are no resources represented in the structure, and the WBS has no relationship to time. Each individual box represents a work package. A work package is a discrete piece of functionality that the product, service, or result of the project is supposed to have. The work packages in the WBS are typically defined using nouns to represent the physical, tangible deliverables the team must deliver during the project. The WBS is a critical component of successful project management. Imagine managing a project using the tools already discussed in this book. Most importantly, imagine having a completed PDS in one hand. The PDS provides the rules the team intends to use along with a picture of the project's current status. In the other hand, imagine holding a WBS showing the deliverables the team must produce. In two pieces of paper, you have what the team must produce, how the team must work, and the project's current status. Figure 10 shows a sample WBS.

Like most things in the project management world, there is a practice standard for the creation of WBSs published by PMI®. The practice standard outlines a variety of WBS elements and WBS types. Some of the items described in the practice standard are more theoretical than practical. This book is about delivering projects in the real world and therefore focuses on three types of elements of a WBS. These include:

- Product/Service Elements
- Cross-Cutting Elements
- Project Management Elements

Product or service elements are the easiest and most common type of element. A WBS built primarily with product or service elements as the work packages is a product or requirements breakdown structure. Many agile methodologies make extensive use of this type of structure but refer to it as a feature breakdown structure. The authors of these books usually introduce their FBSs after first criticizing traditional WBSs as ineffective because they possess a strong process orientation. These authors do have a legitimate complaint, but the complaint is not with the WBS itself; rather it is with the project managers who build them. This is a problem discussed in more depth later in the book. Product or service elements define the work packages based on the product or service's requirements. Each box or work package represents a different feature or requirement. These elements focus the team on a visualization of the business and technical requirements of the project as opposed to how the work is completed. A WBS built using product or service elements ignores project phases.

Cross-cutting elements represent an effort to group complex elements of the WBS completed in multiple project phases. A WBS built using project phases often requires cross-cutting elements to link a single deliverable across phases such as design or testing. This often becomes confusing, complex, and difficult to manage. The best way to avoid using cross-cutting elements is to avoid organizing the WBS by project phases. Remember, one of the core purposes of the WBS is to improve communication and visually show the "what" of the project. Complexity detracts from that purpose.

Project management elements are a specific type of deliverable that are not typically part of the product or service of the project. They represent real deliverables, but they are tied to the process of project management and not the product or service. The team often invests significant time and money to create them. These items are critical to the successful delivery of the project. In many cases, key stakeholders of the project are not interested in or willing to pay for these items. They simply expect them free. In the real world, it is an absolute imperative that the project manager includes these items in their product or service-based WBS to manage the expectations for how much time, money, and effort it takes to manage the project. Examples of project management elements includes the communication management plan, change management plan, PDS, risk management plan, design documents, or any other documents that will be used to manage the project.

The best WBSs focus on the product or service under development and not on the process. They provide a simple visualization of all the things created throughout the project. A better understanding of the WBS comes from examining what it is not.

- A WBS is not an organizational chart for the project team.
- A WBS is not a list of project tasks.
- A WBS rarely uses verbs to describe the work packages.
- A WBS does not show sequence.

A WBS has nothing to do with resources. Although the basic structure closely resembles an organization chart, the two tools have very different purposes. An organization chart is designed to visually describe the reporting relationships within the organization. A WBS visually describes the product or service the team must create. The closest these two goals come is when team members are assigned to produce the project's various deliverables. When that happens, some teams mark the work packages with the assigned resource's name. This is a powerful practice used by many agile methodologies.

Properly created WBSs focus on the features or requirements. These are physical, tangible things. They represent deliverables. Tasks rarely appear on a WBS. Tasks represent action or activities the team must take to complete the project. While tasks are important to actually producing deliverables, they create a problem when placed on a WBS. It is a problem with which many projects struggle. Regardless of the purpose of the project, the only way it has any value is by producing real results or deliverables. Stakeholders get no value from the team working on the deliverable. Value comes only from the finished item and, in some cases, not even then because sometimes multiple deliverables must combine to produce something the stakeholders want. When project managers build their WBS based on tasks, they typically find it difficult to accurately report the project's status. Many project managers break their deliverable-based WBS down further to include tasks, but they always maintain the deliverables at the reporting level. If a WBS does not include tasks, it also should not include verbs because verbs denote action.

Sequencing is the act of defining the order in which work is completed. In a project, knowing which things must be done first, second, third, and so on is critical to project success. However, a WBS does not provide this information. Many project managers are quickly frustrated with the WBS because they attempt to use it to show sequence, and it does not work. To show sequence or what is sometimes called precedence, use a precedence diagram, which is specifically designed to show sequence.

There are three major components of the WBS that provide you with the detail and structure necessary to successfully manage the project. These components include:

- **The Structure** – The structure is the graphical representation of the project. It is a picture. The structure resembles an organizational chart but instead provides a visual representation of all the components and work packages that must be completed during the project.
- **The WBS Dictionary** – The WBS dictionary is the detailed description of each deliverable. The best way to think of the WBS dictionary is as the detailed requirements. Without the WBS dictionary, the graphical representation found in the structure has little meaning.
- **The Code of Accounts** – The code of accounts provides a numbering scheme to enable the project team to quickly reference each individual work package and understand the hierarchy without seeing the picture. The highest level of the code typically starts with the project name or a single letter or number, and it is used to identify the product or service that is being created. The second level takes the value from the highest level, adds a separator (typically a period), and then begins recounting again. So the first deliverable of a product or service would be 1.1, the second deliverable would be 1.2, and so on. The subsequent levels identify work packages associated with the deliverables and follow the deliverable numbers with another decimal point. So the first item under the deliverable listed previously would be 1.1.1, the second task would be 1.1.2, and so on. There are two main reasons project managers use the code of accounts. First, experienced project managers use it to create a mental picture of where a deliverable fits into the structure of the project without seeing the WBS chart. Secondly, the code of accounts provides a way to link an organization's project management system to their accounting for accurate financial tracking. Finally, it is important to note that the code of accounts is an optional component of a WBS. Many successful project managers never create a code of accounts for their WBSs.

When creating the WBS, there are four main questions project managers ask to ensure the WBS is correct. Those four questions include:

- Can you accurately estimate the resources you will need to produce the work package?
- Can you accurately estimate how long it will take to produce the work package?
- If you had to assign the work package to someone else, are you confident they would understand what to do?

- If the team does those items, and only these items, do they meet the success criteria? This question can be reversed. If an item was removed from the WBS, would the project still meet the success criteria? If the answer is "yes" to this second question, then the deliverable is not necessary and should be removed.

The real value of the work breakdown structure is its ability to focus the project team and stakeholders on the product or service being delivered and to clearly understand the impacts of scope changes. To use the WBS to track scope change, the project manager simply uses three colors to represent the individual work packages. The first color represents the baseline scope or the scope the team presented to the governance committee as necessary to meet the project's success criteria. The second color is used to represent features or work packages added after the governance committee approves the project's baseline scope. The third color is used to represent work packages or features that previously were considered in scope but are now being excluded from the project. In order for a work package to change color, it must go through the change control process described on the project datasheet. Imagine showing a stakeholder a WBS where one-third of the work packages are the color representing post-baseline added scope. What would that tell you about the project? Some people think that such a high degree of scope change means the project is in trouble. While the project might be in trouble, that cannot be determined from the WBS. Usually what happens in these cases is the sponsor is surprised to see all the new boxes and immediately asks how much more time and money it will take to produce those new features. That is exactly what a project manager wants. Many project managers struggle to get stakeholders and sponsors to understand the correlation between scope change and schedule or cost increases, and there is a direct connection. The key in this area is getting some movement from the sponsor. Once they ask the question, they have made the connection, and the question, "Is there an increase in time or cost?" no longer exists. Instead, they are asking how big the change is. There are a couple other tools project managers might need to use when dealing with requirements.

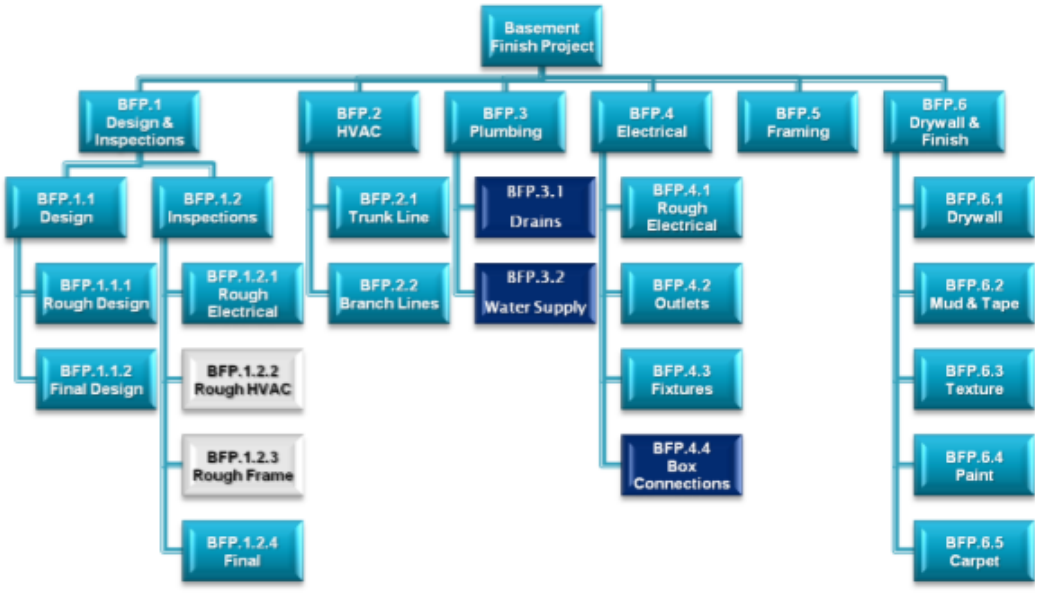


Figure 11: Using Color & the WBS to Manage Change

The first tool is the requirements or product backlog. This is a tool originally used in the agile methodology Scrum. The backlog is a list of the features, requirements, or deliverables shown as work packages in the WBS. The items on the backlog are prioritized so that the most important features to the sponsor and key stakeholders appear at the top of the list, and the least important appear at the bottom. In addition to prioritizing the work packages, the backlog usually includes detailed descriptions of the features along with various estimating details to help the team deliver. When combined with the WBS, the product backlog provides a huge amount of information about the product or service the project is delivering.

Once the team understands what they must produce, it is important to define who will produce each item. Assignments are often much easier to see using a combination of a WBS and a responsibility assignment matrix or RAM. The RAM is a dual-axis grid like what you would see in Excel. Each row represents a unique feature, requirement, or deliverable on the project. Each column represents an individual resource. Each individual cell represents the role a specific resource owns for the specific deliverable. The diagram allows for a specific defined set of roles that include Participant, Accountable, Review Required, Input Required, and Sign-off Required. The only difference between a RAM and a RACI diagram are the values placed in each cell. A RACI diagram uses the values: Responsible, Accountable, Consent, and Inform. Using a tool that enables team members to clearly visualize how both they and their deliverables fit into the overall project significantly increases commitment. Combined, these tools provide a powerful launching point in theory for any project, but how is a WBS created in the real world?

	Sally	Bob	Jim	Kate	Fran	Cal	...
Feature 1	S	R	A	P	P		
Feature 2	S		A	P		P	
Feature 3	S		R	A	I		P
Feature 4		R	S	A		P	P
Feature 5			S	P	I	A	P

Figure 12: A RAM or RACI Diagram

The initial kickoff meeting described earlier had a primary goal of developing the WBS. However, the description of that meeting dropped off before fully explaining how to create the WBS. Once the project manager leads the meeting through the vision box exercise, the next step is to execute a displayed thinking exercise, which is the process used to create the WBS. Displayed thinking is one of the most powerful tools you can use to develop a project's WBS before having to commit to a particular methodology.

While there are very few methodologies that do not benefit from having a WBS, most do not formally specify its creation. This is often because the designers of methodologies are more interested in how work gets accomplished rather than how the team is communicating with its stakeholders or what the deliverables need to be. Additionally, many organizational leaders seem to value perceived simplicity over actual effectiveness. The simplicity comes from the organization establishing a single methodology for every project. Unfortunately, when a single methodology is used, one out of every three projects fails. There is simply no such thing as a perfect methodology, and it is therefore incumbent on the project manager to align the team, deliverables, and stakeholders with the process used to produce results. Unfortunately, most methodologies make all kinds of assumptions that make it difficult to get the project moving effectively. What makes the initiating processes described in this book so powerful is that they work regardless of methodology.

If we return to the kickoff meeting, it is possible to implement displayed thinking. Having just completed the vision box presentations, the project manager can have confidence that everyone in the room has a consistent, clear understanding of the business need and why the project is important because of the vision box exercise. The next question the team needs to answer is, "What product or service with which features will best meet that need?"

In many kickoff meetings, the team uses brainstorming to analyze the project and determine the requirements or features. There are some major differences between your typical brainstorming session and a displayed thinking session. In a brainstorming session, people are encouraged to shout out the features, requirements, or deliverables to a scribe who tries to capture all the information on a whiteboard as the scribe attempts to hear one voice over all the others. Inevitably, the scribe misses ideas or misinterprets them, and then time is spent wordsmithing and correcting the input. Worse yet, some team members fail to participate because they do not want to have to shout over others. In traditional brainstorming sessions, business stakeholders and technical members of the project team often combine to gather information about the project. Usually these sessions are the worst of all as the technical participants quickly dominate the discussion, and business stakeholders shut down.

In displayed thinking, project managers avoid these concerns by splitting the session into two components. In the first step, only the business stakeholders participate. These are the key stakeholders that should already be present at the project kickoff meeting. These stakeholders must be capable of representing the needs of the users. Additionally, most kickoff meetings include the primary team as meeting attendees. These people are present to listen and gain a better understanding of the stakeholders' needs. They are not there to participate in the discussions. The resources are there to listen, and it is important that this point gets reinforced with the team. If the team dominates the conversation, the project will have the wrong requirements. Once the initial session is complete, the displayed thinking process repeats with the team to ensure any required technical deliverables are included within the WBS. When the process completes in this manner, the technical deliverables align to the business requirements but still appear based on the requirements defined by the key project stakeholders.

Returning to the kickoff meeting, the project manager completes the vision box exercise and then hands each participant a marker and a stack of three-by-three-inch Post-it™ Notes. The project manager then explains the objective of the exercise is to define as many of the features or deliverables the stakeholders need produced. When the project manager says "begin," stakeholders are to write down any deliverable or feature they believe necessary to achieve the success criteria. When a participant writes something on a Post-it™ Note, they hold it up for the project manager to pick up. The PM picks up the deliverable and calls it out for the entire group to hear to prevent some potential repetition and to spur additional thinking. The participants may not comment on the ideas written on the Post-its at this stage because the goal is to capture as many potential requirements or features as possible and real-time evaluation can often reduce the idea-generation process. The only rule is that no tasks are allowed. As the project manager picks up the pieces of paper, they stick them in a big pile on a wall or whiteboard. After only ten to fifteen minutes, the participants are able to develop a relatively large and complete list of deliverables. To be clear, this is not likely to be everything the team must produce to meet the success criteria, but it will likely represent 80 percent of the necessary features. When everyone believes all the features or deliverables are captured, it is time to move to the next stage.

The project manager then draws a line down the middle of the whiteboard and titles one side "In Scope" and the other "Out of Scope." The team then goes through each of the Post-it™ Notes and as a group democratically decides if the item is in or out of scope. Be careful to not waste time in this process. If the team cannot quickly agree on the item, place the Post-it™ Note on the centerline and come back to it later. When all the Post-it™ Notes are organized into the three groups – in scope, out of scope, or undecided – the team then focuses on the items where there was disagreement.

These features often represent key problem areas for many projects. When stakeholders have different opinions on features, project managers often feel trapped. If the features are delivered, the team runs the risk of overrunning the budget. If the team fails to deliver the features, they run the risk of missing the success criteria. Unfortunately, far too many project teams and project managers make these decisions when they should not. They lack the authority to make these decisions. These are decisions for the stakeholders. To ensure the "right" people are making these decisions, stakeholders must take ownership of the process. Using a voting process and allowing stakeholders to present their positions enables the project manager to act as a facilitator instead of the decision maker and the results are astounding. However, do not be surprised when this process takes a significant portion of the meeting.

Once the team places all the work packages either in or out of scope, it is time to organize the in-scope items into a WBS. This is usually a quick process because of the use of Post-it™ Notes. It is now time for the project manager and team to take a step back. Here, the project manager asks all the stakeholders at the meeting to stand up and come forward. It is their job to move the Post-its™ until they create a satisfactory WBS. Along the way, it is perfectly acceptable if they add some additional deliverables or features and take items they had thought were out of scope but discover must be completed. When the WBS is complete, the participants prioritize the features, requirements, or deliverables to create the product backlog. Once done, it is time to end the kickoff meeting and get the technical project team together to evaluate the WBS for missing items or further decomposition.

The next stage in the process is the technical kickoff. This is a meeting for the project team only. No customers or users are present. The primary purpose of the technical kickoff is to walk out of the meeting prepared to move into whatever methodology the team believes appropriate for the project. Getting to that point typically takes the team sixty to ninety minutes.

The process begins with the team examining the WBS and the ranked product backlog created by the stakeholders in the initial kickoff meeting. The team is looking primarily for technical features, requirements, or deliverables they believe are required to deliver the specified product, service, or result. Most customers or end users are not aware of these items, so they are often missed in the initial kickoff. Occasionally, there are even a few customer-facing features that get missed as well.

The team adds these items to the existing work breakdown structure and product backlog. Next, the team must create estimates for all of these items. Many project managers find this estimating process frustrating because they expect a high degree of accuracy that simply does not exist. It does not exist because there simply isn't enough detailed information to provide an exacting estimate. The key is to understand that any estimate done during the early stages of a project are by their very nature inexact. The team lacks enough information to provide an accurate estimate. Teams respond two ways to this problem.

One response is to spend significantly more time developing the requirements. This is the typical response in a linear methodology such as waterfall. The problem with this response is that it assumes it is possible to fully understand the requirements at this early stage. This assumption is a fool's errand. Teams following this approach struggle late in the project life cycle with significant scope change because their assumption usually leads the team to also assume that since they spent so much time on the requirements, they got everything. When the stakeholders begin asking for changes or become frustrated because the team seemingly missed things, the wheels fall off.

The alternative response is to assume it is impossible to fully understand the project's requirements at the beginning and set the project up so that the team will obtain the necessary details when it is really necessary to know information. Estimates at the early stages are done as relative estimates with wide ranges to be refined later. This model provides the team and sponsor enough information for budgeting and scheduling purposes, but it also helps manage the level of expectation held. A common practice is to allow the team to use T-shirt sizing or rough order of magnitude estimates during the technical kickoff to quickly provide a basis from which to work. T-shirt sizing is an affinity-estimating technique where the team groups similarly sized features or requirements based on the amount of work required to complete them. Common groups include extra small, small, medium, large, and extra large. Once the team completes its basic estimating exercise, it is time for the project manager, along with any interested team members, to decide which development methodology provides the greatest opportunity for success. That recommendation, along with the data collected in the two kickoff meetings, is returned to the governance committee for project approval. Once the committee approves the project, the team is ready move to the next stage.

Before we continue with the practical process, it is necessary to add a little bit of theory. So far the discussion of requirements has focused on the creation of the initial WBS and product backlog, but that it not enough for the team to actually begin producing the project product or service. For the team to actually begin producing the required features and requirements, there are two questions the team must answer:

- **Is the requirement verifiable?** This is a binary criteria. The real question is, "Can the requirement be tested and have a firm *yes* or *no* answer?"
- **Is the requirement validated?** This question ties the requirements to the testing of the product or service. This is simply a question of, "Has someone actually looked at the product or service to ensure the requirement has been satisfied?"

All requirements fall into three basic types. These include:

- **Business Requirements** – Business requirements represent core business functionality or key business desires. The key to defining these requirements is understanding how the process would work without any automation. These requirements include things that are often difficult to measure or quantify, such as "maximized automation," "state of the art," or "best in class." The best solution for these difficult-to-define items is to make sure you manage the stakeholders' expectations for exactly what you are going to deliver and do so early in the project. Often this will raise concerns on the part of various stakeholders, but it is better that this happens early.

- **Technical Requirements** – Technical requirements represent issues that are necessary for the project based on the specific tools, methods, or other technical resources being used in the project. Technical members of the project team and not business representatives often define them. To be successful with these requirements do not develop them until after you clearly understand the business requirements. Examples of technical requirements include processor speeds, hard-drive space, load-bearing capacity, or temperature capabilities.
- **Nonfunctional Requirements** – Nonfunctional requirements represent areas such as regulatory requirements, legal requirements, or specific policy requirements within your organization. You do not have to understand the justification for these, but you must ensure they are followed.

Project requirements are the rules and characteristics that the finished product or service must provide or demonstrate. Imagine someone asked you to build a breadbox. Would you be able to do it? For most, a breadbox is a fairly simple thing. It is an enclosed box that sits on a kitchen counter for the purpose of storing bread. However, building one is an entirely different matter. Even if you have great skills in the area of breadbox making, you would likely fail the given task regardless of the number of times you have built other breadboxes. The sponsor's definition of a breadbox is the key. With the information given, you do not know what the project sponsor meant by the term "breadbox." Without a clear understanding of the dimensions, materials, and other nuances of the sponsor's expectations for the breadbox, you are left making assumptions based on your own knowledge. As many project managers have discovered over the years, this is a formula for failure.

Regardless of your knowledge or expertise, you must clearly understand what the key stakeholders of the project want and expect. Successful scope definition demands the team not assume an understanding of the requirements for the project. To get at this level of understanding you can use a variety of tools, including:

- Process Diagramming or Business Flow Mapping (Venn Diagramming)
- Displayed Thinking
- The Work Breakdown Structure
- Use Cases

The process described in this book has already made use of displayed thinking and a WBS, but what about process diagramming and the use case? Business flow mapping or process diagramming represent techniques used to visually represent a business process through a series of shapes and arrows. It often provides a powerful tool to confirm understanding of core business processes. The use case provides a way to document detailed system requirements. Originally, use cases were developed by the information technology industry. However, today they are used by a wide range of industries. Any place you have a "system" you can have a use case to define it. For many, the use of the word "system" is troubling. It seems to indicate some type of software. However, a "system" is really only a combination of parts that create a whole. Systems have inputs and outputs and run some kind of process. When working in project management, we link the WBS to the use cases by having each major deliverable or work package defined by a separate use case. Modern software makes this method extremely easy and functional by allowing each work package to contain a hyperlink to its associated use case.

The components of a use case allow any technical resource, project team member, or sponsor to better understand the feature or functionality that is to be included in the product. This provides the reader with the specific details necessary to understand how it will perform, not only in the ideal case but also in the event that the system does not perform as expected. The sections of the use case should include:

- **ID** – This is usually the same number defined in the WBS code of accounts.
- **Use Case Name** – This is the name of the feature or function that is being tested.
- **Brief Description** – This section provides a brief description of the process and should be considered a scope statement for this process.
- **Primary Actor** – This identifies what type of user or system will be interacting with this feature or piece of functionality.
- **Precondition** – This identifies the state of the system prior to the primary actor interacting with the feature or functionality.
- **Post Condition** – This describes the state of the system after the primary actor has interacted with the feature or functionality.

- **Normal Event Flow** – This displays the steps that the primary actor will follow to take the feature or functionality from the precondition to the post-condition state.
- **Exceptions** – This describes how the feature or functionality will respond to the primary actor when the interaction does not go as planned.
- **Future Enhancements** – This describes the future enhancements that are going to be developed for the feature or functionality currently in place.

In some cases this is all the information that would be needed for developers to begin the development effort for the system; however, there are times when additional information is required beyond the high-level use case sample provided. In these cases, a detailed use case is warranted. The detailed use case adds the following sections to the high-level use case:

- **Frequency of Occurrence** – This defines how often a feature or functionality will need to be executed during an interaction with the primary or secondary actors.
- **Business Rules** – This defines the business rules that the feature or functionality must follow.
- **Data Description** – This describes the data that is to be displayed.
- **UI Definition** – The user interface provides a visual sample of how the actor will engage with the system.

6 Development Methodologies

Development methodologies are critical to project success. However, do not confuse a development methodology with project management. This chapter examines how development methodologies affect projects before detailing a basic understanding of the three major families of development methodologies. The purpose of this discussion is not to make you an expert at any one methodology, but rather to provide enough information to give you a clear understanding of how they work. This understanding will enable you to align the results of the project, the organization, and the team with a methodology most likely to produce success. Above all else, remember that almost any project can succeed with almost any methodology. The question is how hard will it be to achieve that success? Great project managers know they must make their team's lives easier and not harder. Delivering results requires the team avoid using processes that require a bunch of steps that fail to add value to the product or service of the project. Therefore, the goal of every development methodology must be to provide the ordered steps the team must follow to deliver the product or service of the project with the least amount of nonvalue-added effort. Picking the right development methodology is critical to overall project success, but it cannot be confused with general project management.

How is project management different from developmental methodologies? Project management provides the overarching umbrella that defines the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements (PMI 2012). This definition is incredibly far-reaching and includes, but is not limited to, understanding the art and science of managing people, effective communication with stakeholders, requirements definition and management, many aspects of financial management (such as budgeting and cost accounting), development methodologies, and knowledge of the technical area of the project. This is a huge list and is not even close to complete.

One of the topics included as part of project management is the area of developmental methodologies. Development methodologies define which specific steps the team executes first, second, third, and so on. The umbrella of project management defines every project as having five phases: initiating, planning, executing, monitoring and controlling, and finally closing. However, the project management framework does not define the absolute order or length of the phases or process groups. It also does not define any specific tools the team must employ. The specific development methodology defines each of these things. Distinguishing among methodologies is equally simple.

A two-axis grid defines development methodologies based on two key measures. The horizontal axis in the model measures the amount of formality or a structured process the methodology uses. The amount of documentation the methodology demands is an example of the level of formality. Methodologies with low formality typically require little documentation while methodologies with highly structured processes typically require significantly more documentation. However, do not equate the amount of process or formality with the quality of the management or likelihood of success. The vertical axis represents the number of times the team will likely iterate through the process steps. A methodology that cycles only once through its steps is linear or sequential. Linear methodologies often appear rigid and do not loop back on themselves or repeat steps. If the methodology is not linear, then it is iterative. This means that the methodology allows the project to repeat steps as more information is learned.

Today, there are more than thirty major methodologies used throughout the world. Some methodologies are tied to particular industries, others to regulatory requirements, and still others to project types. However, most methodologies are generic, and many different project types can use them. Additionally, it is not required that only pure methodologies be used. Experienced project managers regularly combine methodologies to best meet specific business needs. This is a key ability for project success. However, to combine methodologies, a project manager must understand how the major methodologies work to ensure something unforeseen does not happen. Three families comprise the most popular development methodologies used today. These methodologies include waterfall, spiral, and agile development.

The first methodology is the waterfall methodology. It is also referred to as the software development life cycle or SDLC. The waterfall model is the oldest of the development methodologies. It was originally created by the engineering profession and is still extensively used today. In 1970, Dr. Winston W. Royce published a paper entitled *Managing the Development of Large Software Systems*. The paper outlined the basics of the waterfall methodology and named the set of practices. Today, waterfall development is applied for the creation of transactional or legacy systems. Waterfall development is most warranted when errors or missing requirements cannot be fixed later. The waterfall model has the highest amount of structure and documentation.

The waterfall model gets its name from its linear series of steps that proceed downward like a waterfall. Work is completed in a sequential manner where one deliverable must be completed and approved prior to moving to the next deliverable of the project. These gates are commonly referred to as phase gates, stage gates, milestones, or go-no-go decision points. Examples of these gates include stakeholder reviews, requirements review, use case review, and the critical design review.

The waterfall model uses an extremely linear process. This process begins with the definition of the business need, which is referred to as "conceptualization" or "analysis." It then continues through all the steps in the waterfall until ending in the deployment of the product or service of the project. The software development life cycle or SDLC is one of the best-known waterfall models. Like many waterfall models, it has five steps or phases. These phases include:

- **Analysis** – In the analysis phase the need is defined and the top-level scope is developed that will produce the product or service that will best meet the need.
- **Design** – In the design phase the specific requirements necessary to complete the product or service are defined in detail.
- **Development** – In the development phase the product or service is built in accordance with the previously defined requirements.
- **Testing** – In the testing phase the product is tested to ensure that all the features and functionality are working in accordance with the requirement. In addition, integration testing is completed to ensure the product or service will function correctly within the global environment.
- **Deployment** – The final phase of the waterfall methodology is deployment. Here, the product or service is completed and moves into the operations phase.

The waterfall methodology has a number of advantages over other ways of executing a project. First, a waterfall process offers the easiest departmentalization and managerial control. Next, a waterfall model forces the team to completely define all requirements before proceeding to the next phase. Many people also consider this the waterfall methodology's biggest disadvantage. The waterfall model has strong emphasis on documentation and the development of source code. Finally, the waterfall model provides a very structured, disciplined approach to development. This high degree of structure is also seen as a disadvantage.

The waterfall methodology is far from perfect, and there are a number key disadvantages or risks attributed to the waterfall methodology. Most importantly, real-world projects rarely follow a purely sequential process. In practice, steps are often repeated multiple times, or the project must go backwards to go forward. The waterfall model requires the project team to know and define all the requirements at the beginning of the project. This can be extremely unrealistic. Waterfall models often cause a large time gap between requirements definition and when stakeholders actually see the product or service of the project. This gap can cause the stakeholders to become uncomfortable with the progress or to change requirements. There is also a risk the product or service may no longer meet stakeholder needs.

With such large potential problems, when does it make sense to use a waterfall methodology? Selecting a waterfall methodology is often warranted if any of the following are true:

- The project has requirements that are extremely well known and unlikely to change.
- The project involves a high-volume, transactional system where errors or incomplete requirements could damage existing capabilities, and there are limited implementation windows.
- The project team is comprised of new and inexperienced resources or resources that have never worked together before.
- The project is contract-based, with predefined requirements written into the contract that cannot be changed.

The second family of methodologies is spiral development. Spiral development is an iterative approach to completing a project. Iterative development is a critical concept for every project manager. It is the concept of looping, or repeating, steps with one loop or iteration building on the last. What differentiates spiral development from other iterative development practices is its laser focus on prototyping. This methodology is often called "chunking" because it makes use of discrete phases that each produce a prototype. Each phase of the project goes through four stages:

- Determine objectives, alternatives, and constraints.
- Evaluate alternatives; identify and resolve risks (prototype).
- Develop and verify the next level of the product.
- Plan the next phase of the project.

The spiral model demands the project manager make a strong effort to determine how many phases the project will take *before* beginning the looping process since not making this determination will often lead to a significant problem with schedule and cost control. In the spiral model, the team builds a prototype during the "evaluate alternatives" phase. After gathering feedback about the prototype, the project team determines the next level of the project. The team then plans the next set of deliverables and the next loop begins. This process continues in a spiral fashion with more and more iterations until the final product is ready for evaluation and testing. The key to this process is prototyping.

When prototyping, the project team builds a smaller version of the product or a core piece of the product's functionality. This process enables the project team to test theories, evaluate alternative solutions, or prove they are capable of delivering specific features. The prototyping process also enables the team to makes refinements to the product requirements as new information is learned. Prototyping assumes that it is difficult to know all the project requirements at the inception of the project. To be able to discover and refine the requirements, the developer must build a simplified version of the system and present it to the customer for evaluation and feedback. The team uses prototyping to solicit feedback, prove capabilities, and gather and refine requirements, but they must never release the prototype as a finished product.

Deploying the prototype is a common error. To prevent this from happening, the project manager and the team must manage their stakeholders' expectations. In managing these stakeholder expectations, communication becomes even more important. First, building a prototype costs the organization both time and money and will not produce any releasable product or service. As the project costs rise, the team is often pressured to release the prototypes because stakeholders see functional features and cannot understand why they can't use them. When this happens, it is important to remind those stakeholders that when done correctly, prototyping saves time and money. This happens because prototyping enables the team to experiment on a small scale where the cost of a mistake is less than when the product is complete and there are mistakes requiring the product or service be deconstructed.

Second, deploying the prototype often causes technical difficulties because it is rarely designed to handle the load of real-world use. The use of prototypes can dramatically increase the likelihood of a problem called "architectural compression." This problem occurs when organizations build one system either on top of or beside another repeatedly without consideration for the overall architecture. Eventually, the entire foundation collapses under the weight of all the independent components. The use of prototypes can often make this problem worse because they rarely have any consideration for the overall architecture. To be successful with the spiral methodology, the project manager must keep a careful eye on the needs of the overall architecture and stay focused on those changing expectations.

There are a number of advantages to the spiral methodology. The spiral model is evolutionary in nature, allowing the features and functions to develop over time and creating a better final product by working in layers. The spiral model provides a strong focus on the project risks through its use of prototyping. The iterative process mitigates risk by using prototypes to ensure the team can actually deliver the desired results at an earlier point when compared to the waterfall methodology. Prototypes allow for rapid evaluation of the solution provided by the team so that they can adjust the solution based on a changing business environment. Additionally, spiral development enables the team to incorporate other methodologies more effectively addressing special project needs. This means one iteration might be an agile methodology, another might be a waterfall, and still others just the basic spiral methodology.

Spiral is an imperfect methodology like all the others. This means it also faces a few challenges. First, the basic design of spiral development enables the team to better manage project risks by extensively using prototyping. Project teams must have strong risk-assessment expertise. The primary advantage of the spiral methodology is that it provides for better risk management. If the project team lacks skills in this area, this advantage does not exist. Many project managers also often complain that projects using spiral development struggle to manage the project schedule and budget. This occurs because of the constant prototyping. As the team loops through the process, they often learn new things, which generates new requirements and increases the project's schedule and budget. This fear is artificial. Think about it for a second. If the project team is using a version of the waterfall methodology, the team would still find out about the new requirements, but they would learn about these items only once the team presented what they thought was the finished product to the stakeholders. When this happens, those same changes are much more expensive. Even though spiral development does experience scope creep, its impact is less than in a waterfall project.

The final methodology is agile development. Agile development is not one methodology, but rather a family of at least eight methodologies characterized by low formality, a low level of documentation, and highly iterative processes. The software-development community originally created these methodologies in response to very bad project management and poorly implemented waterfall projects.

Agile methodologies focus on motivating resources to participate on projects, providing them with the environment and support they need and trusting those key resources to get the job done. However, these basic tenants should make sense regardless of the methodology you select. As managers, we need to support all team members. Providing team members with the opportunity to thrive in a positive, supportive environment sustains a high level of productivity for extended periods. If project managers removed the long hours traditionally worked by resources because of poor management and allowed them to function within a normalized work schedule, they would achieve much better results for a longer period. This reduces the likelihood of burnout from team members being pushed beyond their limits to cover for poor project planning and management.

Agile methodologies are grounded in a document called the Agile Manifesto for Software Development. The manifesto is comprised of twelve core values central to the software-development community. Those values include:

- Individuals & Interactions OVER Processes & Tools
- Customer Collaboration OVER Contract Negotiations
- Responding to Change OVER Following a Plan
- Working Software OVER Comprehensive Documentation

A good project manager recognizes these values as not unique to agile but as best practice for every project. The first value highlights the importance of people over process. This does not mean process is unimportant. It simply highlights the fact that at all times project managers must place their people first. The second value focuses the project team on working together. The project team must work daily with the project's stakeholders to ensure the project actually meets the success criteria. This is different from the way most projects actually progress. In most cases, the project team develops a set of requirements followed by a period where they work in isolation from the stakeholders to produce those requirements. The problem with this model is that the separation provides the stakeholders time to reflect on their needs while simultaneously not allowing the advantage of reviewing the work in progress. Far too many projects begin with the stakeholders spending copious amounts of time negotiating formal terms of requirements, milestones, and cost. The customer uses the terms to lock the team and protect the stakeholders from underperforming teams. The focus in these cases is constantly on holding the team's feet to the fire. The next value is responding to change over following a plan. This value is tied to the fact it is impossible to know all the requirements up front. This means the team cannot ever follow a plan perfectly. Therefore, it is about following the intent of the plan and not its letter.

In addition to four core values, agile development promotes twelve main principles. These principles include:

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple weeks to a couple months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity – the art of maximizing the amount of work not done – is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Extreme programming (XP) is one of the most widely used development methodologies from the agile family. This method differs from other methodologies previously discussed in that it places a greater weight on the ability of the programmers to adapt to the changing needs of the client. Users of the XP methodology view customer-requested requirements changes as a natural part of the development process that should be embraced to improve real project results. Extreme programming is a methodology that introduces checkpoints used to integrate new requirements and improve productivity. Typically, XP project iterations are one to two weeks in length. This is slightly shorter than most agile methodologies. XP was originally created by Kent Beck with Ward Cunningham and Ron Jeffries while working at Chrysler.

Extreme programming focuses on goals, activities, values, principles, and practices. For the purposes of this short introduction, we will focus on some of the principles and practices. XP highlights two core principles:

- **Assume Simplicity** – This principle is about treating every problem as if its solution were extremely simple. The team does not look for complex solutions but breaks the problem down and looks for the easiest possible answer that works.
- **Embrace Change** – The team refuses to work against change and instead embraces it as a key requirement of delivering success.

XP directs the team to twelve core practices broken into four specific areas: fine scale feedback, continuous process, shared understanding, and programmer welfare. Best known of these concepts are two from the fine scale feedback area: paired programming and the planning game.

- **Paired Programming** – Paired programming occurs when two programmers work together at one workstation. One programmer writes the code while the other reviews it and thinks strategically. These pairs are not fixed and often change based on the needs of the project.
- **The Planning Game** – Extreme programming's main planning process is called the planning game. This process occurs once per iteration, or typically once per week. The planning game includes two parts: release planning and iteration planning.

The extreme programming methodology uses a five-step process. The first step in the process is envision. In this step, the team has conversations with the customer for the purposes of determining the project requirements. The second step in the XP process is speculate. In the speculation stage the team spends time generating user stories. These user stories provide business-focused descriptions of the project requirements. The stories are not done to the same level of details as a requirement specification or other tool, but they are a common tool used in agile development. The third stage of extreme programming is explore. In the explore stage, developers use paired programming to write code. This is the primary execution stage. The fourth stage is adapt. In this stage, the team uses source control with a process referred to as red, green, refactor. This process focuses the team on the agile process test-driven development. In this process, the team continuously integrates the new features into the product or service. The final stage of the XP process requires the customer to test the completed features and accept the results.

Agile development uses several unique tools to assist team members during the project to deliver the finished product or service. Regardless of the methodology you select, these tools may make your project more successful. The team completes the vision box during the project kickoff meeting. The exercise begins by breaking the participants into teams and giving each team a cereal box that has had blank construction paper glued to each panel. The objective of the exercise is to have each team build a cereal box that would represent the product, service, or result of the project. As part of this exercise, it is usually helpful to imagine your favorite cereal and think about what is on the outside of the box. Often it is also valuable to have each team create a thirty-second elevator pitch for the product as part of the exercise. The PM Basics chapter addresses the PDS.

The feature breakdown structure is a visual representation of the product of the project that focuses on the features, requirements, or deliverables. It is simply a properly formed WBS. The team employs feature cards in an agile environment to create an understanding of the features and functionality that will be included in the product. The front side of the feature card describes how the feature, function, or deliverable will look and work from the customer's perspective. The reverse side of the card gives the technical information about that feature or function. Feature cards provide the information that the technical resource needs to know to program that feature. Feature cards create a physical sense of ownership for project resources as they are able to hold in their hands the features for which they are responsible.

As a project manager looks at the different methodologies that are available for the project team, it is important to realize that no one methodology can meet every situation. Many organizations fail to deliver successful projects because they believe that project management is just some rote process to follow, and they can achieve success by ensuring that everyone always fills out the same documents and follows the same process. Unfortunately, there is no perfect methodology. To be successful, project managers must understand how each methodology will affect the triple constraints in their specific situation. To ensure your understanding of this concept, answer the following questions:

- What leg of the triangle does each methodology attempt to lock?
- What leg of the triangle does each methodology attempt to leave flexible?
- What risks do these impacts have on the project and organization?

Selecting the appropriate methodology hinges on four factors that are critical to the success of the methodology:

- The project manager's experience
- The project team
- The product or service of the project
- What the organization will accept

Imagine a credit-card-processing computer system. Several million times a day merchants send credit-card transactions into your system. If your team deploys inaccurate or incomplete features, the entire system might fail. This both significantly and negatively affects the business. This situation would provide a timely opportunity to use a waterfall methodology. Now imagine a new website. What would be the impact on the site if one or two of the pages were not complete when the site went live? You would not be able to see those pages, but all the other pages would work correctly. This may lead the project manager to select a different methodology, such as one where the project manager could deliver some type of actual product so that the stakeholders could determine what they really want prior to the end of the project.

7 Effective Budgets and Schedules

Successful project management requires the ability to deliver all three legs of the project management triangle (cost, time, quality, and scope). The last two chapters addressed the scope leg. Next are the cost and scheduling legs. Most project managers have experienced the real-world results of projects. The statistics earlier showed most projects are late, over budget, and fail to deliver the expected features. If this is the reality, what do you believe are the perceptions held by executives concerning a majority of the budgets and schedules sent out by project managers? Do you believe these negative perceptions reflect on the project managers? Every time a project manager sends out a budget or schedule, they must consider these documents as contracts with their project sponsors and key stakeholders. It is therefore imperative that project managers do everything in their power to ensure the schedule and budget estimates reflect reality. This module will cover the techniques that will enable you to better estimate the project resources, schedule, and budget to manage a successful project.

Take a moment to refresh yourself on where we are in the process. The project manager and team created the charter and received approval from the governance committee. The team then held the initial kickoff meeting during which displayed thinking and the vision box exercise generated a WBS. The stakeholders used the WBS to prioritize the features and then closed the kickoff. The team took a short break and then reconvened in the technical kickoff where they added more deliverables, generated affinity estimates, and made a first attempt at estimating the amount of time it would take to complete the project based on current information.

Estimating the amount of time the project will take to execute based on "current" information is fraught with risks. Delivery order is highly dependent on methodology. If delivery order is dependent on methodology, so is the project schedule. If the team intends to use a waterfall methodology, the next step is to begin a detailed requirements development stage. If a spiral process is desired, the next step is to plan the number of intended iterations. If an agile methodology is intended, the next step is to complete the release planning meeting to determine the number of releases and iterations required as well as the iteration length. Regardless of the methodology, understanding how the team derives it time estimates is critical.

Most people have had at least one experience where a project manager wanted to know how long they thought a task or deliverable was going to take. Immediately after providing the answer to this question, most are then asked, "How confident are you in that estimate?" If you are like most, you probably answered something like, "very confident," "pretty confident," or something approximating "90 percent." Yet, there is a problem with these statements. The problem occurs because management assumes these estimates are precise, or in other words, if we say that we are very confident, we will be able to deliver exactly on time. Unfortunately, those estimates rarely reflect the project's results. The reason is that project budget and schedule estimates are an exercise in probability and not precision.

To make this point clearer, imagine that you need to go from your home to the grocery store and purchase a gallon of milk. Assume that you know where the milk is located in the store and have been to this particular store many times before. Could you tell EXACTLY how long it would take to go to the store, purchase the gallon of milk, and come home? Chances are high that there is no way you could tell exactly how long it would take. Why not?

The major reasons most cited in this exercise by students are the number of variables and the fact that many of these variables are outside the individual's control. Think about it for a moment: you must navigate traffic and traffic signals, find a parking space, locate the milk, potentially run into people you know, deal with either a self-checkout line or a cashier, and then get home. It is the same in project management. Dealing with people and attempting to manage things that are largely outside the project manager's control are 90 percent of project management. If all project managers had to do was work with machinery or technology, it would be a lot easier. Computers and machines respond in highly predictable fashions. Unfortunately, people do not, and this seriously impacts the project manager's ability to meet specific time or cost targets. To succeed, we must conclude that project management is an exercise in probability and not precision. As such, the goal must be to produce a range of likely outcomes with a probability that the particular result will be within that range.

The complexity of the calculation is further complicated by the simple fact that the human brain is not designed for precise estimating. We are designed for affinity estimating. Think about an eagle or hawk soaring high in the air. They possess amazing vision, and it is very precise. It has to be. As the bird sees its prey, it swoops down in a steep dive to capture its meal in its talons. Without its incredibly precise vision, the predator would crash into the ground or miss its target.

We, on the other hand, do not require such precise vision. It is much more important that humans are able to determine proximity. To survive, early humans did not have to be faster than the saber-toothed tiger chasing them. They just had to be faster than the other person was. In that scenario, it was critical that the caveman could quickly determine what the closest threat was. Our basic thought processes follow a similar style. We are not skilled at telling precisely how long something will take, but we are very good at determining when one thing is bigger or smaller than another is. This is affinity estimating, and it represents one of two primary schools for project estimation.

The first school of thought applies to the agile family of methodologies. This school of thought focuses on affinity estimating techniques such as planning poker, white elephants, or an affinity wall. Many of these estimates make use of a Fibonacci sequence where one number is the sum of the previous two. The Fibonacci numbers provide approximate estimate values. The numbers do not represent actual estimates. Instead, they represent an approximation of estimates using something called story points. Story points are a loose amalgamation of time and complexity. The team is responsible for the estimates instead of the project manager or customers. The easiest technique is planning poker. In planning poker, each member of the team receives a small deck of cards with values of 1, 2, 3, 5, 8, 13, 20, 40, and the infinity symbol. Someone in the group or a stakeholder describes the deliverable, and then at the same time, each member of the team holds up a poker card with the value they believe represents the number of story points for the particular deliverable. The team then determines the number of story points they can produce in an iteration with each iteration always being the same length of time. The iterations combine into releases, which then determine the project completion date based on when the last iteration will finish. This completes the basic scheduling process for an agile project.

The schedule construction process involves six steps for a project using the waterfall methodology. There are two major differences between the agile method defined above and scheduling when using the waterfall methodology. First, agile assumes it is impossible to accurately estimate deliverable durations. Traditional scheduling assumes it is possible to accurately estimate deliverable durations. Secondly, traditional estimating requires a greater focus on getting the deliverables sequenced correctly. There are six steps involved in the waterfall scheduling:

1. Place the deliverables, activities, or tasks in the proper sequence.
2. Estimate the resources that will be needed for each item.
3. Estimate the work and calculate the duration of each item.
4. Develop the schedule based on these estimates.
5. Analyze the schedule.
6. Negotiate changes to the triangle.

Activity sequencing is the process of ordering the deliverables, activities, or tasks defined in the WBS. Remember, the WBS does not include the order of the work, but it does include a complete list of the deliverables, tasks, and/or activities within the project. Activity sequencing takes all of those items and positions them based on the order in which the work needs to be completed. Unfortunately, not all dependencies are defined by a "this comes first and this comes second" type of relationship. That is where the formal discipline of activity sequencing comes in. Activity sequencing is not process flow diagramming. There are no decision gates or alternative process flows. Activity sequencing focuses only on the currently defined tasks and activities. There are a few different techniques for activity sequencing.

When the profession of project management was in its infancy, there were no computers to help create project schedules. Many project managers and schedulers used butcher paper or newsprint to draw sequencing diagrams that tacked onto conference room walls. From these humble beginnings, two major methods of sequence diagramming took hold. The first is actually a family of methodologies referred to as arrow diagramming. Arrow diagramming appears in two forms, activity on arrow (AOA) and activity on node (AON). The easiest way to imagine this methodology is to imagine Tinkertoys™, those little wooden sticks and balls that you played with as a child or used in a high school chemistry class to represent different molecules by inserting the sticks into the small circles. Arrow diagrams are similar. The only difference between AOA and AON is how to represent the work. In an activity on node diagram, work appears in the node, and the arrows only connect the nodes to show the next sequence. In an activity on arrow diagram, all the deliverables, tasks, or activities of the project appear on the arrows. This creates a potential problem for situations when you want to have one task or deliverable dependent on more than one other task or deliverable. To address this problem, "dummy tasks" exist. Dummy tasks are dotted lines in the activity on arrow diagram where no work occurs. Arrow diagramming eventually morphed into precedence diagramming, which is the most common technique used.

The next technique family is conditional diagramming. The most common form of conditional diagramming is GERT, or graphical evaluation and review technique. Unlike the other methods for developing network diagrams, conditional diagramming is capable of representing conditional looping and/or probabilities. Conditional diagramming is significantly more difficult to complete than arrow diagramming or precedence diagramming. When a project is extremely high risk or high profile, it justifies conditional diagramming.

Unlike the other arrow diagramming techniques, precedence diagramming method, or PDM, uses limited and defined relationships between activities. This method changes the activities to rectangles and alters the relationships between each activity as arrows. Instead of the single finish-to-start relationship that exists in arrow diagramming, PDM defines four dependency types. A finish-to-start dependency is the most common and represents the default choice used by most software applications. A finish-to-start relationship occurs whenever one deliverable, activity, or task must be completely finished before the next deliverable, task, or activity can begin. The use of finish-to-start dependencies throughout an entire project network can dramatically extend the length of the project, often unrealistically. An example of a real-world finish-to-start relationship is inserting your automatic teller machine (ATM) card before entering your personal identification number (PIN).

The next dependency type is start-to-start. This dependency type occurs when two items can begin at the same time or when the second item can begin anytime after the first item has begun. This type of dependency compresses the schedule because the two dependent items can occur simultaneously. An example of this type of dependency might occur when an organization decides to replace all the desktop computers. Imagine two different tasks: receive computers and load software. If the organization were large enough, it would be impractical for the system engineers to wait for all the computers to arrive before they started loading software. As soon as the team receives the first machine, resources would begin loading the new software. In effect, as soon as one task began the other would start as well.

The third type of dependency is the finish-to-finish relationship. In this dependency, two tasks, activities, or deliverables can end at the same time, but the first item must end before the second item can end. This dependency type is very similar to the start-to-start type, and the same real-world example applies. A finish-to-finish dependency also reduces a project schedule. The final dependency type is a start-to-finish, which rarely exists in the real world. Using this dependency type means that the first task must start before the second task can finish. In most cases, people struggle to come up with a real-world example of this dependency type as more often than not, reordering the items or breaking them down further will allow a different dependency type. When all the dependency types are together, you get a picture of the project called a network diagram, most often referred to as a precedence diagram. When this diagram is laid on top of a calendar, a Gantt chart results, the most common view used in software tools such as Microsoft Project®.

Once the network diagram or precedence diagram is complete, the project manager must ensure every deliverable, task, and/or activity is assigned to a resource. The precedence diagram enables the project manager to see where the same resource can complete more than one item. The next step in the process is to develop detailed duration estimates for each task, deliverable, or activity. The process used for duration estimating is relatively simple. However, do not confuse the process of duration estimating with scheduling. The purpose of duration estimation is to answer the question of how long each task, deliverable, or activity will take. Based upon this information, we can then determine the project schedule using the critical path methodology (CPM). Any traditional discussion of project estimation begins by establishing a few basic governing principles.

First, all project managers want to deliver their projects on time and on budget with the promised features. This principle establishes the basic rule that all project managers be measured against their ability to deliver against the triangle. Whenever the project manager provides a project schedule, budget, or estimates, they are establishing a contract with the recipient. It is a written, documented commitment of what the team will deliver. If it does not happen, the project manager and team quickly lose credibility, regardless of the reasons why it happened.

Second, Project managers must be realistic about their estimates for time, costs, and resources. This is necessary so that project resources are committed to the assigned deliverables. Project managers must assume that their resources are intelligent and can see unrealistic estimates for what they are – unrealistic. When resources perceive unrealistic targets, they are not committed to achieving them because they are UNREALISTIC! The best way to solve this problem is to require the resources assigned to an item to create its estimate.

Third, executives have a natural distrust of project managers and their schedules based upon real-world results. Senior-level managers realize that you are not likely to hit the number you have given to them. The problem is they do not know what to do about it. The natural inclination is to simply reduce the provided estimate and pressure the project manager to work toward "stretch goals."

Fourth, to ensure commitment, the resources doing the work must have a strong voice in the development of the estimates. The old analogy of the ham-and-eggs breakfast illustrates this point well. For the breakfast, the chicken is interested, but the hog is invested (e.g., the chicken just laid an egg while the hog gave his life). Resources must be as dedicated to the project as the hog.

Fifth, to be successful in delivering a project on schedule, the project manager must have visibility and control over the safety (excess time). In most instances, the project manager does not have this kind of control. Therefore, project safety is misplaced or misused, which provides no value. The performance management chapter extensively addresses this concept.

Finally, adding extra safety to estimates creates no value. Parkinson's Law explains this best when it states, "Project work will expand to fill the allotted time." Most experienced project managers have found this to be true regardless of their industry or the amount of safety they add. Therefore, do not pad the estimates! This is another topic that is extended in the performance management chapter.

Most project managers build their basic project duration estimates assuming that all their resources are 100 percent efficient and dedicated. This is usually unintentional and due to a poor understanding of how the basic calculation within the common software tools available today work. Almost all the major project scheduling software packages begin with this simple calculation:

Duration = Work / Efficiency

The meanings of these variables are often confused, but they need to be specific.

- **Duration** – Duration represents the amount of elapsed calendar time. Duration is measured in days, weeks, or months.
- **Work** – Work represents the amount of effort required to complete a task, deliverable, or activity. Work uses the scale of person hours.
- **Efficiency** – Efficiency is the amount of work that a resource can complete in a specific period of duration. It is shown using a percentage value.

With most software applications, efficiency is a field used to define resources. The value of this field is often a key distinguishing characteristic of senior resources over their junior counterparts. However, many project managers fail to use the efficiency field in their calculations. When this happens, the formula changes to Duration = Work. This means that the amount of work to be completed is equal to the calendar time it will take to complete. Assigning resources with the efficiency set to 100 percent produces the same result. Both of these options are unrealistic. A good rule of thumb, or heuristic, is to expect a general efficiency of 70 percent. When the resource is part of management, this number drops to 50 percent because most managers have greater e-mail, meeting, and phone responsibilities. It is not enough to just deal with efficiency. It is also important to understand the impact that resource availability has on a project schedule.

Availability defines which physical days resources are at their desk to complete project work. Availability takes into consideration a resource's time spent on leave, vacation, training, or other nonwork-related efforts. If a typical person spends 20 percent of their time doing other things not related to the work effort, then they would have only 80 percent of their time available for project work. If there are approximately 160 possible work hours in a month, and the employee is only 80 percent available, they have 128 hours to work on the project. If the resource is only 70 percent efficient, they will produce 89.6 hours of work product in that average 160-hour month. In the real world, the average resource produces deliverables at only a 56 percent rate. If you are scheduling without applying resources and using 100 percent efficiency, you are 44 percent behind schedule on day one!

To calculate the total amount of work completed by an employee each month, use the following formula:

(Total Hours in a Month * % Availability) * % Efficiency

It is critical that we apply resources with the proper efficiency rate. However, that is not enough to build accurate estimates. To build accurate duration estimates you must begin by clearly understanding the end goal. The goal is to produce an accurate estimate of the total number of days that will elapse (*duration*) to deliver the project. However, starting with the duration – although most common – is a bad idea. The best project managers build their project schedules by going to their project resources (*a good idea*) and asking when they can expect to complete the deliverable or task. The problem is that it is extremely difficult for the resource to provide an accurate estimate off the top of their head. Think about all that is required. The calculation begins with the basic formula just discussed:

Duration = Work / Efficiency

Once calculated, the total duration must be then expanded based upon the resource's availability. Take a moment to contemplate what the resource is really being asked when required to provide the finish date for any deliverable. The resource is required to go through the following steps in their head:

1. Determine the amount of work to be accomplished.
2. Apply the appropriate level of efficiency.
3. Determine the resource's availability to work.
4. Evaluate any multitasking impacts.
5. Apply the appropriate amount of safety to the deliverable.

You do not have to be overly imaginative to see that accurately completing this calculation in one's head would be extremely difficult at best. This process becomes even more difficult from the project manager's perspective because they do not have visibility to any of the variables in the calculation. Successful project managers understand the need to have visibility to these drivers if they want any hope of success. Therefore, to be successful in developing duration estimates according to this school of thought, the project manager must remember two keys. First, leaders must remember that estimates are based upon probability and not precision. Secondly, leaders must ensure as many variables as possible are made visible to all.

Remembering estimates are based upon probability and not precision is accomplished by always expressing estimates within a range with a probability of success. Making the variables visible requires more effort and often the use of project management software. It also requires the project manager to change the questions asked of the resources. The correct question to ask is, "How much actual *work* is involved in the deliverable if the resource is 100 percent dedicated with nothing else to do?" This means no e-mail, phone calls, or meetings. Unfortunately, when resources are asked the question, they will likely be extremely uncomfortable because they believe that will be THE number. It is important the project manager develops trust with the resources and informs them that that they will not be held to the work estimate. It is equally important that the resources provide an unpadded estimate and that it not be a duration estimate converted into hours. The project manager can add safety later. Once there is a work estimate, calculate the duration using project management software or by using the formula discussed previously.

The next step is to take those duration estimates back to the resources for confirmation that they are reasonable, most likely case estimates. If the resource does not feel they are reasonable, a negotiation must then happen. In this situation, at least there is now visibility to the variables in the equation allowing for adjustments. Once agreement is reached on a reasonable, most likely case estimate, the resource can provide a best- and a worst-case duration estimate for each deliverable. Upon getting all three estimates (best case, worst case, and most likely case) PERT becomes an option.

Another less common estimating tool is PERT or program or project evaluation and review technique. The basis of the PERT calculation is contained in the principles of a Gaussian distribution. A normal distribution is important in the statistics of both social science and biology. Statisticians and scientists use it to represent random variables whose distributions are not known. It makes use of something called the central limit theorem. The simplest interpretation is that averages of these variables collected independently are normally distributed. For example, if 100 adults in any major city were randomly gathered and their height was compared, it would likely be discovered that there was a natural distribution of people, with a few people being very tall (taller than six foot two) and a few being very short (say, shorter than five feet). Most people cluster together in the middle between five six and five ten. If the distribution of heights is examined closely, three breaks appear. These breaks are called standard deviation. At one standard deviation, 68 percent of the cases appear. Within two standard deviations, 95 percent of the cases appear, and within three standard deviations, 99 percent of the cases appear.

Imagine each project task done 100 or 1,000 times. After a while, the probability that your estimate is close to the result would dramatically improve. Unfortunately, few project managers have the time to redo a project even once, let alone a 100 or a 1,000 times. PERT attempts to calculate the probabilistic duration of each deliverable using three estimates with which most are familiar. These estimates include:

- The best or optimistic case
- The most likely or expected case
- The worst or pessimistic case

Those three estimates combine to create a value called the PERT weighted average. The weighted average is calculated by taking the best-case duration estimate plus four times the most likely duration estimate plus worst-case duration estimate and dividing the result by six. The formula uses four times the most likely because it is artificially creating the hump in the bell curve. The formula uses six as the denominator because six values exist in the numerator. The next step is to calculate the PERT standard deviation so that the three ranges and a probability of hitting that range can be determined. The PERT standard deviation is different from most uses of standard deviation. The formula is (pessimistic – optimistic) / six. By adding and subtracting the result of this equation to the PERT weighted average once, the team can determine one standard deviation from the mean. This range tells the project manager there is a 68 percent probability of the project completing within the range. By both adding and subtracting the PERT standard deviation a second time, the team achieves two Sigma or the 95 percent probability range. If the team adds and subtracts the PERT standard deviation a third time from the weighted average, the three Sigma value is achieved. This is the 99 percent probability range. As the team goes from one, two, and finally to three Sigma, the range gets larger. Once the team has a project time estimate, they can move to the project budget estimate.

According to the PMI® standards, there are two different project budget estimates used during the project life cycle. These estimates assume project information is incomplete, and it gets better over time. The two project estimates include:

- **Rough Order of Magnitude** – A rough order of magnitude, or ROM estimate, has a +/-50 percent variance. It represents the initial estimate of what the project will cost. The ROM estimate is used in the project initiation phase to determine if the project is even within the realm of possibilities. It assumes that the level of information is extremely inaccurate.
- **Definitive Estimate** – The definitive estimate or budget has a +/-10 percent variance. This estimate is created at the end of the project planning process. It represents the budget against which the team is measured. Notice that it is not a single number but has a range of 20 percent. In the real world, project managers often use only the +10 percent value to establish the upper bound of the range. It is the last and most accurate estimate the team produces.

There are several different estimating techniques used theoretically to produce these project estimates. Each of these techniques looks at the pieces of the project or historical data to estimate the actual costs. These techniques include:

- **Analogous Estimating** – Analogous estimating, or top-down estimating uses actual costs from a previous, similar project to generate a new estimate. This can be dangerous because when the details of the current project are compared to the past project, they may be very different. Analogous estimates are most commonly used early in the project life cycle when little detailed information about the project is available.
- **Parametric Modeling** – Parametric modeling uses project characteristics in a mathematical model to calculate estimates. A common example would be a model that calculated the cost to build a new highway by simply taking the total number of lane miles multiplied by the cost per lane mile of highway.
- **Bottom-Up Estimating** – Bottom-up estimating is the most accurate form of budget estimating. It requires the estimate to be built at the lowest level or terminating nodes of the work breakdown structure. It is the most accurate because team members are far better at determining accurate values for small items than for larger items.

The project charter and scope statement are complete. The team created the WBS followed by the deliverables, activities, and the precedence diagram. The team estimated the resources needed to complete the project. The resources were asked to provide work estimates that were converted to a duration estimate for use in PERT. From there, a budget estimate was developed. Now, there is one last step to define the schedule. However, it is important to be cautious at this point. In the real world, it is not unusual for senior management to provide a delivery date for the project. The project manager should accept this date as a deadline. Do not be tempted to schedule the project from the requested finish date because it causes a number of issues. These issues include:

- A focus on the date instead of the work. Although the deadline is important, it must not overshadow what it takes to accomplish the desired results.
- Time estimates based on how long a task is allowed to take instead of how long it will really take to complete.
- The order in which activities are worked is based on the allowed time instead of the most effective path to achieve the project goals.

Once the team has a focus of building the schedule from the project start date, the next step is to define the project's critical path.

A project's critical path is the longest chain of dependent deliverables, tasks, or activities with zero slack or float. If any of the deliverables, tasks, or activities along the critical path slip, then the delivery date of the entire project also slips. The critical path does not have to be the path with the greatest associated risk or even include the most important tasks. Once the team identifies the most likely time estimate, they use it or the PERT weighted average to determine the project's critical path. Either way is acceptable. In addition to the duration estimates, the previously created PDM diagram is also used. There are several terms important to the critical path method. These include:

- **Early Start (ES)** – The soonest a task or activity can begin
- **Duration (DUR)** – How long the task or activity will take
- **Late Start (LS)** – The latest a task or activity can begin without impacting the critical path
- **Late Finish (LF)** – The latest a task can finish without impacting the critical path
- **Float** – The difference between the late finish and early finish

Figure 13: CPM Legend

The critical path method begins by remembering that the earliest the project can begin is the first day of the project. Keeping this in mind, turn your attention to figure 13. This figure displays the location of each of the defined critical path variables. The process for calculating the critical path is a four-step process. These steps include:

1. Take the PDM diagram and insert the known information.
2. Complete the forward pass.
3. Complete the backward pass.
4. Calculate the slack or float.

The only two things known at this stage are the duration of each task or deliverable and the early start for the first item, which is always day one. Therefore, place a one in the top left corner of the first item. Then place the most likely case duration value in the top middle field of each box. Once this is done, begin the forward pass. Complete the forward pass through the network by working in columns and using the following formula:

Early Finish = Early Start for the Task + the Task Duration

A simple example often helps in understanding. Imagine if the first task of the PDM diagram had a duration of five days. Work begins on the task on day zero of the project and continues on days one, two, three, and four. At the end of day four, the resource would have worked on the task for five days and would have completed it.

Once the early finish for the first deliverable has been calculated, place the EF value in the upper-right corner of the deliverable box. Then working from left to right, select the next box in the chain and use the early finish value just calculated. Place the same value in the early start position for the next deliverable or task in the chain. Continue this process until the entire network is complete. A good general practice for this process is to work in columns because convergence points can impact these values. Additionally, remember that whenever a convergence point on the forward pass occurs, always take the largest of the potential early finish values to determine the early start for the next task. Once the last task in the chain is reached, take the early finish value for the last task and move it down to the late finish value for the last task. The forward pass for the network is now complete, and the overall project duration has been determined. Next, complete the backward pass.

To complete the backward pass, work from right to left. Start with the last deliverable or activity in the PDM diagram, and working in columns, use the following formula:

Late Start = the Task Late Finish – Duration

Take the calculated late start, place it in the late finish position for the next deliverable or task, and complete the above calculation again. When a convergence point occurs on the backward pass, do the exact opposite of what was done on the forward pass and take the smallest value. Once both the forward and backward passes are complete, all that is left is determining the slack or float for each item.

To calculate the slack or float for each item, compare the top and bottom corners for each box, or use the formula:

Float = Late Finish – Early Finish

Any task or deliverable where the slack or float is equal to zero is on the critical path. Every project network must have at least one critical path. In the network shown in figure 14, the critical path is tasks A, B, E, F. The total project duration is ten, and slippage in Task C of up to four or slippage of up to three on Task D would not impact the delivery of the project. Therefore, neither task C nor D is on the critical path.

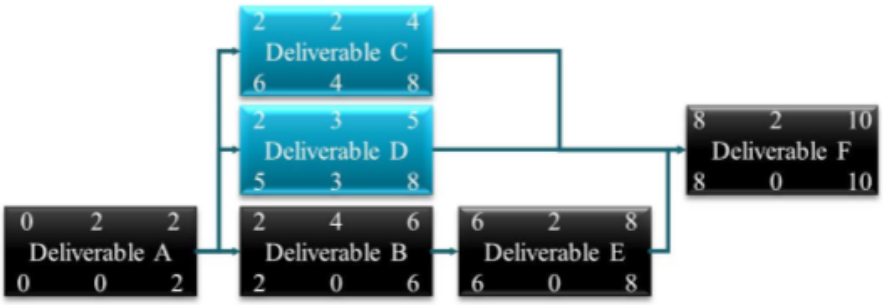


Figure 14: A Simple CPM Diagram

To finish the schedule development process, lay the new critical path on a calendar to set the exact dates for the project. Do not be surprised if the initial project schedule takes longer than allowed. This is not unusual. Remember steps five and six of the scheduling process are to analyze the schedule and negotiate necessary changes. No matter what software package is used, it will not complete these steps automatically!

Inevitably, the project manager must shave time off the project to hit specific targets. To take time off the project, identify the critical path, and reduce its time before another path becomes the critical path. Continue this process throughout the project until a schedule is created that achieves the target. Once the project's critical path has been determined, there are only two techniques used to reduce the length of the critical path. These techniques include:

- **Fast Tracking** – Dependent tasks are completed in parallel. This will compress the overall schedule. The risk associated with fast tracking is rework or having to redo things that should have been done in parallel because the first item was not available to review and to correctly develop the second item.
- **Crashing** – Adding additional resources to the project tasks to complete them more quickly. The risk of crashing is an increase in project costs.

A common issue that many different projects face when they are running over schedule is addressed with Brooke's law. Should the project manager bring on additional resources to get the project back on track? Management typically thinks that there is a linear relationship between productivity and resources. Hence, if the project is behind schedule, the answer is to bring in additional resources to provide an increase in output. Brooke's law argues that if additional resources are added to the team, a dip in productivity will initially occur. This happens because when the additional resource is added to the team, another team member must train the new resource before they can become a valuable contributor. So instead of adding resources, the team initially experiences a subtraction of resources.

8 Project Performance

Project performance is all about measuring a project's actual results against what the team committed to the stakeholders. Many project managers mistakenly argue that they have been successful because the product or service of the project itself eventually becomes successful. Do not make this mistake. Although the project manager does have an ethical responsibility to deliver products and services that meet the intended purpose, successful project management requires the project manager to deliver much more.

Project managers are tasked with the almost impossible goal of meeting their customers' expectations. This starts with delivering the project triangle (cost, schedule, scope and quality). The cost and schedule legs are seemingly easy to measure while the scope and quality legs sometimes appear almost impossible. However, do not give up just yet. Measuring against this triangle is important because it provides a set of objective metrics. However, do not fall into the trap of believing there is no flexibility in the triangle. True project success happens only when the project team is open to change. Professional project managers are agents of change requiring them to ensure the team delivers the "correct" requirements in a constantly evolving environment. Unfortunately, the definition of "correct" is always changing depending on whom and when you ask. The key is to follow the defined change management processes while never losing sight of where the team started, and to use quantitative measure(s) of success. Those two things are easy to say, but often hard to do in the real world.

In his book *Leadership*, Mayor Rudy Giuliani explains the importance of metrics on human behavior. "If you tell me how you are going to measure me, then I will tell you how I will perform." Giuliani's contention is that people perform based on how the organization conditions them to respond. This means that a successful project manager must select the "right" measures for their team to get the "right" results. Unfortunately, most project managers fail to understand this concept and ensure their own failure by selecting measures that condition resources to perform poorly. To prevent this, project managers must select the correct metrics, and this requires a keen understanding of what causes delays.

A number of potential issues cause project delays. These issues are made more complex because they are often intertwined, making it often impossible to tell which is really causing the problem. There are lot of potential issues that could cause delays on any project. The key is to focus on the major ones.

Poorly managed scope – Scope management is a topic already discussed ad nauseam. Poor scope management occurs whenever the project manager, team, and/or stakeholders consider the requirements are completely defined and then struggle to deal with unexpected changes. This problem is complex because it is often as much about stakeholder expectation management as it is about scope management. The telltale sign of this challenge is scope creep, or the seemingly unending scope change many projects experience. IT projects often struggle with this problem because of the perceived ease with which one more feature or function is added. Unfortunately, many project managers exacerbate the problem by attempting to heavily front-load the scope and requirements development process then lock the defined scope down by requiring all kinds of stakeholder sign-offs and commitments. This never works. In fact, all it usually does is anger the stakeholders and cause everyone to see the project manager as incompetent. Like most areas in project management, solving this problem requires a willingness to change and adapt. It requires the project manager to establish simple, easy-to-follow change management processes, repeatedly teach those processes to the project's stakeholders, and then never ever stop communicating with those stakeholders about the impacts to the project for any change.

Unfocused project management – In today's world, it is not unusual for a project manager to be working on three to five projects at the same time. Additionally, many project managers have little formal training. These project leaders are often taught only by the school of hard knocks. Through repeated project failures, these leaders learn that projects fail when team members fail to recognize the necessity of a particular task. Focused on not repeating the mistakes of the past, these project leaders create project plans comprised of hundreds or even thousands of individual tasks built in programs such as Excel or Microsoft Project. No task or activity is too small or insignificant to be listed. Over time, tasks migrate from one project to the next in hopes of not missing an item on the next project. This is simply too much information to track, even with the most advanced software. To be successful, project managers must learn to trust and empower their team and strive to limit the number of items owned by the project manager. The key is remembering the purpose of the project manager in the first place. Project managers exist to make it easier for the team to deliver on time, on budget what was promised to further the organization's strategy. The project manager's role is NOT to create the perfect task list.

A focus on task management – Project managers often build their projects based upon tasks. Resources everywhere are doing work, but very little gets delivered. The problem with task management is that it prevents the project manager and team from realistically seeing the true progress. When a resource has been working late every night for several days or weeks in a row, they will almost always report they are farther along than they really are. Project managers collect that inaccurate information, roll it up, and then present it to senior leaders, thereby unwittingly attaching their names to the inflated data. When the team fails to deliver as promised, everyone appears shocked. Shouldn't someone, say the project manager, have known the project was behind? For many organizations, the problem is so extreme that the organization comes to expect disappointment and even plans for it. This is not an answer.

The problem goes back to the issue of accountability. How do great organizations hold their project managers and teams accountable? Remember what Mayor Giuliani said, "Tell me how you are going to measure me, and I'll tell you how I will perform." The key question is what does the organization really want? Does it want resources all working feverishly? If so, measure tasks, and everyone will always be busy. If, however, the organization is more interested in results, then that is what must be measured. To solve this problem, the project manager must be deliverable focused. Projects are about delivering business value. If the team is measured against their ability to deliver that, then that is what the organization will receive. Tasks keep people busy, but deliverables create value.

Dependencies between steps cause delays to accumulate and advances to be wasted – Readers, project managers, and teams are often confused by this statement. Executing projects successfully is all about the laws of probability. Assuming for a moment this is true, then about 50 percent of the tasks or deliverables come in either right on time or early, and the other 50 percent should be right on time or late. If anyone had the time, they would be able to plot these values and find that they naturally distribute themselves along the normal distribution or bell curve discussed earlier. Is that your experience? If you are like most project managers, you are probably laughing at the notion.

In a majority of cases, the tasks or deliverables in your project consistently take longer than forecasted. How can this be if project management is about probability instead of precision? This happens because there is no incentive for your resources to complete their work early. All the incentives target being only right on time. If and when your resources do get their work done early, they do not hand it off to the next person. They hold onto the deliverable, check it one more time, add some extra functionality, or simply let it sit on their desk. When this happens, the next resource obtains no advantage from the fact that the first resource was done early. However, if the first resource is late, the second resource is automatically negatively impacted.

Parkinson's law – Parkinson's law states that work expands so as to fill the time available for its completion. It was first coined by Cyril Northcote Parkinson in a humorous essay published in *The Economist* in 1955. Imagine having just completed your first project. At the end of this first effort, most project managers look back at the results and determine the majority of resources delivered late. In an effort to this performance on the next project, the project manager adds a little extra safety to the estimates provided by their resources. Does it help? No, most project managers find the resources are just as late on the second project. On the third project they add even more safety with the same unwanted outcome. At the same time this cycle is occurring, another problem rears its ugly head.

Management sees the undesirable results and feels compelled to push the team toward better performance. Their tool is called the "stretch goal." Stretch goals represent the absolute best possible performance if every variable aligns perfectly and the team maximizes their performance in all respects. Although this level of performance is possible, it is highly unlikely. However, management incents the team to work toward this level of performance with some form of reward should it be achieved. In the case of estimates, management creates stretch goals by cutting the estimate provided by the project manager and/or the resources. Of course, any self-respecting project manager sees this occurring and responds by padding the estimate to account for the cut. Eventually, management figures this out and cuts the project estimate even more. This cycle continues almost indefinitely, and through it all the project resources continue to deliver late. Only now they are delivering late against estimates that are either significantly larger than they should be, or they have been changed so many times that they have no resemblance to reality. No matter, the resources are still late, and it is the project manager's fault. At least you have comfort in consistency!

Getting accurate estimates is an area of much frustration and confusion for most project managers, and there are a number of schools of thought on the subject. The ones that fail typically focus on attempting to achieve perfect accuracy, and the ones that typically succeed focus on general probability. Even with good estimates, believers in Parkinson's law will attempt to reduce the timeline in hopes of removing otherwise wasted time. A better strategy comes from providing visibility to the project safety and real work time.

Safety in projects is misplaced – Safety represents the amount of time above the actual estimated duration required to complete the task or deliverable. Estimates in the real world should initially assume that everything on the deliverable goes perfectly, and then safety is placed on top of that value just in case. However, for most projects the safety is actually imbedded in the duration estimate. This means the project manager has no visibility as to how much of the estimate is actual work versus safety. This lack of visibility also means the project manager has no control over how or when the safety is used. To be successful, the project manager must make a choice. Either they must give up on the notion of accurate estimates and use less than two-week-long deliverables and daily tasks defined by many of the agile methodologies, or the project manager must ensure estimates are broken into the components of work and safety. The first choice provides the advantage of smaller mistakes and easier recovery because the mistakes are seen within a day or two, and the second provides the advantage of improved visibility.

Student syndrome – The student syndrome represents an old tenant dealing with human behavior. Since the beginnings of modern society, parents have regularly given their children the same instructions, "You must do your homework and/or chores before you can play." Why is it that regardless of culture, parents make the same demands of their children? It is because over the years parents have learned that when their children do not do their homework or chores first, they either won't get done, they will be done poorly, the children will be up late completing them, or Mom and Dad will end up doing them. This is the student syndrome. It is the tendency to procrastinate with an assumption that there is plenty of time.

In the world of projects, resources put off work because they have other work to do, they perceive the task as easy, or because the resource believes they have plenty of safety built into the estimate and it will all work out. Regardless of the reason, everything is on schedule so long as the key drivers go perfectly, but how often does everything go perfectly? When resources run into issues, the deliverable is guaranteed to be late because all the safety gets used at the beginning. To solve the student syndrome, project managers have two choices. They can either use an agile methodology to place systematic pressure on resources to complete daily tasks and weekly or bimonthly deliverables, or they can take the newly found safety visibility and ensure resources start working on a deliverable as early as possible, using safety only at the end of each task. This requires the project manager to change the way they measure resource performance. Experienced, successful project managers hold resources accountable to starting on time and giving 100 percent effort against the deliverable. If this occurs, the laws of probability take over. The team starts their tasks on time and works as hard as possible. When things happen, as they always do, safety is in place and is allocated to account for the overage. One of the most respected scheduling models to use this concept is critical chain project management.

Based on the theory of constraints originally proposed by Eliyahu Goldratt in his 1984 book *The Goal*, critical chain project management proposes an alternative for defining a schedule baseline. Defining a project's critical chain begins with the same process used to define the critical path. In fact, the definitions of the two terms are very close. Recall, the critical path is the longest chain of dependent tasks, activities, or deliverables with zero slack or float. A delay on any item in the critical path will cause the overall project to be delayed.

The critical chain begins with the same definition. It is the longest chain of dependent tasks, activities, or deliverables with zero slack or float as well. However, it adds one seemingly minor phrase at the end that has a big impact. That phrase is, "taking into account resource constraints." This five-word phrase is designed to deal with a far too common problem called "perfect resourcing." Perfect resourcing occurs whenever a project manager plans the project schedule without considering when the resources are actually available to do their assigned work. In the simplest terms, the project manager assigns a resource to a task or deliverable and just assumes the work actually can start on that date because he or she scheduled it to. Unfortunately, this never works out. Almost every resource has multiple assignments requiring their simultaneous attention. This problem is called "multitasking" and is addressed in a few more paragraphs.

Focusing for now on the critical chain method, it prevents the student syndrome by cutting all estimates and placing a portion of the cut time into a series of buckets called "buffers." These buffers exist in three forms: project buffers, feed buffers, and resource buffers. The buffers represent project safety. The rate at which the team burns through the project buffers versus the project completion rate represents the primary measure of team performance. The goal is to have the two measures closely aligned. Few project managers are familiar with this technique because it requires some significant philosophical changes for most organizations that are often difficult to implement. To learn more about this technique, refer to Goldratt's book *Critical Chain*. It is a short, easy read that is well worth the time.

Lack of performance metrics – Performance metrics provide visibility to the actual results of the project. Understanding where a project is at a deadline or when complete is easy, but when it is the middle of the project, measuring performance is far more difficult. Project managers that do not use quantitative, objective performance metrics deliver a clear message to their resources that results do not matter. Never make this mistake. Use tangible metrics and hold all team members accountable to them. This will also decrease team tension as everyone can see the standards and results. So long as everyone is treated fairly according to the results, the team will adjust their behavior to achieve the desired metric.

Multitasking – Multitasking is the attempt to complete more than one task at a time. This can happen within a single project or when the same resource is assigned to multiple projects occurring at the same time. The ability to multitask is a misnomer when it comes to development because time is a finite resource. To fully understand the impact of multitasking, let us examine a scenario.

Imagine being a project resource who is assigned to three different tasks on three different projects occurring at the same time. For this example, the projects are referred to as Project A, Project B, and Project C. A different project manager manages each project. Each project manager created their project plan without visibility to what the others were doing, and a single resource is responsible for a deliverable on each project. Each of these deliverables has an estimated duration of ten days, and each deliverable is scheduled to begin and end at the same time. How is the resource to manage the work? In the real world, management rarely offers the resource any prioritization for the work, and each project manager instructs the resource that their project must be top priority. Sadly, the resource is left to their own devices to determine the order of the work. If the resource is like most, they will use one of four methods to determine task priority:

- Work on the task from the project manager who is making the most noise
- Work on the first received task
- Work on the task that can be completed the quickest
- Work on the task that appears to offer the most enjoyment

The most common of these is completing work based on the leader making the most noise. This is often the choice because of the pressure these project managers place on the project resource. The other choices assume less external pressure and are therefore less likely. The example assumes the three project managers are reasonable, sympathetic people (probably unrealistic, but do so anyway). The project manager for Project A waits five days before coming to check on progress of their task. When they ask how much of the task is complete, the resource proudly tells them 50 percent. The project manager for Project A leaves satisfied, and the resource is able to get back to work. Unfortunately, five minutes later the project manager for Project B appears at the resource's desk and also wants to know how their task is proceeding. What is the resource going to tell them? They do not want to lie, but the resource has not even started the task. After a few moments of silence, the resource usually responds with something to the effect of, "I'm working on it as fast as I can." With only half the schedule gone, Project B's project manager is uneasy but satisfied for now and leaves the resource to their work. The resource quickly stops working on Project A and begins working on Project B. A slightly less organized project manager manages Project C so it takes until day ten before they appear at the resource's desk, wanting to know how much of their task is complete. Here is where the real trouble begins. Is the resource really going to tell manager C they have not even started? No, if the resource is like most resources they answer, "I am almost done," or "I'm on track," or "I'll get it to you shortly." At this point, the manager for Project C believes the deliverable is around 90 percent complete or otherwise relatively close on day ten of a ten-day deliverable. While not perfect, manager C is satisfied and leaves the resource to forge ahead. The resource immediately drops Project B and begins working on Project C.

On day fifteen, the resource has spent five days on each ten-day deliverable. Each is 50 percent over its scheduled duration, yet all three project managers believe the resource is currently working on their deliverable. The first project manager to come to see the resource is manager A. They are not very happy because the deliverable is already 50 percent over the allotted time. When they ask for a progress report, again they are told that the deliverable is "90% complete and will be completed as fast as humanly possible." Over the next fifteen days, the resource completes the three deliverables, but each one now takes twenty days versus the original forecast of ten. The resource feels incredibly pressured, frustrated, and heading toward burnout. The project managers have lost trust in the resource, and the resource has lost credibility in the organization. No one is happy.

Multitasking does not work. The only solution is to prioritize the work. Imagine if in the above scenario the resource was told that A was the top priority, B was the second, and C was the third priority. When the resource received the three deliverables, they would have been able to successfully manage the expectations of each of the project managers so that project manager A knew they would get their deliverable in ten days, project manager B would get their deliverable in twenty days, and project manager C was going to have to wait until day thirty. Although C is not very happy with this solution, their expectations have been managed, and they can choose to escalate the prioritization to senior management. Furthermore, everyone receives their deliverables faster with the exception of project manager C. The net results include better managed projects and a whole lot less stress.

Managing projects is all about managing people. Managing people is all about driving the desired behaviors. Project managers must battle for the attention of resources from other project or functional managers. Often the challenge is ensuring that the appropriate behaviors are being identified and rewarded quickly. A key attribute of any good leader is their ability to motivate their team members. Team members are best motivated when they can personally identify with the organizational or project goals and objectives. Leaders must understand each of their team members' personal goals and drivers and be able to create appropriate incentives for each resource. Motivation can be broken up into seven different drivers.

- Achievement
- Power
- Affiliation
- Autonomy
- Esteem
- Safety & Security
- Equity

Once an individual's personal motivator is identified, it is possible to create measurements to drive the desired behaviors by focusing on three questions:

- What is the real goal?
- Do the measures reflect the goal?
- What behaviors do the measures entice?

Understanding the real goal is more complicated than it sounds. The question is not about the project at all. It is asking about the goal(s) the project manager has for their team. The easy answer for most project managers is, "I want my team to deliver what they promise when they promise it, and I want them to let me know immediately if there are any issues." Neither of these has anything really to do with the success criteria of the project. They are all about the team culture. For now, assume that getting the team to deliver when they say they will and communicating any issues along with factual results is the real goal. Do the metrics used by most organizations actually reflect that goal? Think about it for a second. Have you ever seen a project where the team achieved all its metrics but the stakeholders were completely unsatisfied with the results? This should be impossible! The achievement of the project's metrics must equal the achievement of the project's success criteria. The two are intrinsically linked. If the project manager, stakeholders, or team find it is possible to achieve the measure and not meet the project's success criteria, it means the team has the wrong metrics. The best way to find the right success metrics is by asking the third question, what behaviors do your metrics entice? The question is all about determining causality. If metrics drive behavior (which only occurs if there are consequences to the achievement and missing of the metrics), then every metric will cause team members to act. The question is, is that the behavior the project needs? If the answer is *yes*, great! Continue moving ahead. However, if the answer is *no*, then the everyone has some work to do, and it is time to select better key performance indicators (KPIs) that truly reflect the unique needs of the project.

There are several basic rules the team must follow for basic measurement.

- Always measure progress against the critical path. The overall project schedule is determined by the longest chain of dependent deliverables, tasks, or activities with zero slack or float. This is the critical path. If the critical path is extended in any way, the project is late. Measuring progress against all the tasks, deliverables, or activities on a project runs the dangerous possibility of overstating progress. Projects with particularly large deliverables are especially susceptible to this risk.
- Avoid subjective measures of progress. The most subjective measure that should be avoided is the percent complete. There are several reasons you should not include such measures:
    - They lead to false reports of completeness.
    - Team members feel negative about the project and other team members.
    - They fail to provide guidance on future progress.
    - The organization will not learn or improve for future projects.

A common way to measure progress and avoid the subjectivity is to use phase gates or milestone management. In this technique, the project manager establishes a series of decision gates throughout the project. Each gate, or milestone, represents a point where the project has completed a deliverable of significance. This methodology provides two key advantages. First, it produces a binary measure of project progress as each gate either has or has not been achieved. Secondly, it enables the organization to more easily stop work on misaligned or unnecessary projects.

When using traditional management, it is difficult to stop bad projects because inertia pushes the continuation of the project even if it has become obvious that the project is ill-conceived or cannot achieve the desired results. It is often difficult for executives or project managers to suggest stopping their own project, as they fear such actions would reflect badly on them. Milestone gate management provides an alternative because it reverses that model. In milestone management, a decision is made to continue the project at each gate or milestone. In most instances, this decision is also accompanied by a physical signature by the responsible authority to continue the project. This overt authorization is the exact opposite of the all-too-common process. In the normal process all the pressure is to not look bad by keeping the project going. In the milestone management process all the pressure is to not sign off on a failing or ill-conceived project.

- Always measure progress against Dempster's Triangle. This means the team must measure progress against the triple constraints of time, cost, and scope/quality. However, such a requirement creates a significant problem. A core element of successful project management is the ability to evaluate the potential trade-offs that must be made among the three constraints. But how can one evaluate the trade-offs of five features against three days and/or $10,000 USD? The answer is you can't! They are entirely different scales. When evaluating the trade-offs with different scales, the evaluation is entirely subjective, meaning 100 different people will provide 100 different answers based on what they think is important. To successfully evaluate the trade-offs the three legs of the triangle must be measured on the same scale. However, when the metrics for the triple constraints are examined, they are anything but similar. Time is measured in hours, days, weeks, or months. Cost is measured in currency. Scope/quality is measured using features or requirements in combination with the question, "Did the customer accept the item?" This does not work. To effectively manage a project, a method must be determined that places all three variables on the same scale.

Earned value is a method for measuring project progress originally developed by the US Department of Defense. It has become increasingly popular because it claims to be able to accurately forecast the final schedule and budget for the project with only 10 to 15 percent of the project completed. Earned value specifically measures the progress of a project against the three legs of the triangle. Earned value measures the progress of cost, time, and scope by converting each of the legs into the local currency. It then converts the three legs of the triangle into three questions:

- How much of the budget has been spent (cost)?
- How many of the project deliverables have been accomplished or completed (scope)?
- How long did it take to obtain these results (time)?

In addition to placing all three legs of the triple constraints on the same scale, earned value has another significant advantage over other measurement techniques. Earned value has the ability to focus on the future of the project as opposed to its past.

Many people have heard of the earned value management system (EVMS) or the earned value technique (EVT), and in most cases they have some significant misperceptions about the technique. When first discussing the technique, many people comment that earned value won't work on their project because it is either too difficult to use, requires too much overhead, or simply won't add any value. Others comment that they are using Microsoft Project®, which does not support proper earned value reporting. None of these statements are true. In fact, almost every project can benefit from using earned value to more accurately report progress, even projects using agile methodologies, such as Scrum or extreme programming. The requirements to make effective use of EVT are actually very simple and are things that have already been discussed in this course. These include:

- A discrete scope of work, typically expressed in work packages (a WBS).
- A time frame to complete each work package (a schedule).
- Authorized project resources and budget (a budget).
- Team members must accurately report their time and cost status (timesheets).
- The project must have tasks, activities, or milestones with vertical traceability (the roll-up seen from smaller items to major ones in a WBS).
- There must be an established relationship among all dependent tasks (a network diagram such as those used in PDM).
- Project performance is measured at the very bottom of the WBS. This measurement unit is called the control account plan or CAP.

Before beginning to calculate earned value for any project, there are a series of terms that need to be understood. These terms will provide the tools necessary to create the calculations used in earned value. By understanding each of these key terms and values, it is possible to manage all three sides of the project triangle. The terms include:

- **Actual Cost (AC)** – This is the easiest of the variables to understand. The actual cost is simply the amount of money that has really been spent on the project. In older definitions of earned value, this was called the actual cost of work performed or the ACWP.
- **Earned Value (EV)** – This is the most difficult of the earned value terms to learn and comprehend. The earned value represents the amount of scope that has been produced. It is defined by taking the definitive budget estimate and saving a baseline before any work on the project begins. The total initial amount budgeted for each work package also represents the value of each regardless of how much it really costs to produce. In previous versions of EVT, the earned value was referred to as the budgeted cost of work performed or BCWP.
- **Planned Value (PV)** – Another word for the planned value is the project budget. This is the amount of money you planned on spending in a given period or for the entire project. In previous versions of earned value, this was called the budgeted cost of work scheduled or BCWS.

Each of these three variables may be discussed in two contexts. First, they are referred to as EV, PV, or AC, which represents the current period. Secondly, the terms might appear with a superscript "C." When the superscript "C" appears, the term is referencing the entire project to date, or cumulative. Hence, the three major terms would appear as follows with the superscript "C": EV^C, PV^C, or AC^C. There are several other locations where the superscript "C" might appear, but in each case it means the same thing.

With these three variables in hand, it is time to measure the progress of a project. Measurement is done using these three variables in a series of basic calculations. The easiest way for many to learn these calculations is by memorizing a simple visualization that positions the three main variables described above in alphabetical order and then calculating four new values from there. Within these four new variables are two groups that represent two of the three triple constraints: cost and schedule. Each group is made up of a variance, which is the real currency amount ahead or behind and an index that provides a percentage indicator. In the real world, the index is often the more valuable of the two.

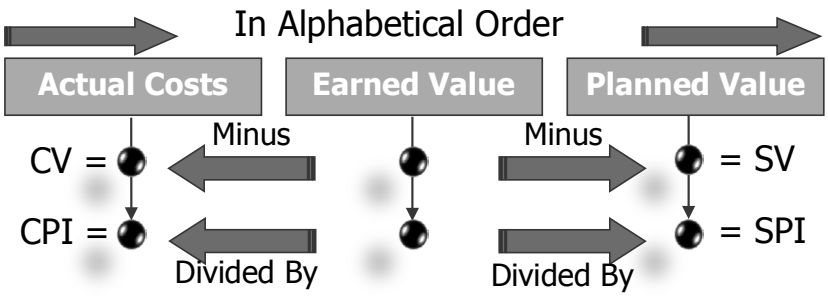


Figure 15: Basic EVMS Calculations

Notice that the three variables previously discussed (actual costs, earned value, and planned value) appear in alphabetical order. On the left-hand side of figure 15 are two calculated variables. Both of these variables are cost variables, which is understood by the fact that both variables on the far left begin with the letter "C." The two variables on the far right are both schedule variables as they begin with "S." Remember, the technique being studied is called earned value. Therefore, it should be no surprise that everything on the diagram begins in the middle with the variable earned value (EV) and calculates outward. To calculate the cost variance (CV) take the earned value (EV) and subtract the actual costs (AC). To calculate the schedule variance (SV) take the earned value (EV) and subtract the planned value (PV).

The calculations for the cost performance index (CPI) and schedule performance index (SPI) are equally simple. To calculate the cost performance index (CPI) take the earned value (EV) and divide it by the actual costs (AC). To calculate the schedule performance index (SPI) take the earned value (EV) and divide it by the planned value (PV).

- Cost Variance (CV) = EV – AC
- Schedule Variance (SV) = EV – PV
- Cost Performance Index (CPI) = EV / AC
- Schedule Performance Index (SPI) = EV / PV

The next step in the process is understanding the significance of the CV, SV, CPI, and SPI. Reading these values is actually very simple as it requires only that one look for ones and zeros. If the cost variance (CV) is less than zero, and/or the cost performance index (CPI) is less than one, then the project is over budget. If these values are equal to one and/or zero, then the project is right on its projected budget; if they are greater than one and/or zero, the project is under budget. If the schedule variance (SV) is less than zero, and/or the schedule performance index (SPI) is less than one, then the project is behind schedule. If these values are equal to one and/or zero, then the project is right on schedule; if they are greater than one and/or zero, the project is ahead of schedule. The cost performance index (CPI) and schedule performance index (SPI) tells the user a whole lot more. Both statistics can tell how much over or under budget and schedule the project is. In most cases, these two statistics will be decimal values. Subtracting these values from one will provide the percentage over budget or behind schedule. However, neither the CPI nor SPI will by themselves tell when the project will finish or how much it will cost. When discussing when the project is going to conclude, most project managers have two key questions:

- How much more will it take?
- How much will we have spent in total?

Unfortunately, there is not total agreement on the best formulas required to answer these questions. In previous editions of the PMBOK® Guide, project managers were taught to use three formulas to determine how much total time and money would be required. These formulas included:

- Schedule: Original Schedule / SPI
- Cost Minimum: Original Budget / CPI
- Cost Maximum: Original Budget / (CPI * SPI)

This last equation generates a key statistic called the critical ratio. The critical ratio = CPI * SPI.

More recent handling of earned value, including the 2012 PMBOK Guide®, makes these calculations more complex by focusing on two primary values (ETC and EAC) and a schedule value:

- **Estimate to Complete (ETC)** – This value represents the additional money required to complete the project (How much more?). PMI® endorses three techniques for calculating this value. In two of these calculations, the variable BAC is used. This is the budget at completion and represents the total project budget.

  1. Assume the old estimate was bad: Simply create an entirely new estimate from scratch.
  2. Assume the variances to date are not typical and not expected to continue:

     ETC = BAC – EV^C

     The value BAC – EV^C is seen in several other instances. It is a mathematical expression representing the work that still must be accomplished. This formula assumes the team will catch up and the things that have caused cost overruns will not remain. Do not assume this assumption to be true. The project manager is responsible for carefully testing this belief.

  3. Assume the variances are typical and will continue:

     ETC = (BAC – EV^C) / CPI^C

This formula is usually the most accurate because it argues the things that have caused delays to date will likely continue to cause delays.

- **Estimate at Completion (EAC)** – This value represents the total amount of money to be spent on the project. This is all the money already spent plus any additional money required to complete the project. PMI® endorses three techniques for calculating this value.

1. Assume the old estimate was faulty and create an entirely new estimate for the project. This concept is reflected in the formula:

   $EAC = AC^C + ETC$

2. Assume the old estimate was accurate and that the variances experienced to date are atypical and not expected to continue. This is a very popular method but usually unrealistic. Its formula is:

   $EAC = AC^C + (BAC - EV^C)$

3. The final method for calculating the EAC assumes that the original estimate was accurate and the variances that have been experienced will continue at the same pace. This is usually the most accurate method of forecasting. The formula for this method is:

   $EAC = AC^C + ((BAC - EV^C) / CPI)$

- **Schedule Completion** – This is an estimate based on the current project performance of how long the project will take to complete.

  Schedule Estimate / SPI

Using both the ETC and EAC formulas will help you more accurately forecast the budget and schedule your project. However, there is one last piece of the puzzle that is necessary to get the most from the earned value technique. That tool is trend analysis. Fortunately, doing trend analysis within the EVT is very easy and does not require the use of any formulas!

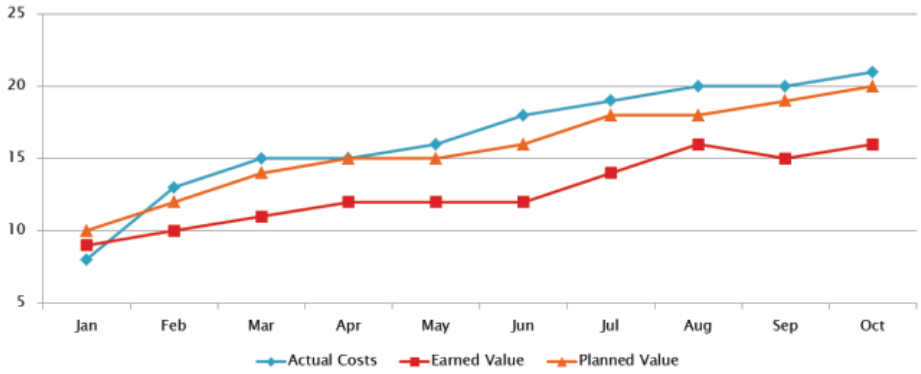


Figure 16: Earned Value Chart

To provide trend analysis using EVT on your project, all you have to do is regularly track the three core earned value variables (AC, EV and PV) over time and then chart these values using a line graph. Figure 16 shows an example of a basic Earned Value plot. If the project is on budget and schedule, then the three lines will appear directly on top of each other. When the lines begin to separate, the project is no longer delivering exactly as promised. To bring the project back in line with its targets, the project manager must not only bring the three lines back on top of each other, but they must also account for the total area where there is a gap between the lines. Therefore, successful reading of an EVT trend chart requires the project manager to look for gaps in the three lines and for inconsistencies or places where the values jump significantly up or down as these will indicate major issues or opportunities within the project.

Earned value charts can be created using two different methods. In the method shown in figure 16, the values are plotted using each reporting period independently. The alternative method for plotting earned value graphs the cumulative values of the three primary variables. This type of plot produces a graph with diagonal lines that tend to be much closer than when plotting the periods separately. This fact often makes them more difficult to evaluate.

9 Change Management

One of the areas of greatest difficulty for most project managers is managing change. Change comes in many different forms and in many different areas. Within the PMBOK Guide®, change is the core focus of the integrated change control process. The integrated change control process is part of the "Integration Management Knowledge Area." This process specifically references managing change in each of the eight other knowledge areas. Regardless of the knowledge area, change creates both many challenges and many opportunities for project managers. These opportunities include:

- Defining and instilling new values, attitudes, norms, and behaviors within an organization that support new ways of doing work and overcoming resistance to change
- Building consensus among customers and stakeholders on specific changes designed to best meet their needs
- Planning, testing, and implementing all aspects of the transition from one organizational structure or business process to another

Although each of the nine knowledge areas offers a unique opportunity for change on a project, the most common area of difficulty is scope change management. Therefore, scope change will be the primary focus of this chapter. As we begin to uncover what change is and how to manage it properly, we need to dispel some common myths about change.

- **This too will pass in time** – Change is a part of the corporate world, and if the company does not change, then it risks the possibility of becoming extinct.
- **Not my job** – People are either part of the solution or part of the problem.
- **I do not have to change** – It is absolutely true, but if people are unwilling to change, they will likely be replaced.
- **These changes don't affect me** – Change affects everyone. People need to analyze how the change will impact their work environment.
- **This is the way we have always done it** – Change and innovation go hand in hand. If organizations don't innovate and adapt, they become outdated.
- **Management never tells us anything that is going to happen** – Are you listening to what is being said? Are the right questions being asked?
- **Management doesn't care about us** – They do care. That's why management is making the changes, to ensure that the business survives.

Perhaps the biggest myth surrounding change is the belief that people generally resist change. The fact is most people voluntarily change quite often. To prove this point answer this series of questions:

- Have you ever voluntarily moved to a new city?
- Have you ever voluntarily taken a new job?
- Have you ever voluntarily gotten married or divorced?
- Have you ever voluntarily had children?

If you are like most people, you answered *yes* to at least one of these questions, and each of these questions represents a significant life change. People do in fact change often, and in many cases, they change quite significantly. So if people do not resist change, what do they resist?

Most people have had the experience of having a new boss come into their organization who wants to quickly change everything. In most instances, the manager fails because few people in the organization are willing to be pushed into the changes, even if the resources recognize the change as positive. How does a project manager get people to accept the changes that are needed to execute a project successfully?

The answer to this question is both very simple and infinitely complex. To get people to change willingly they must believe in the change. Often this is referred to as "buy-in." However, the use of this term is often a sure sign that the change effort will fail. When someone states they are looking to obtain "buy-in," they are saying they want to get the rest of the organization to believe that their idea is the correct path. Simply put, they are selling their idea. The problem with selling an idea is that it is often very easy for the buyer to walk away when the road becomes difficult. The buyers do not have enough commitment to the idea. For any effort to succeed the entire team must be completely committed to its success. Anything less and the project will likely fail at the first sign of trouble. To succeed, project managers do not need buy-in – they require ownership!

Change is inevitable within a project. Every project will be faced with scope and requirements changes. When dealing with change, communication channels must be kept open with all team members and stakeholders. This will enable the project manager to better communicate the impacts of the change to all the appropriate stakeholders. Remember, every change impacts the triangle, and the triangle should always be the focus. Project sponsors must accept these impacts before the changes are approved. By taking a systematic approach to implementing change, project managers can be more successful.

The four key factors for success when implementing change within an organization are:

- **Pressure for change** – Demonstrated senior management commitment is essential.
- **A clear, shared vision** – You must take everyone with you. This is a shared agenda that benefits the whole organization.
- **Capacity for change** – You need to provide the resources necessary to implement the change.
- **Action** – Plan, do, check, act, and keep communication channels open.

There must be a reason for change. Once that need for change is identified and the decision to proceed has been made, it must be communicated to the entire team.

Pressure for change often comes from senior management, but it also may come from customers, clients, or from a regulatory agency. Regardless of where the original pressure came from, management commitment and drive for change is essential if momentum is to be maintained for effective implementation by the project team.

Once a change is requested and approved, it is necessary that all team members understand the reasons and rationale for the change within the project. This understanding will enable each of the resources to have a clear, shared vision for what needs to be done within the project. It also requires the team to revisit parts of the project that were previously deemed complete. The capacity for change addresses the resources, technology, equipment, and money necessary to implement change. However, it is not enough to merely have the capacity for change. Successful project managers identify the resources required to effect the change before proceeding and make sure they are provided.

Having the other factors in place, the planned change must be implemented. Keeping up momentum is what matters here, and implementing the plan, do, check, and act management methodology is essential to maintaining the effectiveness and appropriateness of the change. Good monitoring and analysis of the resulting data is essential. Make sure you continue to keep employees informed of progress and openly communicate throughout the implementation process. These principles are the foundation of scope change management.

The processes used for scope change management are defined differently within each organization; however, a proactive approach to dealing with scope change is at the core of effective management. For an organization, it can mean defining and implementing procedures or technologies to allow the organization to deal with the scope changes in the business environment. Effective scope change management requires that you consistently employ six basic principles:

- The organization must employ techniques and tools that are designed to manage and direct scope change while not inhibiting change.
- Every change in scope must be traceable to a work package in the WBS.
- The project team and system users must be notified of all scope changes that will impact them.
- Senior management and key stakeholders must be notified of all scope changes and accept the impacts of those changes.
- The project team must always include the impacts of both making and not making the change when having any discussions with stakeholders.
- Always have a process and follow it.

The first of the above principles is often the most difficult to implement because of overzealous project management. This usually occurs when project managers who are excellent refiners lose sight of the bigger picture. The processes used to manage scope change must not be so restrictive as to prevent people from using your process. When the change management process is so restrictive as to prevent changes or is overly time consuming, stakeholders will simply ignore the process. This is the exact opposite of the desired behavior. For success, it is key that everyone involved in the project, including the project manager, follow the scope change management process.

The second principle is that every scope change must be traceable to a deliverable or work package on the work breakdown structure. This principle is important because it helps to ensure ownership of and commitment to the scope change. This occurs because each work package is owned by one and only one person. The changes assigned to a particular work package are also owned by the resource who owns the work package. However, it is important to recognize that sometimes scope changes involve the addition or deletion of work packages. In these instances the ownership rule still applies.

The third principle of scope change management can be extremely difficult. The third principle requires the project manager to notify the appropriate project team members and end users of the project of any impacts to them when a scope change is made. Recognizing these situations is only possible when the second principle is followed and every change is tied to a work package. Following the third principle will ensure that those doing the work of the project and those who will use the result of the project are not surprised.

The fourth principle for scope change management requires the project manager to notify both senior management (especially the project sponsor) and key stakeholders of all scope changes. In most situations, these people should also be significantly involved in the determination of whether or not to proceed with any scope changes. However, this may not always possible. In these limited situations it is key to provide accurate, timely information.

The fifth principle requires the project manager and the project team to clearly communicate the impacts of both completing and not completing the change. This requires the project manager and project team to focus on two legs of the triple constraints: time and costs. Additionally, the project manager and team must examine the impacts to any other deliverables and provide that information as well. The key element of this principle is that neither the project team nor the project manager ever accepts the impacts for doing the change as rarely will they have the authority for such decisions. In most cases, the project manager should provide guidance and/or recommendations.

The final principle for effective scope change management is that the project manager and the project team always have and follow a formally documented change management process. Whenever the project manager and/or the project team ever fail to follow their own process, they deliver a clear message that the process is not important, and soon no one else will be following the process either.

Implementing effective scope change management can be a difficult process, but it does not have to be. The key to a successful implementation is to keep it simple. Complicated processes usually lead to failure. Therefore, it is key that the process used is not only simple but easy to understand and follow. To ensure the scope change control process meets these standards it is important that the focus is more on answering some basic questions as opposed to creating an extremely formal process. To create a robust process, answer the following questions:

- Who can initiate a change?
- How is the request documented?
- How are the impacts measured?
- Who approves the change and accepts the impacts?
- Have you followed your own process?

As these questions are answered, remember to keep things simple. Avoid complexity whenever possible. Once these questions are answered, the basic scope change process will take shape. Central to this process is the change request form.

The change request form enables you to get all the relevant information about the change and evaluate its potential impact on the project. This form will also create a historical record of changes that have been requested and the reasons why the change was adopted or not adopted. All the information collected should be stored within a database to enable you to better analyze and track the changes requested. This form should never be larger than half an 8.5" × 11" piece of paper and should contain a majority of open space. The form should ask the requestor of the change for four pieces of information:

- The requestor's name
- The date of the request
- The desired change
- A justification for the request

That is all the information that should be required from the requestor. However, for projects where the project manager does not know all the stakeholders, it might be necessary to add the requestor's title. Once the requestor has completed their portion of the change request form, the project manager must evaluate the request and give it to the resource who owns the applicable work packages or who would own the newly created work packages so that a few more questions may be answered:

- How many hours of work would be involved in completing the change?
- How would the change impact the existing work package(s)?

Once this information is obtained, the project manager must then evaluate this information and answer two final questions:

- What would be the estimated cost of both implementing and not implementing the change?
- What would be the overall impact to the project of doing and not doing the change?

Once these questions have been answered, someone must accept responsibility for the choice to implement the change. Be extremely careful. Usually this should not be the project manager, but the project sponsor or other key stakeholders. However, every project is different, and it is imperative that the established decision-making process be followed. The end of this process occurs when a signed authorization to either do or not do the change is received.

In some instances, a change control board (CCB) or a change review board (CRB) can be an effective part of this process. A CCB or CRB is a committee with the authority to authorize project changes. In most cases this board should be chaired by the project manager as they have ultimate responsibility for the delivery of the project. Additionally, the CCB or CRB should be made up of an odd number of people because democratic voting is used to approve any changes. Finally, always keep the number of members to between three and nine as any more than this will make it very difficult for the project manager to get the entire committee together on a regular basis.

Once the change management process is in place, it is time to get out there and produce great business results that truly further the organization's strategy.

Figure 1: Standish Group, Jim Johnson Chair, Chaos Chronicles, 2013. 8
Figure 2: Standish Group, Jim Johnson Chair, Chaos Chronicles, 2013. 8
Figure 3: Chaos Manifesto, 2013 p. 3. 9
Figure 4: Frequency of Channel Usage on Global Project 22
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1. (Project Management Institute Jan 1, 2001)