

Project Management Basics

Project Management Basics

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KIRKWOOD COMMUNITY COLLEGE



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Introduction

SHARON BLANCHARD

Welcome to the Project Management Basics book!

My name is Sharon Blanchard and I am a faculty member at Kirkwood Community College in Cedar Rapids, Iowa. I teach multiple Project Management Courses and this book was created with intentions to use in Project Management Basics (MGT-121).

This book is a collection of YouTube videos, website content, Open Educational Resources (OERs) from other authored textbooks on Pressbooks as well as content that I originally created. Content was curated with the intention to align with the 7th Edition of the Project Management Body of Knowledge (PMBOK) by the Project Management Institute's (PMI). I hope you find it useful in your learning journey with the “predictive or waterfall” method of Project Management.

To other readers:

The primary purpose of this text is to provide an open source textbook that covers most project management courses. The material in the textbook was obtained from a variety of sources. I expect, with time, the book will grow with more information and more examples.

I welcome any feedback that would improve the book. If you would like to add a section to the book, please let me know.

Attribution

The majority of this text has been adapted from:

1. Essentials of Project Management. Adam Farag, PhD in partnership with the OER Design Studio and the Library Learning Commons at Fanshawe College in London, Ontario.
2. Project Management – 2nd Edition. By Adrienne Watt and Watt, Adrienne. <https://opentextbc.ca/projectmanagement/>
3. Managing Project Costs, Risks, Quality and Procurement: The source URL was <https://pressbooks.bccampus.ca/costsrisksqualityprocurement>. Author: Florence Daddey. License: Managing Project Costs, Risks, Quality and Procurement Copyright © by Florence Daddey. All Rights Reserved.

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Collaborators

This project was a collaboration between the author and the team in the OER Design Studio at Fanshawe. The following staff and students were involved in the creation of this project:

- Samantha Diamond – *Copyeditor*
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About This Book

This textbook is an adaptation of other open educational resources (OER), but specifically designed for students at an introductory level of project management (PM). The purpose of this textbook is to provide a free resource that is dedicated to college's students and as a gateway to understanding PM principals. It consists of; the text body which is structured into fourteen chapters to be delivered over a fourteen-week semester, where each chapter discusses the concept of one topic related to PM. The chapters themselves cover the definition of PM and its types, as well as differentiating PM from common activities. It then describes PM from an organizational perspective including the effect of culture and structure on PM. The five steps of the PM processes are then discussed individually in different chapters, in the addition to sub-processes such as budgeting, scheduling, procurement and communication. Both project manager and project team are introduced separately so that their characteristics and relationship are appreciated. Thereafter, in the last chapter, Agile PM is presented as a contrast to conventional PM.

At the end of each chapter, a business case is presented to demonstrate the concept in real-life scenarios allowing the instructor to present the topic concept in a real business world context, and hence the relation between the concept and application is clear. The business case is also included to provide an opportunity for group discussions and develop peer-to-peer interactions and collaboration. Following the business case, a set of interactive exercises, designed with H5P, are included for a quick assessment of the understanding of the topic. In support of this textbook, a set of slides for each chapter is prepared for online/in-class teaching. Therefore, for the best utilization of the book, the instructor should employ all elements of this OER in order to reach the course learning outcomes.

For the Student

Each chapter in this text begins with a list of the relevant learning objectives and ends with a case study. Each chapter also includes interactive knowledge check questions.

For the Instructor

Please share your adoption, and any feedback you have about the book with us at oer@fanshawec.ca

The following resources are available:

- **Interactive exercises** for students to check their knowledge are provided at the end of each chapter.
- **Slide decks** can be found under ancillary resources in the appendix.
- **Video resources** have been embedded in the text where applicable.

PART I

MODULE 1: INTRODUCTION TO PROJECT MANAGEMENT

Learning Objectives

By the end of this chapter, you should be able to:

1. Define the characteristics of a project.
2. Compare the difference between traditional and Agile project management.
3. Describe how program management differs from project management.
4. List the functions of a Project Management Office and Project Portfolio Management.
5. Explain the difference between a Project Lifecycle and the PMI Project Processes.
6. Explain the three broad categories of projects.

There is no greater example of the art and science of project management (PM) than those demonstrated in the building of the Pyramids of Egypt. Since then, builders and engineers have applied specific processes systematically which have evolved into PM.

Today, in every field of work, PM is an essential practice to achieve project success. The objective, in general is to establish and deliver the customer objectives in an organized and detailed manner. Whether the businesses is in production, construction or service delivery, the need for planning and carrying out a project requires clearly-defined processes.

While the general management function may include many tasks, PM is specifically oriented towards processes and requires a specific set of tools and skills. When PM is performed correctly, organizations gain greatly. PM can reduce risk and improve the likelihood of success. It approaches tasks in an organized, detailed, and accountable way. Even when organizations have limited resources and a small chance of success, PM experts can help in leading through recessions and economic uncertainty, and ensure future strategic goals are met. Therefore, performing PM requires dedicated individuals with good discipline who understand the processes, and are able to follow through to completion. Good project managers keep the project on track and ensure the alignment of project objectives within the strategic objectives of the organization.

The starting point in discussing how projects should be properly managed is to first understand what a project is and, just as importantly, what it is not.

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I. Project Management (PM) Definition

Project

A project has distinctive attributes that distinguish it from ongoing work or business operations. Specifically, projects are temporary in nature. Therefore, they are not an everyday business process but they are unique and have definitive start dates and end dates. This characteristic is important because a large part of the project effort is dedicated to ensuring that the project is completed at the appointed time. To do this, schedules are created showing when tasks should begin and end. Projects can last minutes, hours, days, weeks, months, or years.

Projects exist to bring about a product or service that has not existed before. In this sense, a project is unique. Unique means that this is new; it has never been done before. Maybe it's been done in a very similar fashion before but never exactly in this way. For example, although the Ford Motor Company is in the business of designing and assembling many kinds of vehicles, each model that Ford designs and produces can be considered a unique project. The models differ from each other in their features and are marketed to people with various needs. An SUV serves a different purpose and clientele than a luxury car. The design and marketing of these two models are unique projects. However, the actual assembly of the cars is considered an operation (i.e., a repetitive process that is followed for most makes and models).

Program

When a group of projects are arranged towards achieving certain goal this said to be a program. It is collection of small projects to deliver or achieve certain higher goal. The simplest example for program is the degree program in a school or college, where multiple courses correspond to the projects. In this a program will be completed when all projects are completed and the certificate/degree is awarded.

Operation

In contrast with projects, operations are ongoing and repetitive. They involve work that is continuous without an ending date and with the same processes repeated to produce the same results. The purpose of operations is to keep the organization functioning while the purpose of a project is to meet its goals and objectives. Therefore, operations are ongoing while projects are unique and temporary.

A project is completed when its goals and objectives are accomplished. It is these goals that drive the project, and all the planning and implementation efforts undertaken to achieve them. Sometimes projects end when it is determined that the goals and objectives cannot be accomplished or when the product or service of the project is no longer needed and the project is cancelled.

Definition of a Project

There are many written definitions of a project. All of them contain the key elements described above. However, for those looking for a formal definition of a project, the Project Management Institute

(PMI) defines a project as a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists.

The term “project” is used several ways in popular culture, from describing everyday tasks (planting a garden, hanging a picture, running errands) to large scale enterprises (building a house, constructing a new highway). However, when professional project managers talk about projects, they use a narrower definition. Let's start out with the six defining characteristics of a project. Just about every book, organization, or standards body in the project management field agrees that a project:

1. is a temporary endeavor, with a defined start and end.
2. has a specific objective.
3. has customers or stakeholders.
4. has constraints, such as time, cost and scope.
5. has measures for success.
6. includes some amount of uncertainty.

Watch the video: What is a Project for more information on how these six aspects help define what a project is and is not.



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here: <https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=149#oembed-1>

Operations vs. Projects

Projects are different from ongoing operations, even though some techniques (such as network diagramming) overlap. Project management addresses temporary endeavors, with a start and end date, while operations management focuses on improving ongoing operations. For example, constructing a new factory is a project, while producing bicycle tires in that factory is an operation. This textbook concentrates on traditional project management techniques. Adaptations related to Agile project management, which is often used for software development, are mentioned along the way, but Agile is not a main topic in this chapter. It is discussed in chapter 14.

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2. Triple Constraints



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YouTube Video: Triple Constraints Of Project Management | Iron Triangle Explained | Tips For Project Management by Kandis Porter

Triple Constraint

You may have heard of the term “triple constraint,” which traditionally consisted of only **time**, **cost**, and **scope**. These are the primary competing project constraints that you have to be most aware of. The triple constraint is illustrated in the form of a triangle to visualize the project work and see the relationship between the scope/quality, schedule/time, and cost/resource (Figures 1-2 and 2.2). In this triangle, each side represents one of the constraints (or related constraints) wherein any changes to any one side cause a change in the other sides. The best projects have a perfectly balanced triangle. Maintaining this balance is difficult because projects are prone to change.

Your project may have additional constraints that you must face, and as the project manager, you have to balance the needs of these constraints against the needs of the stakeholders and your project goals. For instance, if your sponsor wants to add functionality to the original scope, you will very likely need more money to finish the

project. On the other hand, if they cut the budget, you will have to reduce the quality of your scope. Further, and if you don't get the appropriate resources to work on your project tasks, you will have to extend your schedule because the resources you have take much longer to finish the work.

For example, if scope increases, cost and time may increase disproportionately. Alternatively, if the amount of money you have for your project decreases, you may be able to do as much, but your time may increase.

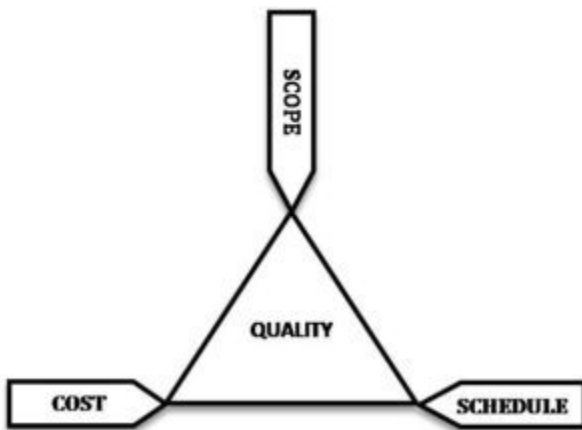


Figure 2.2: A schematic of the triple constraint triangle.

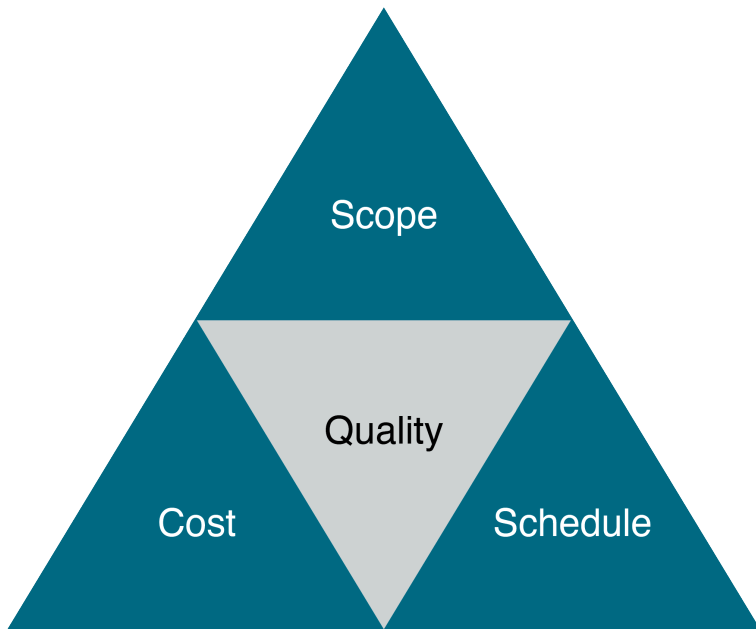


Figure 1-2: The Constraint Triangle.

In this triangle, each side represents one of the constraints (or related constraints) wherein any changes to any one side cause a change in the other sides. The best projects have a perfectly balanced triangle. Maintaining this balance is difficult because projects are prone to change. For example, if scope increases, cost and time may increase disproportionately. Alternatively, if the amount of money you have for your project decreases, you may be able to do as much, but your time may increase.

You get the idea; the **constraints are all dependent on each other**. Think of all of these constraints as the classic carnival game of Whac-a-mole (Figure 2.3). Each time you try to push one mole back in the hole, another one pops out. The best advice is to rely on your project team to keep these moles in place.



Figure 2.3: Whac-a-mole.

The dynamic trade-offs between the project constraint values have been humorously and accurately described in Figure 2.5.

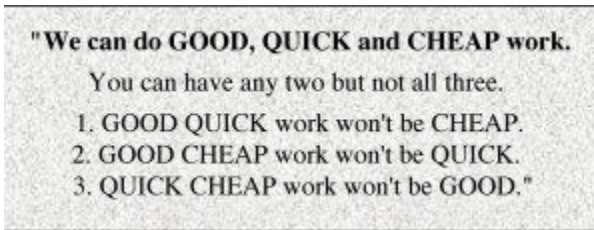
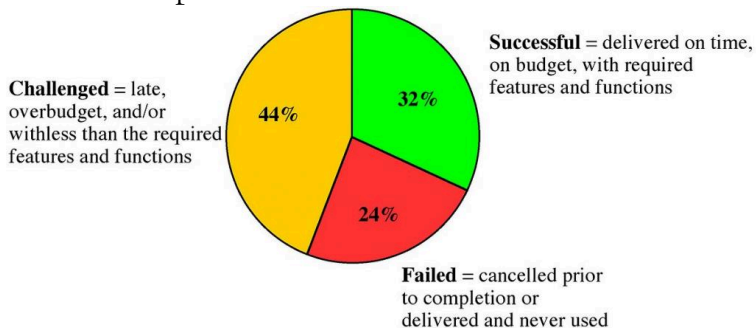


Figure 2.5: Good, Quick, Cheap: Choose two. A sign seen at an automotive repair shop. [Image Description]

3. Project Management Overview

Success Rate of Projects

Figure 2.1: Summary of 2009 Standish Group CHAOS report.



Jim Johnson, chairman of the Standish Group, has stated that “this year’s results show a marked decrease in project success rates, with **32%** of all projects **succeeding** which are delivered on time, on budget, with required features and functions, **44%** were **challenged**-which are late, over budget, and/or with less than the required features and functions and **24%** **failed** which are cancelled prior to completion or delivered and never used.”

When are companies going to stop wasting billions of dollars on failed projects? The vast majority of this waste is completely avoidable: simply get the right business needs (requirements) understood early in the process and ensure that project

management techniques are applied and followed, and the project activities are monitored.

Applying good project management discipline is the way to help reduce the risks. Having good project management skills does not completely eliminate problems, risks, or surprises. The value of good project management is that you have standard processes in place to deal with all contingencies.

Project management is the application of knowledge, skills, tools, and techniques applied to project activities in order to meet the project requirements. **Project management** is a process that includes planning, putting the project plan into action, and measuring progress and performance.

Managing a project includes identifying your project's requirements and writing down what everyone needs from the project. What are the objectives for your project? When everyone understands the goal, it's much easier to keep them all on the right path. Make sure you set goals that everyone agrees on to avoid team conflicts later on. Understanding and addressing the needs of everyone affected by the project means the end result of your project is far more likely to satisfy your stakeholders. Last but not least, as project manager, you will also be balancing the many competing project constraints.

On any project, you will have a number of project constraints that are competing for your attention. They are cost, scope, quality, risk, resources, and time.

- **Cost** is the budget approved for the project including all necessary expenses needed to deliver the project. Within organizations, project managers have to balance between not running out of money and not underspending because many projects receive funds or grants that have contract clauses with a “use it or lose it” approach to project funds. Poorly executed budget plans can result in a last-minute rush to spend the allocated funds. For virtually all projects, cost is ultimately a limiting constraint; few projects can go over

budget without eventually requiring a corrective action.

- **Scope** is what the project is trying to achieve. It entails all the work involved in delivering the project outcomes and the processes used to produce them. It is the reason and the purpose of the project.
- **Quality** is a combination of the standards and criteria to which the project's products must be delivered for them to perform effectively. The product must perform to provide the functionality expected, solve the identified problem, and deliver the benefit and value expected. It must also meet other performance requirements, or service levels, such as availability, reliability, and maintainability, and have acceptable finish and polish. Quality on a project is controlled through quality assurance (QA), which is the process of evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.
- **Risk** is defined by potential external events that will have a negative impact on your project if they occur. Risk refers to the combination of the probability the event will occur and the impact on the project if the event occurs. If the combination of the probability of the occurrence and the impact on the project is too high, you should identify the potential event as a risk and put a proactive plan in place to manage the risk.
- **Resources** are required to carry out the project tasks. They can be people, equipment, facilities, funding, or anything else capable of definition (usually other than labour) required for the completion of a project activity.
- **Time** is defined as the time to complete the project. Time is often the most frequent project oversight in developing projects. This is reflected in missed deadlines and incomplete deliverables. Proper control of the schedule requires the careful identification of tasks to be performed and accurate estimations of their durations, the sequence in which they are going to be done, and how people and other resources are to

be allocated. Any schedule should take into account vacations and holidays.

Project example

Here is an example of a project that cut quality because the project costs were fixed. The P-36 oil platform (Figure 1-3) was the largest floating production platform in the world capable of processing 180,000 barrels of oil per day and 5.2 million cubic meters of gas per day. Located in the Roncador Field, Campos Basin, Brazil, the P-36 was operated by Petrobras (Roncador Oil Rig and gas field project, 2021).



Figure 1-3: The Petrobras P-36 oil platform. P36 No 010 by Richard Collinson used under CC-BY-ND license.

Video Explanations:

What is Project Management? – Zoho Projects



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What is Project Management by the Association for Project Management

In this video you will learn:

- What is project management?
- When do we use project management?
- Why do we use project management?

To learn more, visit us at <https://www.apm.org.uk/>



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Historic Figures

Could the Great Wall of China, the pyramids, or Stonehenge have been built without project management? It is possible to say that the concept of project management has been around since the beginning of history. It has enabled leaders to plan bold and massive projects and manage funding, materials, and labor within a designated time frame.

In late 19th century, in the United States, large-scale government

projects were the impetus for making important decisions that became the basis for project management methodology such as the transcontinental railroad, which began construction in the 1860s. Suddenly, business leaders found themselves faced with the daunting task of organizing the manual labor of thousands of workers and the processing and assembly of unprecedented quantities of raw material.

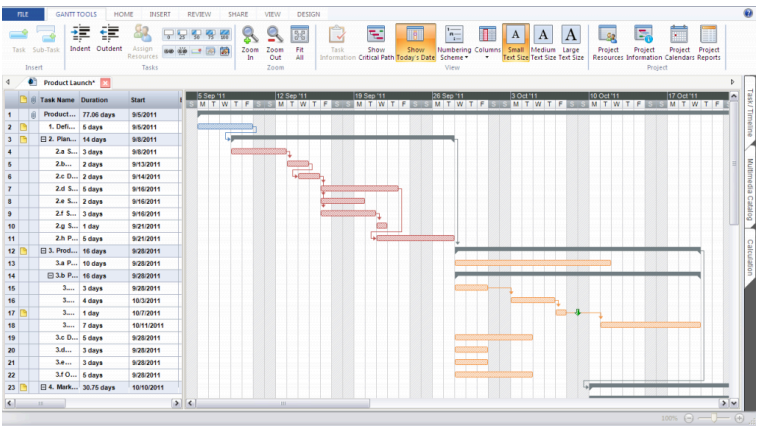


Figure 1.3: MindView Gantt Chart.

Henry Gantt, studied in great detail the order of operations in work and is most famous for developing the Gantt chart in the 1910s. A Gantt chart (Figure 1.3) is a popular type of bar chart that illustrates a project schedule and has become a common technique for representing the phases and activities of a project so they can be understood by a wide audience. Although now a common charting technique, Gantt charts were considered revolutionary at the time they were introduced. Gantt charts were employed on major infrastructure projects in the United States including the Hoover Dam and the interstate highway system and are still accepted today as important tools in project management.

By the mid-20th century, projects were managed on an ad hoc basis using mostly Gantt charts and informal techniques and tools. During that time, the Manhattan Project was initiated and its complexity was only possible because of project management methods. The Manhattan Project was the code name given to the Allied effort to develop the first nuclear weapons during World War II. It involved over 30 different project sites in the United States and Canada, and thousands of personnel from the United States, Canada, and the U.K. Born out of a small research program that began in 1939, the Manhattan Project would eventually employ 130,000 people, cost a total of nearly US\$2 billion, and result in the creation of multiple production and research sites operated in secret. The project succeeded in developing and detonating three nuclear weapons in 1945.

The 1950s marked the beginning of the modern project management era. Two mathematical project-scheduling models were developed.

The program evaluation and review technique (PERT) was developed by Booz-Allen and Hamilton as part of the United States Navy's Polaris missile submarine program. PERT is basically a method for analyzing the tasks involved in completing a project, especially the time needed to complete each task, the dependencies among tasks, and the minimum time needed to complete the total project (Figure 1.4).

The critical path method (CPM) was developed in a joint venture by DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects. The critical path determines the float, or schedule flexibility, for each activity by calculating the earliest start date, earliest finish date, latest start date, and latest finish date for each activity. The critical path is generally the longest full path on the project. Any activity with a float time that equals zero is considered a critical path task. CPM can help you figure out how long your complex project will take to complete and which activities are critical, meaning they have to be done on time or else

the whole project will take longer. These mathematical techniques quickly spread into many private enterprises.

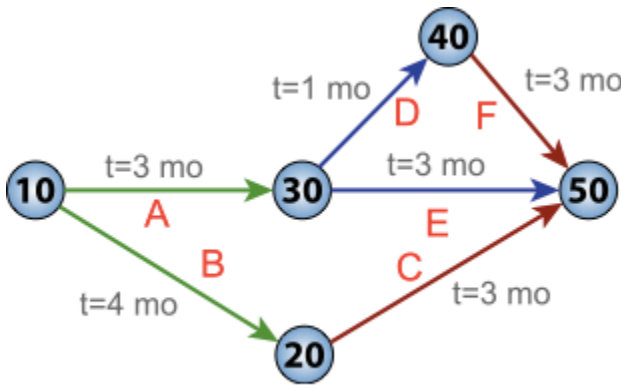


Figure 1.4: Pert Chart

Project management in its present form began to take root a few decades ago. In the early 1960s, industrial and business organizations began to understand the benefits of organizing work around projects. They understood the critical need to communicate and integrate work across multiple departments and professions.

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- Table 2.1: Adapted from P. Russo and S. Boor, *How Fluent is Your Interface? Designing for International Users*, Proceedings of the INTERACT '93 and CHI '93, Association for Computing

Machinery, Inc. (1993). Table from Barron & Barron Project Management for Scientists and Engineers, Source: Project Management for Scientists and Engineers by Merrie Barron; Andrew R. Barron

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4. Types of Projects

There are three broad categories of projects to consider: Strategic Projects, Operational Projects, and Compliance Projects (Figure 1-1).

- **Strategic** Projects involve creating something new and innovative. A new product, a new service, a new retail location, a new branch or division, or even a new factory might be a strategic project, because it will allow an organization to gain strategic advantage over its competitors.
- **Operational** Projects improve current operations. These projects may not produce radical improvements, but they will reduce costs, get work done more efficiently, or produce a higher quality product.
- **Compliance** Projects must be done in order to comply with an industry or governmental regulation or standard. Often there is no choice about whether to implement a project to meet a regulation, but there may be several project options to consider, any of which would result in meeting compliance requirements.

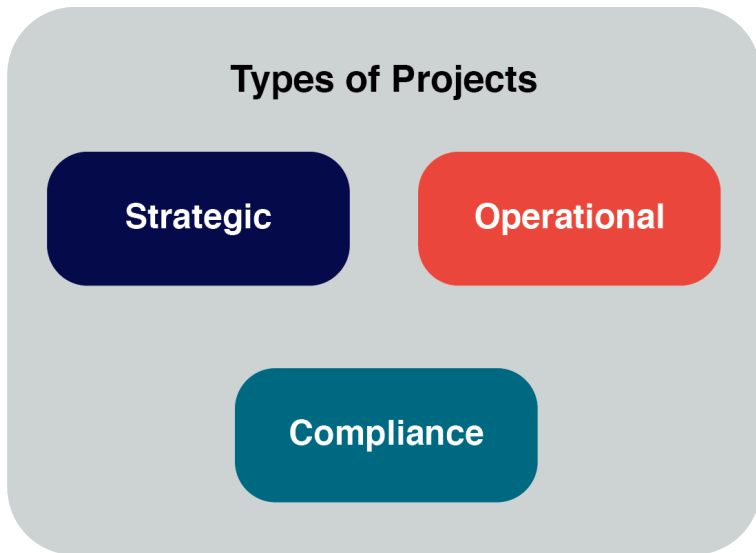


Figure 1-1: Three broad categories of projects

Traditional “Waterfall” Project Management

While project management can be traced back to the building of the Great Pyramids in Egypt, it was really in the post-WW2 industrial boom of the 1950s that project managers started to develop the tools and techniques used in modern project management. These tools were used to complete large industrial and military projects, where the scope of work (what we need to accomplish in a project) was well defined. For example, the scope of what we have to do can be planned out well when we are constructing an apartment building, making a nuclear submarine missile, or building an oil refinery.

These traditional techniques have been elaborated and standardized by organizations such as the Project Management Institute (PMI) in the US and The International Project Management Association (headquartered in Switzerland) and AXELOS (the

organization behind the PRINCE2 certification used in Great Britain). These traditional techniques were also adapted to software development. Techniques such as waterfall (where phases are sequential) and function point analysis were advanced as effective ways to manage software development projects. However, as the world of software development changed—from large, time-consuming projects that were loaded on mainframe computers to fast-moving, fast changing, internet-based applications many programmers found waterfall and similar methods to be limiting. These techniques lacked flexibility and were inadequate to deal with a rapidly changing, competitive landscape. As a result, a “revolution” of sorts was mounted and out of that revolution came several so-called Agile project management methods.

Agile Project Management

Agile is broad term for project management techniques that are iterative in nature. Rather than trying to develop all aspects of a project or software application and then presenting that result to the customer after a long development cycle (6 to 24 months), Agile techniques use short development cycles in which features of high value are developed first and a working product/software can be reviewed and tested at the end of the cycle (20-40 days).

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5. Project Managers: Who are They?

Project Management Expertise

In order for you, as the project manager, to manage the competing project constraints and the project as a whole, there are some areas of expertise you should bring to the project team (Figure 2.11). They are knowledge of the application area and the standards and regulations in your industry, understanding of the project environment, general management knowledge and skills, and interpersonal skills. It should be noted that industry expertise is not in a certain field but the expertise to run the project. So while knowledge of the type of industry is important, you will have a project team supporting you in this endeavor. For example, if you are managing a project that is building an oil platform, you would not be expected to have a detailed understanding of the engineering since your team will have mechanical and civil engineers who will provide the appropriate expertise; however, it would definitely help if you understood this type of work.

Let's take a look at each of these areas in more detail.

Application knowledge

By standards, we mean guidelines or preferred approaches that are not necessarily mandatory. In contrast, when referring to regulations we mean mandatory rules that must be followed, such as government-imposed requirements through laws. It should go without saying that as a professional, you're required to follow all applicable laws and rules that apply to your industry, organization, or project. Every industry has standards and regulations. Knowing which ones affect your project before you begin work will not only help the project to unfold smoothly, but will also allow for effective risk analysis.

Areas of Expertise
Application knowledge, standards & regulations
Understanding the project environment
Management knowledge & skills
Interpersonal skills

Figure 2.6: Areas of expertise that a project manager should bring to the project team.

Some projects require specific skills in certain application areas. Application areas are made up of categories of projects that have common elements. They can be defined by industry group (pharmaceutical, financial, etc.), department (accounting, marketing, legal, etc.), technology (software development, engineering, etc), or management specialties (procurement, research and development, etc.). These application areas are usually concerned with disciplines, regulations, and the specific needs of the project, the customer, or the industry. For example, most government agencies have specific procurement rules that apply to their projects that wouldn't be applicable in the construction industry. The pharmaceutical industry is interested in regulations set forth by government regulators, whereas the automotive industry has little or no concern for either of these types of regulations. You need to stay up-to-date regarding your industry so that you can apply your knowledge effectively. Today's fast-paced advances can leave you behind fairly quickly if you don't stay abreast of current trends.

Having some level of experience in the application area you're working in will give you an advantage when it comes to project management. While you can call in experts who have the application area knowledge, it doesn't hurt for you to understand the specific aspects of the application areas of your project.

Management Knowledge and Skills

As the project manager, you have to rely on your project management knowledge and your general management skills. Here, we are thinking of items like your ability to plan the project, execute it properly, and of course control it and bring it to a successful conclusion, along with your ability to guide the project team to achieve project objectives and balance project constraints.

There is more to project management than just getting the work done. Inherent in the process of project management are the general management skills that allow the project manager to complete the project with some level of efficiency and control. In some respects, managing a project is similar

to running a business: there are risk and rewards, finance and accounting activities, human resource issues, time management, stress management, and a purpose for the project to exist. General management skills are needed in every project.

Interpersonal Skills

Last but not least you also have to bring the ability into the project to manage personal relationships and deal with personnel issues as they arise. Here were talking about your interpersonal skills as shown in Figure 2.8.

Communication

Project managers spend 90% of their time communicating. Therefore they must be good communicators, promoting clear, unambiguous exchange of information. As a project manager, it is your job to keep a number of people well informed. It is essential that your project staff know what is expected of them: what they have to do, when they have to do it, and what budget and time constraints and quality specifications they are working toward. If project staff members do not know what their tasks are, or how to accomplish them, then the entire project will grind to a halt. If you do not know what the project staff is (or often is not) doing, then you will be unable to monitor project progress. Finally, if you are uncertain of what the customer expects of you, then the project will not even get off the ground. Project communication can thus be summed up as knowing “who needs what information and when” and making sure they have it.

Interpersonal Skills	
Communication	Influence
Leadership	Motivation
Negotiation	Problem solving

Figure 2.8: Interpersonal skills required of a project manager.

All projects require sound communication plans, but not all projects will have the same types of communication or the same methods for distributing the information. For example, will information be distributed via mail or email, is there a shared website, or are face-to-face meetings required? The

communication management plan documents how the communication needs of the stakeholders will be met, including the types of information that will be communicated, who will communicate them, and who will receive them; the methods used to communicate; the timing and frequency of communication; the method for updating the plan as the project progresses, including the escalation process; and a glossary of common terms.

Influence

Project management is about getting things done. Every organization is different in its policies, modes of operations, and underlying culture. There are political alliances, differing motivations, conflicting interests, and power struggles. A project manager must understand all of the unspoken influences at work within an organization.

Leadership

Leadership is the ability to motivate and inspire individuals to work toward expected results. Leaders inspire vision and rally people around common goals. A good project manager can motivate and inspire the project team to see the vision and value of the project. The project manager as a leader can inspire the project team to find a solution to overcome perceived obstacles to get the work done.

Motivation

Motivation helps people work more efficiently and produce better results. Motivation is a constant process that the project manager must guide to help the team move toward completion with passion and a profound reason to complete the work. Motivating the team is accomplished by using a variety of team-building techniques and exercises. Team building is simply getting a diverse group of people to work together in the most efficient and effective manner possible. This may involve management events as well as individual actions designed to improve team performance.

Recognition and rewards are an important part of team motivations. They are formal ways of recognizing and promoting desirable behaviour and are most effective when carried out by the management team and the project manager. Consider individual preferences and cultural differences when using rewards and recognition. Some people don't like to be recognized in front of a group; others thrive on it.

Negotiation

Project managers must negotiate for the good of the project. In any project, the project manager, the project sponsor, and the project team will have to negotiate with stakeholders, vendors, and customers to reach a level of agreement acceptable to all parties involved in the negotiation process.

Problem Solving

Problem solving is the ability to understand the heart of a problem, look for a viable solution, and then make a decision to implement that solution. The starting point for problem solving is problem definition. Problem definition is the ability to understand the cause and effect of the problem; this centres on root-cause analysis. If a project manager treats only the symptoms of a problem rather than its cause, the symptoms will perpetuate and continue through the project life. Even worse, treating a symptom may result in a greater problem. For example, increasing the ampere rating of a fuse in your car because the old one keeps blowing does not solve the problem of an electrical short that could result in a fire. Root-cause analysis looks beyond the immediate symptoms to the cause of the symptoms, which then affords opportunities for solutions. Once the root of a problem has been identified, a decision must be made to effectively address the problem.

Solutions can be presented from vendors, the project team, the project manager, or various stakeholders. A viable solution focuses on more than just the problem; it looks at the cause and effect of the solution itself. In addition, a timely decision is needed or the window of opportunity may pass and then a new decision will be needed to address the problem. As in most cases, the worst thing you can do is nothing.

All of these interpersonal skills will be used in all areas of project management. Start practicing now because it's guaranteed that you'll need these skills on your next project.

Image Descriptions

Figure 2.5 image description: The sign says, "We can do good, quick, and cheap work. You can have any two but not all three. 1. Good, quick work won't be cheap. 2. Good, cheap work won't be quick. 3. Quick, cheap work won't be good." [Return to Figure 2.5]

•

Who is a project manager? Many positions in an organization have project management responsibilities – yet do not have the title of Project Manager.

Below shows many examples from different industries to understand more about the skillset that can be applied to various industries.

Example: Construction Managers

Construction managers plan, direct, coordinate, and budget a wide variety of residential, commercial, and industrial construction projects including homes, stores, offices, roads, bridges, wastewater treatment plants, schools, and hospitals. Strong scheduling skills are essential for this role. Communication skills are often used in coordinating design and construction processes, teams executing the work, and governance of special trades (carpentry, plumbing, electrical wiring) as well as government representatives for the permit processes.

A construction manager may be called a project manager or project engineer. The construction manager ensures that the project is completed on time and within budget while meeting quality specifications and codes and maintaining a safe work environment. These managers create project plans in which they divide all required construction site activities into logical steps, estimating and budgeting the time required to meet established deadlines, usually utilizing sophisticated scheduling and cost-estimating software. Many use software packages such as Microsoft Project® or Procure® or online tools like BaseCamp®. Most construction projects rely on spreadsheets for project management. Procurement skills used in this field include acquiring the bills for material, lumber for the house being built, and more. Construction managers also coordinate labor, determining the needs and overseeing their performance, ensuring that all work is completed on schedule.

Values including sustainability, reuse, LEED-certified building, use of green energy, and various energy efficiencies are being incorporated into today's projects with an eye to the future. Jennifer Russell, spoke about project management and global sustainability”

at the 2011 Silicon Valley Project Management Institute (PMI) conference. She informed the attendees of the financial, environmental, and social areas in expanding the vision of project management with the slide in Figure 1.2. These values are part of the PMI's code of ethics and professionalism. By adhering to this code, project managers include in their decisions the best interests of society, the safety of the public, and enhancement of the environment.

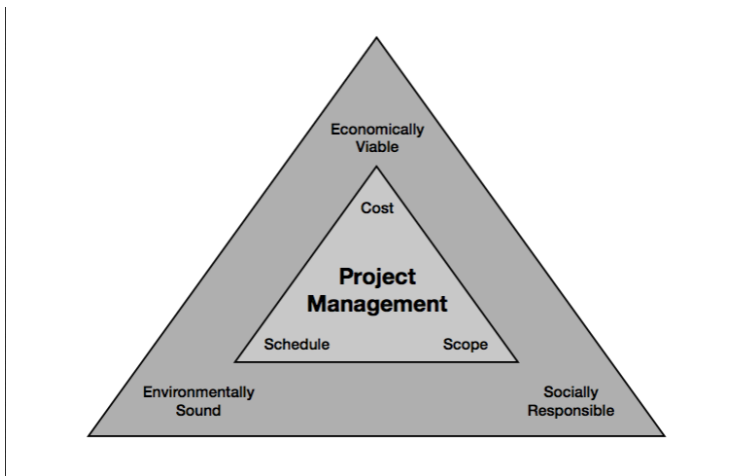


Figure 1.2: In addition to considering the cost, scope, and schedule of a project, a project manager should work to ensure the project is socially responsible, environmentally sound, and economically viable.

Creative Services

Creative service careers include graphic artists, curators, video editors, gaming managers, multimedia artists, media producers, technical writers, interpreters, and translators. These positions use project management skills, especially in handling the delivery channel and meeting clients' requirements.

Let us look at one example, graphic artists, to understand and identify some of the project management skills that aid in this career.

Example: Graphic Artists

Graphic artists plan, analyze, and create visual solutions to communication problems. They use many skills found in project management, especially communications. They work to achieve the most effective way to get messages across in print and electronic media. They emphasize their messages using colour, type, illustration, photography, animation, and various print and layout techniques. Results can be seen in magazines, newspapers, journals, corporate reports, and other publications. Other deliverables from graphic artists using project management skills include promotional displays, packaging, and marketing brochures supporting products and services, logos, and signage. In addition to print media, graphic artists create materials for the web, TV, movies, and mobile device apps.

Initiation in project management can be seen in developing a new design: determining the needs of the client, the message the design should portray, and its appeal to customers or users. Graphic designers consider cognitive, cultural, physical, and social factors in planning and executing designs for the target audience, very similar to some of the dynamics a project manager considers in communicating with various project stakeholders. Designers may gather relevant information by meeting with clients, creative staff, or art directors; brainstorming with others within their firm or professional association; and performing their own research to ensure that their results have high quality and they can manage risks.

Graphic designers may supervise assistants who follow instructions to complete parts of the design process. Therefore

scheduling, resource planning, and cost monitoring are pillars of project management seen in this industry. These artists use computer and communications equipment to meet their clients' needs and business requirements in a timely and cost-efficient manner.

Educators

“Educator” is a broad term that can describe a career in teaching, maybe being a lecturer, a professor, a tutor, or a home-schooler. Other educators include gurus, mullahs, pastors, rabbis, and priests. Instructors also provide vocational training or teach skills like learning how to drive a car or use a computer. Educators provide motivation to learn a new language or showcase new products and services. Educators use project management skills including planning and communication.

Let us look at teachers, since we all have had teachers, and see if we can recognize the project management skills that are demonstrated in this profession.

Example: Teachers

Some teachers foster the intellectual and social development of children during their formative years; other teachers provide knowledge, career skill sets, and guidance to adults. Project management skills that teachers exhibit include acting as facilitators or coaches and communicating in the classroom and in individual instruction. Project managers plan and evaluate various aspects of a project; teachers plan, evaluate, and assign lessons; implement these plans; and monitor each student's progress similar to the way a project manager monitors and delivers goods or

services. Teachers use their people skills to manage students, parents, and administrators. The soft skills that project managers exercise can be seen in teachers who encourage collaboration in solving problems by having students work in groups to discuss and solve problems as a team.

Project managers may work in a variety of fields with a broad assortment of people, similar to teachers who work with students from varied ethnic, racial, and religious backgrounds. These teachers must have awareness and understanding of different cultures.

Teachers in some schools may be involved in making decisions regarding the budget, personnel, textbooks, curriculum design, and teaching methods, demonstrating skills that a project manager would possess such as financial management and decision making.

Engineers

Engineers apply the principles of science and mathematics to develop economical solutions to technical problems. As a project cycles from an idea in the project charter to the implementation and delivery of a product or service, engineers link scientific discoveries to commercial applications that meet societal and consumer needs.

Engineers use many project management skills, especially when they must specify functional requirements. They demonstrate attention to quality as they evaluate a design's overall effectiveness, cost, reliability, and safety similar to the project manager reviewing the criteria for the customer's acceptance of delivery of the product or service.

Estimation skills in project management are used in engineering. Engineers are asked many times to provide an estimate of time and cost required to complete projects.

Health Care

There are many jobs and careers in health care that use project management skills. Occupations in the field of health care vary widely, such as athletic trainer, dental hygienist, massage therapist, occupational therapist, optometrist, nurse, physician, physician assistant, and X-ray technician. These individuals actively apply risk management in providing health care delivery of service to their clients, ensuring that they do not injure the person they are caring for. *Note: There is a section on nursing later in this chapter.*

Many of you may have had a fall while you were growing up, and needed an X-ray to determine if you had a fracture or merely a sprain. Let us look at this career as an example of a health care professional using project management skills.

Example: Radiology Technologists

Radiology technologists and technicians perform diagnostic imaging examinations like X-rays, computed tomography (CT), magnetic resonance imaging (MRI), and mammography. They could also be called radiographers, because they produce X-ray films (radiographs) of parts of the human body for use in diagnosing medical problems.

Project management skills, especially people skills and strong communication, are demonstrated when they prepare patients for radiologic examinations by explaining the procedure and what position the patient needs to be in, so that the parts of the body can be appropriately radiographed. Risk management is demonstrated when these professionals work to prevent unnecessary exposure to radiation by surrounding the exposed area with radiation protection devices, such as lead shields, or limiting the size of the X-ray beam. To ensure quality results, the health technician monitors

the radiograph and sets controls on the X-ray machine to produce radiographs of the appropriate density, detail, and contrast.

Safety and regulations concerning the use of radiation to protect themselves, their patients, and their coworkers from unnecessary exposure is tracked in an efficient manner and reported as a control to ensure compliance. Project management skills are also used in preparing work schedules, evaluating equipment for purchase, or managing a radiology department.

Some radiological technologists specialize in CT scans; as CT technologists they too use project management skills. CT uses ionizing radiation to produce a substantial number of cross-sectional X-rays of an area of the body. Therefore, it requires the same precautionary measures that are used with X-rays, hence the need for risk management and monitoring for exposure.

Teamwork, not only with the patient that the radiological technologist supports and the doctor who ordered the request, but also with other health care providers, relies on strong communication, quality, work done in a timely manner, and wise use of hospital resources. This all boils down to ensuring that the three elements of the project management triangle of cost, schedule, and scope with quality delivered remain the essentials that provide a cornerstone to project management and the skills needed to obtain the objective.

Example: Nurses

Nurses treat and educate patients and their families and the public about various medical conditions and provide advice and emotional support. Nurses establish a care plan for their patients that include activities like scheduling the administration and discontinuation of medications (e.g., intravenous (IV) lines for fluid, medication, blood, and blood products) and application of therapies and treatments. Communication with the patient, their family, physicians and other

health care clinicians may be done in person or via technology. Telehealth allows nurses to provide care and advice through electronic communications media including videoconferencing, the Internet, or telephone.

Risk management is very important for a nurse, with some cases having a life or death consequence. Nurses monitor pain management and vital signs and provide status reports to physicians to help in responding to the health care needs of the patient.

The nursing field varies. Some nurses work in infection control. They identify, track, and control infectious outbreaks in health care facilities and create programs for outbreak prevention and response to biological terrorism. Others are educators who plan, develop, execute, and evaluate educational programs and curricula for the professional development of students and graduate nurses. Nurses may use project management skills while conducting health care consultations, advising on public policy, researching in the field, or providing sales support of a product or service.

Paralegal

Attorneys assume the ultimate responsibility for legal work but they often obtain assistance. Paralegals assume this role in law firms and perform many tasks to aid the legal profession. However, they are explicitly prohibited from carrying out duties considered to be the practice of law (e.g., giving legal advice, setting legal fees, presenting court cases).

Project management skills such as planning are used in helping lawyers prepare for closings, hearings, trials, and corporate meetings. Communication skills are used in preparing written reports that help attorneys determine how cases should be handled or drafts for actions such as pleading, filing motions, and obtaining affidavits.

Monitoring skills aid paralegals who may track files of important case documents, working on risk containment related to filing dates and responses to the court. Procurement skills, which a project manager uses, can also be seen from a paralegal perspective in negotiating terms of hiring expert witnesses as well as other services such as acquiring services from process servers.

Financial skills may be used as well, such as assisting in preparing tax returns, establishing trust funds, and planning estates or maintaining financial office records at the law firm.

Government, litigation, personal injury, corporate law, criminal law, employee benefits, intellectual property, labour law, bankruptcy, immigration, family law, and real estate are some of the many different law practices where a paralegal professional may use project management skills.

Software developer

Computer software developers and computer programmers design and develop software. They apply the principles of computer science and mathematics to create, test, and evaluate software applications and systems that make computers come alive. Software is developed in many kinds of projects: computer games, business applications, operating systems, network control systems, and more. Software developers use project management skills to develop the requirements for the software, identify and track the product development tasks, communicate within the development team and with clients, test cases, and manage quality, the schedule, and resources (staff, equipment, labs, and more).

Science Technicians

Science technicians use principles and theories of science and mathematics to assist in research and development and help invent and improve products and processes. In their jobs, they are more practically oriented than scientists. Planning skills project managers use can be seen as science technicians set up, operate, and maintain laboratory instruments; monitor experiments; and observe, calculate, and record results. Quality is a factor here as it is in project management; science technicians must ensure that processes are performed correctly, with proper proportions of ingredients, for purity or for strength and durability.

There are different fields in which science technicians can apply project management skills. Agricultural and food science technicians test food and other agricultural products and are involved in food, fibre, and animal research, production, and processing. Control and risk management are important here in executing the tests and experiments, for example, to improve the yield and quality of crops, or the resistance of plants and animals to disease, insects, or other hazards. Quality factors are paramount when food science technicians conduct tests on food additives and preservatives to ensure compliance with government regulations regarding colour, texture, and nutrients.

Biological technicians work with biologists studying living organisms. Many assist scientists who conduct medical research or who work in pharmaceutical companies to help develop and manufacture medicines. Skills in scheduling, especially in incubation periods for the study of the impact on cells, could impact projects, such as exploring and isolating variables for research in living organisms and infectious agents. Biotechnology technicians apply knowledge and execution skills and techniques gained from basic research, including gene splicing and recombinant DNA, to product development. Project management skills are used in

collaboration and communication among team members to record and understand the results and progress toward a cure or product.

Other kinds of technicians are chemical technicians who may work in laboratories or factories, using monitoring and control skills in the way they collect and analyze samples. Again, quality assurance is an important factor for most process technicians' work in manufacturing, testing packaging for design, ensuring integrity of materials, and verifying environmental acceptability.

Technicians use a project management skill set to assist in their initiation, planning, and executing tasks, while managing risks with some measure of reporting to determine if their objectives satisfy the constraints of cost, schedule, resource, and quality standards set.

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6. The 5 Project Life Cycles (Process Group/Phases)



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=49#oembed-1>

The project manager and project team have one shared goal: to carry out the work of the project for the purpose of meeting the project's objectives. Every project has a beginning, a middle period during which activities move the project toward completion, and an ending (either successful or unsuccessful). A standard project typically has the following four major phases (each with its own agenda of tasks and issues): initiation, planning, implementation, and closure. Taken together, these phases represent the path a project takes from the beginning to its end and are generally referred to as the project "life cycle."

Initiation Phase

During the first of these phases, the initiation phase, the project objective or need is identified; this can be a business problem or opportunity. An appropriate response to the need is documented in a business case with recommended solution options. A feasibility study is conducted to investigate whether each option addresses the project objective and a final recommended solution is

determined. Issues of feasibility (“can we do the project?”) and justification (“should we do the project?”) are addressed.

Once the recommended solution is approved, a project is initiated to deliver the approved solution and a project manager is appointed. The major deliverables and the participating work groups are identified, and the project team begins to take shape. Approval is then sought by the project manager to move onto the detailed planning phase.

Planning Phase

The next phase, the planning phase, is where the project solution is further developed in as much detail as possible and the steps necessary to meet the project’s objective are planned. In this step, the team identifies all of the work to be done. The project’s tasks and resource requirements are identified, along with the strategy for producing them. This is also referred to as “scope management.” A project plan is created outlining the activities, tasks, dependencies, and timeframes. The project manager coordinates the preparation of a project budget by providing cost estimates for the labor, equipment, and materials costs. The budget is used to monitor and control cost expenditures during project implementation.

Once the project team has identified the work, prepared the schedule, and estimated the costs, the three fundamental components of the planning process are complete. This is an excellent time to identify and try to deal with anything that might pose a threat to the successful completion of the project. This is called risk management. In risk management, “high-threat” potential problems are identified along with the action that is to be taken on each high-threat potential problem, either to reduce the probability that the problem will occur or to reduce the impact on the project if it does occur. This is also a good time to identify all project stakeholders and establish a communication plan describing

the information needed and the delivery method to be used to keep the stakeholders informed.

Finally, you will want to document a quality plan, providing quality targets, assurance, and control measures, along with an acceptance plan, listing the criteria to be met to gain customer acceptance. At this point, the project would have been planned in detail and is ready to be executed.

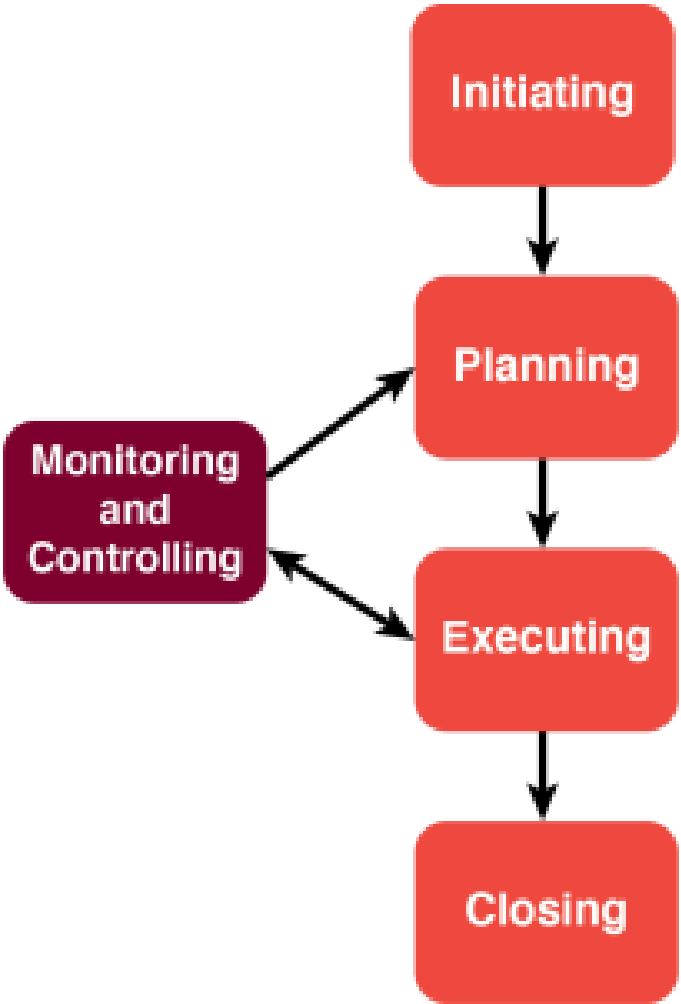


Figure 1-4: Project management phases. Used under CC-BY-SA license.

Implementation (Execution) Phase

During the third phase, the implementation phase, the project plan is put into motion and the work of the project is performed. It is important to maintain control and communicate as needed during implementation. Progress is continuously monitored and appropriate adjustments are made and recorded as variances from the original plan. In any project, a project manager spends most of the time in this step. During project implementation, people are carrying out the tasks, and progress information is being reported through regular team meetings. The project manager uses this information to maintain control over the direction of the project by comparing the progress reports with the project plan to measure the performance of the project activities and take corrective action as needed. The first course of action should always be to bring the project back on course (i.e., to return it to the original plan). If that cannot happen, the team should record variations from the original plan and record and publish modifications to the plan. Throughout this step, project sponsors and other key stakeholders should be kept informed of the project's status according to the agreed-on frequency and format of communication. The plan should be updated and published on a regular basis.

Status reports should always emphasize the anticipated end point in terms of cost, schedule, and quality of deliverables. Each project deliverable produced should be reviewed for quality and measured against the acceptance criteria. Once all of the deliverables have been produced and the customer has accepted the final solution, the project is ready for closure.

Closing Phase

During the final closure, or completion phase, the emphasis is on releasing the final deliverables to the customer, handing over project documentation to the business, terminating supplier contracts, releasing project resources, and communicating the closure of the project to all stakeholders. The last remaining step is to conduct lessons-learned studies to examine what went well and what didn't. Through this type of analysis, the wisdom of experience is transferred back to the project organization, which will help future project teams.

Example: Project Phases on a Large Multinational Project

A U.S. construction company won a contract to design and build the first copper mine in northern Argentina. There was no existing infrastructure for either the mining industry or large construction projects in this part of South America. During the initiation phase of the project, the project manager focused on defining and finding a project leadership team with the knowledge, skills, and experience to manage a large complex project in a remote area of the globe. The project team set up three offices. One was in Chile, where large mining construction project infrastructure existed. The other two were in Argentina. One was in Buenos Aires to establish relationships and Argentinian expertise, and the second was in Catamarca—the largest town close to the mine site. With offices in place, the project start-up team began developing procedures for getting work done, acquiring the appropriate permits, and developing relationships with Chilean and Argentine partners.

During the planning phase, the project team developed an integrated project schedule that coordinated the activities of the

design, procurement, and construction teams. The project controls team also developed a detailed budget that enabled the project team to track project expenditures against the expected expenses. The project design team built on the conceptual design and developed detailed drawings for use by the procurement team. The procurement team used the drawings to begin ordering equipment and materials for the construction team; develop labour projections; refine the construction schedule; and set up the construction site. Although planning is a never-ending process on a project, the planning phase focused on developing sufficient details to allow various parts of the project team to coordinate their work and allow the project management team to make priority decisions.

The implementation phase represents the work done to meet the requirements of the scope of work and fulfill the charter. During the implementation phase, the project team accomplished the work defined in the plan and made adjustments when the project factors changed. Equipment and materials were delivered to the work site, labour was hired and trained, a construction site was built, and all the construction activities, from the arrival of the first dozer to the installation of the final light switch, were accomplished.

The closeout phase included turning over the newly constructed plant to the operations team of the client. A punch list of a few remaining construction items was developed and those items completed. The office in Catamarca was closed, the office in Buenos Aires archived all the project documents, and the Chilean office was already working on the next project. The accounting books were reconciled and closed, final reports written and distributed, and the project manager started on a new project.

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7. Project Management Knowledge Area Overview & PMO



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=51#oembed-1>

YouTube Video from EverHour.com (<https://everhour.com/>) that describes the 10 knowledge areas of Project Management. More information can be found on their blog site: <https://everhour.com/blog/project-management-knowledge-areas/>.

Projects are divided into components, and a project manager must be knowledgeable in each area. Each of these areas of knowledge will be explored in more depth in subsequent chapters. For now, let's look at them in a little more detail to prepare you for the chapters that follow.

Project Start-Up and Integration

The start-up of a project is similar to the start-up of a new organization. The project leader develops the project infrastructure used to design and execute the project. The project management team must develop alignment among the major stakeholders—those who have a share or interest—on the project during the early phases

or definition phases of the project. The project manager will conduct one or more kickoff meetings or alignment sessions to bring the various parties of the project together and begin the project team building required to operate efficiently during the project.

During project start-up, the project management team refines the scope of work and develops a preliminary schedule and conceptual budget. The project team builds a plan for executing the project based on the project profile. The plan for developing and tracking the detailed schedule, the procurement plan, and the plan for building the budget and estimating and tracking costs are developed during the start-up. The plans for information technology, communication, and tracking client satisfaction are also all developed during the start-up phase of the project.

Flowcharts, diagrams, and responsibility matrices are tools to capture the work processes associated with executing the project plan. The first draft of the project procedures manual captures the historic and intuitional knowledge that team members bring to the project. The development and review of these procedures and work processes contribute to the development of the organizational structure of the project.

This is typically an exciting time on a project where all things are possible. The project management team is working many hours developing the initial plan, staffing the project, and building relationships with the client. The project manager sets the tone of the project and sets expectations for each of the project team members. The project start-up phase on complex projects can be chaotic, and until plans are developed, the project manager becomes the source of information and direction. The project manager creates an environment that encourages team members to fully engage in the project and encourages innovative approaches to developing the project plan.

Project Scope

The project scope is a document that defines the parameters—factors that define a system and determine its behaviour—of the project, what work is done within the boundaries of the project, and the work that is outside the project boundaries. The scope of work (SOW) is typically a written document that defines what work will be accomplished by the end of the project—the deliverables of the project. The project scope defines what will be done, and the project execution plan defines how the work will be accomplished.

No template works for all projects. Some projects have a very detailed scope of work, and some have a short summary document. The quality of the scope is measured by the ability of the project manager and project stakeholders to develop and maintain a common understanding of what products or services the project will deliver. The size and detail of the project scope is related to the complexity profile of the project. A more complex project often requires a more detailed and comprehensive scope document.

According to the PMI, the scope statement should include the following:

- Description of the scope
- Product acceptance criteria
- Project deliverables
- Project exclusions
- Project constraints
- Project assumptions

The scope document is the basis for agreement by all parties. A clear project scope document is also critical to managing change on a project. Since the project scope reflects what work will be accomplished on the project, any change in expectations that is not captured and documented creates the opportunity for confusion. One of the most common trends on projects is the incremental

expansion in the project scope. This trend is labeled “scope creep.” Scope creep threatens the success of a project because the small increases in scope require additional resources that were not in the plan. Increasing the scope of the project is a common occurrence, and adjustments are made to the project budget and schedule to account for these changes. *Scope creep* occurs when these changes are not recognized or not managed. The ability of a project manager to identify potential changes is often related to the quality of the scope documents.

Events do occur that require the scope of the project to change. Changes in the marketplace may require change in a product design or the timing of the product delivery. Changes in the client’s management team or the financial health of the client may also result in changes in the project scope. Changes in the project schedule, budget, or product quality will have an effect on the project plan. Generally, the later in the project the change occurs, the greater the increase to the project costs. Establishing a change management system for the project that captures changes to the project scope and assures that these changes are authorized by the appropriate level of management in the client’s organization is the responsibility of the project manager. The project manager also analyzes the cost and schedule impact of these changes and adjusts the project plan to reflect the changes authorized by the client. Changes to the scope can cause costs to increase or decrease.

Project Schedule and Time Management

The definition of project success often includes completing the project on time. The development and management of a project schedule that will complete the project on time is a primary responsibility of the project manager, and completing the project on time requires the development of a realistic plan and the effective management of the plan. On smaller projects, project managers may

lead the development of the project plan and build a schedule to meet that plan. On larger and more complex projects, a project controls team that focuses on both costs and schedule planning and controlling functions will assist the project management team in developing the plan and tracking progress against the plan.

To develop the project schedule, the project team does an analysis of the project scope, contract, and other information that helps the team define the project deliverables. Based on this information, the project team develops a milestone schedule. The milestone schedule establishes key dates throughout the life of a project that must be met for the project to finish on time. The key dates are often established to meet contractual obligations or established intervals that will reflect appropriate progress for the project. For less complex projects, a milestone schedule may be sufficient for tracking the progress of the project. For more complex projects, a more detailed schedule is required.

To develop a more detailed schedule, the project team first develops a work breakdown structure (WBS)—a description of tasks arranged in layers of detail. Although the project scope is the primary document for developing the WBS, the WBS incorporates all project deliverables and reflects any documents or information that clarifies the project deliverables. From the WBS, a project plan is developed. The project plan lists the activities that are needed to accomplish the work identified in the WBS. The more detailed the WBS, the more activities that are identified to accomplish the work.

After the project team identifies the activities, the team sequences the activities according to the order in which the activities are to be accomplished. An outcome from the work process is the project logic diagram. The logic diagram represents the logical sequence of the activities needed to complete the project. The next step in the planning process is to develop an estimation of the time it will take to accomplish each activity or the activity duration. Some activities must be done sequentially, and some activities can be done concurrently. The planning process creates a project schedule by scheduling activities in a way that

effectively and efficiently uses project resources and completes the project in the shortest time.

On larger projects, several paths are created that represent a sequence of activities from the beginning to the end of the project. The longest path to the completion of the project is the critical path. If the critical path takes less time than is allowed by the client to complete the project, the project has a positive total float or project slack. If the client's project completion date precedes the calculated critical path end date, the project has a negative float. Understanding and managing activities on the critical path is an important project management skill.

To successfully manage a project, the project manager must also know how to accelerate a schedule to compensate for unanticipated events that delay critical activities. Compressing—crashing—the schedule is a term used to describe the techniques used to shorten the project schedule. During the life of the project, scheduling conflicts often occur, and the project manager is responsible for reducing these conflicts while maintaining project quality and meeting cost goals.

Project Costs

The definition of project success often includes completing the project within budget. Developing and controlling a project budget that will accomplish the project objectives is a critical project management skill. Although clients expect the project to be executed efficiently, cost pressures vary on projects. On some projects, the project completion or end date is the largest contributor to the project complexity. The development of a new drug to address a critical health issue, the production of a new product that will generate critical cash flow for a company, and the competitive advantage for a company to be first in the marketplace

with a new technology are examples of projects with schedule pressures that override project costs.

The accuracy of the project budget is related to the amount of information known by the project team. In the early stages of the project, the amount of information needed to develop a detailed budget is often missing. To address the lack of information, the project team develops different levels of project budget estimates. The conceptual estimate (or “ballpark estimate”) is developed with the least amount of knowledge. The major input into the conceptual estimate is expert knowledge or past experience. A project manager who has executed a similar project in the past can use those costs to estimate the costs of the current project.

When more information is known, the project team can develop a rough order of magnitude (ROM) estimate. Additional information such as the approximate square feet of a building, the production capacity of a plant, and the approximate number of hours needed to develop a software program can provide a basis for providing a ROM estimate. After a project design is more complete, a project detailed estimate can be developed. For example, when the project team knows the number of rooms, the type of materials, and the building location of a home, they can provide a detailed estimate. A detailed estimate is not a bid.

The cost of the project is tracked relative to the progress of the work and the estimate for accomplishing that work. Based on the cost estimate, the cost of the work performed is compared against the cost budgeted for that work. If the cost is significantly higher or lower, the project team explores reasons for the difference between expected costs and actual costs.

Project costs may deviate from the budget because the prices in the marketplace were different from what was expected. For example, the estimated costs for lumber on a housing project may be higher than budgeted or the hourly cost for labour may be lower than budgeted. Project costs may also deviate based on project performance. For example, a project team estimated that the steel design for a bridge over a river would take 800 labour hours, but

846 hours were actually expended. The project team captures the deviation between costs budgeted for work and the actual cost for work, revises the estimate as needed, and takes corrective action if the deviation appears to reflect a trend.

The project manager is responsible for assuring that the project team develops cost estimates based on the best information available and revises those estimates as new or better information becomes available. The project manager is also responsible for tracking costs against the budget and conducting an analysis when project costs deviate significantly from the project estimate. The project manager then takes appropriate corrective action to ensure that project performance matches the revised project plan.

Project Quality

Project quality focuses on the end product or service deliverables that reflect the purpose of the project. The project manager is responsible for developing a project execution approach that provides for a clear understanding of the expected project deliverables and the quality specifications. The project manager of a housing construction project not only needs to understand which rooms in the house will be carpeted but also what grade of carpet is needed. A room with a high volume of traffic will need a high-grade carpet.

The project manager is responsible for developing a project quality plan that defines the quality expectations and ensures that the specifications and expectations are met. Developing a good understanding of the project deliverables through documenting specifications and expectations is critical to a good quality plan. The processes for ensuring that the specifications and expectations are met are integrated into the project execution plan. Just as the project budget and completion dates may change over the life of a project, the project specifications may also change. Changes in

quality specifications are typically managed in the same process as cost or schedule changes. The impact of the changes is analyzed for impact on cost and schedule, and with appropriate approvals, changes are made to the project execution plan.

The PMI's *A Guide to the Project Management Body of Knowledge (PMBOK Guide)* has an extensive chapter on project quality management. The material found in this chapter would be similar to material found in a good operational management text.

Although any of the quality management techniques designed to make incremental improvement to work processes can be applied to a project work process, the character of a project (unique and relatively short in duration) makes small improvements less attractive on projects. Rework on projects, as with manufacturing operations, increases the cost of the product or service and often increases the time needed to complete the reworked activities. Because of the duration constraints of a project, the development of the appropriate skills, materials, and work processes early in the project is critical to project success. On more complex projects, time is allocated to developing a plan to understand and develop the appropriate levels of skills and work processes.

Project management organizations that execute several similar types of projects may find process improvement tools useful in identifying and improving the baseline processes used on their projects. Process improvement tools may also be helpful in identifying cost and schedule improvement opportunities. Opportunities for improvement must be found quickly to influence project performance. The investment in time and resources to find improvements is greatest during the early stages of the project, when the project is in the planning stages. During later project stages, as pressures to meet project schedule goals increase, the culture of the project is less conducive to making changes in work processes.

Another opportunity for applying process improvement tools is on projects that have repetitive processes. A housing contractor that is building several identical houses may benefit from evaluating

work processes in the first few houses to explore the opportunities available to improve the work processes. The investment of \$1,000 in a work process that saves \$200 per house is a good investment as long as the contractor is building more than five houses.

Project Team: Human Resources and Communications

Staffing the project with the right skills, at the right place, and at the right time is an important responsibility of the project management team. The project usually has two types of team members: functional managers and process managers. The functional managers and team focus on the technology of the project. On a construction project, the functional managers would include the engineering manager and construction superintendents. On a training project, the functional manager would include the professional trainers; on an information technology project, the software development managers would be functional managers. The project management team also includes project process managers. The project controls team would include process managers who have expertise in estimating, cost tracking, planning, and scheduling. The project manager needs functional and process expertise to plan and execute a successful project.

Because projects are temporary, the staffing plan for a project typically reflects both the long-term goals of skilled team members needed for the project and short-term commitment that reflects the nature of the project. Exact start and end dates for team members are often negotiated to best meet the needs of individuals and the project. The staffing plan is also determined by the different phases of the project. Team members needed in the early or conceptual phases of the project are often not needed during the later phases or project closeout phases. Team members needed during the implementation phase are often not needed during the

conceptual or closeout phases. Each phase has staffing requirements, and the staffing of a complex project requires detailed planning to have the right skills, at the right place, at the right time.

Typically a core project management team is dedicated to the project from start-up to closeout. This core team would include members of the project management team: project manager, project controls, project procurement, and key members of the function management or experts in the technology of the project. Although longer projects may experience more team turnover than shorter projects, it is important on all projects to have team members who can provide continuity through the project phases.

For example, on a large commercial building project, the civil engineering team that designs the site work where the building will be constructed would make their largest contribution during the early phases of the design. The civil engineering lead would bring on different civil engineering specialties as they were needed. As the civil engineering work is completed and the structural engineering is well underway, a large portion of the civil engineers would be released from the project. The functional managers, the engineering manager, and civil engineering lead would provide expertise during the entire length of the project, addressing technical questions that may arise and addressing change requests.

Project team members can be assigned to the project from a number of different sources. The organization that charters the project can assign talented managers and staff from functional units within the organization, contract with individuals or agencies to staff positions on the project, temporarily hire staff for the project, or use any combination of these staffing options. This staffing approach allows the project manager to create the project organizational culture. Some project cultures are more structured and detail oriented, and some are less structured with less formal roles and communication requirements. The type of culture the project manager creates depends greatly on the type of project.

Communications

Completing a complex project successfully requires teamwork, and teamwork requires good communication among team members. If those team members work in the same building, they can arrange regular meetings, simply stop by each other's office space to get a quick answer, or even discuss a project informally at other office functions. Many complex projects in today's global economy involve team members from widely separated locations, and the types of meetings that work within the same building are not possible. Teams that use electronic methods of communicating without face-to-face meetings are called virtual teams.

Communicating can be divided into two categories: synchronous and asynchronous. If all the parties to the communication are taking part in the exchange at the same time, the communication is synchronous. A telephone conference call is an example of synchronous communication. When the participants are not interacting at the same time, the communication is asynchronous. (The letter *a* at the beginning of the word means *not*.) Communications technologies require a variety of compatible devices, software, and service providers, and communication with a global virtual team can involve many different time zones. Establishing effective communications requires a communications plan.

Project Risk

Risk exists on all projects. The role of the project management team is to understand the kinds and levels of risks on the project and then to develop and implement plans to mitigate these risks. Risk represents the likelihood that an event will happen during the life of the project that will negatively affect the achievement of

project goals. The type and amount of risk varies by industry type, complexity, and phase of the project. The project risk plan will also reflect the risk profile of the project manager and key stakeholders. People have different comfort levels with risk, and some members of the project team will be more risk averse than others.

The first step in developing a risk management plan involves identifying potential project risks. Some risks are easy to identify, such as the potential for a damaging storm in the Caribbean, and some are less obvious. Many industries or companies have risk checklists developed from past experience. The Construction Industry Institute published a 100-item risk checklist that provides examples and areas of project risks. No risk checklist will include all potential risks. The value of a checklist is the stimulation of discussion and thought about the potential risks on a project.

The project team analyzes the identified risks and estimates the likelihood of the risks occurring. The team then estimates the potential impact on project goals if the event does occur. The outcome from this process is a prioritized list of estimated project risks with a value that represents the likelihood of occurrence and the potential impact on the project.

The project team then develops a risk mitigation plan that reduces the likelihood of an event occurring or reduces the impact on the project if the event does occur. The risk management plan is integrated into the project execution plan, and mitigation activities are assigned to the appropriate project team member. The likelihood that all the potential events identified in the risk analysis would occur is extremely rare. The likelihood that one or more events will happen is high.

The project risk plan reflects the risk profile of the project and balances the investment of the mitigation against the benefit for the project. One of the more common risk mitigation approaches is the use of contingency. Contingency is funds set aside by the project team to address unforeseen events. Projects with a high-risk profile will typically have a large contingency budget. If the team knows which activities have the highest risk, contingency can be allocated

to activities with the highest risk. When risks are less identifiable to specific activities, contingency is identified in a separate line item. The plan includes periodic risk-plan reviews during the life of the project. The risk review evaluates the effectiveness of the current plan and explores possible risks not identified in earlier sessions.

Project Procurement

The procurement effort on projects varies widely and depends on the type of project. Often the client organization will provide procurement services on less complex projects. In this case, the project team identifies the materials, equipment, and supplies needed by the project and provides product specifications and a detailed delivery schedule. When the procurement department of the parent organization provides procurement services, a liaison from the project can help the procurement team better understand the unique requirements of the project and the time-sensitive or critical items of the project schedule.

On larger, more complex projects, personnel are dedicated to procuring and managing the equipment, supplies, and materials needed by the project. Because of the temporary nature of projects, equipment, supplies, and materials are procured as part of the product of the project or for the execution of the project. For example, the bricks procured for a construction project would be procured for the product of the project, and the mortar mixer would be equipment procured for the execution of the project work. At the end of the project, equipment bought or rented for the execution of the work of the project are sold, returned to rental organizations, or disposed of some other way.

More complex projects will typically procure through different procurement and management methods. Commodities are common products that are purchased based on the lowest bid. Commodities include items like concrete for building projects, office supplies,

or even lab equipment for a research project. The second type of procurement includes products that are specified for the project. Vendors who can produce these products bid for a contract. The awarding of a contract can include price, ability to meet the project schedule, the fit for purpose of the product, and other considerations important to the project. Manufacturing a furnace for a new steel mill would be provided by a project vendor. Equipment especially designed and built for a research project is another example. These vendors' performances become important parts of the project, and the project manager assigns resources to coordinate the work and schedule of the vendor. The third procurement approach is the development of one or more partners. A design firm that is awarded the design contract for a major part of the steel mill and a research firm that is conducting critical subparts of the research are examples of potential project partners. A partner contributes to and is integrated into the execution plan. Partners perform best when they share the project vision of success and are emotionally invested in the project. The project management team builds and implements a project procurement plan that recognizes the most efficient and effective procurement approach to support the project schedule and goals.

Project Stakeholder Management

People and organizations can have many different relationships to the project. Most commonly, these relationships can be grouped into those who will be impacted by the project and those who can impact the project.

A successful project manager will identify stakeholders early in the project. For each stakeholder, it is important to identify what they want or need and what influence or power they have over the project. Based on this information, the need to communicate with the stakeholder or stakeholder group can be identified, followed

by the creation of a stakeholder management plan. A stakeholder register is used to identify and track the interactions between the project and each stakeholder. This register must be updated on a regular basis, as new stakeholders can arise at any time, and the needs and interest levels of a particular stakeholder may change through the course of the project.

Table 4.1 Stakeholder Register

Knowledge Area	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Integration Management	Develop Project Charter	Develop Project Management Plan		<ul style="list-style-type: none"> • Monitor and control project work • Perform integrated change control 	Close project or phase
Project Scope Management		<ul style="list-style-type: none"> • Plan scope management • Collect requirements • Define scope • Create WBS 		<ul style="list-style-type: none"> • Validate scope • Control scope 	
Project Time Management		<ul style="list-style-type: none"> • Plan schedule management • Define activities • Sequence activities • Estimate activity resources • Estimate activity durations • Develop schedule 		Control schedule	
Project Cost Management		<ul style="list-style-type: none"> • Plan cost management • Estimate costs • Determine budget 		Control costs	

Knowledge Area	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Quality Management		Plan quality management	Perform quality assurance	Control quality	

The Project Management Office (PMO)

Many large and even medium-sized organizations have created a department to oversee and support projects throughout the organization. This is an attempt to reduce the high numbers of failed projects (see the Project Management Overview chapter.) These offices are usually called the project management office or PMO.

The PMO may be the home of all the project managers in an organization, or it may simply be a resource for all project managers, who report to their line areas.

Typical objectives of a PMO are:

- Help ensure that projects are aligned with organizational objectives
- Provide templates and procedures for use by project managers
- Provide training and mentorship
- Provide facilitation
- Stay abreast of the latest trends in project management
- Serve as a repository for project reports and lessons learned

The existence and role of PMOs tends to be somewhat fluid. If a PMO is created, and greater success is not experienced in organizational projects, the PMO is at risk of being disbanded as a cost-saving measure. If an organization in which you are a project manager or a project team member has a PMO, try to make good use of the resources available. If you are employed as a resource person

in a PMO, remember that your role is not to get in the way and create red tape, but to enable and enhance the success of project managers and projects within the organization.

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8. Overview of Project Planning

After the project has been defined and the project team has been appointed, you are ready to enter the second phase in the project management life cycle: the detailed project planning phase.

Project planning is at the heart of the project life cycle, and tells everyone involved where you're going and how you're going to get there. The planning phase is when the project plans are documented, the project deliverables and requirements are defined, and the project schedule is created. It involves creating a set of plans to help guide your team through the implementation and closure phases of the project. The plans created during this phase will help you manage time, cost, quality, changes, risk, and related issues. They will also help you control staff and external suppliers to ensure that you deliver the project on time, within budget, and within schedule.

The project planning phase is often the most challenging phase for a project manager, as you need to make an educated guess about the staff, resources, and equipment needed to complete your project. You may also need to plan your communications and procurement activities, as well as contract any third-party suppliers.

The purpose of the project planning phase is to:

- Establish business requirements
- Establish cost, schedule, list of deliverables, and delivery dates
- Establish resources plans
- Obtain management approval and proceed to the next phase

The basic processes of project planning are:

- Scope planning – specifying the in-scope requirements for the project to facilitate creating the work breakdown structure
- Preparation of the work breakdown structure – spelling out the breakdown of the project into tasks and sub-tasks
- Project schedule development – listing the entire schedule of the activities and detailing their sequence of implementation
- Resource planning – indicating who will do what work, at which time, and if any special skills are needed to accomplish the project tasks
- Budget planning – specifying the budgeted cost to be incurred at the completion of the project
- Procurement planning – focusing on vendors outside your company and subcontracting
- Risk management – planning for possible risks and considering optional contingency plans and mitigation strategies
- Quality planning – assessing quality criteria to be used for the project
- Communication planning – designing the communication strategy with all project stakeholders

The planning phase refines the project's objectives, which were gathered during the initiation phase. It includes planning the steps necessary to meet those objectives by further identifying the specific activities and resources required to complete the project. Now that these objectives have been recognized, they must be clearly articulated, detailing an in-depth scrutiny of each recognized objective. With such scrutiny, our understanding of the objective may change. Often the very act of trying to describe something precisely gives us a better understanding of what we are looking at. This articulation serves as the basis for the development of requirements. What this means is that after an objective has been clearly articulated, we can describe it in concrete (measurable) terms and identify what we have to do to achieve it. Obviously, if we do a poor job of articulating the objective, our requirements will

be misdirected and the resulting project will not represent the true need.

Users will often begin describing their objectives in qualitative language. The project manager must work with the user to provide quantifiable definitions to those qualitative terms. These quantifiable criteria include schedule, cost, and quality measures. In the case of project objectives, these elements are used as measurements to determine project satisfaction and successful completion. Subjective evaluations are replaced by actual numeric attributes.

Example 1

A web user may ask for a fast system. The quantitative requirement should be all screens must load in under three seconds. Describing the time limit during which the screen must load is specific and tangible. For that reason, you'll know that the requirement has been successfully completed when the objective has been met.

Example 2

Let's say that your company is going to produce a holiday batch of eggnog. Your objective statement might be stated this way: Christmas Cheer, Inc. will produce two million cases of holiday eggnog, to be shipped to our distributors by October 30, at a total cost of \$1.5 million or less. The objective criteria in this statement are clearly stated and successful fulfillment can easily be measured. Stakeholders will know that the objectives are met when the two million cases are produced and shipped by the due date within the budget stated.

When articulating the project objectives you should follow the SMART rule:

- Specific – get into the details. Objectives should be specific and written in clear, concise, and understandable terms.
- Measurable – use quantitative language. You need to know when you have successfully completed the task.
- Acceptable – agreed with the stakeholders.
- Realistic – in terms of achievement. Objectives that are impossible to accomplish are not realistic and not attainable. Objectives must be centred in reality.
- Time based – deadlines not durations. Objectives should have a time frame with an end date assigned to them.

If you follow these principles, you'll be certain that your objectives meet the quantifiable criteria needed to measure success.

Project Implementation Overview

After you have carefully planned your project, you will be ready to start the project implementation phase, the third phase of the project management life cycle. The implementation phase involves putting the project plan into action. It's here that the project manager will coordinate and direct project resources to meet the objectives of the project plan. As the project unfolds, it's the project manager's job to direct and manage each activity, every step of the way. That's what happens in the implementation phase of the project life cycle: you follow the plan you've put together and handle any problems that come up.

The implementation phase is where you and your project team actually do the project work to produce the deliverables. The word “**deliverable**” means anything your project delivers. The deliverables for your project include all of the products or services that you

and your team are performing for the client, customer, or sponsor, including all the project management documents that you put together.

The steps undertaken to build each deliverable will vary depending on the type of project you are undertaking, and cannot therefore be described here in any real detail. For instance engineering and telecommunications projects will focus on using equipment, resources, and materials to construct each project deliverable, whereas computer software projects may require the development and implementation of software code routines to produce each project deliverable. The activities required to build each deliverable will be clearly specified within the project requirements document and project plan.

Your job as project manager is to direct the work, but you need to do more than deliver the results. You also need to keep track of how well your team performs. The implementation phase keeps the project plan on track with careful monitoring and control processes to ensure the final deliverable meets the acceptance criteria set by the customer. This phase is typically where approved changes are implemented.

Most often, changes are identified by looking at performance and quality control data. Routine performance and quality control measurements should be evaluated on a regular basis throughout the implementation phase. Gathering reports on those measurements will help you determine where the problem is and recommend changes to fix it.

Change Control

When you find a problem, you can't just make a change, because it may be too expensive or take too long to do. You will need to look at how it affects the triple constraint (time, cost, scope) and how it impacts project quality. You will then have to figure out if

it is worth making the change. If you evaluate the impact of the change and find that it won't have an impact on the project triple constraint, then you can make the change without going through change control. Change control is a set of procedures that lets you make changes in an organized way.

Any time you need to make a change to your plan, you must start with a change request. This is a document that either you or the person making the request must complete. Any change to your project must be documented so you can figure out what needs to be done, by when, and by whom.

Once the change request is documented, it is submitted to a change control board. A change control board is a group of people who consider changes for approval. Not every change control system has a board but most do. The change request could also be submitted to the project sponsor or management for review and approval. Putting the recommended changes through change control will help you evaluate the impact and update all the necessary documents. Not all changes are approved, but if the changes are approved, you send them back to the team to put them in place.

The implementation phase uses the most project time and resources, and as a result, costs are usually the highest during this phase. Project managers also experience the greatest conflicts over schedules in this phase. You may find as you are monitoring your project that the actual time it is taking to do the scheduled work is longer than the amount of time planned.

When you absolutely have to meet the date and you are running behind, you can sometimes find ways to do activities more quickly by adding more resources to critical path tasks. That's called *crashing*. Crashing the schedule means adding resources or moving them around to bring the project back into line with the schedule. Crashing **always** costs more and doesn't always work. There's no way to crash a schedule without raising the overall cost of the project. So, if the budget is fixed and you don't have any extra money to spend, you can't use this technique.

Sometimes you've got two activities planned to occur in sequence, but you can actually do them at the same time. This is called *fast tracking* the project. On a software project, you might do both your user acceptance testing (UAT) and your functional testing at the same time, for example. This is pretty risky. There's a good chance you might need to redo some of the work you have done concurrently. Crashing and fast tracking are schedule compression tools. Managing a schedule change means keeping all of your schedule documents up to date. That way, you will always be comparing your results to the correct plan.

After the deliverables have been physically constructed and accepted by the customer, a phase review is carried out to determine whether the project is complete and ready for closure.

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9. Assignment: Pick your Project

Pick Your Project semester-long Assignment

The rest of the semester we will be work on a Project Management Plan using a project you will choose from the three provided preliminary Scope Statements. Each week you will be asked to create a part of the plan based on the project you choose. A sample Preliminary Scope Statement is provided below to help you get started.

How do I choose a project?

I have provided three sample (draft) scope statements along with this document. Although I am providing examples, it is best that you will actually execute whether it be for work or in your personal life. This has been the advice from students in past semesters to keep them interested and motivated throughout the term. You should look over all three of the following documents and consider your own projects to make a decision.

Example 1: Shed

Example 2: Fundraiser

Example 3: Website

How to get started

1. Review the examples above carefully and consider any your own project ideas that you could potentially carry out in real life. Consider if you could work on this project for the rest of the semester.
2. If you choose a provided draft project, you may change any details about the project as you would like. Make it your own!
3. When you have decided, first take the Develop my Scope Statement questionnaire to help you start to brainstorm your scope statement. After completing, you will be able to see the answers to your questions.
4. Your Instructor will provide feedback on your submissions to help guide your project scope. You will use this information for next week's Scope Statement draft.

What if I want to change my mind?

You should choose a project that you are interested in working through the rest of the semester. It is possible to change your idea or tweak it to go in another direction, but starting next week you will be writing parts of the plan that will go in the final project so if you dramatically change your project, you will have to rewrite all the documentation.

Some clarifications on the questions to consider:

Project Team:

You must have a team so you can manage your team. Your team can be real people or a pretend group of people you believe would be needed to complete the project. Every project is different so more people will be needed for some projects but I ask that you have a minimum of three people other than yourself.

Project Objective:

This must answer the questions of:

What (short description of the outcome),

When (project deadline with date),

Where it will take place (if necessary),

for Who (customer)

How Much Will it Cost (budget).

You should write it in paragraph form as described in chapter 4.

Deliverables (5+):

What will your project provide? You should have a least five deliverables listed here. This is a list of items that will be produced during the project. This list can include thoughts as well. The list should show movement through the project. Consider that these should represent each of the phases of Project Management lifecycle (Initiation, Planning, Execution, Monitor & Control, & Closing).

To come up with your list, consider the

important steps of the project and also the parts of the project that can be broken down into smaller tasks.

Milestones (5+):

Please make sure you have listed a date for each of these major steps through your project.

Example: Purchase building supplies by March 3, 2020.

Technical Requirements/Limits and Exclusions (5+):

Please include at least five items in each of these categories.

This can be measurements, technical qualifications, trainings, technology requirements, time requirements, etc.

Customer Review:

Who will be the person who can oversee the progress of the project? This should be a certain person by name or title.

See the sample below. You will submit a preliminary scope statement which I will evaluate and provide comments. There is a template in this module.

10. Project Management

Chapter Questions

Knowledge Check 1



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<https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=163#h5p-1>

Knowledge Check 2



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Knowledge Check 3



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projectmanagementbasics/?p=163#h5p-3](https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=163#h5p-3)

[https://kirkwood.pressbooks.pub/projectmanagementbasics/
chapter/1-7-chapter-questions/](https://kirkwood.pressbooks.pub/projectmanagementbasics/chapter/1-7-chapter-questions/)

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PART II

MODULE 2: PROJECT SELECTION

Learning Objectives

After reading this chapter, you will be able to:

1. Explain the three broad categories of projects
2. Understand SMART criteria for developing and defining projects
3. Explain the types of costs that need to be considered (Direct Costs, and Overhead Cost)
4. Describe the elements of a project charter and explain its role in the initiation phase
5. Understand the value of a project charter to project success
6. Explain issues related to project scope
7. Understand how to use a simple checklist and a weighted scoring model
8. Identify project requirements

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II. Strategy - Portfolio - Program - Project

Effective project management and execution start with choosing the right projects. While you might not have control over which projects your organization pursues, you do need to understand why your organization chooses to invest in particular projects so that you can effectively manage your projects and contribute to decisions about how to develop and, if necessary, terminate a project. Your study of technical project management will primarily focus on doing things the right way. In this chapter, we'll concentrate on doing the right thing from the very beginning.

As always, it's helpful to start with some basic definitions:

- **Project:** The “temporary initiatives that companies put into place alongside their ongoing operations to achieve specific goals. They are clearly defined packages of work, bound by deadlines and endowed with resources including budgets, people, and facilities” (Morgan et al., 2007, p. 3). Note that this is a more expansive definition than the Cambridge English Dictionary definition piece of planned work or activity that is completed over a period of time and intended to achieve a “particular aim”. In this, lesson we focus on the trade-offs necessitated by deadlines and limited resources.
- **Program:** “A cluster of interconnected projects” (Morgan et al., 2007, p. 9).
- **Portfolio:** The “array of investments in projects and programs a company chooses to pursue” (Morgan et al., 2007, p. 3).
- **Strategy:** According to Merriam-Webster dictionary, it is “a careful plan or method for achieving a particular goal usually over a long period of time.”

As shown in Figure 2-8, a portfolio is made up of programs and

projects. An organization's strategy is the game plan for ensuring that the organization's portfolios, programs, and projects are all directed toward a common goal.

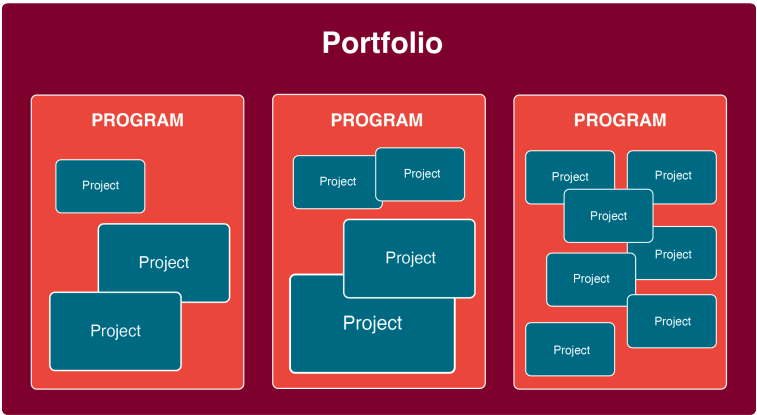


Figure 2-8: Relationship between a portfolio, programs, and projects

The Essence of Strategy

An organization without a clearly defined strategy can never expect to navigate the permanent white-water of living order. This is especially true if the strategy is motivated by the organization attempting to push its vision onto customers, rather than pulling the customer's definition of value into its daily operations. An organization's strategy is an expression of its mission and overall culture. In a well-run company, every decision about a project, program, or portfolio supports the organization's strategy. The strategy, in turn, defines the company's portfolio and day-to-day operations. Projects and their budgets flow out of the organizational strategy. Morgan et al. (2007) emphasize the importance of aligning a company's portfolio with its strategy:

- Without clear leadership that aligns each activity and every

project investment to the espoused strategy, individuals will use other decision rules in choosing what to work on: first in, first out; last in, first out; loudest demand; squeakiest wheel; boss's whim; least risk; easiest; best guess as to what the organization needs; most likely to lead to raises and promotion; most politically correct; wild guess—or whatever they feel like at the time. Portfolio management still takes place, but it is not necessarily aligned with strategy, and it occurs at the wrong level of the organization. (2007, p. 5)

As a project manager, you should be able to refer to your organization's strategy for guidance on how to proceed. You should also be able to use your organization's strategy as a means of crossing possibilities off your list. Michael E. Porter, author of the hugely influential book *Competitive Strategy*, explains that strategy is largely a matter of deciding what your organization won't do. In an interview with *Fast Company* magazine, he puts it like this:

- The essence of strategy is that you must set limits on what you're trying to accomplish. The company without a strategy is willing to try anything. If all you're trying to do is essentially the same thing as your rivals, then it's unlikely that you'll be very successful. It's incredibly arrogant for a company to believe that it can deliver the same sort of product that its rivals do and actually do better for very long. That's especially true today, when the flow of information and capital is incredibly fast. (Hammonds, 2001)

Ultimately, strategy comes down to making trade-offs. It's about "aligning every activity to create an offering that cannot easily be emulated by competitors" (Porter, 2001). Southwest Airlines, which has thrived while most airlines struggle, is often hailed as an example of a company with a laser-like focus on a well-defined strategy. Excluding options from the long list of possibilities available to an airline allows Southwest to focus on doing a few

things extremely well—specifically providing reliable, low-cost flights between mid-sized cities. As a writer for Bloomberg View puts it:

- By keeping the important things simple and implementing them consistently, Southwest manages to succeed in an industry better known for losses and bankruptcies than sustained profitability. Yet none of this seems to have gone to the company's head, even after 40 years. As such, the airline serves as a vivid—and rare—reminder that size and success need not contaminate a company's mission and mind-set, nor erode the addictive enthusiasm of management and staff. (El-Erian, 2014)

Aligning Projects with Strategy Through Portfolio Management

Projects are the way organizations operationalize strategy. In the end, executing a strategy effectively means pursuing the right projects. In other words, it's a matter of aligning projects and initiatives with the company's overall goals. And keep in mind that taking a big-picture, long-term approach to executing a new organizational strategy requires a living order commitment to a certain amount of uncertainty in the short term. It can take a while for everyone to get on board with the new plan, and in the meantime, operations may not proceed as expected. But by keeping your eye on the North Star of your organization's strategy, you can help your team navigate the choppy waters of change.

Project selection proceeds on two levels: the portfolio level and the project level. On the portfolio level, management works to ensure that all the projects in a portfolio support the organization's larger strategy. In other words, management focuses on optimizing its portfolio of projects. According to Morgan et al. (2007, p. 167),

portfolio optimization is “the difficult and iterative process of choosing and constantly monitoring what the organization commits to do”.

Morgan et al (2007, p. 167). see portfolio management as the heart and soul of pursuing a strategy effectively:

- Strategic execution results from executing the right set of strategic projects in the right way. It lies at the crossroads of corporate leadership and project portfolio management—the place where an organization’s purpose, vision, and culture translate into performance and results. There is simply no path to executing strategy other than the one that runs through project portfolio management. (2007, p. 4-5).

To manage portfolios effectively, large organizations often use scenario-planning techniques that involve sophisticated quantitative analysis. One such technique is based on the knapsack problem, a classic optimization problem. Various items, each with a weight and a value are available to be placed in a knapsack. The challenge of planning is an analogue to choose the types and numbers of items that can be fit into the knapsack without exceeding the weight limit of the knapsack. Portfolio managers are faced with a similar challenge: choosing the number and types of projects, each with a given cost and value, to optimize the collective value without exceeding resource availability.

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12. Virtual PM

Managing a team of people who work side-by-side in the same office is difficult enough. But what about managing a virtual team—that is, a team whose members are dispersed at multiple geographical locations? In the worldwide marketplace, such teams are essential. Deborah L. Duarte and Nancy Tennant Snyder explain the trend in their helpful workbook, *Mastering Virtual Teams*:

- Understanding how to work in or lead a virtual team is now a fundamental requirement for people in many organizations.... The fact is that leading a virtual team is not like leading a traditional team. People who lead and work on virtual teams need to have special skills, including an understanding of human dynamics and performance without the benefit of normal social cues, knowledge of how to manage across functional areas and national cultures, skill in managing their careers and others without the benefit of face-to-face interactions, and the ability to use leverage and electronic communication technology as their primary means of communicating and collaborating. (Duarte & Tennant Snyder, 2006, p. 4)

When properly managed, collaboration over large distances can generate serious advantages. For one thing, the diversity of team members as per Siebdrat et al. (2009) “exposes members to heterogeneous sources of work experience, feedback, and networking opportunities.” At the same time, the team’s diversity enhances the “overall problem-solving capacity of the group by bringing more vantage points to bear on a particular project” (Siebdrat et al., 2009, p. 65). Often, engaging with stakeholders via email allows for more intimacy and understanding than face-to-face conversations, which, depending on the personality types involved, can sometimes be awkward or ineffective.

However, research consistently underscores the difficulties in getting a dispersed team to work effectively. In a widely cited study of 70 virtual teams, Vijay Govindarajan and Anil K. Gupta (2001) found that “only 18% considered their performance ‘highly successful’ and the remaining 82% fell short of their intended goals. In fact, fully one-third of the teams ... rated their performance as largely unsuccessful”. Furthermore, research has consistently shown that virtual team members are “overwhelmingly unsatisfied” with the technology available for virtual communication and do not view it “as an adequate substitute for face-to-face communication” (Purvanova, 2014).

Given these challenges, what’s a virtual team manager to do? It helps to be realistic about the barriers to collaboration that arise when your team is scattered around the office park or around the globe.

The Perils of Virtual Distance

Physical distance—the actual space between team members—can impose all sorts of difficulties. Most studies have shown that teams who are located in the same space, where members can build personal, collaborative relationships with one another, are usually more effective than teams that are dispersed across multiple geographical locations.

- Potential issues include difficulties in communication and coordination, reduced trust, and an increased inability to establish a common ground.... Distance also brings with it other issues, such as team members having to negotiate multiple time zones and requiring them to reorganize their work days to accommodate others’ schedules. In such situations, frustration and confusion can ensue, especially if coworkers are regularly unavailable for discussion or

clarification of task-related issues. (Siebdrat, et. al., 2009, p. 64)

Even dispersing teams on multiple floors of the same building can decrease the team's overall effectiveness, in part because team members "underestimate the barriers to collaboration deriving from, for instance, having to climb a flight of stairs to meet a teammate face-to-face." Team members end up behaving as if they were scattered across the globe. As one team leader at a software company noted, teams spread out within the same building tend to "use electronic communication technologies such as e-mail, telephone, and voicemail just as much as globally dispersed teams do" (Siebdrat, et. al., 2009, p. 64).

Communication options like video conferences, text messages, and email can do wonders to bridge the gap. But you do need to make sure your communication technology is working seamlessly. Studies show that operational glitches (such as failed Skype connections or thoughtlessly worded emails) can contribute to a pernicious sense of distance between team members. Karen Sobel-Lojeski and Richard Reilly coined the term virtual distance to refer to the "psychological distance created between people by an over-reliance on electronic communications" (2008, xxii). Generally speaking, it is tough to build a team solely through electronic communication. That's why it's helpful to meet face-to-face occasionally. A visit from a project manager once a year or once a quarter can do wonders to nurture relationships among all team members and keep everyone engaged and focused on project success.

In their book *Uniting the Virtual Workforce*, Sobel-Lojeski and Reilly document some "staggering effects" of virtual distance:

- 50% decline in project success (on-time, on-budget delivery).
- 90% drop in innovation effectiveness.
- 80% plummet in work satisfaction.
- 83% fall off in trust.
- 65% decrease in role and goal clarity.

- 50% decline in leader effectiveness (2008, xxii).

The Special Role of Trust on a Virtual PM

So, what's the secret to making virtual teams work for you? We've already discussed the importance of building trust on any team. But on virtual teams, building trust is a special concern. Erin Meyer describes the situation like this: "Trust takes on a whole new meaning in virtual teams. When you meet your workmates by the water cooler or photocopier every day, you know instinctively who you can and cannot trust. In a geographically distributed team, trust is measured almost exclusively in terms of reliability" (Meyer, 2010).

All sorts of problems can erode a sense of reliability on a virtual team, but most of them come down to a failure to communicate. Sometimes the problem is an actual, technical inability to communicate (for example, because of unreliable cell phone service at a remote factory); sometimes the problem is related to scheduling (for example, a manager in Japan being forced to hold phone meetings at midnight with colleagues in North America); and sometimes the problem is simply a failure to understand a message once it is received. Whatever the cause, communication failures have a way of eroding trust among team members as they begin to see each other as unreliable.

And as illustrated in Figure 8-1, communicating clearly will lead your team members to perceive you as a reliable person, which will then encourage them to trust you.

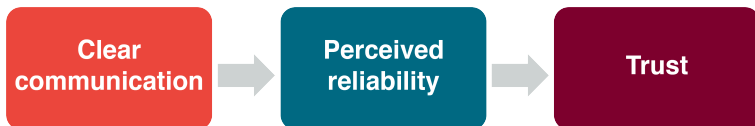


Figure 8-1: The benefits of clear communication

Leigh Thompson, a professor at Northwestern University's Kellogg School of Management, offers a number of practical suggestions for improving virtual team work, including the following:

- Verify that your communication technology works reliably, and that team members know how to use it.
- Take a few minutes before each virtual meeting to share some personal news, so that team members can get to know each other.
- Use video conferencing whenever possible, so everyone can see each other. The video image can go a long way toward humanizing your counterparts in distant locales. If video conferencing is not an option, try at least to keep a picture of the person you're talking to visible, perhaps on your computer. Studies have shown that even a thumbnail image can vastly improve your ability to reach an agreement with a remote team member. (Thompson, 2015)

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13. PM and Organization

Chapter Introduction

Learning Objectives

By the end of this chapter, you will be able to:

1. Understand the different types of organizational structures
2. Explain the relative advantages and disadvantages of each structure as it relates to project management
3. Define terms related to strategy and portfolios
4. Identify project selection methods.

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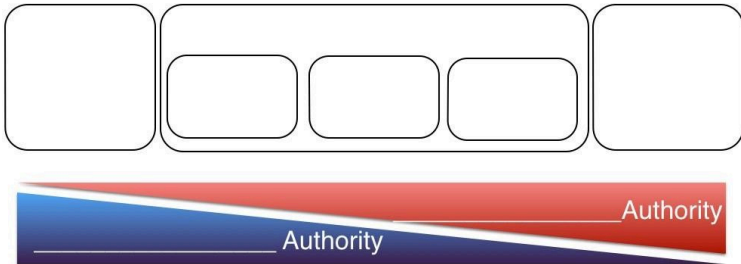
14. 3.1: Organizational Structures

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Notes

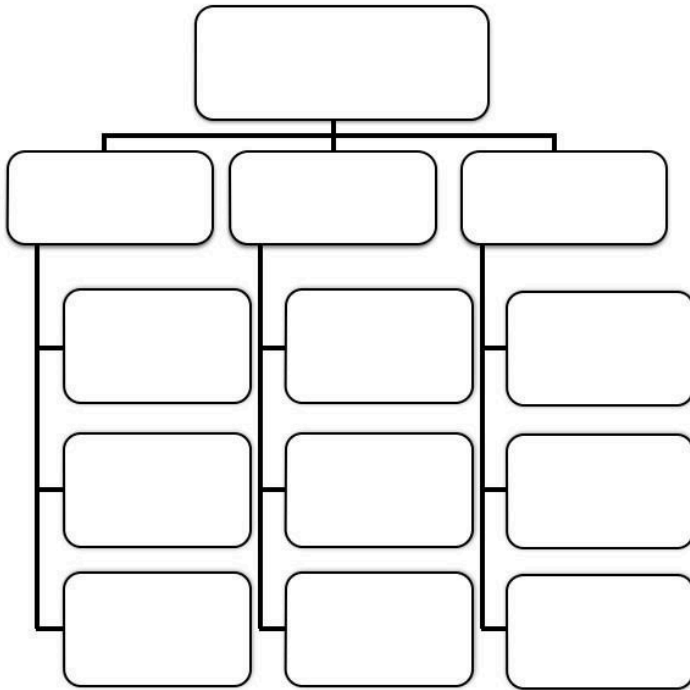
Project Management Organizations

Fill in the boxes in the figure below using the figure in the book as your guide.



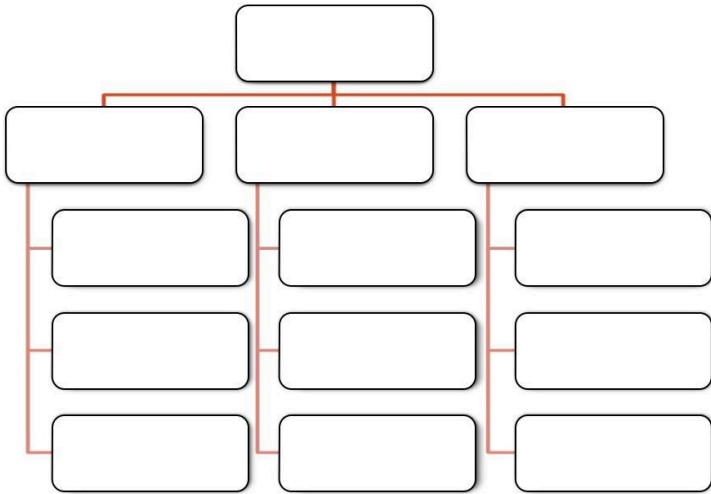
Functional Organizations

Fill in the boxes in the figure below using the figure in the book as your guide.



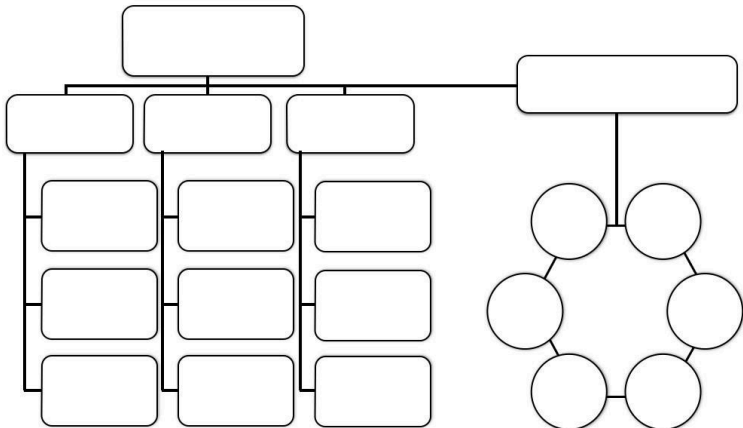
Projectized Organizations

Fill in the boxes in the figure below using the figure in the book as your guide.



Project Team

Fill in the boxes in the figure below using the figure in the book as your guide.



Check Your Knowledge

Questions: Project Management Organizations

Advantages	Disadvantages
<ul style="list-style-type: none">• Subject matter experts are well organized and have support of peers in their department• Maximize efficiency in terms of ongoing operations	<ul style="list-style-type: none">• Not focused on the project goals• Inefficient use of time and money in regards to project goals• Lack of responsibility or ownership of the project



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=538#h5p-28>

Fill in the Blank: Organization Structures: Advantages and Disadvantages

Complete the following table with the advantages and disadvantages of the functional, matrix, and dedicated project team organizations.

	Advantages	Disadvantages
Functional		
Matrix		
Dedicated Project Team		

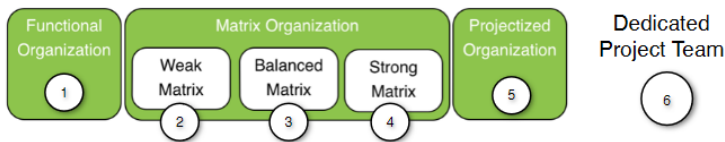
Fill in the Blank: Matrix Organizations

Fill in the types of Matrix organizations in the diagram below, and indicate the relative strength of the functional and project manager’s authorities.



Matching: Know Your Organization

Fill in the number that corresponds to the correct organization type.



A. Recognizing the benefits that the projectized organization has by giving authority to the project manager, functional organizations often organize ____ where a project manager can have authority over the staff assigned to that particular project.

B. The most typical problem with a _____ structure is that communication within the company can be rather rigid, making the organization slow and inflexible. Communication in organizations with these structures can be rigid because of the standardized ways of operation and the high degree of formalization.

C. Project Manager's Authority is Little or None in a ____ or ____.

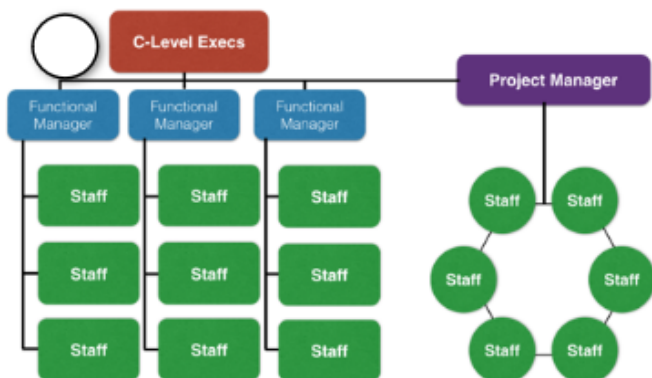
D. A project manager is primarily responsible for the project. Functional managers provide technical expertise and assign resources as needed in a ____.

E. In a ____ power is shared equally between the project manager and the functional managers. It brings the best aspects of functional and projectized organizations. However, this is the most difficult system to maintain as the sharing of power is a delicate proposition.

F. Among all three matrix organizations, the project manager's authority is the weakest in a _____.

G. Among all three matrix organizations, the functional manager's authority is the weakest in a _____.

H. On the figures below, fill in the circle with the number that corresponds to the correct organizational structure.





15. Structures

There are three broad structures by which an organization can be organized: functional, matrix, and projectized. These structures represent a continuum, from structures where the project manager has very little authority (functional) to those where project managers have very broad power (projectized) (See Figure 2-1).

There have been many studies about the impact that organizational structure has on project success, and it is not uncommon for corporations to change their organizational structure in order to increase their relative success in executing projects on time and within budget. This type of change takes great effort and may take a long period of time to fully implement. Instead of changing their entire structure, an organization may elect to create a dedicated project team in order to carry out a critical project without reorganizing the entire enterprise. This way, they can get many of the same benefits of the projectized organization without reorganizing the enterprise. This approach is not without risk, as we'll explore in the section on dedicated project teams.

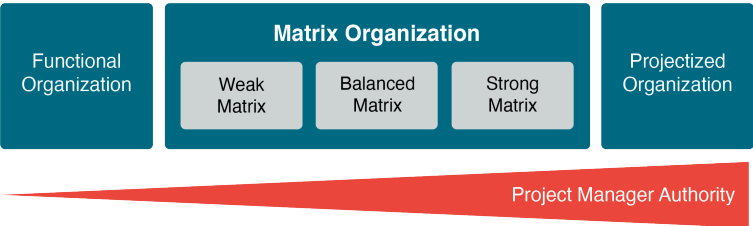


Figure 2-1: Project Manager Authority and Organization Type

Functional Organizations

Perhaps the least project-focused type of organization is functional

organizations. Large organizations are traditionally organized by function into various departments, with staff in each department reporting to a departmental manager or head of department. This allows for groupings of specialists within the organization where they can work together, share knowledge and prioritize their work. Traditional functional departments might include:

- Human resources
- Accounting
- Procurement
- Marketing
- Sales
- Shipping

These functional units work independently of each other, and the functional managers serve as conduits for communications and collaboration (See Figure 2-2). This type of structure is very efficient for operations management where continuous process improvement can be conducted on all regular departmental operations. However, it is not optimal for the completion of projects.

Projects often require work across disciplines. In the functional organization, with staff isolated inside their departmental “silos,” communication is directed through the functional managers. These managers often have differing priorities, which can make communications slow and error-prone in a functional organization.

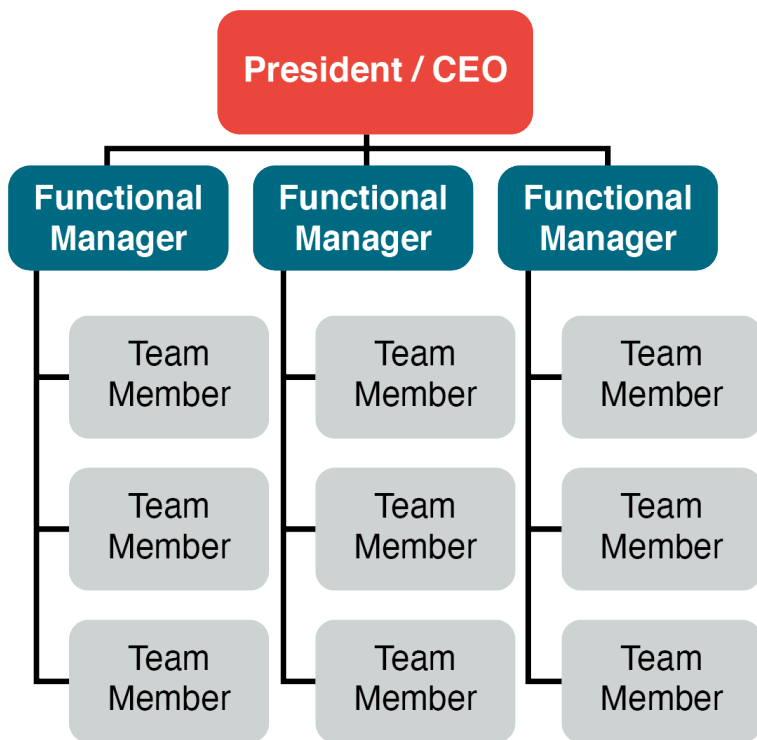


Figure 2-2: Functional Organization Structure

The success of projects within a functional organization depends on functional managers working together and cooperating. While someone may be designated as the project manager for a particular project, that person may not have much authority (See Figure 2-3). Often titles such as Project Coordinator, Project Scheduler, or Project Expediter will be used instead. Regardless of title, those in charge of projects are often put in the role of simply trying to maintain a schedule of what is happening.

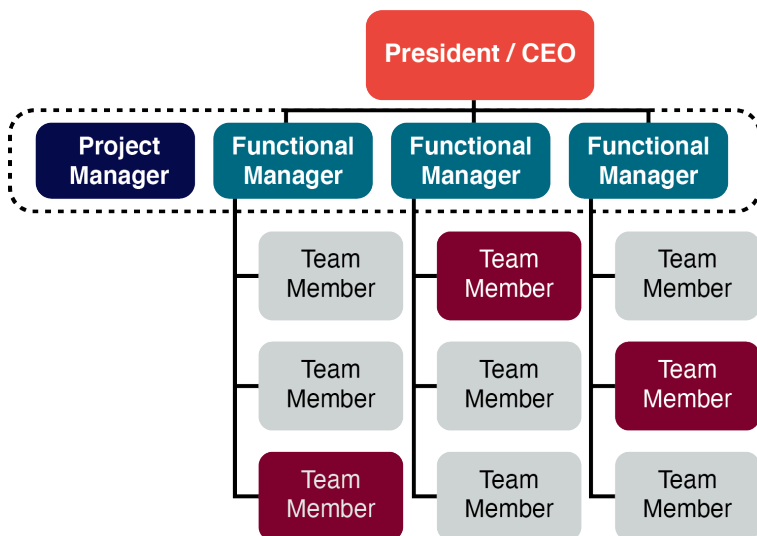


Figure 2-3: A “Project Manager” in a functional organization

PMI identifies the following project characteristics for projects conducted in functional organizations:

- Project Manager’s Authority: Little or None
- Resource Availability: Little or None
- Who Manages the Project Budget: Functional Manager
- Project Manager’s Role: Part-time
- Project Management Administrative Staff: Part-time

Projectized Organizations

Projectized organizations are at the opposite end of the organizational spectrum from functional organizations. Organizational energy and resources are focused on completing projects rather than ongoing operations. In a projectized

organization, operations are minimal and the project manager has great authority over resources and personnel decisions. Projectized organizations may have organizational units called departments and these groups either report directly to the project manager or provide support services to projects. In the project-based structure, personnel are specifically assigned to the project and report directly to the project manager (See Figure 2-4). The project manager is responsible for the performance appraisal and career progression of all project team members while on the project.

As you can imagine, employees in this type of environment are able to focus their loyalty to a project rather than their particular discipline. Not all people can succeed in such an organization, as they must adapt to the leadership styles and organizational skills of different project managers.

This is the most efficient organizational type for conducting projects, and it is used in those types of organizations that bid on and undertake large projects—military, industrial, scientific, etc.—that may last several years.

Examples of project-based organizations include construction companies, aeronautical manufacturers such as Lockheed Martin, and many software development companies. This type of organizational structure can put additional stress on employees as they have no home to return to once their project is over, if they are not selected for a subsequent project. But it is generally considered ideal for project management since there is a significant reduction in the layers of bureaucracy that a project manager must navigate. PMI identifies the following project characteristics for projects conducted in projectized organizations:

- Project Manager's Authority: High or Absolute
- Resource Availability: High or Absolute
- Who Manages the Project Budget: Project Manager
- Project Manager's Role: Full-time
- Project Management Administrative Staff: Full-time

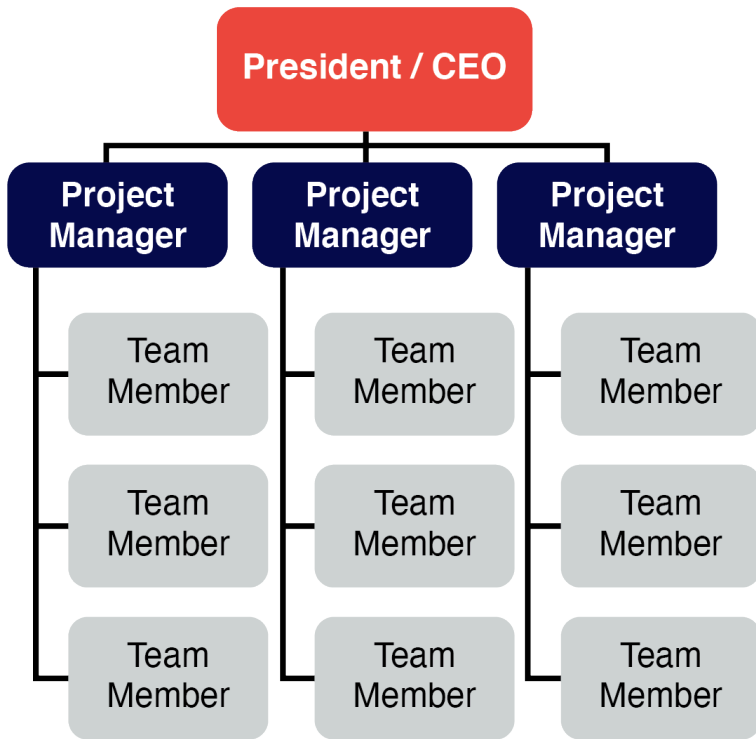


Figure 2-4: Projectized Organizations

Matrix Organizations

While the functional structure may work well in times of little change, it has some serious limitations when the success of a company depends on being adaptable. A matrix structure tries to combine the strengths a functional organization provides for operations management with the strengths a projectized organization provides for project management. In a matrix organization, the functional and project manager share authority and responsibility. This can lead to several negatives:

- Employees can have two supervisors to which they have to report, breaking the rule of a solitary chain of command.
- Employees have to balance their work between the needs of the projects, they are working on, and their functional unit.
- Supervisors may find that it is more difficult to achieve a consistent rate of progress since employees are often pulled in different directions.
- Costs and communication channels can increase.

However, there are several advantages to a matrix structure in terms of projects:

- It significantly disrupts the communication “silos” of a functional organization, creating a more horizontal structure for teams and increasing the flow of information.
- It allows people to concentrate on their areas of speciality and bring that strength to current projects.

PMI recognizes three types of matrix structures, as described below (See also Figure 2-5).

- **Weak Matrix:** The project manager has less authority over resources and people than the functional managers. Project managers in a weak matrix may go by other titles such as a project coordinator or project scheduler.
- **Balanced Matrix:** In a balanced matrix, the project manager and functional managers equally share authority over resources and staff. This allows the organization to experience the “best of both worlds” by receiving the benefits of a projectized organization and functional organization at the same time. However, this system presents many challenges:
- Functional managers and project managers have to work well together and maintain regular communications. Staff will have two managers to which they have to report, breaking the concept of the chain of command and organization.

- If functional and project managers have conflicting priorities, subordinates may be unable to meet expectations.

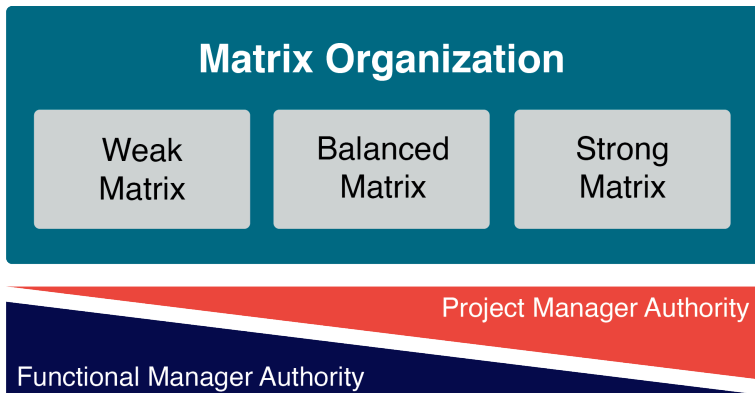


Figure 2-5: Matrix Organization

- **Strong Matrix:** In a strong matrix, the project manager has more direct control over resources and staffing, while the functional manager will provide support to the project staff in terms of hiring, technical expertise, and professional development. Of all the matrix structures, this is the one in which the project manager has the most authority, and the functional manager has the least.

Dedicated Project Team

Many functional organizations find that they often need to carry out important projects but do not want to change their entire organizational structure. Recognizing the advantages that are achieved by giving authority to a project manager, functional organizations often organize dedicated project teams where a project manager can have authority over the staff assigned to that

particular project. The project manager and project team members are sometimes located in a special office, away from the desks and duties that they normally have within the functional organization (See Figure 2-6). This can be a very effective way to complete projects. However, some difficulties can arise:

- Temporary loss of staff from the functional groups.
- Integration of project team members back into the functional organization after the project is completed can be difficult.
- An “us versus them” mentality, where the people on the project team are deemed to be more special than those working in the functional departments. There have been numerous case studies of conflict arising from dedicated project teams.

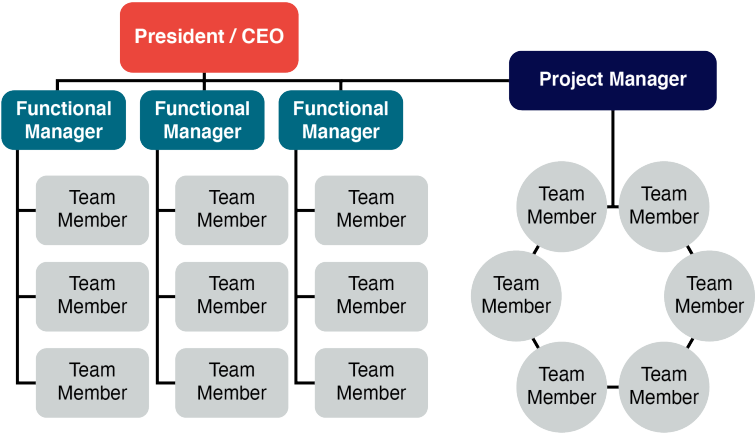


Figure 2-6: Dedicated Project Team

A classic case of the use of a dedicated project team—and the problems it can cause to the functional organization—was when Steve Jobs picked the best and brightest engineers from Apple to work on the development of the Macintosh computer. The project was very successful, but there was a lot of tension between the project team and the functional organization.

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16. What is a Business Case



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=307#oembed-1>

Simple Example of a Project Charter

Identification Section

List the project name, the date of the current version of the project charter, the sponsor's name and authority, and the project manager's name.

Example:

Project Name: Rice University Computer Store Creation

Project Sponsor: Jane Ungam, Facilities Manager

Date: Jan 12, 2010

Revision: 1

Project Manager: Fred Rubens

Overview of the Project

Provide a simple but precise statement of the project.

Example: Rice University is planning to create a store to sell computer supplies.

Objective

State the objectives of the project clearly and ensure they contain a measure of how to assess whether they have been achieved. The statement should be realistic and should follow the SMART protocol:

- Specific (get into the details)
- Measurable (use quantitative language so that you know when you are finished)
- Acceptable (to stakeholders)
- Realistic (given project constraints)
- Time based (deadlines, not durations)

Example: The objective of this project is to implement a campus store when class starts in August 2010 with enough inventory (computer supplies, such as memory sticks, mouse pads, and cables) to last through the first two weeks of classes.

Scope

Specify the scope of the project by identifying the domain or range of requirements.

Example: The scope of the Rice's school supplies store project includes the activities listed below:

1. Determine what supplies will be sold in the store.
2. Establish competitive prices for the computer supplies.
3. Source and secure supply vendors.

4. Establish marketing, procurement, operations, and any other necessary departments, schools, centers, and institutes

It is equally important to include in the scope what is not included in the project.

Example: The scope of the project does not include:

- Development of any other school store departments
- Store design or construction

Major Milestones

List all major milestones needed to ensure project completion successfully.

Example:

- All vendors selected
- Contracts or orders completed with all vendors
- Supplies delivered to the store
- Pricing determined

Major Deliverables

List and describe the major deliverables that will result from the project.

Example:

- Operations, procurement, marketing, and other teams established
- Store supplies stocked and displayed
- Store staffing completed, including work schedules
- Store operations policies, including hours of operation,

established

Assumptions

Outline the assumptions made in creating the project. An assumption is a fact you are unsure of but can either confirm at a later time or are simply stating so that the project can proceed as if the statement were true.

Example:

- Only computer supplies will be sold in the store.
- Customers will be the Rice University student body and faculty.
- Rice University students will manage the project and be responsible for ongoing operations.
- A store sponsor from the university faculty or staff will be assigned to mentor students and provide oversight.
- Store hours of operation will be approved by the Rice University students or store sponsor.
- Supplier deliveries will be arranged or the store sponsor will pick them up with students.
- Students will be empowered to contact vendors for order placement and inquiries via telephone.

Constraints

Define any and all constraints on the project or those working on the project. This is an important part of the project charter. A constraint is anything that limits the range of solutions or approaches.

Example:

- Student availability to meet for project planning is limited to school hours.
- Software is not available for project planning and control.

Business Need or Opportunity (Benefits)

Provide a concise statement of the business need or opportunity that led to the creation of the project. Why was it created? What are the benefits? How does the project contribute to organizational objectives?

Example: The goal of this project is to provide income for the Rice Student Center while supplying necessary items to students and faculty at competitive prices. The school store will be a convenience to students since necessary supplies will be available on campus. This will help students learn to manage their personal supplies.

Preliminary Cost for the Project

Provide a statement indicating how the cost of the project will be defined and controlled.

Example: The procurement team will assemble a proposal based on expected costs for review by the Dean of Undergraduate Studies.

Project Risks

A risk is anything uncertain that may occur that will reduce or decrease the chances of project success.

Example:

1. There is a state election coming and the new government may change the taxation rules for private university retail outlets.
2. The cloud is changing student demand for media such as flash drives in somewhat unpredictable ways. If this happens faster than we forecast, we may be building a store that students don't need.
3. Deliveries of items, such as store shelves, will be delayed if a major hurricane occurs.

Project Charter Acceptance

Provide the names, titles, and signature lines of the individuals who will sign off on the project charter.

Project Stakeholders

Provide the key stakeholders and team members by function, name, and role.

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17. Consideration

The project initiation phase is the first phase within the project management life cycle, as it involves starting up a new project. Within the initiation phase, the business problem or opportunity is identified, a solution is defined, a project is formed, and a project team is appointed to build and deliver the solution to the customer. A business case/proposal (sometimes called feasibility study) is created to define the problem or opportunity in detail and identify a preferred solution for implementation. The business case/proposal includes:

- A detailed description of the problem or opportunity with headings such as Introduction, Business Objectives, Problem/Opportunity Statement, Assumptions, and Constraints
- A list of the alternative solutions available
- An analysis of the business benefits, costs, risks, and issues
- A description of the preferred solution
- Main project requirements
- A summarized plan for implementation that includes a schedule and financial analysis

SMART Project Objectives

In the early 1980s, George T. Doran introduced the SMART set of criteria for projects, goals and objectives. S+MART is an acronym for Specific, Measurable, Assignable, Realistic, and Time-Related. The smart criteria have been applied in many different areas of management, including project management. Let's take a look at each of Doran's criteria as they apply to project management.

Specific – A project needs to be specific about what it will accomplish. Unlike many organizational goals, the goal of a project

should not be vague or nebulous. An organization may want to “make London, Ontario a great place to live,” but its projects need to focus on a specific goal. For example, a more specific goal would be to build a downtown farmers’ market. A project that is specific is one that can be clearly communicated to all team members and stakeholders. A specific project goal will answer the five ‘W’ questions:

1. **What** do we want to accomplish?
2. **Why** are we undertaking this project?
3. **Who** is involved or will be affected by the project?
4. **Where** will this project be conducted?
5. **Which** constraints (scope, time, money, risk, etc.) have been placed on our project?

Measurable – How will project progress and success be measured? What will be the measurable difference once our project is completed successfully? These measures should be quantifiable.

Assignable – Who will do the work? Can people be identified who have the expertise in the organization to complete this work? Or can the expertise be hired from outside of the organization?

Realistic – Is it realistic that the organization can achieve this project, given its talents and resources? This is a very important consideration for businesses of all sizes. Yes, it would be great to produce a new driverless car, but is that realistic given the resources that the organization has available?

Time-related – when will the project be completed and how long will it take? These criteria can be very useful when defining a project. If the description for a project does not meet all these

criteria, then it is time to go back to the drawing board and make sure that what is being described is really a project, rather than a program or strategic goal.

For example, an objective of the team principle (project manager) of a Formula 1 racing team may be that their star driver, “finish the lap as fast as possible.” That objective is filled with ambiguity.

How fast is “fast as possible?” Does that mean the fastest lap time (the time to complete one lap) or does it mean the fastest speed as the car crosses the start/finish line (that is at the finish of the lap)?

By when should the driver be able to achieve the objective? It is no use having the fastest lap after the race has finished, and equally the fastest lap does not count for qualifying and therefore starting position, if it is performed during a practice session.



Figure 4-1: Monaco 2004 by Cord Rodefeld (top); Jarno Trulli by ph-stop(middle); Jenson Button by Evoflash (bottom); used under CC-BY license.

The ambiguity of this objective can be seen from the following example. Ferrari's Michael Schumacher achieved the race lap record at the Circuit de Monaco of 1 min 14.439 sec in 2004 (Figure 4-1). However, he achieved this on lap 23 of the race, but crashed on lap 44 of a 77-lap race. While he achieved a fastest lap and therefore met the specific project goal of "finish the lap as fast as possible," it did not result in winning the race, clearly a different project goal. In contrast, the fastest qualifying time at the same event was by Renault's Jarno Trulli (1 min 13.985 sec), which gained him pole position for the race, which he went on to win (Figure 4-1). In his case, he achieved the specific project goal of "finish the lap as fast as possible," but also the larger goal of winning the race.

The objective can be strengthened considerably if it is stated as follows: "To be able to finish the 3.340 km lap at the Circuit de Monaco at the Monaco Grand Prix in 1 min 14.902 sec or less, during qualifying on May 23, 2009." This was the project objective achieved by Brawn GP's Jenson Button.

Financial Considerations

In many new project endeavors, we need to find out if our project is financially feasible. We do that by using net present value (NPV), rate of return (ROI), and payback analysis, as will be discussed later in chapters 6 and 10.

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18. Culture and Project Management

What Is Organizational Culture?

When working with internal and external customers on a project, it is essential to pay close attention to relationships, context, history, and the corporate culture. Corporate culture refers to the beliefs, attitudes, and values that the organization's members share and the behaviours consistent with them (which they give rise to). Corporate culture sets one organization apart from another, and dictates how members of the organization will see you, interact with you, and sometimes judge you. Often, projects too have a specific culture, work norms, and social conventions.

Some aspects of corporate culture are easily observed; others are more difficult to discern. You can easily observe the office environment and how people dress and speak. In one company, individuals work separately in closed offices; in another, teams may work in a shared environment. The more subtle components of corporate culture, such as the values and overarching business philosophy, may not be readily apparent, but they are reflected in member behaviours, symbols, and conventions used.

Project Manager's Checklist

Once the corporate culture has been identified, members should try to adapt to the frequency, formality, and type of communication customary in that culture. This adaptation will strongly affect

project members' productivity and satisfaction internally, as well as with the client organization.

- Which stakeholders will make the decision in this organization on this issue? Will your project decisions and documentation have to go up through several layers to get approval? If so, what are the criteria and values that may affect acceptance there? For example, is being on schedule the most important consideration? Cost? Quality?
- What type of communication among and between stakeholders is preferred? Do they want lengthy documents? Is “short and sweet” the typical standard?
- What medium of communication is preferred? What kind of medium is usually chosen for this type of situation? Check the files to see what others have done. Ask others in the organization.
- What vocabulary and format are used? What colours and designs are used (e.g., at Hewlett-Packard, all rectangles have curved corners)?

Project Team Challenges

Today's globally distributed organizations (and projects) consist of people who have differing “worldviews.” *Worldview* is a looking glass through which people see the world as Bob Shebib describes: “[It is] a belief system about the nature of the universe, its perceived effect on human behaviour, and one's place in the universe. Worldview is a fundamental core set of assumptions explaining cultural forces, the nature of humankind, the nature of good and evil, luck, fate, spirits, the power of significant others, the role of time, and the nature of our physical and natural resources” (Shebib, 2003, p. 296).

If, for example, a Canadian manager is sent to India to manage an R&D team or a joint venture, they are likely to have to “[cope] with

eco-shock or the physiological, psychological, and social reaction to a new assignment ecology.” Hanging a shingle in a fluid and culturally diverse organization, project team, and work culture, a project manager may find new working relationships and hidden challenges have significant implications for performance and knowledge exchange – for the manager and colleagues at home and in the host country.

In most situations, there is simply **no** substitute for having a well-placed person from the host culture to guide the new person through the cultural nuances of getting things done. In fact, if this “intervention” isn’t present, it is likely to affect the person’s motivation or desire to continue trying to break through the cultural (and other) barriers. Indeed, optimal effectiveness in such situations requires learning of cultures in developing countries or international micro-cultures and sharing perceptions among the culturally diverse task participants on how to get things done. Project leaders require sensitivity and awareness of multicultural preferences. The following broad areas should be considered:

- Individual identity and role within the project versus family of origin and community
- Verbal and emotional expressiveness
- Relationship expectations
- Style of communication
- Language
- Personal priorities, values, and beliefs
- Time orientation

There are many interpersonal dynamics and intra-project challenges faced by a globally distributed team. Individual members and the team itself requires important social supports to mitigate uncertainty, conflict, motivational challenges, culture shock, and the more-encompassing eco-shock that comes from facing head-on the unfamiliar and diverse situations consistent with a different cultural and geographically distributed context.

Diverse and globally distributed project teams (i.e., different ethnic cultures, genders, ages, and functional capabilities), often working on complex projects spanning multiple time zones, geography, and history, and operating with tight deadlines in cost-conscious organizations, need to make time and resources available to physically meet each other, and connect (at the very least) at a formal “kick-off” meeting. Especially when working with team members from high-context cultures, it is essential to meet face-to-face, discover member’s individual identities and cultural preferences, share professional knowledge and personal stories, and observe critical verbal and non-verbal cues (that may not easily be observed online, or on the telephone). This is key to establishing a safer climate and building trust for stronger relationships among both team members and management.

Dealing with Conflict

The question isn’t whether, when, or with what frequency conflict will occur among intercultural team members — or what will create the conflict. If a team wants to overcome (or harness) conflict for effectiveness and productivity, the question is how to navigate and resolve the conflicts. Conflict that springs from diversity can actually assist the team in completing complex problem solving. However, if not navigated successfully, it can create relationship strain and derail achievement due to increased difficulties in communication and coordination.

As the global marketplace continues its rapid expansion, researchers are increasingly turning their attention to the issue of conflict management. Differing social and cultural values don’t necessarily increase the number of conflicts a team will experience, but they can have an impact on how conflicts are managed and resolved. Cultural awareness is needed for understanding and appreciating others’ values and behavioural norms. Without that,

foreign assignments will become an overwhelming challenge. Self-awareness and skill development can aid in resolving the problematic conflict arising from cultural differences to help a team maintain good relations and remain productive.

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19. Culture

What Is Organizational Culture?

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There are many factors that need to be understood within your project environment (Figure 2-7). At one level, you need to think in terms of the cultural and social environments (i.e., people, demographics, and education). The international and political environment is where you need to understand about different countries' cultural influences. Furthermore, the physical environment of the project requires you to consider the impact of time zones. Think about how your project will be executed differently whether it is just in your country or if it involves an international project team that is distributed throughout the world in five different countries.

Of all the factors, the physical ones are the easiest to understand, and it is the cultural and international factors that are often misunderstood or ignored. How we deal with clients, customers, or project members from other countries can be critical to the success of the project. For example, the culture of the United States values accomplishments and individualism. Americans tend to be informal and call each other by first names, even if having just met. Europeans tend to be more formal, using surnames instead of first names in a business setting, even if they know each other well. In addition, their communication style is more formal than in the United States, and while they tend to value individualism, they also value history, hierarchy, and loyalty. The Japanese, on the other hand, tend to communicate indirectly and consider themselves part of a group, not as individuals. The Japanese value hard work and success, as most of us do.

Project Environment	
Cultural	Social
International	Political
Physical	

Figure 2-7: The important factors to consider within the project environment. Table from *Project Management for Scientists and Engineers* by Barron & Barron CC-BY 4.0

How a product is received can be very dependent on the international cultural differences. For example, in the 1990s, when many large American and European telecommunications companies were cultivating new markets in Asia, their customer's cultural differences often produced unexpected situations. Western companies planned their telephone systems to work the same way in Asia as they did in Europe and the United States. But the protocol of conversation was different. Call-waiting, a popular feature in the

West, is considered impolite in some parts of Asia. This cultural blunder could have been avoided had the team captured the project environment requirements and involved the customer.

It is often the simplest things that can cause trouble since, unsurprisingly, in different countries, people do things differently. One of the most notorious examples of this is also one of the simplest: date formats. What day and month is 2/8/2021? Of course, it depends where you come from: in North America, it is February 8th while in Europe (and much of the rest of the world) it is 2nd August. Clearly, when schedules and deadlines are being defined it is important that everyone is clear on the format used.

The diversity of practices and cultures and its impact on products in general and on software in particular goes well beyond the date issue. You may be managing a project to create a new website for a company that sells products worldwide. There are language and presentation style issues to take into consideration; converting the site into different languages isn't enough. It is obvious that you need to ensure the translation is correct; however, the presentation layer will have its own set of requirements for different cultures. The left side of a website may be the first focus of attention for a Canadian; the right side would be the initial focus for anyone from the Middle East, as both Arabic and Hebrew are written from right to left. Colors also have different meanings in different cultures. White, which is a sign of purity in North America (e.g., a bride's wedding dress), and thus would be a favored background color in North America, signifies death in Japan (e.g., a burial shroud).

Color	Canada	China	Japan	Egypt	France
Red	Danger, stop	Happiness	Anger, danger	Death	Aristocracy
Blue	Sadness, melancholy	Heavens, clouds	Villainy	Virtue, faith, truth	Freedom, peace
Green	Novice, apprentice	Ming dynasty, heavens	Future, youth, energy	Fertility, strength	Criminality
Yellow	Cowardice	Birth, wealth	Grace, nobility	Happiness, prosperity	Temporary
White	Purity	Death, purity	Death	Joy	Naturality

Table 2-1 The meaning of colors in various cultures (Russo & Boor, 1883).

Project managers in multicultural projects must appreciate the culture dimensions and try to learn relevant customs, courtesies, and business protocols before taking responsibility for managing an international project. A project manager must take into consideration these various cultural influences and how they may affect the project's completion, schedule, scope, and cost.

Creating a Project Culture

Project managers have a unique opportunity during the start-up of a project. They create a project culture, something organizational managers seldom have a chance to do. In most organizations, the corporate or organizational culture has developed over the life of the organization, and people associated with the organization understand what is valued, what has status, and what behaviors are expected. Edgar Schein identified three distinct levels in organizational culture.

1. Artifacts and behaviours
2. Espoused values

3. Assumptions

Artifacts are the visible elements in a culture and they can be recognized by people not part of the culture. Espoused values are the organization's stated values and rules of behavior. Shared basic assumptions are the deeply embedded, taken-for-granted behaviors that are usually unconscious, but constitute the essence of culture.

Characteristics of Project Culture

A project culture represents the shared norms, beliefs, values, and assumptions of the project team. Understanding the unique aspects of a project culture and developing an appropriate culture to match the complexity profile of the project are important project management abilities.

Culture is developed through the communication of:

- The priority
- The given status
- The alignment of official and operational rules

Official rules are the rules that are stated, and operational rules are the rules that are enforced. Project managers who align official and operational rules are more effective in developing a clear and strong project culture because the project rules are among the first aspects of the project culture to which team members are exposed when assigned to the project.

Example

Creating a Culture of Collaboration

A project manager met with his team prior to the beginning of an instructional design project. The team was excited about the prestigious project and the potential for career advancement involved. With this increased competitive aspect came the danger of selfishness and backstabbing. The project leadership team told stories of previous projects where people were fired for breaking down the team efforts and often shared inspirational examples of how teamwork created unprecedented successes—an example of storytelling. Every project meeting started with teambuilding exercises (a ritual) and any display of hostility or separatism was forbidden (taboo) and was quickly and strongly cut off by the project leadership if it occurred.

Culture guides behavior and communicates what is important and is useful for establishing priorities. On projects that have a strong culture of trust, team members feel free to challenge anyone who breaks a confidence, even managers. The culture of integrity is stronger than the cultural aspects of the power of management.

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20. Weighted Decision Matrix

A weighted decision matrix is a decision tool used by decision makers.

A decision matrix is basically an array presenting on one axis a list of alternatives, also called options or solutions. On the other axis, a list of criteria, which are weighted depending on their respective importance in the final decision to be taken.

The example in Figure 4.2 shows a weighted decision matrix that compared three options for a web development project (SJS Enterprises). This method is especially useful when choosing purchase alternatives and comparing them against specific desirable system requirements.

Weighted Decision Matrix for Game Delivery System

Criteria	Weight	SJS Enterprises	Game Access	DVD Link
Educational	15%	90	0	0
Sports-related	15%	90	90	90
Secure payment area with the ability to use Paypal, bank payments, cheques, school payment systems as a payment source	10%	90	50	50
Live Support	15%	90	0	0
Search Option	5%	50	50	30
Games available for all platforms currently on the market including school learning systems	10%	60	30	30
Longer Rental Periods (1 to 2 weeks)	5%	40	20	40
Sidebar with categories such as most popular, multiplayer and just released	5%	50	50	20
Registered customers must be able to order the videos, track delivery, return of videos and be able to provide reviews of views	10%	50	30	30
Age/grade appropriate section (can isolate certain games to certain ages or grade levels)	10%	70	5	0
Weighted Project Scores	100%	74.5	31	29

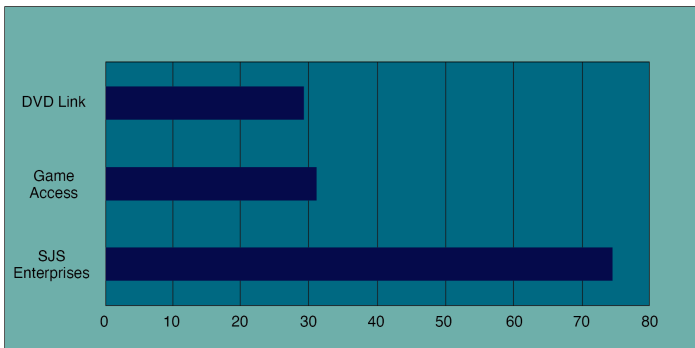


Figure 4-2

Comparing Options Using a Weighted Decision Matrix

Sometimes we have multiple options to choose from when determining requirements and deciding which project to work on. To select the best option, we can use tools such as a weighted decision matrix.

A basic decision matrix consists of establishing a set of criteria for options that are scored and summed to gain a total score that can then be ranked. Importantly, it is not weighted to allow a quick selection process.

A weighted decision matrix operates in the same way as the basic decision matrix but introduces the concept of weighting the criteria in order of importance. The resultant scores better reflect the importance to the decision maker of the criteria involved. The more important a criterion, the higher the weighting it should be given. Each of the potential options is scored and then multiplied by the weighting given to each of the criteria to produce a result.

The advantage of the weighted decision matrix is that subjective opinions about one alternative versus another can be made more objective. Another advantage of this method is that sensitivity studies can be performed. An example of this might be to see how much your opinion would have to change in order for a lower-ranked alternative to outrank a competing alternative.

A weighted decision matrix therefore allows decision makers to structure and solve their problem by:

1. Specifying and prioritizing their needs with a list of criteria; then
2. Evaluating, rating, and comparing the different solutions; and
3. Selecting the best matching solution.

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2I. Project Selection

Factors that Affect Project Selection

In any organization, project selection is influenced by the available resources. When money is short, organizations often terminate existing projects and postpone investing in new ones. For example, in 2015, the worldwide drop in oil prices forced oil companies to postpone \$380 billion in projects, such as new deep-water drilling operations (Scheck, 2016).

An organization's project selection process is also influenced by the nature of the organization. At a huge aerospace technology corporation, for example, the impetus for a project nearly always comes from the market and is loaded with government regulations. Such projects are decades-long undertakings, which necessarily require significant financial analysis. On the other hand, at a consumer products company, the idea for a project often originates inside the company as a way to respond to a perceived consumer demand. In that case, with less time and fewer resources at stake, the project selection process typically proceeds more quickly.

Size is a major influence on an organization's project selection process. At a large, well-established corporation, the entrenched bureaucracy can impede quick decision-making. By contrast, a twenty-person start-up can make decisions quickly and with great agility.

Value and Risk

Keep in mind that along with the customer's definition of value comes the customer's definition of the amount of risk he or she

is willing to accept. As a project manager, it's your job to help the customer understand the nature of possible risks inherent in a project, as well as the options for and costs of reducing that risk. It's the rare customer who is actually willing or able to pay for zero risk in any undertaking. In some situations, the difference between a little risk and zero risk can be enormous. This is true, for instance, in the world of computer networking, where a network that is available 99.99% of the time (with 53 minutes and 35 seconds of down time a year) costs much less than a network that is 99.999% available (with only 5 minutes and 15 seconds of down time a year) (Dean, 2013, p. 645). If you're installing a network for a small chain of restaurants, shooting for 99.99% availability is a waste of time and money. By contrast, on a military or healthcare network, 99.999% availability might not be good enough.

Identifying the magnitude and impact of risks, as well as potential mitigation strategies, are key elements of the initial feasibility analysis of a project. Decision-makers will need that information to assess whether the potential value of the project outweighs the costs and risks. Risk analysis will be addressed further in chapter nine. For some easy-to-digest summaries of the basics of risk management, check out the many YouTube videos by David Hillson, who is known in the project management world as the Risk Doctor. Start with his video named "Risk Management Basics: What Exactly Is It?"

The Project Selection Process

No matter the speed at which its project selection process plays out, successful organizations typically build in a period of what Scott Anthony calls "staged learning," in which the project stakeholders expand their knowledge of potential projects. In an interesting article in the Harvard Business Review, Anthony compares this process to the way major leagues use the minor leagues to learn

more about the players they want to invest in. In the same way, consumer product companies use staged learning to expose their products to progressively higher levels of scrutiny, before making the final, big investment required to release the product to market (Anthony, 2009).

You can think of the project selection process as a series of screens that reduce a plethora of ideas, opportunities, and needs to a few approved projects. From all available ideas, opportunities, and needs, the organization selects a subset that warrant consideration given their alignment with the organization's strategy. As projects progress, they are subjected to a series of filters based on a variety of business and technical feasibility considerations. As shown in Figure 2-9, projects that pass all screens are refined, focused, and proceed to execution.

This same concept is applied in Stage-Gate™ or phase-gate models, in which a project is screened and developed as it passes through a series of stages/phases and corresponding gates. During each stage/phase, the project is refined, and at each gate a decision is required as to whether the project warrants the additional investment needed to advance to the next stage/phase of development. "The typical Stage-Gate new product process has five stages, each stage preceded by a gate. Stages define best-practice activities and deliverables, while gates rely on visible criteria for Go/Kill decisions" (Cooper, et al., 2000).

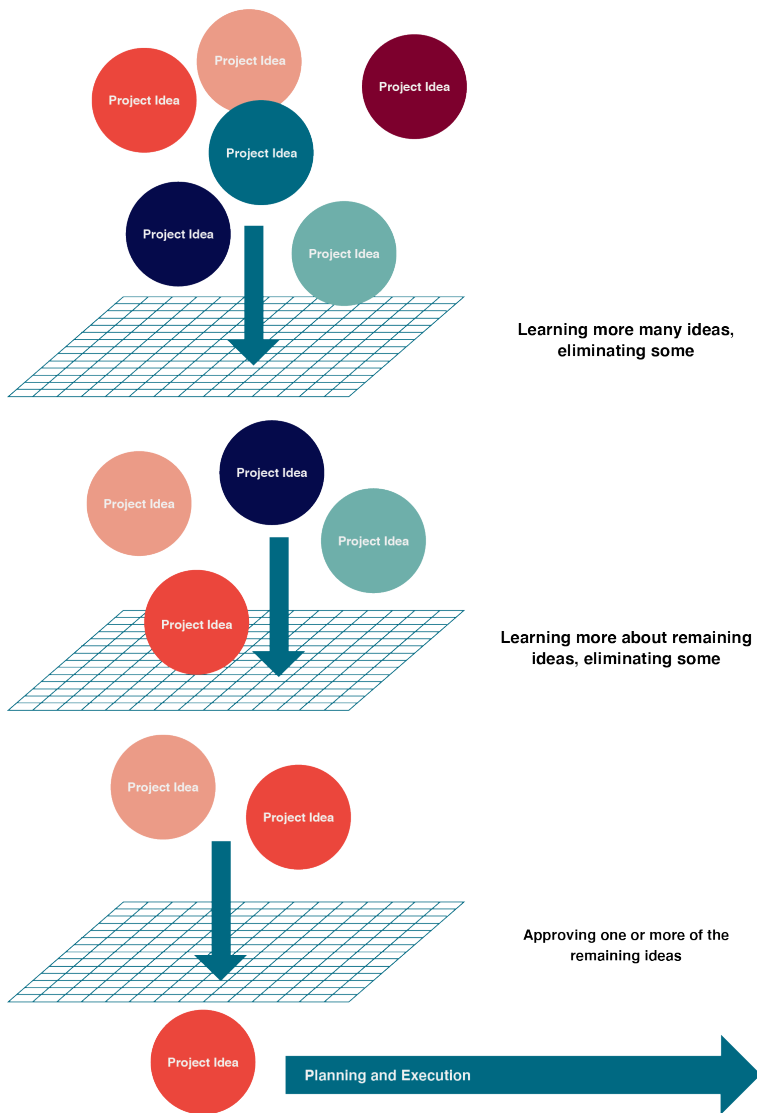


Figure 2-9: A project selection process can be seen as a series of screens

This approach is designed to help an organization make decisions

about projects where very limited knowledge is available at the outset. The initial commitment of resources is devoted to figuring out if the project is viable. After that, you can decide if you are ready to proceed with detailed planning, and then, whether to implement the project. This process creates a discipline of vetting each successive investment of resources and allows safe places to kill the project if necessary.

Another approach to project selection, set-based concurrent engineering, avoids filtering projects too quickly, instead focusing on developing multiple solutions through to final selection just before launch. This approach is expensive and resource-hungry, but its proponents argue that the costs associated with narrowing to a single solution too soon—a solution that subsequently turns out to be sub-optimal—are greater than the resources expended on developing multiple projects in parallel. Narrowing down rapidly to a single solution is typical of many companies in the United States and in other western countries. Japanese manufacturers, by contrast, emphasize developing multiple options (even to the point of production tooling).

In an article for the International Project Management Association, Joni Seeber discusses some general project selection criteria. Like Michael Porter, she argues that first and foremost, you should choose projects that align with your organization's overall strategy. She suggests a helpful test for determining whether a project meaningfully contributes to your organization's strategy:

A quick and dirty trick to determining the meaningfulness of a project is answering the question “So what?” about intended project outcomes. The more the project aligns with the strategic direction of the organization, the more meaningful. The higher the likelihood of success, the more meaningful.

To illustrate, developing a vaccine for HIV is meaningful; however, developing a vaccine for HIV that HIV populations cannot afford is not. Size matters as well since the size of a project and the amount of resources required are usually positively correlated. Building the pyramids of Egypt may be meaningful, but the size of the project

makes it a high-stake endeavor only suitable to pharaohs and Vegas king pins. (Seeber, 2011)

Project Selection Methods

Projects are selected by comparing the costs and benefits of potential projects. Some of the selection methods are more subjective than others, but all try to use a standard set of criteria to determine which project is the best for an organization to pursue. Methods can include:

- **Murder Boards.** A group of experts (internal and external) attempt to “murder” a project proposal by pointing out its flaws and weaknesses. This can be very useful in high-risk projects where there is little data from previous projects from which we can learn, or in situations where the environment has changed significantly since the development of the original scope of the project. Participants in a murder board session are encouraged to be aggressive and not hold back in their attempt to murder the project.
- **Qualitative Scoring Methods.** Scoring methods can take a variety of factors into account. These can range from simple checklists to complex weighted scoring systems. Scoring systems can assist staff with evaluating the relative merit of different projects while limiting political influence. Scoring models might survey a wide variety of experts and have them rate the project in terms of importance to the company or relative chance of success. Scoring methods will be examined in the next section of this chapter.
- **Economic Scoring Methods.** These methods assess the ability of the project to help the bottom line, either by increasing profits or reducing costs. These models often look at the cash flow that a project will generate after it is completed. The final

section of this chapter examines economic models in more detail.

- **Constrained Optimization Methods.** Constrained Optimization Methods of project selection are mathematically intensive means of analyzing a series of projects and are not easily generalized.

In project management, these methods can include:

- Linear Programming
- Dynamic Programming
- Branch and Bound Algorithms
- Integer Programming

We might also refer to Constrained Optimization Methods as mathematical approaches to project selection. These methods are beyond the scope of this text, but students preparing to take PMI exams should know that if they see any type of programming or algorithms used for project selection, a Constrained Optimization Method is being used.

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PART III

MODULE 3: DEFINING THE PROJECT

In this module a **Project Charter** will be introduced. The project charter is a document that officially starts a project. It formally authorizes the existence of the project and provides a reference source for the future. The charter gives direction and a sense of purpose to the management from start to end.

22. Lesson Videos



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=549#oembed-1>

23. Project Initiation

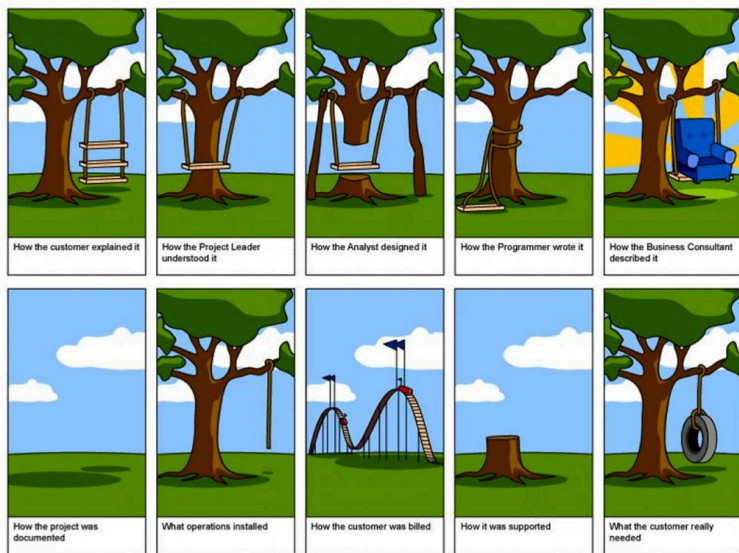


Figure 7.1 Project Management.

For example, an objective of the team principle (project manager) of a Formula 1 racing team may be that their star driver, “finish the lap as fast as possible.” That objective is filled with ambiguity.

How fast is “fast as possible?” Does that mean the fastest lap time (the time to complete one lap) or does it mean the fastest speed as the car crosses the start/finish line (that is at the finish of the lap)?

By when should the driver be able to achieve the objective? It is no use having the fastest lap after the race has finished, and equally the fastest lap does not count for qualifying and therefore starting position, if it is performed during a practice session.

The ambiguity of this objective can be seen from the following example. Ferrari’s Michael Schumacher achieved the race lap record at the Circuit de Monaco of 1 min 14.439 sec in 2004 (Figure 7.2).

However, he achieved this on lap 23 of the race, but crashed on lap 44 of a 77-lap race. So while he achieved a fastest lap and therefore met the specific project goal of “finish the lap as fast as possible,” it did not result in winning the race, clearly a different project goal. In contrast, the fastest qualifying time at the same event was by Renault’s Jarno Trulli (1 min 13.985 sec), which gained him pole position for the race, which he went on to win (Figure 7.2). In his case, he achieved the specific project goal of “finish the lap as fast as possible,” but also the larger goal of winning the race.

The objective can be strengthened considerably if it is stated as follows: “To be able to finish the 3.340 km lap at the Circuit de Monaco at the Monaco Grand Prix in 1 min 14.902 sec or less, during qualifying on May 23, 2009.” This was the project objective achieved by Brawn GP’s Jenson Button (Figure 7.2).



Figure 7.2: Despite achieving the project goal of the “finish the lap as fast as possible,” Ferrari’s Michael Schumacher crashed 21 laps later and did not finish the race (top); Renault’s Jarno Trulli celebrating his win at the 2004 Monaco Grand Prix (middle); Jenson Button took his Brawn GP car to pole position at the Monaco Grand Prix with a lap time of 1 min 14.902 sec. He also went on to win the race, even though he did not achieve that lap time during the race (bottom).

There is still some ambiguity in this objective; for example, it assumes the star driver will be driving the team’s race car and not a rental car from Hertz. However, it clarifies the team principal’s intent quite nicely. It should be noted that a clear goal is not enough. It must also be achievable. The team principal’s goal becomes

unachievable, for example, if he changes it to require his star driver to finish the 3.340 km lap in 30 sec or less.

To ensure the project's objectives are achievable and realistic, they must be determined jointly by managers and those who perform the work. Realism is introduced because the people who will do the work have a good sense of what it takes to accomplish a particular task. In addition, this process assures some level of commitment on all sides: management expresses its commitment to support the work effort and workers demonstrate their willingness to do the work.

Imagine an office manager has contracted a painter to paint his office. His goal or objective is to have the office painted a pleasing blue colour. Consider the conversation that occurs in Figure 7.3 after the job was finished.

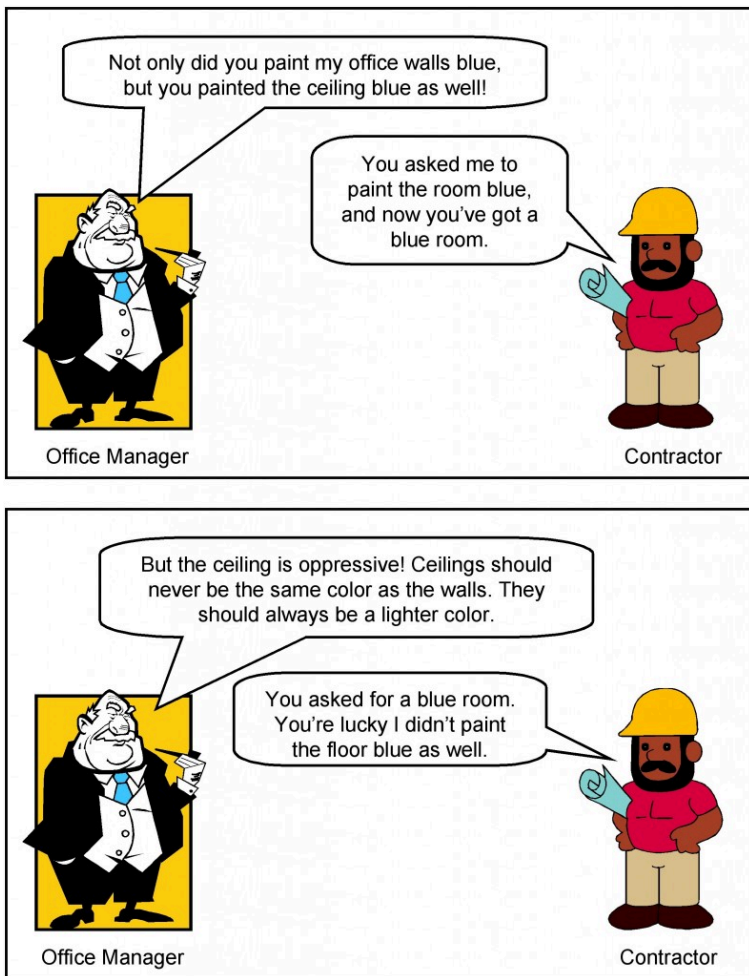


Figure 7.3: The consequence of not making your objective clear. [Image Description]

This conversation captures in a nutshell the essence of a major source of misunderstandings on projects: the importance of setting clear objectives. The office manager's description of how he wanted

the room painted meant one thing to him and another to the painter. As a consequence, the room was not painted to the office manager's satisfaction. Had his objective been more clearly defined, he probably would have had what he wanted.

Comparing Options Using a Weighted Decision Matrix

Sometimes we have multiple options to choose from when determining requirements and deciding which project to work on. To select the best option, we can use tools such as a weighted decision matrix.

A basic decision matrix consists of establishing a set of criteria for options that are scored and summed to gain a total score that can then be ranked. Importantly, it is not weighted to allow a quick selection process.

A weighted decision matrix operates in the same way as the basic decision matrix but introduces the concept of weighting the criteria in order of importance. The resultant scores better reflect the importance to the decision maker of the criteria involved. The more important a criterion, the higher the weighting it should be given. Each of the potential options is scored and then multiplied by the weighting given to each of the criteria to produce a result.

The advantage of the weighted decision matrix is that subjective opinions about one alternative versus another can be made more objective. Another advantage of this method is that sensitivity studies can be performed. An example of this might be to see how much your opinion would have to change in order for a lower-ranked alternative to outrank a competing alternative.

A **weighted decision matrix** therefore allows decision makers to structure and solve their problem by:

1. **Specifying** and **prioritizing** their needs with a list a criteria; then
2. **Evaluating, rating,** and **comparing** the different solutions; and
3. **Selecting** the best matching solution.

A weighted decision matrix is a decision tool used by decision makers.

A *decision matrix* is basically an array presenting on one axis a list of **alternatives**, also called *options* or *solutions*, that are evaluated regarding, on the other axis, a list of **criteria**, which are *weighted* depending on their respective importance in the final decision to be taken.

Weighted Decision Matrix Sample

The example in Figure 7.4 shows a weighted decision matrix that compared three options for a web development project (SJS Enterprises). This method is especially useful when choosing purchase alternatives and comparing them against specific desirable system requirements.

Weighted Decision Matrix for Game Delivery System

Criteria	Weight	SJS Enterprises	Game Access	DVD Link
Educational	15%	90	0	0
Sports-related	15%	90	90	90
Secure payment area with the ability to use Paypal, bank payments, cheque, school payment systems as a payment source	10%	90	50	50
Live Support	15%	90	0	0
Search Option	5%	50	50	30
Games available for all platforms currently on the market including school learning systems	10%	60	30	30
Longer Rental Periods (1 to 2 weeks)	5%	40	20	40
Sidebar with categories such as most popular, multiplayer and just released	5%	50	50	20
Registered customers must be able to order the videos, track delivery, return of videos and be able to provide reviews of views	10%	50	30	30
Age/grade appropriate section (can isolate certain games to certain ages or grade levels)	10%	70	5	0
Weighted Project Scores	100%	74.5	31	29



Figure 7.4: Weighted Decision Matrix for Game Delivery Project. [Image description]

Financial Considerations

In many new project endeavors, we need to find out if our project is financially feasible. We do that by using net present value (NPV), rate of return (ROI), and payback analysis.

NPV

A dollar earned today is worth more than a dollar earned one or more years from now. The NPV of a time series of cash flows, both incoming and outgoing, is defined as the sum of the present values (PVs) of the individual cash flows of the same entity.

In the case when all future cash flows are incoming and the only outflow of cash is the purchase price, the NPV is simply the PV of future cash flows minus the purchase price (which is its own PV). NPV is a standard method for using the time value of money to appraise long-term projects. Used for capital budgeting and widely used throughout economics, finance, and accounting, it measures the excess or shortfall of cash flows, in present value terms, once financing charges are met.

NPV can be described as the “difference amount” between the sums of discounted cash inflows and cash outflows. It compares the present value of money today to the present value of money in the future, taking inflation and returns into account.

The NPV of a sequence of cash flows takes as input the cash flows and a discount rate or discount curve and outputs a price.

Each cash inflow/outflow is discounted back to its present value (PV). Then they are summed. Therefore NPV is the sum of all terms.

where

- t is the time of the cash flow
- i is the discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk; the opportunity cost of capital)
- R_t is the net cash flow (i.e., cash inflow – cash outflow, at time t).

$$\frac{R_t}{(1 + i)^t}$$

NPV is an indicator of how much value an investment or project adds to the firm. With a particular project, if NPV is a positive value, the project is in the status of positive cash inflow in the time t . If NPV is a negative value, the project is in the status of discounted cash outflow in the time t . Sometimes risky projects with a positive NPV could be accepted. This does not necessarily mean that they should be undertaken since NPV at the cost of capital may not account for opportunity cost (i.e., comparison with other available investments). In financial theory, if there is a choice between two mutually exclusive alternatives, the one yielding the higher NPV should be selected.

Table 7.1 Net Present Value

If...	It means...	Then...
NPV > 0	The investment would add value to the firm.	The project may be accepted.
NPV < 0	The investment would subtract value from the firm.	The project should be rejected.
NPV = 0	The investment would neither gain nor lose value for the firm.	We should be indifferent in the decision whether to accept or reject the project. This project adds no monetary value. Decision should be based on other criteria (e.g., strategic positioning or other factors not explicitly included in the calculation).

Table 7.2: Present Value Table
(Take note of the decreasing value of money as the period increases from 1 to 10 years.)

Periods (years)	6%	8%	10%	12%	14%
1	0.943	0.926	0.909	0.893	0.877
2	0.890	0.857	0.826	0.797	0.769
3	0.840	0.794	0.751	0.712	0.675
4	0.792	0.735	0.683	0.636	0.592
5	0.747	0.681	0.621	0.567	0.519
6	0.705	0.630	0.564	0.507	0.456
7	0.665	0.583	0.513	0.452	0.400
8	0.627	0.540	0.467	0.404	0.351
9	0.592	0.500	0.424	0.361	0.308
10	0.558	0.463	0.386	0.322	0.270

NPV Example

The following example is calculating the NPV of a project at a discount rate of 12%. The project takes five years to complete with given benefits and costs for each year. In Year 0, there is no benefit to the organization, just an initial cost of \$75,000 with no discount rate. In Year 1, the discount rate is 89%. This means that at 12% assumed interest, the time value of money says that the \$1 today is worth \$0.89 in one year, \$0.80 in two years, etc. By calculating the NPV for the benefits and the costs, you subtract the NPV of all costs from the NPV of all benefits. The final result is a positive value of \$105,175.

	A	B	C	D	E	F	G	H
1	NPV	Discount Factors (12%) (used Row 10)						
2			0.893	0.797	0.712	0.636	0.567	
3	EXAMPLE							
4								
5	Interest rate	12%						
6								
7	Year	0	1	2	3	4	5	
8								
9	Benefits		85,000	85,000	85,000	85,000	85,000	
10	PV factor	100%	89%	80%	71%	64%	57%	
11	PV of Benefits	-	75,905	67,745	60,520	54,060	48,195	
12	Cumulative Benefits PV	-	75,905	143,650	204,170	258,230	306,425	
13	Net Present Value	306,425						
14								
15								
16								
17								
18	Year	0	1	2	3	4	5	
19								
20	Costs	75,000	35,000	35,000	35,000	35,000	35,000	
21	PV factor	100%	89%	80%	71%	64%	57%	
22	PV of Costs	75,000	31,255	27,895	24,920	22,260	19,845	
23	Cumulative Costs PV	75,000	106,255	134,150	159,070	181,330	201,175	
24	Net Present Value	201,175						
25								
26	Overall NPV	105,250		NPV of Benefits - NPV of Costs				
27								
28	ROI	0.523		benefits-costs/ costs				
29								
30	Payback	(75,000)	(30,350)	9,500	45,100	76,900	105,250	
31								
32								

Table 7.3: Table of NPV of costs and benefits.

ROI

Return on investment (ROI) is a performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. It is one way of considering profits in relation to capital invested.

This is calculated by subtracting the project's costs from the benefits and then dividing by the costs. For example, if you invest \$100 and your investment is worth \$110 next year, the ROI is $(110 - 100) \div 100 = 0.1$ or a 10% return.

In our example: $(306,425 - 201,175) \div 201,175 = 0.52$, or a 52% return. That's considered a nice return on investment.

Payback Analysis

Payback analysis is important in determining the amount of time it will take for a project to recoup its investments. This is the point at which the benefits start to outweigh the costs. The best way to see that is by charting the cumulative benefits and costs. As you can see in the example in Figure 7.5, the cumulative benefits outweigh the cumulative costs in the second year.

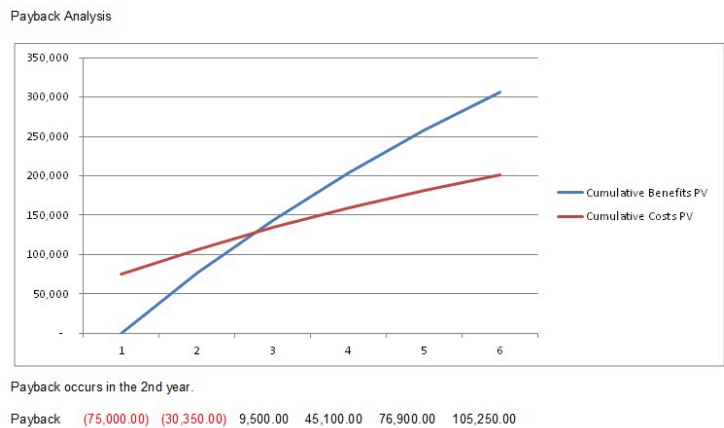


Figure 7.5: Payback Analysis Chart

Project Charter

A project charter, project definition, or project statement is a statement of the scope, objectives, and participants in a project. It provides a preliminary delineation of roles and responsibilities, outlines the project objectives, identifies the main stakeholders, and

defines the authority of the project manager. It serves as a reference of authority for the future of the project.

The purpose of a project charter is to:

- Provide an understanding of the project, the reason it is being conducted, and its justification
- Establish early on in the project the general scope
- Establish the project manager and his or her authority level. A note of who will review and approve the project charter must be included.

Example of a Project Charter

List the project name, the date of the current version of the project charter, the sponsor's name and authority, and the project manager's name.

Example:

Project Name: Rice University Computer Store Creation

Project Sponsor: Jane Ungam, Facilities Manager

Date: Jan 12, 2010

Revision: 1

Project Manager: Fred Rubens

Overview of the Project

Provide a simple but precise statement of the project.

Example: *Rice University is planning to create a store to sell computer supplies.*

Objective

State the objectives of the project clearly and ensure they contain a measure of how to assess whether they have been achieved. The statement should be realistic and should follow the **SMART** protocol:

- **Specific** (get into the details)
- **Measurable** (use quantitative language so that you know when you are finished)
- **Acceptable** (to stakeholders)
- **Realistic** (given project constraints)
- **Time based** (deadlines, not durations)

Example: The objective of this project is to implement a campus store that is ready to sell computer supplies such as memory sticks, mouse pads, and cables, when class starts in August 2010, with enough inventory to last through the first two weeks of classes.

Scope

Specify the scope of the project by identifying the domain or range of requirements.

Example: The scope of Rice's school supplies store project includes the activities listed below:

1. Determine what supplies will be sold in the store.
2. Establish competitive prices for the computer supplies.
3. Source and secure supply vendors.
4. Establish marketing, procurement, operations, and any other necessary departments, schools, centres, and institutes.

It is equally important to include in the scope what is not included in the project.

Example: *The scope of the project does not include:*

- Development of any other school store departments
- Store design or construction

Major Milestones

List all major milestones needed to ensure successful project completion.

Example:

- All vendors selected
- Contracts or orders completed with all vendors
- Supplies delivered to the store
- Pricing determined

Major Deliverables

List and describe the major deliverables that will result from the project.

Example:

- Supplies procured
- Operations, procurement, marketing, and other teams established
- Store supplies stocked and displayed
- Store staffing completed, including work schedules
- Store operations policies, including hours of operation, established

Assumptions

Outline the assumptions made in creating the project. An assumption is a fact you are unsure of but can either confirm at a later time or are simply stating so that the project can proceed as if the statement were true.

Example:

- Only computer supplies will be sold in the store.
- Customers will be the Rice University student body and faculty.
- Rice University students will manage the project and be responsible for ongoing operations.
- A store sponsor from the university faculty or staff will be assigned to mentor students and provide oversight.
- Store hours of operation will be approved by the Rice University students or store sponsor.
- Supplier deliveries will be arranged or the store sponsor will pick them up with students.
- Students will be empowered to contact vendors for order placement and inquiries via telephone.

Constraints

Define any and all constraints on the project or those working on the project. This is an important part of the project charter. A constraint is anything that limits the range of solutions or approaches.

Example:

- Student availability to meet for project planning is limited to school hours.
- Software is not available for project planning and control.

Business Need or Opportunity (Benefits)

Provide a concise statement of the business need or opportunity that led to the creation of the project. Why was it created? What are the benefits? How does the project contribute to organizational objectives?

Example: *The goal of this project is to provide income for the Rice Student Centre while supplying necessary items to students and faculty at competitive prices. The school store will be a convenience to students since necessary supplies will be available on campus. This will help students learn to manage their personal supplies.*

Preliminary Cost for the Project

Provide a statement indicating how the cost of the project will be defined and controlled.

Example: *The procurement team will assemble a proposal based on expected costs for review by the Dean of Undergraduate Studies.*

Project Risks

A risk is anything uncertain that may occur that will reduce or decrease the chances of project success.

Example:

1. *There is a state election coming and the new government may change the taxation rules for private university retail outlets.*
2. *The cloud is changing student demand for media such as*

flash drives in somewhat unpredictable ways. If this happens faster than we forecast, we may be building a store that students don't need.

- 3. Deliveries of store shelves, etc. will be delayed if a major hurricane occurs.

Project Charter Acceptance

Provide the names, titles, and signature lines of the individuals who will sign off on the project charter.

Project Stakeholders

Provide the key stakeholders and team members by function, name, and role.

Function	Name	Role
Project Manager	Monica Styles	Leads the project
Sponsor	Adrienne Watt	Project sponsor
etc.		

Image Descriptions

Figure 7.3 image description: A conversation between an office manager and a contractor.

Office manager: Not only did you paint my office walls blue, but you painted the ceiling blue as well.

Contractor: You asked me to paint the room blue, and now you've got a blue room.

Office manager: But the ceiling is oppressive! Ceilings should never be the same colour as the walls. They should always be a lighter colour.

Contractor: You asked for a blue room. You're lucky I didn't paint the floor blue as well.

[Return to Figure 7.3]

Figure 7.4 image description:

Weighted Decision Matrix for Game Delivery System

Criteria	Weight	SJS Enterprises	Game Access	DVD Link
Educational	15%	90	0	0
Sports-related	15%	90	90	90
Secure payment area with the ability to use Payplay, bank payments, cheques, and school payment systems as a payment source.	10%	90	50	50
Live Support	15%	90	0	0
Search Option	5%	50	50	30
Games available for all platforms currently on the market including school learning systems.	10%	60	30	30
Longer rental periods (1 to 2 weeks)	5%	40	20	40
Sidebar with categories, such as most popular, multiplayer, and just released.	5%	50	50	20

Criteria	Weight	SJS Enterprises	Game Access	DVD Link
Registered customers must be able to order the videos, track delivery, return videos, and be able to provide reviews of views.	10%	50	30	30
Age/grade appropriate section (can isolate certain games to certain ages or grade levels)	10%	70	5	0
Weighted project scores:	100%	75.4	31	29

[Return to Figure 7.4]

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24. Project Scope

You always want to know exactly what work has to be done before you start it. You have a collection of team members, and you need to know exactly what they're going to do to meet the project's objectives. The scope planning process is the very first thing you do to manage your scope. Project scope planning is concerned with the definition of all the work needed to successfully meet the project objectives. The whole idea here is that when you start the project, you need to have a clear picture of all the work that needs to happen on your project, and as the project progresses, you need to keep that scope up to date and documented in the project's scope management plan.

Defining the Scope

You already have a head start on refining the project's objectives in quantifiable terms, but now you need to plan further and write down all the intermediate and final deliverables that you and your team will produce over the course of the project. Deliverables include everything that you and your team produce for the project (i.e., anything that your project will deliver). The deliverables for your project include all of the products or services that you and your team are performing for the client, customer, or sponsor. They include every intermediate document, plan, schedule, budget, blueprint, and anything else that will be made along the way, including all of the project management documents you put together. Project deliverables are tangible outcomes, measurable results, or specific items that must be produced to consider either the project or the project phase completed. Intermediate deliverables, like the objectives, must be specific and verifiable.

All deliverables must be described in a sufficient level of detail

so that they can be differentiated from related deliverables. For example:

- A twin-engine plane versus a single engine plane
- A red marker versus a green marker
- A daily report versus a weekly report
- A departmental solution versus an enterprise solution

One of the project manager's primary functions is to accurately document the deliverables of the project and then manage the project so that they are produced according to the agreed-on criteria. Deliverables are the output of each development phase, described in a quantifiable way.

Project Requirements

After all the deliverables are identified, the project manager needs to document all the requirements of the project. Requirements describe the characteristics of the final deliverable, whether it is a product or a service. They describe the required functionality that the final deliverable must have or specific conditions the final deliverable must meet in order to satisfy the objectives of the project. A requirement is an objective that must be met. The project's requirements, defined in the scope plan, describe what a project is supposed to accomplish and how the project is supposed to be created and implemented. Requirements answer the following questions regarding the as-is and to-be states of the business: who, what, where, when, how much, and how does a business process work?

Requirements may include attributes such as dimensions, ease of use, color, and specific ingredients. If we go back to the example of the company producing holiday eggnog, one of the major deliverables is the cartons that hold the eggnog. The requirements

for that deliverable may include carton design, photographs that will appear on the carton, and colour choices.

Requirements specify what the final project deliverable should look like and what it should do. Requirements must be measurable, testable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design. They can be divided into six basic categories: functional, non-functional, technical, business, user, and regulatory requirements.

Functional Requirements

Functional requirements describe the characteristics of the final deliverable in ordinary non-technical language. They should be understandable to the customers, and the customers should play a direct role in their development. Functional requirements are what you want the deliverable to do.

Vehicle Example: If you were buying vehicles for a business, your functional requirement might be: “The vehicles should be able to take up to a one-ton load from a warehouse to a shop.”

Computer System Example: For a computer system you may define what the system is to do: “The system should store all details of a customer’s order.”

The important point to note is that what is wanted is specified and not how it will be delivered.

Non-functional Requirements

Non-functional requirements specify criteria that can be used to judge the final product or service that your project delivers. They are restrictions or constraints to be placed on the deliverable and how to build it. Their purpose is to restrict the number of solutions

that will meet a set of requirements. Using the vehicle example, the functional requirement is for a vehicle to take a load from a warehouse to a shop. Without any constraints, the solutions being offered might result in anything from a small to a large truck. Non-functional requirements can be split into two types: performance and development. To restrict the types of solutions, you might include these performance constraints:

- The purchased trucks should be American-made trucks due to government incentives.
- The load area must be covered.
- The load area must have a height of at least 10 feet.

As mentioned earlier in chapter 1, projects have constraints that can be categorised according to type of requirements. There are three general types of non-functional development constraints:

- **Time:** When a deliverable should be delivered
- **Cost:** How much money is available to develop the deliverable
- **Quality:** Any standards that are used to develop the deliverable, development methods, etc.

Technical Requirements

Technical requirements emerge from the functional requirements to answer the questions: how will the problem be solved this time and will it be solved technologically and/or procedurally? They specify how the system needs to be designed and implemented to provide required functionality and fulfill required operational characteristics.

For example, in a software project, the functional requirements may stipulate that a database system will be developed to allow access to financial data through a remote terminal. The

corresponding technical requirements would spell out the required data elements, the language in which the database management system will be written (due to existing knowledge in-house), the hardware on which the system will run (due to existing infrastructure), telecommunication protocols that should be used, and so forth.

Business Requirements

Business requirements are the needs of the sponsoring organization, always from a management perspective. Business requirements are statements of the business rationale for the project. They are usually expressed in broad outcomes, satisfying the business needs, rather than specific functions the system must perform. These requirements grow out of the vision for the product that, in turn, is driven by mission (or business) goals and objectives.

User Requirements

User requirements describe what the users need to do with the system or product. The focus is on the user experience with the system under all scenarios. These requirements are the input for the next development phases: user-interface design and system test cases design.

Regulatory Requirements

Regulatory requirements can be internal or external and are usually non-negotiable. They are the restrictions, licenses, and laws

applicable to a product or business that are imposed by the government.

Measuring Requirements

Requirements Traceability Matrix

The requirements traceability matrix is a table that links requirements to their origin and traces them throughout the project life cycle. The implementation of a requirements traceability matrix helps ensure that each requirement adds business value by linking it to the business and project objectives. It provides a means to track requirements throughout the project life cycle, helping to ensure that requirements approved in the requirements documentation are delivered at the end of the project. Finally, it provides a structure for managing changes to the product scope. This process includes, but is not limited to, tracking:

- Requirements to business needs, opportunities, goals, and objectives
- Requirements to project objectives
- Requirements to project scope/work breakdown structure deliverables
- Requirements to product design
- Requirements to product development
- Requirements to test strategy and test scenarios
- High-level requirements to more detailed requirements

Attributes associated with each requirement can be recorded in the requirements traceability matrix. These attributes help to define key information about the requirement. Typical attributes used in the requirements traceability matrix may include a unique

identifier, a textual description of the requirement, the rationale for inclusion, owner, source, priority, version, current status (such as active, cancelled, deferred, added, approved), and date completed. Additional attributes to ensure that the requirement has met stakeholders' satisfaction may include stability, complexity, and acceptance criteria.

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25. Managing the Scope

Time, cost, and scope are known as the triple constraints of project management. It's not possible to change one without changing at least one of the others. If the project takes twice as long as expected to complete, then the cost will almost certainly go up. On the other hand, a decision to cut costs, perhaps by using less experienced labor, could lead to a work slowdown, extending the schedule. Such a decision might also result in a change to the project's scope, perhaps in the form of a lower quality product.

The initiation phase is too early in the project to nail down precise details about time and cost, but it is a good time to think long and hard about scope, which is “all of the work that needs to be done to provide the product or service your project is delivering” (Martinez, n.d.). In this early stage, you and the project stakeholders might do some blue sky thinking about what your project could possibly achieve, without regard to the constraints of time, cost, and scope. But before too long you'll need to zero in on a definition of the project's scope, formalizing it as a scope statement, using the information currently available to you.

Except for the simplest projects, any scope definition will almost certainly evolve as you learn more about the project and the customer's needs. The term scope evolution refers to changes that all stakeholders agree on, and that are accompanied by corresponding changes in budget and schedule. Scope evolution is a natural result of the kind of learning that goes on as a project unfolds. This includes learning that arises from fresh insights into the needs of the end user, new regulations, or upheaval in the marketplace. As long as all stakeholders agree on the scope changes (and the associated changes to the budget and schedule), scope evolution ensures that customers actually get what they want out of the project. The more you talk with the client and learn about their needs, the more you will be able to refine the scope.

Indeed, one of the main jobs of a project manager is managing scope evolution. But different types of projects will involve varying amounts of scope evolution. For example, if you're working on a project related to satisfying a specific environmental regulation, the initial definition of the project's scope might be clear, requiring little refinement as the project unfolds, as long as the regulation itself is not altered. But if you are working on a product designed to satisfy a brand-new market demand, you might need to refine the scope continually to ensure that you satisfy your customers' needs.

Perhaps the most common cause of **scope evolution** is a change in the context in which a project is planned and executed. Alterations in market forces, changing demographics, new or more vigorous competition, and technological advancements can all change a project's context, forcing you to rethink its scope. This potential for changing contexts means that no two projects are the same. You might think Project B is nearly identical to Project A, but then a sudden shift in context can change everything. As shown in Figure 4-3, context is largely defined by the organizational, social, and political structures in which a project occurs.

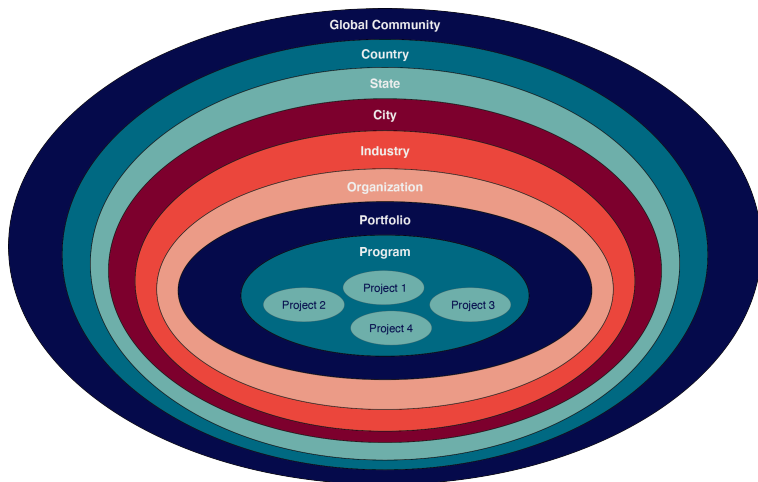


Figure 4-3: Context is largely defined by the organizational, social, and political structures in which a project occurs

Scope evolution is managed change. It is an approved alteration to the project scope that occurs as the project participants learn more about the project. It results in an official change in the project scope, and therefore to the project budget or schedule, as agreed to by all project participants. This kind of managed change is a natural and rational result of the kind of learning that goes on throughout the course of a project. It is a conscious choice necessitated by new information forcing you to reconsider project essentials in order to achieve the intended project value.

Scope creep is unmanaged change. It is caused by uncontrolled changes to the project scope. Such changes might add value from the customer's perspective, but the time, money, and resources consumed by the change of scope lead to additional overruns. Scope creep tends to happen bit by bit because no one is paying close attention to the project's scope. For example, in a kitchen remodeling project intended to replace countertops and cabinets, deciding at the last minute to replace all appliances might be an example of scope creep.

Creating a Clear Scope Statement

The key to managing scope is a carefully crafted scope statement, which should be clear and precise. The details of how you plan to carry out a project may be vague at first, but what you want to achieve should be perfectly clear. Vagueness can lead to small changes to the project's scope, which in turn lead to other changes, until the original project is no longer recognizable.

Writing a scope statement, the document that defines the project's scope, is a major part of the initiation phase. However, according to Brad Bigelow (2012, p. 1) in an article for the Project Management Institute, it is "usually expressed in qualitative terms that leave room for interpretation and misunderstanding. Consequently, it's often the biggest source of conflicts in a project".

To avoid such problems, experienced project managers put a lot of effort into learning what should and shouldn't be included in the project, and then articulating these boundaries as clearly as possible in the form of a scope statement. According to Bigelow (2012, p. 2), this work is essential to ensuring a project's success: "No project's scope can ever be entirely free of fuzziness—free from subjectivity and imperfect definitions—as long as human beings are involved. On the other hand, it's also highly improbable that any project will ever survive initiation if its scope is entirely vague, undefined, and subject to unpredictable expectations".

If the scope is poorly defined, then what is or isn't within the project scope is reduced to a matter of perspective. Not surprisingly, these "different perspectives...can often be the root of conflicts within a project" Bigelow (2012, p. 2). Bigelow describes a project in which the team and the customer see things very differently:

When the scope is poorly defined, satisfying the customer can grow increasingly difficult, with the team going off and creating what it thinks the customer wants, only to be told, "No, that's not it."

Opinions vary on exactly what a scope statement should include, but at the very least it should contain the following:

- A brief justification of the project's purpose, including a summary of the business needs the project will address.
- An explanation of the project's goals.
- Acceptance criteria that specify the conditions the product or service must satisfy before the customer will accept the deliverables.
- Deliverables, which are "the quantifiable goods or services that will be provided upon the completion of a project. Deliverables can be tangible or intangible parts of the development process, and they are often specified functions or characteristics of the project" (Bloomenthal, n.d., para. 1.).
- An explanation of anything excluded from the project—in other words, an explanation of what is out of scope for the project.

This list should be “as detailed as is necessary to define the project boundaries to all stakeholders” (Feldsher, 2016, para. 11).

- Constraints, such as budget and schedule.
- Assumptions, including anything you currently believe to be true about the project. It's also helpful to include ideas “about how you will address uncertain information as you conceive, plan, and perform your project” (Portny n.d., 2018).
- An explanation of any new or unusual technology you plan to use throughout the project. This is not a typical part of a scope statement, but “it's likely that stakeholders will appreciate the transparency and feel more comfortable with the project moving forward” (Feldsher, 2016, para. 13).

Practical

- **Engage all stakeholders:** Your goal is to keep people meaningfully engaged in your project. You don't want stakeholders showing up for ceremonial appearances at project meetings. Instead, you want them seriously focused on the prospects for project success.
- **Outcome clarity:** Ask your customer to define success right at the beginning. Then, working with the customer and other stakeholders, define how success will be measured.
- **Use a common vocabulary:** At the beginning of any project, go to your end-customers and learn their vocabulary. Make sure you understand the terms that are important to them and what such terms mean to them. Whenever possible, use your customer's vocabulary, not yours. Also, strive to speak in plain English whenever you can, and avoid techno speak.
- **Create a glossary of terms:** On projects with a lot of complex jargon, consider creating a glossary of terms. Then publish it in a way that makes it accessible to all stakeholders, updating it as needed. Here's an example of one such glossary: “COSO

Framework “.

- **Identify what you don't know:** When you start a project, there are always things you don't know. The key is to know that you don't know them. The more you strive to recognize this, the better you will be at predicting those unknowns and making provisions for them.
- **Have key team members sign major project documents:** Research shows that the act of signing a document makes people much more committed to delivering on the promises described in the document. Consider asking the entire project team to sign the project charter and scope documents. This simple act can serve as a powerful inducement to completing the project successfully.
- **Proactive concurrency:** In the early stages, avoid the trap of plotting one thing after another, in a linear fashion. Instead, start fast, doing as many things as you can concurrently, as quickly as you can. This will give you a sense of whether or not the scope, budget, resources, and schedule are all in relatively close alignment at the macro scale. If you find they are not, report that to management right away.
- **Permanent urgency:** In the living order in which all modern projects unfold, permanent urgency is the new law of nature. In the traditional, geometric order form of project management, you could assume that you would have sufficient time and resources to do things in a linear, step-by-step manner. But in the modern world, that's rarely the case. Get used to an element of urgency in all projects. Try not to let this paralyze you and your team. Instead, let a sense of urgency spur you on to more agile, alert, and flexible project management techniques.
- **Post the project documents prominently:** Putting important documents front and center helps a team stay focused, especially if you have everyone sign them first. It also encourages the team to update them when necessary.
- **Plan for errors:** You and your team will almost certainly make

mistakes, especially in the early stages of a project. Therefore, you should plan for that. Keep thinking ahead to what might go wrong, and how you could correct course.

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26. Scope Planning



Figure 9.1 Automated Teller Machine.

The following represents one possible example of each type of requirement as they would be applied to a bank's external ATM.

- ATM functional requirement: The system will enable the user to select whether or not to produce a hard-copy transaction receipt before completing a transaction.
- ATM non-functional requirement: All displays will be in white, 14-point Arial text on black background.
- ATM technical requirement: The ATM system will connect seamlessly to the existing customer's database.
- ATM user requirement: The system will complete a standard withdrawal from a personal account, from login to cash, in less than two minutes.
- ATM business requirement: By providing superior service to our retail customers, Monumental Bank's ATM network will allow us to increase associated service fee revenue by 10% annually on an ongoing basis.
- ATM regulatory requirement: All ATMs will connect to standard utility power sources within their civic jurisdiction,

and be supplied with an uninterrupted power source approved by the company.

The effective specification of requirements is one of the most challenging undertakings project managers face. Inadequately specified requirements will guarantee poor project results.

Documenting requirements is much more than just the process of writing down the requirements as the user sees them; it should cover not only what decisions have been made, but why they have been made, as well. Understanding the reasoning that was used to arrive at a decision is critical in avoiding repetition. For example, the fact that a particular feature has been excluded, because it is simply not feasible, needs to be recorded. If it is not, then the project risks wasted work and repetition, when a stakeholder requests the feature be reinstated during development or testing.

Once the requirements are documented, have the stakeholders sign off on their requirements as a confirmation of what they desire.

While the project manager is responsible for making certain the requirements are documented, it does not mean that the project manager performs this task. The project manager enlists the help of all the stakeholders (business analysts, requirement analysts, business process owners, customers and other team members) to conduct the discussions, brain-storming, and interviews, and to document and sign off the requirements. The project manager is responsible only for enabling the process and facilitating it. If the project manager feels that the quality of the document is questionable, his or her duty is to stop the development process.

The project manager reviews the requirements, incorporates them into the project documentation library, and uses them as an input for the project plan.

Software Requirements Fundamentals

This section refers to requirements of “software” because it is concerned with problems to be addressed by software. A software requirement is a property that must be exhibited by software developed or adapted to solve a particular problem. The problem may be to automate part of a task of someone who will use the software, to support the business processes of the organization that has commissioned the software, to correct shortcomings of existing software, to control a device, etc. The functioning of users, business processes, and devices is typically complex. Therefore, the requirements on particular software are typically a complex combination of requirements from different people at different levels of an organization and from the environment in which the software will operate.

An essential property of all software requirements is that they be verifiable. It may be difficult or costly to verify certain software requirements. For example, verification of the throughput requirement on a call centre may necessitate the development of simulation software. Both the software requirements and software quality personnel must ensure that the requirements can be verified within the available resource constraints.

Requirements have other attributes in addition to the behavioural properties that they express. Common examples include a priority rating to enable trade-offs in the face of finite resources and a status value to enable project progress to be monitored. Typically, software requirements are uniquely identified so that they can be monitored over the entire software life cycle.

Measuring Requirements

As a practical matter, it is typically useful to have some concept of

the volume of the requirements for a particular software product. This number is useful in evaluating the size of a change in requirements, in estimating the cost of a development or maintenance task, or simply in using it as the denominator in other measurements (see Table 9.1).

Table 9.1: Measuring Requirements

Property	Measure
Speed	<ul style="list-style-type: none">• Processed transactions/second• User/Event response time• Screen refresh time
Size	<ul style="list-style-type: none">• K Bytes• Number of RAM chips
Ease of use	<ul style="list-style-type: none">• Training time• Number of help frames
Reliability	<ul style="list-style-type: none">• Mean time to failure• Probability of unavailability• Rate of failure occurrence• Availability
Robustness	<ul style="list-style-type: none">• Time to restart after failure• Percentage of events causing failure• Probability of data corruption on failure
Portability	<ul style="list-style-type: none">• Percentage of target dependent statements• Number of target systems

Scope Inputs

The project manager gathers initial project facts from the project charter. In addition, background information on the stakeholder’s workplace, existing business model and rules, etc. assist in creating the vision of the final product/service, and consequently, the project scope (see Figure 9.2).



Figure 9.2: Scope input-output. [Image description]

Techniques

Certainly being a seasoned project manager broadens the repertoire of one’s scope planning techniques. An experienced project manager can draw on past experiences with like projects to determine the work that is realistically doable, given time and cost constraints, for a current project. Communication and negotiation skills are a “must-have” as well. Project managers need to educate stakeholders about the project impacts of some requirements. Adding complexity to a project may require more staff, time, and/or money. It may also have an impact on project quality. Some aspects of the project may be unfeasible – stakeholders need to know this so they can adjust their vision or prepare for future challenges.

Gathering requirements is part of scope definition, and it can be done using one or more of following techniques:

- Interviews
- Focus groups
- Facilitated groups such as JAD (joint application development)
- Group creativity techniques: brainstorming, nominal groups, delphi, mind map, affinity diagnostics
- Prototyping
- Observation
- Questions and surveys
- Group decision-making techniques: unanimity, majority, plurality, dictatorship

Requirements Traceability Matrix

The requirements traceability matrix is a table that links requirements to their origin and traces them throughout the project life cycle. The implementation of a requirements traceability matrix helps ensure that each requirement adds business value by linking it to the business and project objectives. It provides a means to track requirements throughout the project life cycle, helping to ensure that requirements approved in the requirements documentation are delivered at the end of the project. Finally, it provides a structure for managing changes to the product scope. This process includes, but is not limited to, tracking:

- Requirements to business needs, opportunities, goals, and objectives
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- Requirements to project scope/work breakdown structure deliverables
- Requirements to product design

- Requirements to product development
- Requirements to test strategy and test scenarios
- High-level requirements to more detailed requirements

Attributes associated with each requirement can be recorded in the requirements traceability matrix. These attributes help to define key information about the requirement. Typical attributes used in the requirements traceability matrix may include a unique identifier, a textual description of the requirement, the rationale for inclusion, owner, source, priority, version, current status (such as active, cancelled, deferred, added, approved), and date completed. Additional attributes to ensure that the requirement has met stakeholders' satisfaction may include stability, complexity, and acceptance criteria.

Matrix Fields

These are suggestions only and will vary based on organizational and project requirements.

- A unique identification number containing the general category of the requirement (e.g., SYSADM) and a number assigned in ascending order (e.g., 1.0, 1.1, 1.2)
- Requirement statement
- Requirement source (conference, configuration control board, task assignment, etc.)
- Software requirements specification/functional requirements document paragraph number containing the requirement
- Design specification paragraph number containing the requirement
- Program module containing the requirement
- Test specification containing the requirement test
- Test case number(s) where requirement is to be tested

(optional)

- Verification of successful testing of requirements
- Modification field (If a requirement was changed, eliminated, or replaced, indicate disposition and authority for modification.)
- Remarks

Work Breakdown Structure

Now that we have the deliverables and requirements well defined, the process of breaking down the work of the project via a work breakdown structure (WBS) begins. The WBS defines the scope of the project and breaks the work down into components that can be scheduled, estimated, and easily monitored and controlled. The idea behind the WBS is simple: you subdivide a complicated task into smaller tasks, until you reach a level that cannot be further subdivided. Anyone familiar with the arrangements of folders and files in a computer memory or who has researched their ancestral family tree should be familiar with this idea. You stop breaking down the work when you reach a low enough level to perform an estimate of the desired accuracy. At that point, it is usually easier to estimate how long the small task will take and how much it will cost to perform than it would have been to estimate these factors at the higher levels. Each descending level of the WBS represents an increased level of detailed definition of the project work.

WBS describes the products or services to be delivered by the project and how they are decomposed and related. It is a deliverable-oriented decomposition of a project into smaller components. It defines and groups a project's discrete work elements in a way that helps organize and define the total work scope of the project.

A WBS also provides the necessary framework for detailed cost

estimating and control, along with providing guidance for schedule development and control.

Overview

WBS is a hierarchical decomposition of the project into phases, deliverables, and work packages. It is a tree structure, which shows a subdivision of effort required to achieve an objective (e.g., a program, project, and contract). In a project or contract, the WBS is developed by starting with the end objective and successively subdividing it into manageable components in terms of size, duration, and responsibility (e.g., systems, subsystems, components, tasks, subtasks, and work packages), which include all steps necessary to achieve the objective.

The WBS creation involves:

- Listing all the project outputs (deliverables and other direct results)
- Identifying all the activities required to deliver the outputs
- Subdividing these activities into subactivities and tasks
- Identifying the deliverable and milestone(s) of each task
- Identifying the time usage of all the resources (personnel and material) required to complete each task

The purpose of developing a WBS is to:

- Allow easier management of each component
- Allow accurate estimation of time, cost, and resource requirements
- Allow easier assignment of human resources
- Allow easier assignment of responsibility for activities

Example of a WBS

If I want to clean a room, I might begin by picking up clothes, toys, and other things that have been dropped on the floor. I could use a vacuum cleaner to get dirt out of the carpet. I might take down the curtains and take them to the cleaners, and then dust the furniture. All of these tasks are subtasks performed to clean the room. As for vacuuming the room, I might have to get the vacuum cleaner out of the closet, connect the hose, empty the bag, and put the machine back in the closet. These are smaller tasks to be performed in accomplishing the subtask called vacuuming. Figure 9.3 shows how this might be portrayed in WBS format.

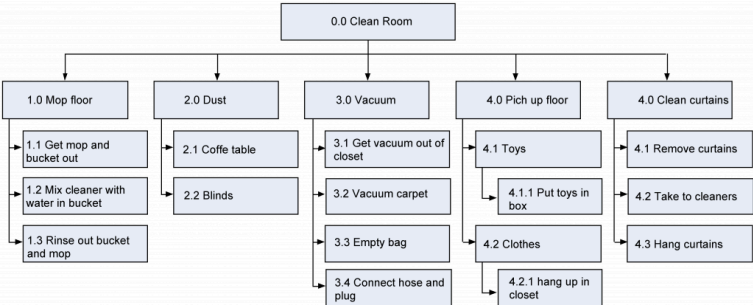


Figure 9.3: A WBS for cleaning a room. [Image description]

It is very important to note that we do not worry about the sequence in which the work is performed or any dependencies between the tasks when we do a WBS. That will be worked out when we develop the schedule. For example, under 3.0 Vacuum, it would be obvious that 3.3 Vacuum carpet would be performed after 3.4 Connect hose and plug! However, you will probably find yourself thinking sequentially, as it seems to be human nature to do so. The main idea of creating a WBS is to capture all of the

tasks, irrespective of their order. So if you find yourself and other members of your team thinking sequentially, don't be too concerned, but don't get hung up on trying to diagram the sequence or you will slow down the process of task identification. A WBS can be structured any way it makes sense to you and your project. In practice, the chart structure is used quite often but it can be composed in outline form as well (Figure 9.4).

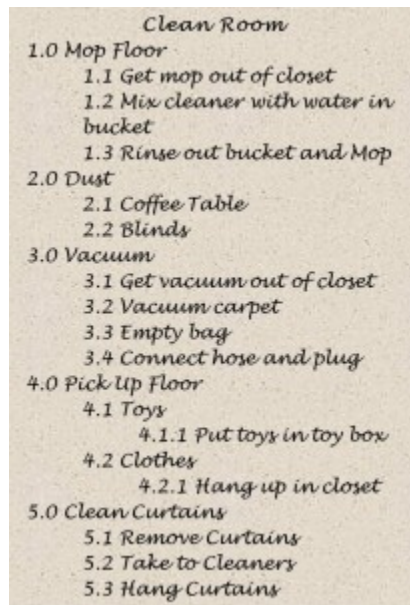


Figure 9.4: Clean Room in an outline view.

You'll notice that each element at each level of the WBS in both figures is assigned a unique identifier. This unique identifier is typically a number, and it's used to sum and track costs, schedules, and resources associated with WBS elements. These numbers are usually associated with the corporation's chart of accounts, which

is used to track costs by category. Collectively, these numeric identifiers are known as the code of accounts.

There are also many ways you can organize the WBS. For example, it can be organized by either deliverable or phase. The major deliverables of the project are used as the first level in the WBS. For example, if you are doing a multimedia project the deliverables might include producing a book, CD, and a DVD (Figure 9.5).

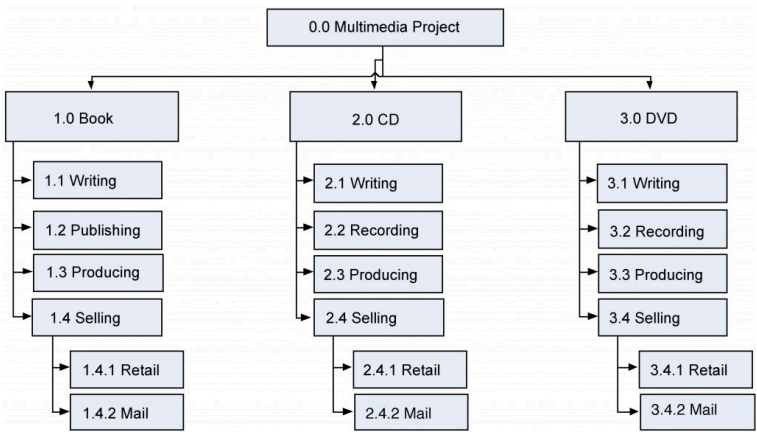


Figure 9.5: A WBS for a multimedia project

Many projects are structured or organized by project phases (Figure 9.6). Each phase would represent the first level of the WBS and their deliverables would be the next level and so on.

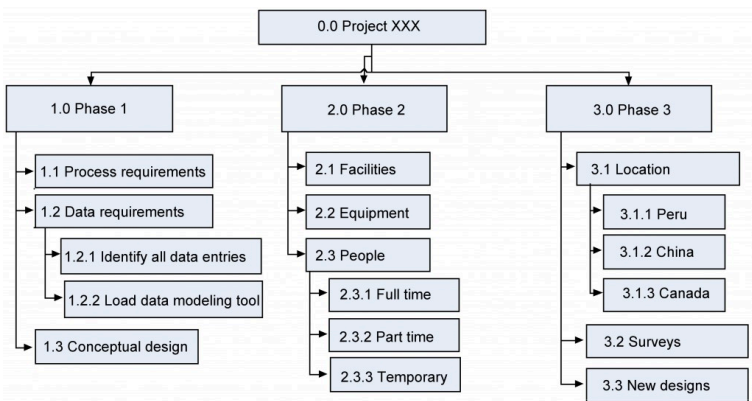


Figure 9.6: WBS Project Phases

The project manager is free to determine the number of levels in the WBS based on the complexity of the project. You need to include enough levels to accurately estimate project time and costs but not so many levels that are difficult to distinguish between components. Regardless of the number of levels in a WBS, the lowest level is called a work package.

Work packages are the components that can be easily assigned to one person or a team of people, with clear accountability and responsibility for completing the assignment. The work-package level is where time estimates, cost estimates, and resource estimates are determined.

100 Percent Rule

The 100 percent rule is the most important criterion in developing and evaluating the WBS. The rule states that each decomposed level (child) must represent 100 percent of the work applicable to the

next higher (parent) element. In other words, if each level of the WBS follows the 100 percent rule down to the activities, then we are confident that 100 percent of the activities will have been identified when we develop the project schedule. When we create the budget for our project, 100 percent of the costs or resources required will be identified.

Scope Statement

Scope statements may take many forms depending on the type of project being implemented and the nature of the organization. The scope statement details the project deliverables and describes the major objectives. The objectives should include measurable success criteria for the project.

A scope statement captures, in very broad terms, the product of the project: for example, “development of a software-based system to capture and track orders for software.” A scope statement should also include the list of users using the product, as well as the features in the resulting product.

As a baseline scope statements should contain:

- The project name
- The project charter
- The project owner, sponsors, and stakeholders
- The problem statement
- The project goals and objectives
- The project requirements
- The project deliverables
- The project non-goals (what is out of scope)
- Milestones
- Cost estimates

In more project-oriented organizations, the scope statement may also contain these and other sections:

- Project scope management plan
- Approved change requests
- Project assumptions and risks
- Project acceptance criteria

Image Descriptions

Figure 9.2 image description: A project manager develops a Scope Management Plan by taking the project charter, organizational memory, and the project plan and applying the following techniques and tools:

- Calls on past project experience
- Uses scope management templates (SOS, WBS, Scope Management Plan)
- Uses Communication skills (for negotiating with and educating clients)

[Return to Figure 9.2]

Figure 9.3 image description:

0.0 Clean Room

- 1.0 Mop floor.
 - 1.1 Get mop and bucket out.
 - 1.2 Mix cleaner with water in bucket.
 - 1.3 Rinse out bucket and mop.
- 2.0 Dust
 - 2.1 Coffee table
 - 2.2 Blinds
- 3.0 Vacuum

- 3.1 Get vacuum out of closet
- 3.2 Vacuum carpet
- 3.3 Empty bag
- 3.4 Connect hose and plug
- 4.0 Pick up floor
 - 4.1 Toys
 - 4.1.1 Put toys in box
 - 4.2 Clothes
 - 4.2.1 Hang up in closet
- 5.0 Clean curtains
 - 5.1 Remove curtains
 - 5.2 Take to cleaners
 - 5.3 Hang curtains

[Return to Figure 9.3]

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27. What Is a Vision Statement?

15 Vision Statement Examples to Inspire You+

Source: What Is a Vision Statement? 15 Vision Statement Examples to Inspire You (projectmanager.com)
by Stephanie Ray | Nov 12, 2021

Table of Contents

- What Is a Vision Statement?
- Vision Statement vs. Mission Statement
- How to Write a Vision Statement
- Vision Statement Examples

A vision statement almost sounds mystical. But it's not supernatural, far from it. Rather, a vision statement is a foundational business document. There is a lot of paperwork that clutters the office of any organization, but the vision statement is unique from the rest. Often confused with a mission statement, the vision statement has a different purpose. A vision statement looks towards the future, but a mission statement talks about what the company is doing in the present.

What Is a Vision Statement?

A vision statement is a business document that states the current and future objectives of an organization. A company's vision must align with its mission, strategic planning, culture, and core values. A vision statement is not only used in business, as nonprofits and government offices also use them to set strategic goals.

Vision statements are not necessarily set in stone. They can be returned to, reviewed and revised as necessary. Any changes should be minimal, however, because a vision statement is a guideline for a company's strategic plan, so it must be thoroughly reviewed.

The business vision of an organization might change over time, as companies adapt to their business environment and external factors that might affect their ability to achieve their mission.

Related: Free Project & Tracking Templates for Excel

A vision statement doesn't have any particular length. However long it is, the vision statement is formally written and is used as a reference in company documents to serve as a guide for short and long-term strategic planning actions.

The best way to learn about vision statements is to look at real-life examples. We've gathered 15 vision statement examples from the best companies in the world to help you write your own.

What Is the Purpose of a Vision Statement?

As stated above, a vision statement is a very important part of an organization because it aligns with its mission, core values, and culture. It also guides the strategic plan, because it sets future goals. Similar to a mission statement, a vision statement it's a living document that is referred to as a lodestar to lead a company to its next innovation.

There are also different types of vision statements, as companies

have unique core values. For example, a motivational vision statement will both motivate existing employees and also drive talent to the company. They'll want to work at a place with a business vision that aligns with their personal values. A strong vision statement also works to help differentiate your company from others. All companies want to become profitable, but a company can create a unique vision statement that is appealing to its customers and employees.

It's very easy to get bogged down in the details of your mission statement and the day-to-day challenges of running an organization. That's why you need a long-term vision statement to guide your efforts and help you plan long-term.

Now that we've learned what a company vision is, let's look at the main differences between a vision and a mission statement, and how they relate to each other.

Vision Statement vs. Mission Statement

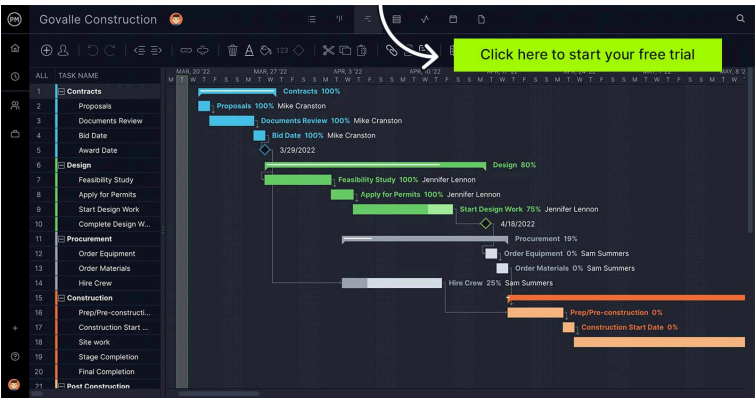
The vision statement and mission statement are both equally important for a company as they complement each other and guide the direction of your company. The main difference between them is that the mission statement describes what your company does, while your vision statement explains what the company attempts to achieve in the future.

On the other hand, their main similarity is that they both need to align with your company's core values and culture because all these elements make up your company's identity and differentiation factors.

Once you have your company mission and vision statements in place, the hard work begins. Now you can create a strategic plan, and begin executing your projects.

Once the vision statement is in place, the hard work begins. Project management software helps you achieve your goals and

objectives. ProjectManager does this with one of the most robust Gantt charts on the market. Our work management tool creates a visual timeline, links task dependencies and sets milestones. Now you know what tasks are essential and whether your actual progress is aligned with what you planned. Make your vision a reality by trying our work management software free today.



Meet your vision statement goals with ProjectManager and Gantt charts that organize your work.

How to Write a Vision Statement

Every company has a unique vision statement, but the process is similar for most of them. Here are some steps to help you write your own.

1. What Are the Core Values of Your Company?

The core values of your company define its identity and how it interacts with the communities and the environment. It's important to understand them to define your company vision.

2. What's Your Company Mission?

Understanding what your company does and how it operates it's essential to planning for the future.

3. Understand Your Company Culture

A strong company culture it's a very important part of the success of any business. That's why your vision must be aligned with it, or otherwise, your strategic planning couldn't work.

4. Identify Current Strategic Goals

Before you think about future goals, you must understand where your organization currently stands. Your vision might be a long-term plan that sets goals for the next 5 to 10 years, but those goals need to be realistic.

5. Define Future Goals

Think about what you'd like your company to achieve in the next 5 or 10 years based on the current status of your business and create a strategic plan to achieve your goals.

6. Write Your Vision Statement

Now that you have an idea of the main elements that are involved

in the process of writing your vision statement, you can create one that fits your organization.

Best Practices for Writing a Vision Statement

There is no template for writing a vision statement, however, a common structure for successful ones includes these traits:

- **Be Concise:** This is not the place to stuff a document with fluff statements. It should be simple, easy to read and cut to the essentials so that it can be set to memory and be repeated accurately.
- **Be Clear:** A good rule of thumb for clarity is to focus on one primary goal, rather than trying to fill the document with a scattering of ideas. One clear objective is also easier to focus on and achieve.
- **Have a Time Horizon:** A time horizon is simply a fixed point in the future when you will achieve and evaluate your vision statement. Define that time.
- **Make it Future-Oriented:** Again, the vision statement is not what the company is presently engaged in but rather a future objective where the company plans to be.
- **Be Stable:** The vision statement is a long-term goal that should, ideally, not be affected by the market or technological changes.
- **Be Challenging:** That said, you don't want to be timid in setting your goals. Your objective shouldn't be too easy to achieve, but also it shouldn't be so unrealistic as to be discarded.
- **Be Abstract:** The vision statement should be general enough to capture the organization's interests and strategic direction.
- **Be Inspiring:** Live up to the title of the document, and create something that will rally the troops and be desirable as a goal for all those involved in the organization.

Because the vision statement is a foundational business document that will guide the company's strategic planning direction for years to come, consider using project planning tools and brainstorming techniques to get input from everyone on the team. That way, you'll get greater buy-in from the company, and you'll widen your net for collecting business vision ideas.

Now that we understand the role that vision statements have in organizations, let's look at real-life vision statement examples from 15 of the top companies in the world.

Vision Statement Examples

These examples prove that a vision statement isn't a templated document that only differs from other organizations by the branded logo on top of it.

IKEA

"Our vision is to create a better everyday life for many people." That's aspirational, short and to the point. More than that, it sets the tone for the company and makes it clear that they're in the market to offer low-priced good furnishings that suit everyone's lifestyle.

Nike

"Bring inspiration and innovation to every athlete* in the world. (*If you have a body, you are an athlete.)" Nobody cared much for sneakers in the past. They were just another piece of sports equipment. But Nike saw a future that had not yet existed, in which

they delivered products that inspired and motivated people. Notice how they include everyone as an athlete. It's clever and inclusive.

McDonald's

"To be the best quick service restaurant experience. Being the best means providing outstanding quality, service, cleanliness and value, so that we make every customer in every restaurant smile." The power of this vision is that it's constructed like a checklist. The word best is a word that requires definition, and McDonald's provides it with qualifiers, making the roadmap to success clearly marked with signposts.

Amazon

"We strive to offer our customers the lowest possible prices, the best available selection and the utmost convenience." This follows the classic series of threes, each of which defines what a customer is looking for in a seller.

Walmart

"Be the destination for customers to save money, no matter how they want to shop." Here the retailer is positioning themselves at the customer's bottomline, money, while stepping beyond brick-and-mortar to address the digital age of shopping.

Google

“To provide access to the world’s information in one click” They’ve moved from the altruistic and more abstract “Don’t be evil” from their corporate code of conduct to the more customer-centric and pragmatic.

Microsoft

“To help people and businesses throughout the world realize their full potential.” Shows that they’re both personal and professional, while highlighting how they help rather than profit off customers.

Facebook

“People use Facebook to stay connected with friends and family, to discover what’s going on in the world and to share and express what matters to them.” A bit of a mouthful, but then Facebook is working against a lot of negative exposure and wants to emphasize their connecting with people rather than alienating them.

Coca Cola

“Our vision is to craft the brands and choice of drinks that people love, to refresh them in body and spirit.” More than just the iconic red coke can, the company is expressing their breath of products all promising to quench whatever thirst you have.

Starbucks

“Treat people like family, and they will be loyal and their all.” This defines how intimate the brand wants to be, to the point that you’ll not ask for a coffee but a Starbucks.

Tesla

“To create the most compelling car company of the 21st century by driving the world’s transition to electric vehicles.” They see an opening in the automotive field and want to be the lead in differentiating themselves from gas vehicles.

Samsung

“Inspire the world with our innovative technologies, products and design that enrich people’s lives and contribute to social prosperity.” People love their electronics and Samsung says they’ll make the best and go even as far as to imply that’ll have more than mere entertainment value.

Netflix

“Becoming the best global entertainment distribution service.” Aiming for world domination in streaming services is up front and center in their vision statement.

Zoom

“Zoom is for you.” Simple and direct, if a bit presumptuous.

Patagonia

“We’re in business to save our home planet.” What, they don’t care about other planets? But seriously, this maker of outdoor wear and equipment knows that their customers are environmentally conscious and they’re tapping into the solution for global warming rather than fear of the future.

Oxfam

“A world without poverty.” This may seem to contradict one of the traits of a good vision statement in that it feels unrealistic. But as challenging visions go, it’s hard to see how anyone wouldn’t be inspired and motivated by this short and powerful one.

28. Project Charter

What is the Project Charter?

A project charter, project definition, or project statement is a statement of the scope, objectives, and participants in a project. It provides a preliminary delineation of roles and responsibilities, outlines the project objectives, identifies the main stakeholders, and defines the authority of the project manager. It serves as a reference of authority for the future of the project.

The charter document can be just a couple pages in length or can be 50-100 pages. Ideally it will be short (less than 5 pages) and written in clear and concise language so that anyone who reads it will have a clear understanding of the project, regardless of their technical background. Most project charters include a place at the end of the document for approval sign off by the project sponsors or customers (i.e. those people that are paying for the project).

Purpose of the Project Charter

The project charter is used by the project manager during the planning process. The project charter informs the project manager about what skills will be required on the project team, as well as the general scope of work for the project. Some organizations forgo creation of a project charter, viewing it as a document that merely takes time to create and contains information that “everyone already knows.” This can be a big mistake. The charter can be referenced by the project manager and stakeholders if some of the goals of the project are not met or they are asked to do something outside the scope of the project. A well-drafted project charter can

prevent political interference in achieving the goals of the project and reduce scope creep.

In summary, the purpose of a project charter is to:

- Provide an understanding of the project, the reason it is being conducted, and its justification.
- Establish early on in the project the general scope.
- Establish the project manager and his or her authority level. A note of who will review and approve the project charter must be included.

What Should Be in the Project Charter?

There are many templates available for project charters and these vary greatly in the content and level of detail. (The PMI affiliated web site ProjectManagement.com offers a number of project charter templates) At a minimum, good project charters will contain the following sections.

Background

The background should provide a broad overview of the project and answer the following questions:

- What is the purpose of the project?
- Where did the project originate? Have we conducted similar projects in the past?
- Who is the project manager and what level of authority does the project manager have?

Business Case

The Business Case describes why this project was selected over others and answers the following questions:

- Why was this project selected to move forward (project justification)? What selection criteria were used? (Project selection techniques are covered in a later chapter.)
- What problems is this project solving or what opportunities is it creating? What are the high-level requirements?

Goals

Listing the goals for the project ensures that the stakeholders will not be disappointed when the project is completed. This section should answer the following questions:

- What are the broad goals of this project?
- How will we know if the project is a success (what are our metrics for success)?
- Are there industry standards that we are trying to meet or benchmarks for performance that we want this project to attain?

Key Stakeholders

This section describes the key stakeholders and their interest in the project. This doesn't have to be an exhaustive list of stakeholders, but should contain a list of people that are interested in the project, as well as people who will pay for, or benefit from, the project.

Major Milestones

This section provides a summary of the major milestones for the project. A listing of any hard deadlines for the project should be included. Milestones can relate to project work (when are major deliverables expected to be complete?) as well as invoicing and payment deadlines.

Project Budget

The project budget section should provide a summary of the budget for the project and information about how it was determined. It answers the following questions:

- What is the initial budget for this project?
- How was that budget developed?
- Are the numbers used for budgeting rough estimates based on top-down estimation techniques, such as analogous or parametric estimating, or are they hard constraints?
- What contingency funds have been allocated?

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29. What Is a Project Deliverable?

Definition, Examples & More

by Marshall Simmons | Nov 23, 2020

Projects produce deliverables, which are simply the results of project activities. Project deliverables can be big or small, and their number can also vary depending on the project. They're agreed upon by the project management team and stakeholders during the project planning phase. Another way to put that is that there are inputs and outputs in any type of project. That being what you put into the project, such as data, resources, etc., and then what comes out, which are the deliverables. Again, those deliverables vary greatly. For example, a project deliverable can be either a product or service, or it can also be the documentation that is part of the project closure.

Project vs. Product Deliverables

There is a distinction between project and product deliverables. Project deliverables are such outputs as the project plans, project reports and even meeting minutes. Product deliverables, on the other hand, could be hardware, software, mobile applications, contracts, or even test assessment results.

The deliverables that clients and stakeholders expect at the end of the project are the product or service, of course, but there is also paperwork, as noted. These documents, when completed, are

deliverables that clients and stakeholders need in order to evaluate the progress or completion of the project.

This paperwork can include:

- Signed contracts
- Finalized expense reports
- Other types of project reports show how work is proceeding versus project plan estimations

Deliverables can vary according to the project's specifications and the stakeholders' requirements. But all clients and stakeholders want deliverables that thoroughly wrap up the project at its closure and measure performance against expectations throughout the project. When defining project deliverables, it's important that you use a project planning software such as ProjectManager to create a project timeline where you can easily visualize all your project tasks, assign work and track time.

How to Present Deliverables to Stakeholders

Project managers' reports are the means by which these types of deliverables are presented to clients and stakeholders. Different stakeholders have different needs, so flexibility and customization is important for effective reporting. In order to meet their needs, project management software must be able to filter the many data inputs to deliver the proper output.

Example of a timesheet for one person working on multiple projects during one timeframe.

Consistent use of these three reports helps keep your team on time, under budget and within scope. Lessons learned in libraries can also be a great tool to help build upon successes and avoid duplicating mistakes in future projects.

Lessons Learned Libraries

Creating a lessons learned library is a great way to compile takeaways from projects. It's a central place to view work that exceeded expectations, and also works that could have been better. As a new project kicks off, project managers use this resource to plan for known roadblocks.

Project Deliverables Expected Prior to Closure

Development of deliverables doesn't just happen during project closure. Project sponsors also expect deliverables during the initiation, planning and execution phases of a project. Let's take a look at the types of deliverables created in these phases in greater detail.

Final deliverables outline a project's entire scope of work, while deliverables created during earlier phases of a project are based on short-term snapshots of project activity.

Initiation phase deliverables can include a project charter or a business case. The lessons learned library is accessed at the outset of the planning phase, so information can be used from previous projects to better inform the planning of the next project. The communications plan, risk and issue management plan, change management plan, procurement plans and overall project schedule are also created during the planning phase. There are documents surrounding each of these plans which inform stakeholders and clients as the plan is being developed.

Referencing the project plan is the most common activity during project execution. All project activity is managed against the project plan.

Tracking of project execution includes:

1. Performance reports to measure how work is going and team

members are performing

2. Risk and issue logs to track issues that need to be addressed, and
3. Change the logs that identify changes made to the project plan and how these are affecting the project

Stakeholders and clients can demand reports and logs at a moment's notice. Always be prepared is the moral of the story.

PART IV

MODULE 4: STAKEHOLDER MANAGEMENT

In this module you will do an Analysis of Stakeholder Management. Stakeholders are the people who can affect your project either negatively or positively. It is very important that you know who your stakeholders are before and as you are working on your project.

Stakeholders can be your champions or they can cause you problems. The documents you will complete for this module will assist you in identifying your stakeholders, level their power and influence, and document the steps to manage the stakeholders with the most power and influence.

30. Stakeholder Management

Click play on the following audio player to listen along as you read this section.

https://media.bccampus.ca/id/0_w4u22wam?width=608&height=70&playerId=23449753

A project is successful when it achieves its objectives and meets or exceeds the expectations of the stakeholders. But who are the stakeholders? Stakeholders are individuals who either care about or have a vested interest in your project. They are the people who are actively involved with the work of the project or have something to either gain or lose as a result of the project. When you manage a project to add lanes to a highway, motorists are stakeholders who are positively affected. However, you negatively affect residents who live near the highway during your project (with construction noise) and after your project with far-reaching implications (increased traffic noise and pollution).

The project sponsor, generally an executive in the organization with the authority to assign resources and enforce decisions regarding the project, is a stakeholder. The customer, subcontractors, suppliers, and sometimes even the government are stakeholders.

The project manager, project team members, and the managers from other departments in the organization are stakeholders as well. It's important to identify all the stakeholders in your project upfront. Leaving out important stakeholders or their department's function and not discovering the error until well into the project could be a project killer.

Figure 5.1 shows a sample of the project environment featuring

NOTE: Key stakeholders can make or break the success of a project. Even if all the deliverables are met and the objectives are satisfied, if your key stakeholders aren't happy, nobody's happy.

the different kinds of stakeholders involved on a typical project. A study of this diagram confronts us with a couple of interesting facts.

First, the number of stakeholders that project managers must deal with ensures that they will have a complex job guiding their project through the lifecycle. Problems with any of these members can derail the project.

Second, the diagram shows that project managers have to deal with people external to the organization as well as the internal environment, certainly more complex than what a manager in an internal environment faces. For example, suppliers who are late in delivering crucial parts may blow the project schedule. To compound the problem, project managers generally have little or no direct control over any of these individuals.

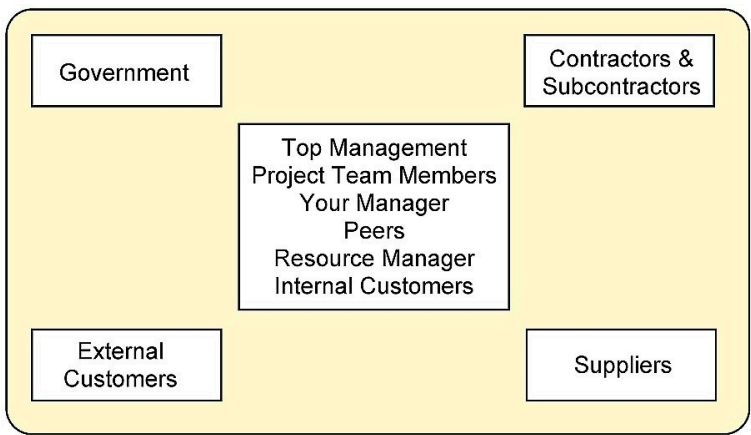


Figure 5.1: Project stakeholders. In a project, there are both internal and external stakeholders. Internal stakeholders may include top management, project team members, your manager, peers, resource manager, and internal customers. External stakeholders may include external customers, government, contractors and subcontractors, and suppliers.

Let's take a look at these stakeholders and their relationships to the project manager.

Project Stakeholders

Top Management

Top management may include the president of the company, vice-presidents, directors, division managers, the corporate operating committee, and others. These people direct the strategy and development of the organization.

On the plus side, you are likely to have top management support, which means it will be easier to recruit the best staff to carry out the project, and acquire needed material and resources; also visibility can enhance a project manager's professional standing in the company.

On the minus side, failure can be quite dramatic and visible to all, and if the project is large and expensive (most are), the cost of failure will be more substantial than for a smaller, less visible project.

Some suggestions in dealing with top management are:

- Develop in-depth plans and major milestones that must be approved by top management during the planning and design phases of the project.
- Ask top management associated with your project for their information reporting needs and frequency.
- Develop a status reporting methodology to be distributed on a scheduled basis.
- Keep them informed of project risks and potential impacts at all times.

The Project Team

The project team is made up of those people dedicated to the

project or borrowed on a part-time basis. As project manager, you need to provide leadership, direction, and above all, the support to team members as they go about accomplishing their tasks. Working closely with the team to solve problems can help you learn from the team and build rapport. Showing your support for the project team and for each member will help you get their support and cooperation.

Here are some difficulties you may encounter in dealing with project team members:

- Because project team members are borrowed and they don't report to you, their priorities may be elsewhere.
- They may be juggling many projects as well as their full-time job and have difficulty meeting deadlines.
- Personality conflicts may arise. These may be caused by differences in social style or values or they may be the result of some bad experience when people worked together in the past.
- You may find out about missed deadlines when it is too late to recover.

Managing project team members requires interpersonal skills. Here are some suggestions that can help:

- Involve team members in project planning.
- Arrange to meet privately and informally with each team member at several points in the project, perhaps for lunch or coffee.
- Be available to hear team members' concerns at any time.
- Encourage team members to pitch in and help others when needed.
- Complete a project performance review for team members.

Your Manager

Typically the boss decides what the assignment is and who can work with the project manager on projects. Keeping your manager informed will help ensure that you get the necessary resources to complete your project.

If things go wrong on a project, it is nice to have an understanding and supportive boss to go to bat for you if necessary. By supporting your manager, you will find your manager will support you more often.

- Find out exactly how your performance will be measured.
- When unclear about directions, ask for clarification.
- Develop a reporting schedule that is acceptable to your boss.
- Communicate frequently.

Peers

Peers are people who are at the same level in the organization as you and may or may not be on the project team. These people will also have a vested interest in the product. However, they will have neither the leadership responsibilities nor the accountability for the success or failure of the project that you have.

Your relationship with peers can be impeded by:

- Inadequate control over peers
- Political maneuvering or sabotage
- Personality conflicts or technical conflicts
- Envy because your peer may have wanted to lead the project
- Conflicting instructions from your manager and your peer's manager

Peer support is essential. Because most of us serve our self-interest

first, use some investigating, selling, influencing, and politicking skills here. To ensure you have cooperation and support from your peers:

- Get the support of your project sponsor or top management to empower you as the project manager with as much authority as possible. It's important that the sponsor makes it clear to the other team members that their cooperation on project activities is expected.
- Confront your peer if you notice a behaviour that seems dysfunctional, such as bad-mouthing the project.
- Be explicit in asking for full support from your peers. Arrange for frequent review meetings.
- Establish goals and standards of performance for all team members.

Resource Managers

Because project managers are in the position of borrowing resources, other managers control their resources. So their relationships with people are especially important. If their relationship is good, they may be able to consistently acquire the best staff and the best equipment for their projects. If relationships aren't good, they may find themselves not able to get good people or equipment needed on the project.

Internal Customers

Internal customers are individuals within the organization who are customers for projects that meet the needs of internal demands. The customer holds the power to accept or reject your work. Early

in the relationship, the project manager will need to negotiate, clarify, and document project specifications and deliverables. After the project begins, the project manager must stay tuned in to the customer's concerns and issues and keep the customer informed.

Common stumbling blocks when dealing with internal customers include:

- A lack of clarity about precisely what the customer wants
- A lack of documentation for what is wanted
- A lack of knowledge of the customer's organization and operating characteristics
- Unrealistic deadlines, budgets, or specifications requested by the customer
- Hesitancy of the customer to sign off on the project or accept responsibility for decisions
- Changes in project scope

To meet the needs of the customer, client, or owner, be sure to do the following:

- Learn the client organization's buzzwords, culture, and business.
- Clarify all project requirements and specifications in a written agreement.
- Specify a change procedure.
- Establish the project manager as the focal point of communications in the project organization.

External customer

External customers are the customers when projects could be marketed to outside customers. In the case of Ford Motor Company, for example, the external customers would be the buyers of the

automobiles. Also if you are managing a project at your company for Ford Motor Company, they will be your external customer.

Government

Project managers working in certain heavily regulated environments (e.g., pharmaceutical, banking, or military industries) will have to deal with government regulators and departments. These can include all or some levels of government from municipal, provincial, federal, to international.

Contractors, subcontractors, and suppliers

There are times when organizations don't have the expertise or resources available in-house, and work is farmed out to contractors or subcontractors. This can be a construction management foreman, network consultant, electrician, carpenter, architect, or anyone who is not an employee. Managing contractors or suppliers requires many of the skills needed to manage full-time project team members.

Any number of problems can arise with contractors or subcontractors:

- Quality of the work
- Cost overruns
- Schedule slippage

Many projects depend on goods provided by outside suppliers. This is true for example of construction projects where lumber, nails, bricks, and mortar come from outside suppliers. If the supplied

goods are delivered late or are in short supply or of poor quality or if the price is greater than originally quoted, the project may suffer.

Depending on the project, managing contractor and supplier relationships can consume more than half of the project manager's time. It is not purely intuitive; it involves a sophisticated skill set that includes managing conflicts, negotiating, and other interpersonal skills.

Politics of Projects

Many times, project stakeholders have conflicting interests. It's the project manager's responsibility to understand these conflicts and try to resolve them. It's also the project manager's responsibility to manage stakeholder expectations. Be certain to identify and meet with all key stakeholders early in the project to understand all their needs and constraints.

Project managers are somewhat like politicians. Typically, they are not inherently powerful or capable of imposing their will directly on coworkers, subcontractors, and suppliers. Like politicians, if they are to get their way, they have to exercise influence effectively over others. On projects, project managers have direct control over very few things; therefore their ability to influence others – to be a good politician – may be very important

Here are a few steps a good project politician should follow. However, a good rule is that when in doubt, stakeholder conflicts should always be resolved in favour of the customer.

Assess the environment

Identify all the relevant stakeholders. Because any of these

stakeholders could derail the project, you need to consider their particular interest in the project.

- Once all relevant stakeholders are identified, try to determine where the power lies.
- In the vast cast of characters, who counts most?
- Whose actions will have the greatest impact?

Identify goals

After determining who the stakeholders are, identify their goals.

- What is it that drives them?
- What is each after?
- Are there any hidden agendas or goals that are not openly articulated?
- What are the goals of the stakeholders who hold the power? These deserve special attention.

Define the problem

- The facts that constitute the problem should be isolated and closely examined.
- The question “What is the real situation?” should be raised over and over.

Culture of Stakeholders

When project stakeholders do not share a common culture, project

management must adapt its organizations and work processes to cope with cultural differences. The following are three major aspects of cultural difference that can affect a project:

1. Communications
2. Negotiations
3. Decision making

Communication is perhaps the most visible manifestation of culture. Project managers encounter cultural differences in communication in language, context, and candor.

Language is clearly the greatest barrier to communication. When project stakeholders do not share the same language, communication slows down and is often filtered to share only information that is deemed critical.

The barrier to communication can influence project execution where quick and accurate exchange of ideas and information is critical.

The interpretation of information reflects the extent that context and candor influence cultural expressions of ideas and understanding of information. In some cultures, an affirmative answer to a question does not always mean yes. The cultural influence can create confusion on a project where project stakeholders represent more than one culture.

Example: Culture Affects Communication in Mumbai

A project management consultant from the United States was asked to evaluate the effectiveness of a U.S. project management team executing a project in Mumbai, India. The project team reported that the project was on schedule and within budget. After a project review meeting where each of the engineering leads reported that

the design of the project was on schedule, the consultant began informal discussions with individual engineers and began to discover that several critical aspects of the project were behind schedule. Without a mitigating strategy, the project would miss a critical window in the weather between monsoon seasons. The information on the project flowed through a cultural expectation to provide positive information. The project was eventually canceled by the U.S. corporation when the market and political risks increased.

Not all cultural differences are related to international projects. Corporate cultures and even regional differences can create cultural confusion on a project.

Example: Cultural Differences between American Regions

On a major project in South America that included project team leaders from seven different countries, the greatest cultural difference that affected the project communication was between two project leaders from the United States. Two team members, one from New Orleans and one from Brooklyn, had more difficulty communicating than team members from Lebanon and Australia.

Managing Stakeholders

Often there is more than one major stakeholder in the project. An increase in the number of stakeholders adds stress to the project and influences the project's complexity level. The business or emotional investment of the stakeholder in the project and the ability of the stakeholder to influence the project outcomes or

execution approach will also influence the stakeholder complexity of the project. In addition to the number of stakeholders and their level of investment, the degree to which the project stakeholders agree or disagree influences the project's complexity.

A small commercial construction project will typically have several stakeholders. All the building permitting agencies, environmental agencies, and labour and safety agencies have an interest in the project and can influence the execution plan of the project. The neighbours will have an interest in the architectural appeal, the noise, and the purpose of the building.

Example: Tire Plant in India

A U.S. chemical company chartered a project team to design and build a plant to produce the raw materials for building truck tires designed for unpaved roads. The plant was to be built in India a few years after an accident that killed several Indians and involved a different U.S. chemical company. When the company announced the new project and began to break ground, the community backlash was so strong that the project was shut down. A highly involved stakeholder can significantly influence your project.

Example: Wind Turbine on a College Campus

A small college in South Carolina won a competitive grant to erect and operate a wind turbine on campus. The engineering department submitted the grant as a demonstration project for engineering students to expose students to wind technology. The campus facilities department found only one location for the wind turbine that would not disrupt the flow of traffic on campus. The engineering department found that location unacceptable for

students who had to maintain the wind turbine. The county construction permitting department had no policies for permitting a wind turbine and would not provide a building permit. The college had to go to the county council and get an exception to county rules. The marketing department wanted the wind turbine placed in a highly visible location to promote the innovative approach of the college.

Each of the college's stakeholders had a legitimate interest in the location of the wind turbine. The number of stakeholders on the project, multiplied by their passion for the subject and the lack of agreement on the location, increased the complexity of the project. Significant time and resources of a project will be dedicated to identifying, understanding, and managing client expectations.

Example: Stakeholders and a Bridge Project

The Department of Highways chartered a project to upgrade a number of bridges that crossed the interstate in one of the larger cities in South Carolina. The closing of these bridges severely impacted traffic congestion, including a large shopping mall. The contract included provisions for minimizing the impact on the traffic and communities near the construction areas. This provision allowed businesses or interested parties to review the project schedule and make suggestions that would lessen the impact of the construction. The project leadership invested significant time and resources in developing alignment among the various political stakeholders on the project approach and schedule.

Relationship Building Tips

Take the time to identify all stakeholders before starting a new

project. Include those who are impacted by the project, as well as groups with the ability to impact the project. Then, begin the process of building strong relationships with each one using the following method.

- **Analyze stakeholders:** Conduct a stakeholder analysis, or an assessment of a project's key participants, and how the project will affect their problems and needs. Identify their individual characteristics and interests. Find out what motivates them, as well as what provokes them. Define roles and level of participation, and determine if there are conflicts of interest among groups of stakeholders.
- **Assess influence:** Measure the degree to which stakeholders can influence the project. The more influential a stakeholder is, the more a project manager will need their support. Think about the question, "What's in it for them?" when considering stakeholders. Knowing what each stakeholder needs or wants from the project will enable the project manager to gauge his or her level of support. And remember to balance support against influence. Is it more important to have strong support from a stakeholder with little influence, or lukewarm support from one with a high level of influence?
- **Understand their expectations:** Nail down stakeholders' specific expectations. Ask for clarification when needed to be sure they are completely understood.
- **Define "success":** Every stakeholder may have a different idea of what project success looks like. Discovering this at the end of the project is a formula for failure. Gather definitions up front and include them in the objectives to help ensure that all stakeholders will be supportive of the final outcomes.
- **Keep stakeholders involved:** Don't just report to stakeholders. Ask for their input. Get to know them better by scheduling time for coffee, lunch, or quick meetings. Measure each stakeholder's capacity to participate and honour time constraints.

- **Keep stakeholders informed:** Send regular status updates. Daily may be too much; monthly is not enough. One update per week is usually about right. Hold project meetings as required, but don't let too much time pass between meetings. Be sure to answer stakeholders' questions and emails promptly. Regular communication is always appreciated – and may even soften the blow when you have bad news to share.

These are the basics of building strong stakeholder relationships. But as in any relationship, there are subtleties that every successful project manager understands – such as learning the differences between and relating well to different types stakeholders.

How to Relate to Different Types of Stakeholders

By conducting a stakeholder analysis, project managers can gather enough information on which to build strong relationships – regardless of the differences between them. For example, the needs and wants of a director of marketing will be different from those of a chief information officer. Therefore, the project manager's engagement with each will need to be different as well.

Stakeholders with financial concerns will need to know the potential return of the project's outcomes. Others will support projects if there is sound evidence of their value to improving operations, boosting market share, increasing production, or meeting other company objectives.

Keep each stakeholder's expectations and needs in mind throughout each conversation, report or email, no matter how casual or formal the communication may be. Remember that the company's interests are more important than any individual's – yours or a stakeholder's. When forced to choose between them, put the company's needs first.

No matter what their needs or wants, all stakeholders will respect the project manager who:

- Is always honest, even when telling them something they don't want to hear
- Takes ownership of the project
- Is predictable and reliable
- Stands by his or her decisions
- Takes accountability for mistakes

Supportive Stakeholders are Essential to Project Success

Achieving a project's objectives takes a focused, well-organized project manager who can engage with a committed team and gain the support of all stakeholders. Building strong, trusting relationships with interested parties from the start can make the difference between project success and failure.

Tools to Help Stakeholder Management

There are many project decelerators, among them lack of stakeholder support. Whether the stakeholders support your project or not, if they are important to your project, you must secure their support. How do you do that?

First, you must identify who your stakeholders are. Just because they are important in the organization does not necessarily mean they are important to your project. Just because they think they are important does not mean they are. Just because they don't think they need to be involved does not mean they do not have to be. The typical suspects: your manager, your manager's manager, your

client, your client’s manager, any SME (subject matter expert) whose involvement you need, and the board reviewing and approving your project. Note that in some situations there are people who think they are stakeholders. From your perspective they may not be, but be careful how you handle them. They could be influential with those who have the power to impact your project. Do not dismiss them out of hand.

Second, you need to determine what power they have and what their intentions toward your project are. Do they have the power to have an impact on your project? Do they support or oppose you? What strategies do you follow with them?

Third, what’s the relationship among stakeholders? Can you improve your project’s chances by working with those who support you to improve the views of those who oppose you? Table 5.1 summarizes the options based on an assessment of your stakeholders’ potential for cooperation and potential for threat.

Table 5.1 Stakeholder Analysis (Solera, 2009)

	Low threat potential	High threat potential
Low potential for cooperation	Type: Marginal	Type: Non-supportive
	Strategy: Monitor	Strategy: Defend
High potential for cooperation	Type: Supportive	Type: Mixed blessing
	Strategy: Involve	Strategy: Collaborative

Now that you have this information, you can complete a stakeholder analysis template (Table 5.2) that will help you define your strategies to improve their support:

Table 5.2 Stakeholder Analysis Template (Solera, 2009)

Stakeholder Names and Roles	How important? (Low – Med – High)	Current level of support? (Low – Med – High)	What do you want from stakeholders?	What is important to stakeholders?	How could stakeholders block your efforts?	What is your strategy for enhancing stakeholder support?

Finally, a key piece of your stakeholder management efforts is constant communication to your stakeholders. Using the information developed above, you should develop a communications plan that secures your stakeholders' support. The template in Figure 5.2 can be used.

Project Scope:

Key Messages:

Communication Goals:

Communication Team:

Project Team:

Other stakeholders:

Communication Date	Deliverable	Audience	Message	Action Item or FYI (Info?)	Plans	Status

Figure 5.2 Stakeholder Communication Template [Image description]

References

Solera, J. (2009). Project Decelerators – Lack of Stakeholder Support. *Silicon Valley Project Management*. Retrieved from <https://svprojectmanagement.com/project-decelerators-lack-of-stakeholder-support>.

Image descriptions

Figure 5.2 Stakeholder Communication Template

The stakeholder analysis template has six fields plus a table to be filled out. The lines ask for: the project scope, key messages, communication goals, communication teams, project team, and other stakeholders. Then, there is a table with seven columns where you can track the communication plan. The column headers of this table are: communication date, deliverable, audience, message, action item or FYI (info?), plans, and status. [Return to Figure 5.2]

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PART V

MODULE 5: WORK BREAKDOWN STRUCTURE

In this module you will do a Work Breakdown Structure (WBS). The WBS is the document that lists all of work that that must be done to complete the project in the form of activities and tasks. You will use this list on future documents. There are a number of ways you can create this list, the most accurate way of doing this is using a previous list or enlisting your team members to help.

PART V

MODULE 6: ESTIMATING PROJECT TIMES

In this module you will create a Critical Path Diagram sometimes known as a Network Diagram. In project management, a critical path is the sequence of project network activities which add up to the longest overall duration, regardless if that longest duration has float or not. This determines the shortest time possible to complete the project.

3I. Time Estimation

Estimates have a huge influence on a project and are a large source of project risk. Watch the video on time estimates to learn about how estimates are used for project planning.



One or more interactive elements has been excluded from this version of the text. You can view them online

here: <https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=326#oembed-1>

Top-down estimation	Also referred to as macro, estimation methods are used to determine if a project is feasible, to calculate funding requirements, and to determine the resources needed to complete a project. These methods are not extremely accurate but provide a relatively fast way to make an estimate of the time and costs required for a project.
Bottom-up estimation	Also referred to as micro, estimation methods are used to provide a detailed, and more accurate, estimate and are usually derived from the detailed list of work packages or activities found in the work-breakdown structure.

As the video mentions, all estimates contain risk. If estimates are too low, then a project will take more time and money to complete than what was budgeted. Obviously, a bad situation. If estimates are too high, then a project will take less time and money than originally estimated. This might seem to be a desirable situation, but good project managers will realize that estimates that are too high will cause an organization to over allocate resources to a project, thereby preventing other projects from being pursued due to organizational resource shortages. Therefore, it is important to have the most accurate estimates possible. The project team needs to understand the value of accurate estimates and avoid the natural

human tendency to pad estimates. Once unbiased estimates for a project have been generated, the project manager can calculate what time buffers and budgetary reserves should be added to the project plan to deal with uncertainty.

Accuracy of Estimates

Prior to project authorization, estimates for project cost need to be given, but these estimates can be rough estimates. As the project progresses, more definitive estimates will be needed and can be generated.

PMI defines the following ranges for estimates:

- Rough Order of Magnitude (ROM). ROM estimates are made at the initiation of the project and can be +/- 50 percent from the actual or final cost.
- Budget Estimate. Budget estimates are used in project planning and can be within a range from -10 to +25 percent from the actual or final cost.
- Definitive Estimate. Definitive estimates are generated as the project progresses and the variability of the estimate is reduced (see Figure 5-4). Definitive estimates are within a range from -5 to +10 percent from the actual or final cost.

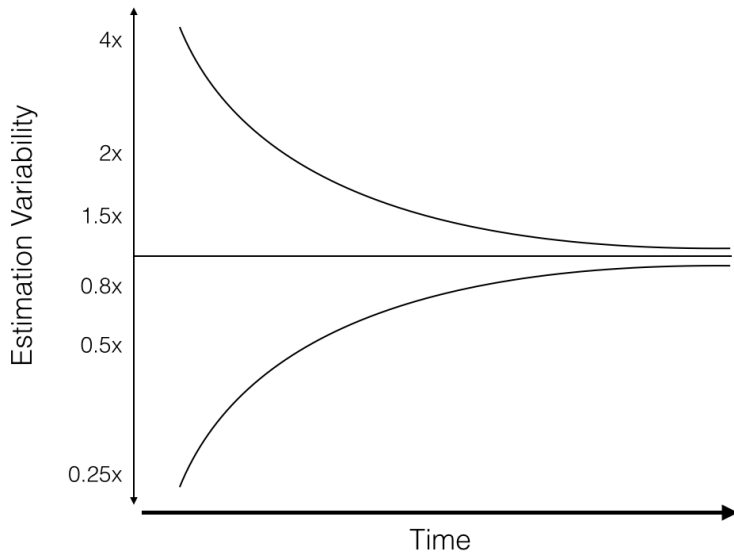


Figure 5-4: Estimates contain a high degree of variability at the inception of a project, and that variability decreases as the project is defined and moves toward completion.

Top Down (Macro) Estimation

Top-down, or macro, estimation methods allow for a quick estimate of project costs based on historical information.

Analogous Estimating

Analogous estimating uses information from a previous project to estimate the cost of completing a similar project in the future. This provides a quick estimate, but should be used with caution. Analogous estimating only works when comparing projects that are similar in scope and will be completed in similar conditions.

For example, a small IT business developed a website for a local restaurant for which they charged \$4000. Another restaurant approaches the IT firm and asks for a rough cost estimate for a similar site. The IT firm can tell the second restaurant that such

work will cost approximately \$4000. Of course, the caveat is that this second website will have a similar number of pages, functions, and graphics as the first site.

The advantage of analogous estimating is that it allows for a very quick estimate to be provided for a customer. If in the example above, the second restaurant had only budgeted \$200 for a website, they would have quickly determined that they have not budgeted enough, and the IT firm would be able to quickly determine that this is not a serious customer. However, if the second restaurant is okay with this approximate price, the IT firm can work with the restaurant to develop a detailed cost proposal.

Analogous estimating, is not accurate if:

- The projects differ in scope.
- There is a difference in the conditions under which the work will be performed.
- There is a difference in the cost of resources (materials, labor).

Parametric Estimating

Parametric estimates, also called the ratio method, uses historical information or industry benchmarks as the basis for making an estimate. Parametric estimates are made by multiplying the size of a project by an established cost per unit.

Cost Estimate (Union Labor)	Cost per Square Foot
Labor and Materials	\$234.09
Contractor Fees (GC, Overhead, Profit)	\$58.52
Architectural Fees	\$26.34
Total Building Cost (per Square foot)	\$318.95

Cost Estimate (Open Shop)	Cost per Square Foot
Labor and Materials	\$217.51
Contractor Fees (GC, Overhead, Profit)	\$54.38
Architectural Fees	\$24.47
Total Building Cost (per Square foot)	\$296.36

Table 5-1: Hospital construction costs – Data from Reed Construction (<http://www.cmdgroup.com/>) 2014.

For example, industry data is available for the per square foot construction cost for many types of buildings. An architect can use this information to make a parametric estimate by multiplying the cost per square foot by the size of any new building being considered. If an organization wants to build a new hospital using union labor, a rough estimate of the construction cost can be calculated using the information in Table 5.1: $20,000 \text{ ft}^2 \text{ clinic} \times \$318.95/\text{ft}^2 = \$6,379,000$. The organization can then use this estimate as an approximate cost and start securing the money for the project. Once the funding is secured, an architect can develop a complete plan and produce a more accurate project budget, using a bottom-up estimation method.

Learning Curves

Projects that require an activity to be repeated several times throughout the project will benefit from a so-called learning curve. Learning curves, also known as improvement curves or experience curves, are important when labor is one of our main resources.

Consider a large construction project for a new highway. The first

hundred feet of highway may be fairly slow to complete. But as workers become more experienced, and figure out better ways to organize their work, the time required to construct the next one hundred feet of new highway will be less.

Learning curves were first observed in aircraft production and are also used heavily in operations management. Each time production doubles, a learning rate can be calculated. See Table 5.2 for the calculation of a learning curve. When output doubles, from the first screen installed to the second, a learning rate is calculated. Another learning rate is calculated when the output doubles from the second screen installed to the fourth, and so on. The average learning curve can then be calculated. Later, if this company is contracted to install projector screens as part of a project, they can use this learning curve in their labor estimates.

There is a limit to the improvement of a learning curve. Eventually, the learning curve will “bottom out” and no more improvement gains can be achieved.

Table 5-2

Number of screens installed	Time to install projector screen	Learning Rate
1	500	
2	440	88.0%
3	420	
4	400	90.9%
5	390	
6	380	
7	370	
8	360	90.0%
9	355	
10	350	
11	345	
12	344	
13	342	
14	340	
15	339	
16	338	93.9%
Average	90.7%	<i>Data from Table 5-2 shown on graph 5-5. Notice improvement from one installation to the next.</i>

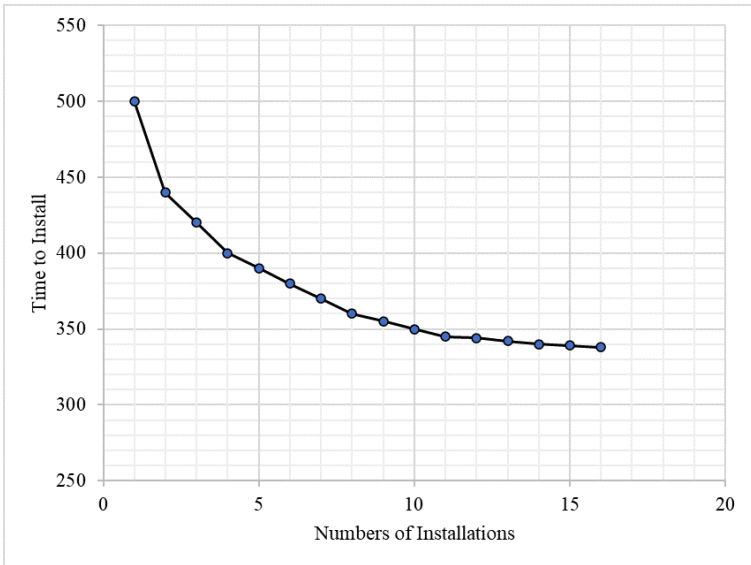


Figure 5-5: Learning curve calculation – Each time production is doubled, the learning rate for that doubling is calculated: (screen 2 time/screen 1 time), (screen 4 time/screen 2 time), (screen 8 time/screen 4 time), and (screen 16 time/screen 8 time).

However, there are several things that can be done to extend and improve the slope of a learning curve:

- Incentivize workers to improve the processes they are using to complete their tasks. These incentives are “built in” for companies that are employee owned, where employees share in the reward if profits increase.
- Make investments in new technology and equipment.
- Invest in training and education for new workers, so they are not “learning on the job.”
- Give workers the flexibility to make changes to how materials are sourced, delivered, and organized.
- Re-engineer the deliverables so they are easier to produce.

Learning curves usually hold if the work is continuous. If there is a break in the work, gains in productivity when work resumes will not be as great as if the work had continued uninterrupted.

Bottom Up (Micro) Estimation

Bottom up, or micro, estimation techniques are used when the project is approved or is very likely to be approved. Bottom up estimation techniques generate estimates for individual work packages or sub-deliverables, which are then summarized to reflect total costs. Bottom up estimates are more accurate, detailed and take more time to generate. Instead of relying on historical information, bottom-up estimates rely on people with experience who can provide time and cost estimates for a particular work package or sub-deliverable.

These basic guidelines should be followed when generating bottom up estimates:

- Have people familiar with the work make the estimate.
- If possible, use several people to make estimates.
- Estimates should be based on normal conditions and a normal level of resources.
- Estimates should not make allowances for contingencies.

The project manager or team will add buffer times and contingency funds to the project after estimates are collected and analyzed.

Single Point Estimate

Single point estimation is an estimate obtained from just one estimator. This can work well with experienced estimators and work packages that are straight forward. Single point estimates are quick to generate and summarize in a project plan. The risk with single point estimates is that the estimator will overlook some aspect of the work and inadvertently provide an inaccurate estimate.

Three-points estimate

Instead of asking an estimator for just one estimate, a three-points estimate asks the estimator to provide three-time estimates for each activity:

- An optimistic time estimate (if all goes well, what is the shortest time period one could realistically expect for the completion of this activity?). This will be designated in calculations as **a**.
- The most likely time estimate (if all goes normally, what is the average time one would expect it would take for an activity to be completed?). This will be designated in calculations as **m**.
- A pessimistic time estimate (if work goes poorly, what is the longest time period one could realistically expect for the completion of this activity). This will be designated in calculations as **b**.

These three estimates can be used as inputs to calculate an estimated time for the activity or work package to be completed, either through a simple average or through a weighted average known as **T_e**, where **$T_e = (a + 4m + b) / 6$** .

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PART VI

MODULE 7: SCHEDULING & TIME MANAGEMENT

32. Scheduling Chapter Introduction

Learning Objectives

After reading this chapter, you will be able to:

1. Define terms related to scheduling.
2. Be able to calculate parametric estimates.
3. Understand how cost and time are summarized in a WBS.
4. Understand the process of decomposition is used to create a WBS.
5. Understand the difference between a deliverable and work package.
6. Understand the WBS numbering system.
7. Understand top-down estimation methods.
8. Understand bottom-up estimation methods.
9. Be able to calculate learning curves and apply them.
10. Discuss issues related to moving from the planning phase of a project to the scheduling phase.
11. Explain concepts related to the critical path method including schedule compression.

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33. Resource Planning

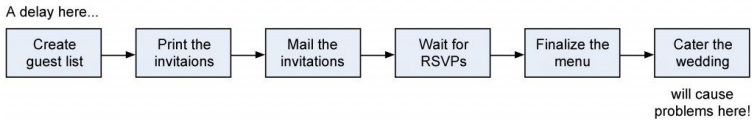


Figure 11.1: An example of problems that can be caused within the critical path.

Knowing where your critical path is can give you a lot of freedom. If you know an activity is not on the critical path, then you know a delay in that activity may not necessarily delay the project. This can really help you handle emergency situations. Even better, it means that if you need to bring your project in earlier than was originally planned, you know that adding resources to the critical path will be much more effective than adding them elsewhere.

It's easy to find the critical path in any project. Of course, on a large project with dozens or hundreds of tasks, you'll probably use software like Microsoft Project to find the critical path for you. But when it does, it's following the same exact steps that are followed here (Figure 11.12).

Step 1. Start with a network diagram.

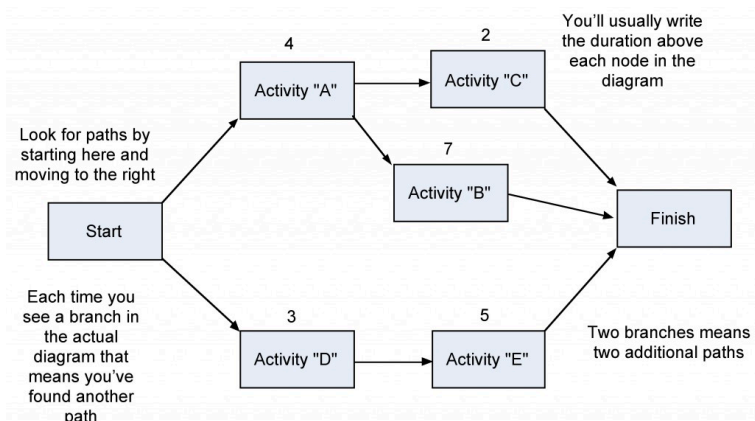


Figure 11.2 Step 1. Create a Network Diagram

Step 2. Find all the paths in the diagram. A path is any string of activities that goes from the start of the project to the end.

- Start > Activity "A" > Activity "B" > Finish
- Start > Activity "A" > Activity "C" > Finish
- Start > Activity "D" > Activity "E" > Finish

Step 3. Find the duration of each path by adding up the durations of each of the activities on the path.

- Start > Activity "A" > Activity "B" > Finish = $4 + 7 = 11$
- Start > Activity "A" > Activity "C" > Finish = $4 + 2 = 6$
- Start > Activity "D" > Activity "E" > Finish = $3 + 5 = 8$

Step 4. The first path has a duration of 11, which is longer than the other paths, so it's the critical path.

The schedule can also be displayed using a Gantt chart (Figure 11.3).

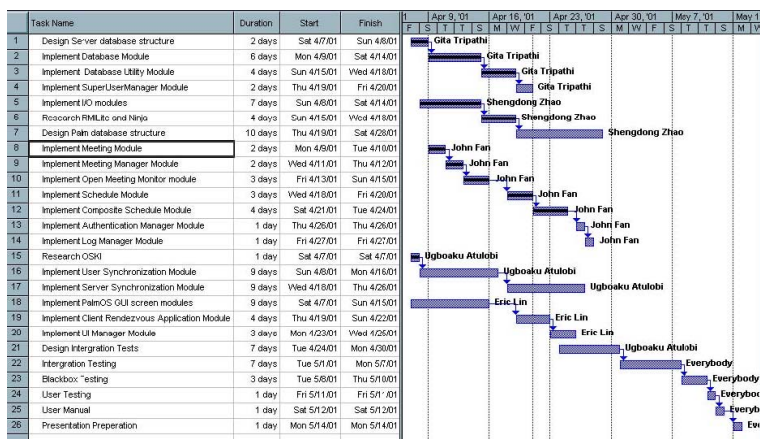


Figure 11.3: An example of a Gantt chart.

Resource Management

Resource management is the efficient and effective deployment of an organization's resources when they are needed. Such resources may include financial resources, inventory, human skills, production resources, or information technology (IT). In the realm of project management, processes, techniques, and philosophies for the best approach for allocating resources have been developed. These include discussions on functional versus cross-functional resource allocation as well as processes espoused by organizations like the Project Management Institute (PMI) through the methodology of project management outlined in their publication *A Guide to the Project Management Body of Knowledge (PMBOK)*. Resource management is a key element to activity resource estimating and project human resource management. As is the case with the larger discipline of project management, there are resource management

software tools available that automate and assist the process of resource allocation to projects.

HR Planning

The most important resource to a project is its people—the project team. Projects require specific expertise at specific moments in the schedule, depending on the milestones being delivered or the given phase of the project. An organization can host several strategic projects concurrently over the course of a budget year, which means that its employees can be working on more than one project at a time. Alternatively, an employee may be seconded away from his or her role within an organization to become part of a project team because of a particular expertise. Moreover, projects often require talent and resources that can only be acquired via contract work and third party vendors. Procuring and coordinating these human resources, in tandem with managing the time aspect of the project, is critical to overall success.

Managing the Team

In order to successfully meet the needs of a project, it is important to have a high-performing project team made up of individuals who are both technically skilled and motivated to contribute to the project's outcome. One of the many responsibilities of a project manager is to enhance the ability of each project team member to contribute to the project, while also fostering individual growth and accomplishment. At the same time, each individual must be encouraged to share ideas and work with others toward a common goal.

Through performance evaluation, the manager will get the

information needed to ensure that the team has adequate knowledge, to establish a positive team environment and a healthy communication climate, to work properly, and to ensure accountability.

Managing the project team includes appraisal of employee performance and project performance. The performance reports provide the basis for managerial decisions on how to manage the project team.

Employee performance includes the employee's work results such as:

- Quality and quantity of outputs
- Work behaviour (such as punctuality)
- Job-related attributes (such as cooperation and initiative)

After conducting employee performance reviews, project managers should:

- Provide feedback to employees about how well they have performed on established goals
- Provide feedback to employees about areas in which they are weak or could do better
- Take corrective action to address problems with employees performing at or below minimum expectations
- Reward superior performers to encourage their continued excellence

Techniques for Managing Resources

One resource management technique is resource leveling. It aims at smoothing the stock of resources on hand, reducing both excess inventories and shortages.

The required data are the demands for various resources, forecast

by time period into the future as far as is reasonable; the resources' configurations required in those demands; and the supply of the resources, again forecast by time period into the future as far as is reasonable.

The goal is to achieve 100% utilization. However that is very unlikely, when weighted by important metrics and subject to constraints; for example: meeting a minimum quality level, but otherwise minimizing cost.

Resource Leveling

Resource leveling is used to examine unbalanced use of resources (usually people or equipment) over time and for resolving over-allocations or conflicts.

When performing project planning activities, the manager will attempt to schedule certain tasks simultaneously. When more resources such as machines or people are needed than are available, or perhaps a specific person is needed in both tasks, the tasks will have to be rescheduled sequentially to manage the constraint. Resource leveling during project planning is the process of resolving these conflicts. It can also be used to balance the workload of primary resources over the course of the project, usually at the expense of one of the traditional triple constraints (time, cost, scope).

When using specially designed project software, leveling typically means resolving conflicts or over-allocations in the project plan by allowing the software to calculate delays and update tasks automatically. Project management software leveling requires delaying tasks until resources are available. In more complex environments, resources could be allocated across multiple, concurrent projects thus requiring the process of resource leveling to be performed at company level.

In either definition, leveling could result in a later project finish date if the tasks affected are in the critical path.

Working with Individuals

Working with other people involves dealing with them both logically and emotionally. A successful working relationship between individuals begins with appreciating the importance of emotions and how they relate to personality types, leadership styles, negotiations, and setting goals.

Emotional Intelligence

Emotions are both a mental and physiological response to environmental and internal stimuli. Leaders need to understand and value their emotions to appropriately respond to the client, project team, and project environment.

Emotional intelligence includes the following:

- Self-awareness
- Self-regulation
- Empathy
- Relationship management

Emotions are important to generating energy around a concept, building commitment to goals, and developing high-performing teams. Emotional intelligence is an important part of the project manager's ability to build trust among the team members and with the client. It is an important factor in establishing credibility and an open dialogue with project stakeholders. Emotional intelligence is critical for project managers, and the more complex the project

profile, the more important the project manager's emotional intelligence becomes to project success.

Personality Types

Personality types refer to the differences among people in such matters as what motivates them, how they process information, how they handle conflict, etc. Understanding people's personality types is acknowledged as an asset in interacting and communicating with them more effectively. Understanding your personality type as a project manager will assist you in evaluating your tendencies and strengths in different situations. Understanding others' personality types can also help you coordinate the skills of your individual team members and address the various needs of your client.

The Myers-Briggs Type Indicator (MBTI) is one of most widely used tools for exploring personal preference, with more than two million people taking the MBTI each year. The MBTI is often referred to as simply the Myers-Briggs. It is a tool that can be used in project management training to develop awareness of preferences for processing information and relationships with other people.

Based on the theories of psychologist Carl Jung, the Myers-Briggs uses a questionnaire to gather information on the ways individuals prefer to use their perception and judgment. Perception represents the way people become aware of people and their environment. Judgment represents the evaluation of what is perceived. People perceive things differently and reach different conclusions based on the same environmental input. Understanding and accounting for these differences is critical to successful project leadership.

The Myers-Briggs identifies 16 personality types based on four preferences derived from the questionnaire. The preferences are between pairs of opposite characteristics and include the following:

- Extroversion (E)-Introversion (I)

- Sensing (S)-Intuition (N)
- Thinking (T)-Feeling (F)
- Judging (J)-Perceiving (P)

Sixteen Myers-Briggs types can be derived from the four dichotomies. Each of the 16 types describes a preference: for focusing on the inner or outer world (E-I), for approaching and internalizing information (S-I), for making decisions (T-F), and for planning (J-P). For example, an ISTJ is a Myers-Briggs type who prefers to focus on the inner world and basic information, prefers logic, and likes to decide quickly.

It is important to note that there is no best type and that effective interpretation of the Myers-Briggs requires training. The purpose of the Myers-Briggs is to understand and appreciate the differences among people. This understanding can be helpful in building the project team, developing common goals, and communicating with project stakeholders. For example, different people process information differently. Extroverts prefer face-to-face meetings as the primary means of communicating, while introverts prefer written communication. Sensing types focus on facts, and intuitive types want the big picture.

On larger, more complex projects, some project managers will use the Myers-Briggs as a team-building tool during project start-up. This is typically a facilitated work session where team members take the Myers-Briggs and share with the team how they process information, what communication approaches they prefer, and what decision-making preferences they have. This allows the team to identify potential areas of conflict, develop communication strategies, and build an appreciation for the diversity of the team.

Another theory of personality typing is the DISC method, which rates people's personalities by testing a person's preferences in word associations in the following four areas:

- **Dominance/Drive**—relates to control, power, and assertiveness

- **Inducement/Influence**—relates to social situations and communication
- **Submission/Steadiness**—relates to patience, persistence, and thoughtfulness
- **Compliance/Conscientiousness**—relates to structure and organization

Understanding the differences among people is a critical leadership skill. This includes understanding how people process information, how different experiences influence the way people perceive the environment, and how people develop filters that allow certain information to be incorporated while other information is excluded. The more complex the project, the more important the understanding of how people process information, make decisions, and deal with conflict. There are many personality-type tests that have been developed and explore different aspects of people's personalities. It might be prudent to explore the different tests available and utilize those that are most beneficial for your team.

Leadership Styles

Leadership style is a function of both the personal characteristics of the leader and the environment in which the leadership must occur, and a topic that several researchers have attempted to understand. Robert Tannenbaum and Warren Schmidt described leaders as either autocratic or democratic (1958). Harold Leavitt described leaders as pathfinders (visionaries), problem solvers (analytical), or implementers (team oriented) (1986). James MacGregor Burns conceived leaders as either transactional (focused on actions and decisions) or transformational (focused on the long-term needs of the group and organization) (1978).

Fred Fiedler introduced his contingency theory, which is the ability of leaders to adapt their leadership approach to the

environment (1971). Most leaders have a dominant leadership style that is most comfortable for them. For example, most engineers spend years training in analytical problem solving and often develop an analytical approach to leadership.

A leadership style reflects personal characteristics and life experiences. Although a project manager's leadership style may be predominantly a pathfinder (using Leavitt's taxonomy), most project managers become problem solvers or implementers when they perceive the need for these leadership approaches. The leadership approach incorporates the dominant leadership style and Fiedler's contingency focus on adapting to the project environment.

No particular leadership approach is specifically appropriate for managing a project. Due to the unique circumstances inherent in each project, the leadership approach and the management skills required to be successful vary depending on the complexity profile of the project. However, the Project Management Institute published Shi and Chen's research that studied project management leadership traits and concluded that good communication skills and the ability to build harmonious relationships and motivate others are essential (2006). Beyond this broad set of leadership skills, the successful leadership approach will depend on the profile of the project. For example, a transactional project manager with a strong command-and-control leadership approach may be very successful on a small software development project or a construction project, where tasks are clear, roles are well understood, and the project environment is cohesive. This same project manager is less likely to be successful on a larger, more complex project with a diverse project team and complicated work processes.

Matching the appropriate leadership style and approach to the complexity profile of the project is a critical element of project success. Even experienced project managers are less likely to be successful if their leadership approach does not match the complexity profile of the project.

Each project phase may also require a different leadership approach. During the start-up phase of a project, when new team

members are first assigned to the project, the project may require a command-and-control leadership approach. Later, as the project moves into the conceptual phase, creativity becomes important, and the project management takes on a more transformational leadership approach. Most experienced project managers are able to adjust their leadership approach to the needs of the project phase. Occasionally, on very large and complex projects, some companies will bring in different project managers for various phases of a project. Changing project managers may bring the right level of experience and the appropriate leadership approach, but is also disruptive to a project. Senior management must balance the benefit of matching the right leadership approach with the cost of disrupting established relationships.

On a project to publish a new textbook at a major publisher, a project manager led a team that included members from partners that were included in a joint venture. The editorial manager was Greek, the business manager was German, and other members of the team were from various locations in the United States and Europe. In addition to the traditional potential for conflict that arises from team members from different cultures, the editorial manager and business manager were responsible for protecting the interest of their company in the joint venture.

The project manager held two alignment or team-building meetings. The first was a two-day meeting held at a local resort and included only the members of the project leadership team. An outside facilitator was hired to facilitate discussion, and the topic of cultural conflict and organizational goal conflict quickly emerged. The team discussed several methods for developing understanding and addressing conflicts that would increase the likelihood of finding mutual agreement.

The second team-building session was a one-day meeting that included the executive sponsors from the various partners in the joint venture. With the project team aligned, the project manager

was able to develop support for the publication project's strategy and commitment from the executives of the joint venture. In addition to building processes that would enable the team to address difficult cultural differences, the project manager focused on building trust with each of the team members. The project manager knew that building trust with the team was as critical to the success of the project as the technical project management skills and devoted significant management time to building and maintaining this trust.

Leadership Skills

The project manager must be perceived to be credible by the project team and key stakeholders. A successful project manager can solve problems and has a high degree of tolerance for ambiguity. On projects, the environment changes frequently, and the project manager must apply the appropriate leadership approach for each situation.

The successful project manager must have good communication skills. All project problems are connected to skills needed by the project manager:

- Breakdown in communication represents the lack of communication skills
- Uncommitted team members represents the lack of team-building skills
- Role confusion represents the lack of organizational skill

Project managers need a large numbers of skills. These skills include administrative skills, organizational skills, and technical skills associated with the technology of the project. The types of skills and the depth of the skills needed are closely connected to the complexity profile of the project. Typically on smaller, less complex

projects, project managers need a greater degree of technical skill. On larger, more complex projects, project managers need more organizational skills to deal with the complexity. On smaller projects, the project manager is intimately involved in developing the project schedule, cost estimates, and quality standards. On larger projects, functional managers are typically responsible for managing these aspects of the project, and the project manager provides the organizational framework for the work to be successful.

Listening

One of the most important communication skills of the project manager is the ability to actively listen. Active listening is placing oneself in the speaker's position as much as possible, understanding the communication from the point of view of the speaker, listening to the body language and other environmental cues, and striving not just to hear, but to understand. Active listening takes focus and practice to become effective. It enables a project manager to go beyond the basic information that is being shared and to develop a more complete understanding of the information.

A client just returned from a trip to Australia where he reviewed the progress of the project with his company's board of directors. The project manager listened and took notes on the five concerns expressed by the board of directors to the client.

The project manager observed that the client's body language showed more tension than usual. This was a cue to listen very carefully. The project manager nodded occasionally and clearly demonstrated he was listening through his posture, small agreeable sounds, and body language. The project manager then began to provide feedback on

what was said using phrases like “What I hear you say is...” or “It sounds like....” The project manager was clarifying the message that was communicated by the client.

The project manager then asked more probing questions and reflected on what was said. “It sounds as if it was a very tough board meeting.” “Is there something going on beyond the events of the project?” From these observations and questions, the project manager discovered that the board of directors meeting did not go well. The company had experienced losses on other projects, and budget cuts meant fewer resources for the project and an expectation that the project would finish earlier than planned. The project manager also discovered that the client’s future with the company would depend on the success of the project. The project manager asked, “Do you think we will need to do things differently?” They began to develop a plan to address the board of directors’ concerns.

Through active listening, the project manager was able to develop an understanding of the issues that emerged from the board meeting and participate in developing solutions. Active listening and the trusting environment established by the project manager enabled the client to safely share information he had not planned on sharing and to participate in creating a workable plan that resulted in a successful project.

In the example above, the project manager used the following techniques:

- Listening intently to the words of the client and observing the client’s body language
- Nodding and expressing interest in the client without forming rebuttals
- Providing feedback and asking for clarity while repeating a summary of the information back to the client
- Expressing understanding and empathy for the client

Active listening was important in establishing a common

understanding from which an effective project plan could be developed.

Negotiation

When multiple people are involved in an endeavor, differences in opinions and desired outcomes naturally occur. Negotiation is a process for developing a mutually acceptable outcome when the desired outcome for each party conflicts. A project manager will often negotiate with a client, team members, vendors, and other project stakeholders. Negotiation is an important skill in developing support for the project and preventing frustration among all parties involved, which could delay or cause project failure.

Negotiations involve four principles:

1. Separate people from the problem. Framing the discussions in terms of desired outcomes enables the negotiations to focus on finding new outcomes.
2. Focus on common interests. By avoiding the focus on differences, both parties are more open to finding solutions that are acceptable.
3. Generate options that advance shared interests. Once the common interests are understood, solutions that do not match with either party's interests can be discarded, and solutions that may serve both parties' interests can be more deeply explored.
4. Develop results based on standard criteria. The standard criterion is the success of the project. This implies that the parties develop a common definition of project success.

For the project manager to successfully negotiate issues on the project, he or she should first seek to understand the position of the other party. If negotiating with a client, what is the concern

or desired outcome of the client? What are the business drivers and personal drivers that are important to the client? Without this understanding, it is difficult to find a solution that will satisfy the client. The project manager should also seek to understand what outcomes are desirable to the project. Typically, more than one outcome is acceptable. Without knowing what outcomes are acceptable, it is difficult to find a solution that will produce that outcome.

One of the most common issues in formal negotiations is finding a mutually acceptable price for a service or product. Understanding the market value for a product or service will provide a range for developing a negotiating strategy. The price paid on the last project or similar projects provides information on the market value. Seeking expert opinions from sources who would know the market is another source of information. Based on this information, the project manager can then develop an expected range within the current market from the lowest price to the highest price.

Additional factors will also affect the negotiated price. The project manager may be willing to pay a higher price to assure an expedited delivery or a lower price if delivery can be made at the convenience of the supplier or if payment is made before the product is delivered. Developing as many options as possible provides a broader range of choices and increases the possibility of developing a mutually beneficial outcome.

The goal of negotiations is not to achieve the lowest costs, although that is a major consideration, but to achieve the greatest value for the project. If the supplier believes that the negotiations process is fair and the price is fair, the project is more likely to receive higher value from the supplier. The relationship with the supplier can be greatly influenced by the negotiation process and a project manager who attempts to drive the price unreasonably low or below the market value will create an element of distrust in the relationship that may have negative consequences for the project. A positive negotiation experience may create a positive relationship that may be beneficial, especially if the project begins to fall behind

schedule and the supplier is in a position to help keep the project on schedule.

Conflict Resolution

Conflict on a project is to be expected because of the level of stress, lack of information during early phases of the project, personal differences, role conflicts, and limited resources. Although good planning, communication, and team building can reduce the amount of conflict, conflict will still emerge. How the project manager deals with the conflict results in the conflict being destructive or an opportunity to build energy, creativity, and innovation.

David Whetton and Kim Cameron developed a response-to-conflict model that reflected the importance of the issue balanced against the importance of the relationship (2005). The model presented five responses to conflict:

- Avoiding
- Forcing
- Collaborating
- Compromising
- Accommodating

Each of these approaches can be effective and useful depending on the situation. Project managers will use each of these conflict resolution approaches depending on the project manager's personal approach and an assessment of the situation.

Most project managers have a default approach that has emerged over time and is comfortable. For example, some project managers find the use of the project manager's power the easiest and quickest way to resolve problems. "Do it because I said to" is the mantra for project managers who use forcing as the default approach to

resolve conflict. Some project managers find accommodating with the client the most effective approach to dealing with client conflict.

The effectiveness of a conflict resolution approach will depend on the situation. The forcing approach often succeeds in a situation where a quick resolution is needed, and the investment in the decision by the parties involved is low.

Two senior managers both want the office with the window. The project manager intercedes with little discussion and assigns the window office to the manager with the most seniority. The situation was a low-level conflict with no long-range consequences for the project and a solution all parties could accept.

Sometimes office size and location is culturally important, and this situation would take more investment to resolve.

In another example, the client rejected a request for a change order because she thought the change should have been foreseen by the project team and incorporated into the original scope of work. The project controls manager believed the client was using her power to avoid an expensive change order and suggested the project team refuse to do the work without a change order from the client.

This is a more complex situation, with personal commitments to each side of the conflict and consequences for the project. The project manager needs a conflict resolution approach that increases the likelihood of a mutually acceptable solution for the project. One conflict resolution approach involves evaluating the situation, developing a common understanding of the problem, developing alternative solutions, and mutually selecting a solution. Evaluating the situation typically includes gathering data. In our example of a change order conflict, gathering data would include a review of the original scope of work and possibly of people's understandings, which might go beyond the written scope. The second step in developing a

resolution to the conflict is to restate, paraphrase, and reframe the problem behind the conflict to develop a common understanding of the problem. In our example, the common understanding may explore the change management process and determine that the current change management process may not achieve the client's goal of minimizing project changes. This phase is often the most difficult and may take an investment of time and energy to develop a common understanding of the problem.

After the problem has been restated and agreed on, alternative approaches are developed. This is a creative process that often means developing a new approach or changing the project plan. The result is a resolution to the conflict that is mutually agreeable to all team members. If all team members believe every effort was made to find a solution that achieved the project charter and met as many of the team member's goals as possible, there will be a greater commitment to the agreed-on solution.

Delegation

Delegating responsibility and work to others is a critical project management skill. The responsibility for executing the project belongs to the project manager. Often other team members on the project will have a functional responsibility on the project and report to a functional manager in the parent organization. For example, the procurement leader for a major project may also report to the organization's vice-president for procurement. Although the procurement plan for the project must meet the organization's procurement policies, the procurement leader on the project will take day-to-day direction from the project manager. The amount of direction given to the procurement leader, or others on the project, is the decision of the project manager.

If the project manager delegates too little authority to others

to make decisions and take action, the lack of a timely decision or lack of action will cause delays on the project. Delegating too much authority to others who do not have the knowledge, skills, or information will typically cause problems that result in delay or increased cost to the project. Finding the right balance of delegation is a critical project management skill.

When developing the project team, the project manager selects team members with the knowledge, skills, and abilities to accomplish the work required for the project to be successful. Typically, the more knowledge, skills, abilities, and experience a project team member brings to the project, the more that team member will be paid. To keep the project personnel costs lower, the project manager will develop a project team with the level of experience and the knowledge, skills, and abilities to accomplish the work.

On smaller, less complex projects, the project manager can provide daily guidance to project team members and be consulted on all major decisions. On larger, more complex projects, there are too many important decisions made every day for the project manager to be involved at the same level, and project team leaders are delegated decision-making authority. Larger projects, with a more complex profile will typically pay more because of the need for the knowledge and experience. On larger, more complex projects, the project manager will develop a more experienced and knowledgeable team that will enable the project manager to delegate more responsibility to these team members.

An instructional design project in Peru was falling behind schedule, and a new manager was assigned to the design team, which was the one most behind schedule. He was an experienced project manager from the United States with a reputation for meeting aggressive schedules. However, he failed to see that as a culture, Peruvians do a great deal more socializing than teams in the U.S. The project

manager's communication with the team was then limited because he did not go out and spend time with them, and his team did not develop trust or respect for him. Due to these cultural differences, the project fell further behind, and another personnel change had to be made at a significant cost of time, trust, and money.

The project manager must have the skills to evaluate the knowledge, skills, and abilities of project team members and evaluate the complexity and difficulty of the project assignment. Often project managers want project team members they have worked with in the past. Because the project manager knows the skill level of the team member, project assignments can be made quickly with less supervision than with a new team member with whom the project manager has little or no experience.

Delegation is the art of creating a project organizational structure with the work organized into units that can be managed. Delegation is the process of understanding the knowledge, skills, and abilities needed to manage that work and then matching the team members with the right skills to do that work. Good project managers are good delegators.

Adjusting Leadership Styles

Remember that personality traits reflect an individual's preferences, not their limitations. It is important to understand that individuals can still function in situations for which they are not best suited. It is also important to realize that you can change your leadership style according to the needs of your team and the particular project's attributes and scope.

For example, a project leader who is more thinking (T) than feeling

(F) (according to the Myers-Briggs model) would need to work harder to be considerate of how team members who are more feeling (F) might react if they were singled out in a meeting because they were behind schedule. If individuals know their own preferences and which personality types are most successful in each type of project or project phase, they can set goals for improvement in their ability to perform in those areas that are not their natural preference.

Another individual goal is to examine which conflict resolution styles you are least comfortable and work to improve those styles so that they can be used when they are more appropriate than your default style.

Working with Groups and Teams

A team is a collaboration of people with different personalities that is led by a person with a favoured leadership style. Managing the interactions of these personalities and styles as a group is an important aspect of project management.

Trust

Trust is the foundation for all relationships within a project. Without a minimum level of trust, communication breaks down, and eventually the project suffers in the form of costs increasing and schedules slipping. Often, when reviewing a project where the performance problems have captured the attention of upper management, the evidence of problems is the increase in project costs and the slippage in the project schedule. The underlying cause is usually blamed on communication breakdown. With deeper

investigation, the communication breakdown is associated with a breakdown in trust.

On projects, trust is the filter through which we screen information that is shared and the filter we use to screen information we receive. The more trust that exists, the easier it is for information to flow through the filters. As trust diminishes, the filters become stronger and information has a harder time getting through, and projects that are highly dependent on an information-rich environment will suffer from information deprivation.

Contracts and Trust Relationships

A project typically begins with a charter or contract. A contract is *a legal agreement that includes penalties for any behaviour or results not achieved. Contracts are based on an adversarial paradigm and do not lend themselves to creating an environment of trust. Contracts and charters are necessary to clearly establish the scope of the project, among other things, but they are not conducive to establishing a trusting project culture.*

A relationship of mutual trust is less formal but vitally important. When a person or team enters into a relationship of mutual trust, each person's reputation and self-respect are the drivers in meeting the intent of the relationship. A relationship of mutual trust within the context of a project is a commitment to an open and honest relationship. There is nothing that enforces the commitments in the relationship except the integrity of the people involved. Smaller, less complex projects can operate within the boundaries of a legal contract, but larger, more complex projects must develop a relationship of mutual trust to be successful.

Types of Trust

Svenn Lindskold describes four kinds of trust (1978):

- *Objective credibility.* A personal characteristic that reflects the truthfulness of an individual that can be checked against observable facts.
- *Attribution of benevolence.* A form of trust that is built on the examination of the person's motives and the conclusion that they are not hostile.
- *Non-manipulative trust.* A form of trust that correlates to a person's self-interest and the predictability of a person's behaviour in acting consistent in that self-interest.
- *High cost of lying.* The type of trust that emerges when persons in authority raise the cost of lying so high that people will not lie because the penalty will be too high.

Creating Trust

Building trust on a project begins with the project manager. On complex projects, the assignment of a project manager with a high trust reputation can help establish the trust level needed. The project manager can also establish the cost of lying in a way that communicates an expectation and a value for trust on the project. Project managers can also assure that the official goals (stated goals) and operational goals (goals that are reinforced) are aligned. The project manager can create an atmosphere where informal communication is expected and reinforced.

The informal communication is important to establishing personal trust among team members and with the client. Allotting time during project start-up meetings to allow team members to develop a personal relationship is important to establishing the team trust. The informal discussion allows for a deeper

understanding of the whole person and creates an atmosphere where trust can emerge.

On a project in Charleston, South Carolina, the client was asking for more and more backup to information from the project. The project manager visited the client to better understand the reporting requirements and discovered the client did not trust the reports coming from the project and wanted validating material for each report. After some candid discussion, the project manager discovered that one of the project team members had provided information to the client that was inaccurate. The team member had made a mistake but had not corrected it with the client, hoping that the information would get lost in the stream of information from the project. The project manager removed the team member from the project for two main reasons. The project manager established that the cost of lying was high. The removal communicated to the project team an expectation of honesty. The project manager also reinforced a covenant with the client that reinforced the trust in the information the project provided. The requests for additional information declined, and the trust relationship between project personnel and the client remained high.

Small events that reduce trust often take place on a project without anyone remembering what happened to create the environment of distrust. Taking fast and decisive action to establish a high cost of lying, communicating the expectation of honesty, and creating an atmosphere of trust are critical steps a project manager can take to ensure the success of complex projects.

Project managers can also establish expectations of team members to respect individual differences and skills, look and react to the positives, recognize each other's accomplishments, and value people's self-esteem to increase a sense of the benevolent intent.

Managing Team Meetings

Team meetings are conducted differently depending on the purpose of the meeting, the leadership style that is appropriate for the meeting, and the personality types of the members of the team.

Action Item Meetings

Action item meetings are short meetings to develop a common understanding of what the short-term priorities are for the project, individual roles, and expectations for specific activities. This type of meeting is for sharing, not problem solving. Any problems that emerge from the discussion are assigned to a person, and another meeting is established to address the issue. Action item meetings focus on short-term activities, usually less than a week in duration.

The action item meeting is fact based and information oriented. It is a left-brain-type focus. The action item meeting has very little dialogue except to ask clarification questions. If discussion is needed or disagreement is not easily resolved, another problem-solving meeting is established to deal with that issue. On smaller topics, that meeting might take place immediately after the action item meeting and only include those people with an interest in the outcome of the discussion.

The project manager keeps the successful action item meeting short in duration and focused on only those items of information needed for the short-term project plan. The project manager will restate the common understandings of what activities are priorities and who will be responsible for the activities. Often these meetings can include a review of safety procedures or security procedures when these issues are important to the project. The leadership approach to action item meetings focuses on data, actions, and commitments. Although the project manager may observe stresses

between project team members or other issues, they are not addressed in this meeting. These are fact-based meetings. If issues begin to arise between people, the project manager will develop other opportunities to address these issues in another forum. Using the Myers-Briggs descriptions, team members who favour thinking more than feeling and judging more than perceiving are more comfortable with this type of meeting.

Management Meetings

Management meetings are longer in duration and are focused on planning. They are oriented toward developing plans, tracking progress of existing plans, and making adjustments to plans in response to new information.

These meetings include focused discussion on generating a common understanding of the progress of the existing plan. This discussion is based on quantitative information provided on the progress of the schedule and other data, but the discussion is qualitative in evaluating the data to develop a more complete understanding of the data. The experience and opinions of the project leaders are solicited, and disagreement about meaning of the data is even encouraged to develop a deeper understanding of the data. Through this discussion, a common understanding of the status of the project should emerge, and the project manager invites discussion, invites people to offer their thoughts, and assures that disagreements are positive discussions about interpretation of the information and that disagreements do not become personal.

Management meetings also focus on developing mid-term goals. For larger, more complex projects, the goals may be monthly or even quarterly. For smaller or less complex projects, weekly goals will provide the focus. The project manager focuses the discussion on the broad priorities for the next period and includes all the functional leaders in the discussion. The goals that emerge from

the discussion should represent a common understanding of the priorities of the project for the next term.

For example, during the early phases of a project, the team is focused on developing a conceptual understanding of the project. A major milestone on complex projects is typically the completion of the conceptual plan. The project manager would lead a discussion on what needs to be accomplished to meet the project milestone and asks what potential barriers exist and what key resources are needed. From the discussion, the project team develops a few key goals that integrate the various functions of the project team and focus the team on priorities.

The following are some examples of goals during the conceptual phase:

- Developing a list of the procurement long-lead items and defining critical dates
- Developing a human resources plan that identifies critical positions
- Developing and building agreement with the client on the project scope of work

Each of these goals is measurable and has a time frame specified. They can be developed as positive motivators and will take the project leaders and most of the project team to accomplish. They develop a general understanding of the priorities and are easy to remember.

Management meetings are a combination of left-brain thinking, which is fact based, and right-brain thinking, which is creative and innovative. Using the Myers-Briggs terminology, team members who prefer feeling over thinking and perceiving over judging can contribute ideas and perspectives on the project that the more fact-oriented members might miss.

The project manager allows and encourages conversation in developing and evaluating the goals but focuses the discussion on the goals and obstacles. Management meetings take on a different

focus during the month. Meetings at the beginning of the month spend time addressing the progress and potential barriers to the goals developed the previous month. During the middle of the month, the project manager leads the team to develop next month's goals as the team also works on the current month's goals. Toward the end of the month as the goals for the month are accomplished, the meeting focuses more on the next month, enabling the team to remain goal focused during the life of the project.

Management meetings are also an opportunity to discover obstacles to goal achievement. The project team reallocates resources or develops alternative methods for accomplishing the goals. As the project team discusses the progress of project goals, the project manager explores possible obstacles and encourages exposing potential problems in achieving goals. The project manager focuses the team on finding solutions and avoids searching for blame.

The project manager uses a facilitative leadership approach, encouraging the management team to contribute their ideas, and builds consensus on what goals will bring the appropriate focus. The project manager keeps the focus on developing the goals, tracking progress, identifying barriers, and making adjustments to accomplish the management goals. Although there are typically meetings for scheduling and procurement and other meetings where goals are established and problems solved, the management meeting and the goal development process create alignment among the project leadership on the items critical to the project's success.

Leadership Meetings

Leadership meetings are held less frequently and are longer in length. These meetings are used by the project manager to reflect on the project, explore the larger issues of the project, and back away from the day-to-day problem solving. The project manager

will create a safe environment for sharing thoughts and evaluations of issues that are less data oriented. This is a right-brained, creative meeting that focuses on the people issues of the project: the relationship with the client, vendors, and project team. Team members who favour feeling, perceiving, and intuition often contribute valuable insights in this type of meeting. The team might also share perceptions by upper management and perceptions of the community in which the project is being executed. Where the time frame for action item meetings is in weeks and management meetings is in months, the time frame for leadership meetings is longer and takes in the entire length and impact of the project.

The project manager's meeting management skill includes creating the right meeting atmosphere for the team discussion that is needed. For discussions based on data and facts, the project manager creates the action item type meeting. The conversation is focused on sharing information and clarification. The conversation for leadership meetings is the opposite. Discussion is more open ended and focused on creativity and innovation. Because each type of meeting requires a different meeting atmosphere, mixing the purposes of a meeting will make it difficult for the project manager to develop and maintain the appropriate kind of conversation.

Skilled project managers know what type of meeting is needed and how to develop an atmosphere to support the meeting type. Meetings of the action item type are focused on information sharing with little discussion. They require efficient communication of plans, progress, and other information team members need to plan and execute daily work. Management type meetings are focused on developing and progressing goals. Leadership meetings are more reflective and focused on the project mission and culture.

These three types of meetings do not cover all the types of project meetings. Specific problem-solving, vendor evaluation, and scheduling meetings are examples of typical project meetings. Understanding what kinds of meetings are needed on the project and creating the right focus for each meeting type is a critical project management skill.

Types of Teams

Teams can outperform individual team members in several situations. The effort and time invested in developing a team and the work of the team are large investments of project resources, and the payback is critical to project success. Determining when a team is needed and then chartering and supporting the development and work of the team are other critical project management abilities.

Teams are effective in several project situations:

- When no one person has the knowledge, skills, and abilities to either understand or solve the problem
- When a commitment to the solution is needed by large portions of the project team
- When the problem and solution cross project functions
- When innovation is required

Individuals can outperform teams on some occasions. An individual tackling a problem consumes fewer resources than a team and can operate more efficiently—as long as the solution meets the project's needs. A person is most appropriate in the following situations:

- When speed is important
- When one person has the knowledge, skills, and resources to solve the problem
- When the activities involved in solving the problem are very detailed
- When the actual document needs to be written (Teams can provide input, but writing is a solitary task.)

In addition to knowing when a team is appropriate, the project manager must also understand what type of team will function best.

Functional Teams

A functional team refers to the team approach related to the project functions. The engineering team, the procurement team, and the project controls team are examples of functional teams within the project. On a project with a low complexity profile that includes low technological challenges, good team member experience, and a clear scope of work, the project manager can utilize well-defined functional teams with clear expectations, direction, and strong vertical communication.

Cross-Functional Teams

Cross-functional teams address issues and work processes that include two or more of the functional teams. The team members are selected to bring their functional expertise to addressing project opportunities.

A cross-functional project team in Tennessee was assigned to develop a project approach to drafting, shooting, and editing educational videos without storing the videos on the school server. Although the complexity of this goal is primarily related to creating the videos and procuring editing equipment, the planning involved coordination of the script drafting, procurement of equipment and talent, and establishment of project controls. Team members from each of these functions developed and tracked a plan to meet the project goal. Because they communicated so frequently and clearly, the cross-functional team was successful in designing a process and executing the plan in a way that saved three weeks on the video schedule and several thousand dollars in cost by hosting off-site.

Problem-Solving Teams

Problem-solving teams are assigned to address specific issues that arise during the life of the project. The project leadership includes members that have the expertise to address the problem. The team is chartered to address that problem and then disband.

Qualitative Assessment of Project Performance

Project managers should provide an opportunity to ask such questions as “What is your gut feeling about how the project going?” and “How do you think our client perceives the project?” This creates the opportunity for reflection and dialogue around larger issues on the project. The project manager creates an atmosphere for the team to go beyond the data and search for meaning. This type of discussion and reflection is very difficult in the stress of day-to-day problem solving.

The project manager has several tools for developing good quantitative information—based on numbers and measurements—such as the project schedules, budgets and budget reports, risk analysis, and goal tracking. This quantitative information is essential to understanding the current status and trends on the project. Just as important is the development of qualitative information—comparisons of qualities—such as judgments made by expert team members that go beyond the quantitative data provided in a report. Some would label this the “gut feeling” or intuition of experienced project managers.

The Humm Factor is a survey tool developed by Russ Darnall to capture the thoughts of project participants. It derived its name from a project manager who always claimed he could tell you more

by listening to the hum of the project than reading all the project reports. “Do you feel the project is doing the things it needs to do to stay on schedule?” and “Is the project team focused on project goals?” are the types of questions that can be included in the Humm Factor. It is distributed on a weekly or less frequent basis depending on the complexity profile of the project. A project with a high level of complexity due to team-based and cultural issues will be surveyed more frequently.

The qualitative responses are converted to a quantitative value as a score from 1 to 10. Responses are tracked by individuals and the total project, resulting in qualitative comparisons over time. The project team reviews the ratings regularly, looking for trends that indicate an issue may be emerging on the project that might need exploring.

On a project in South Carolina, the project surveyed the project leadership with a Humm Survey each week. The Humm Factor indicated an increasing worry about the schedule beginning to slip when the schedule reports indicated that everything was according to plan. When the project manager began trying to understand why the Humm Factor was showing concerns about the schedule, he discovered an apprehension about the performance of a critical project supplier. When he asked team members, they responded, “It was the way they answered the phone or the hesitation when providing information—something didn’t feel right.”

The procurement manager visited the supplier and discovered the company was experiencing financial problems and had serious cash flow problems. The project manager was able to develop a plan to help the supplier through the period, and the supplier eventually recovered. The project was able to meet performance goals. The Humm Factor survey provided a tool for members of the project team to express concerns that were based on very soft data, and the project team was able to discover a potential problem.

Another project team used the Humm Factor to survey the client

monthly. The completed surveys went to a person who was not on the project team to provide anonymity to the responses. The responses were discussed at the monthly project review meetings, and the project manager summarized the results and addressed all the concerns expressed in the report. “I don’t feel my concerns are being heard” was one response that began increasing during the project, and the project manager spent a significant portion of the next project review meeting attempting to understand what this meant. The team discovered that as the project progressed toward major milestones, the project team became more focused on solving daily problems, spent more time in meetings, and their workday was becoming longer. The result was fewer contacts with the clients, slower responses in returning phone calls, and much fewer coffee breaks where team members could casually discuss the project with the client.

The result of the conversation led to better understanding by both the project team and client team of the change in behaviour based on the current phase of the project and the commitment to developing more frequent informal discussion about the project.

Creating a Project Culture

Project managers have a unique opportunity during the start-up of a project. They create a project culture, something organizational managers seldom have a chance to do. In most organizations, the corporate or organizational culture has developed over the life of the organization, and people associated with the organization understand what is valued, what has status, and what behaviours are expected. Edgar Schein identified three distinct levels in organizational culture.

1. Artifacts and behaviours

2. Espoused values
3. Assumptions

Artifacts are the visible elements in a culture and they can be recognized by people not part of the culture. Espoused values are the organization's stated values and rules of behaviour. Shared basic assumptions are the deeply embedded, taken-for-granted behaviours that are usually unconscious, but constitute the essence of culture.

Characteristics of Project Culture

A project culture represents the shared norms, beliefs, values, and assumptions of the project team. Understanding the unique aspects of a project culture and developing an appropriate culture to match the complexity profile of the project are important project management abilities.

Culture is developed through the communication of:

- The priority
- The given status
- The alignment of official and operational rules

Official rules are the rules that are stated, and operational rules are the rules that are enforced. Project managers who align official and operational rules are more effective in developing a clear and strong project culture because the project rules are among the first aspects of the project culture to which team members are exposed when assigned to the project.

During an instructional design project that required individuals to

collaborate remotely, an official rule had been established that individuals would back up their work in a location other than the shared folders they were using every week. It did not take long, however, for everyone involved to see that one member was actively backing up all work. Believing that was sufficient, the operational rule became simply leaving the backing up to a single individual. They assumed that official rules could be ignored if they were difficult to obey.

When this individual fell ill, however, no one picked up the slack and followed the official rule. When some files were corrupted, the team found that their most recent backups were weeks old, resulting in redoing a lot of work. The difference between the official rules and the operational rules of the project created a culture that made communication of the priorities more difficult.

In addition to official and operational rules, the project leadership communicates what is important by the use of symbols, storytelling, rituals, rewards or punishments, and taboos.

A project manager met with his team prior to the beginning of an instructional design project. The team was excited about the prestigious project and the potential for career advancement involved. With this increased competitive aspect came the danger of selfishness and backstabbing. The project leadership team told stories of previous projects where people were fired for breaking down the team efforts and often shared inspirational examples of how teamwork created unprecedented successes—an example of storytelling. Every project meeting started with team-building exercises—a ritual—and any display of hostility or separatism was forbidden—taboo—and was quickly and strongly cut off by the project leadership if it occurred.

Culture guides behaviour and communicates what is important and is useful for establishing priorities. On projects that have a strong culture of trust, team members feel free to challenge anyone who breaks a confidence, even managers. The culture of integrity is stronger than the cultural aspects of the power of management.

Innovation on Projects

The requirement of innovation on projects is influenced by the nature of the project. Some projects are chartered to develop a solution to a problem, and innovation is a central ingredient of project success. The lack of availability of education to the world at large prompted the open education movement, a highly innovative endeavor, which resulted in the textbook you are now reading. Innovation is also important to developing methods of lowering costs or shortening the schedule. Traditional project management thinking provides a trade-off between cost, quality, and schedule. A project sponsor can typically shorten the project schedule with an investment of more money or a lowering of quality. Finding innovative solutions can sometimes lower costs while also saving time and maintaining the quality.

Innovation is a creative process that requires both fun and focus. Stress is a biological reaction to perceived threats. Stress, at appropriate levels, can make the work environment interesting and even challenging. Many people working on projects enjoy a high-stress, exciting environment. When the stress level is too high, the biological reaction increases blood flow to the emotional parts of the brain and decreases the blood flow to the creative parts of the brain, making creative problem solving more difficult. Fun reduces the amount of stress on the project. Project managers recognize the benefits of balancing the stress level on the project with the need to create an atmosphere that enables creative thought.

When a project manager visited the team tasked with designing the website for a project, she found that most of the members were feeling a great deal of stress. As she probed to find the reason behind the stress, she found that in addition to designing, the team was increasingly facing the need to build the website as well. As few of them had the necessary skills, they were wasting time that could be spent designing trying to learn building skills. Once the project manager was able to identify the stress as well as its cause, she was able to provide the team with the support it needed to be successful.

Exploring opportunities to create savings takes an investment of time and energy, and on a time-sensitive project, the project manager must create the motivation and the opportunity for creative thinking.

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34. Project Schedule Planning

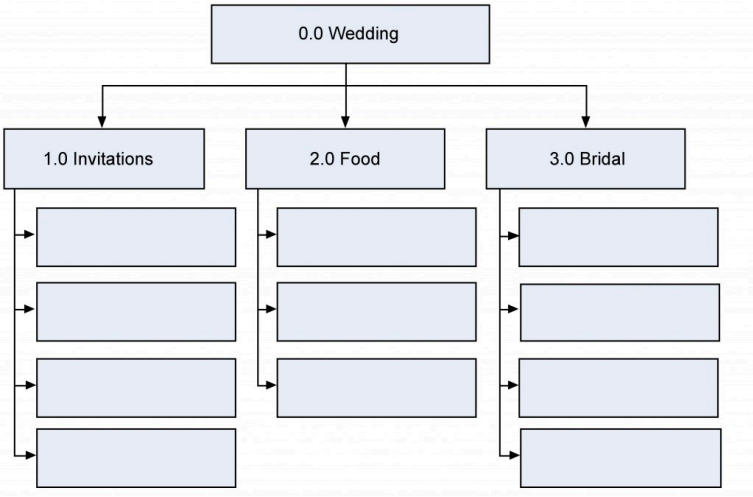


Figure 10.1 Work breakdown structure (WBS) based on the project phase.

Solution to Exercise:

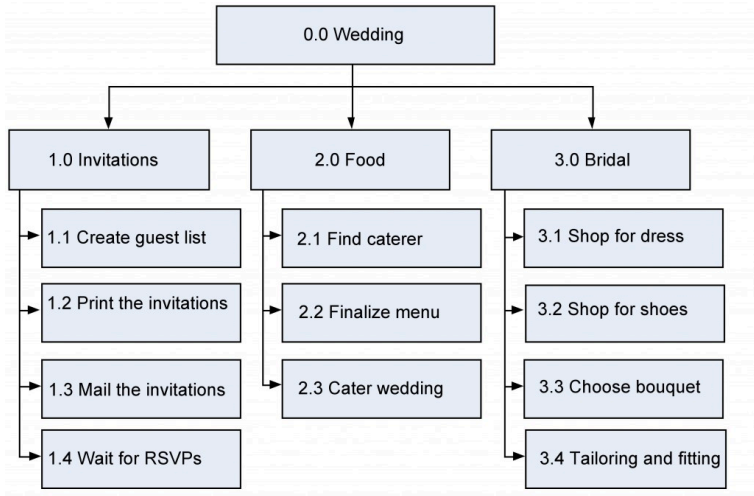


Figure 10.2 WBS Wedding Exercises Solution. [Image description]

Activity List

Now that the activity definitions for the work packages have been completed, the next task is to complete the activity list. The project activity list is a list of everything that needs to be done to complete your project, including all the activities that must be accomplished to deliver each work package. Next you want to define the activity attributes. Here's where the description of each activity is kept. It includes all the information you need to figure out plus the order of the work. Any predecessor activities, successor activities, or constraints should be listed in the attributes along with descriptions and any other information about resources or time that you need for planning. The three main kinds of predecessors are finish-to-start (FS), start-to-start (SS), and finish-to-finish (FF). The most common kind of predecessor is the finish-to-start. It means that one task needs to be completed before another one can start. When you

think of predecessors, this is what you usually think of; one thing needs to end before the next can begin. It's called finish-to-start because the first activity's finish leads into the second activity's start (Figure 10.3).



Figure 10.3: An example of a finish-to-start (FS) predecessor.

It is possible to have start-to-finish (SF) predecessors. This happens when activities require that another task be started before the successor task can finish. An example might be that the musicians cannot finish playing until the guests have started leaving the ceremony. In addition, there are some particular types of predecessors that must be considered.

External Predecessors

Sometimes your project will depend on things outside the work you're doing. For the wedding, we are depending on the wedding party before us to be out of the reception hall in time for us to decorate. The decoration of the reception hall then depends on that as an external predecessor.

Discretionary Predecessors

These are usually process- or procedure-driven or best-practice techniques based on past experience. In the wedding example,

Steve and Susan want the bridesmaids to arrive at the reception before the couple arrives. There's no necessity; it is just a matter of preference.

Mandatory Predecessors

You can't address an invitation that hasn't been printed yet. So printing invitations is a mandatory predecessor for addressing them. Mandatory predecessors are the kinds that have to exist just because of the nature of the work.

Leads and Lags

Sometimes you need to give some extra time between activities. Lag time is when you purposefully put a delay between the predecessor task and the successor. For example, when the bride and her father dance, the others wait awhile before they join them (Figure 10.6).

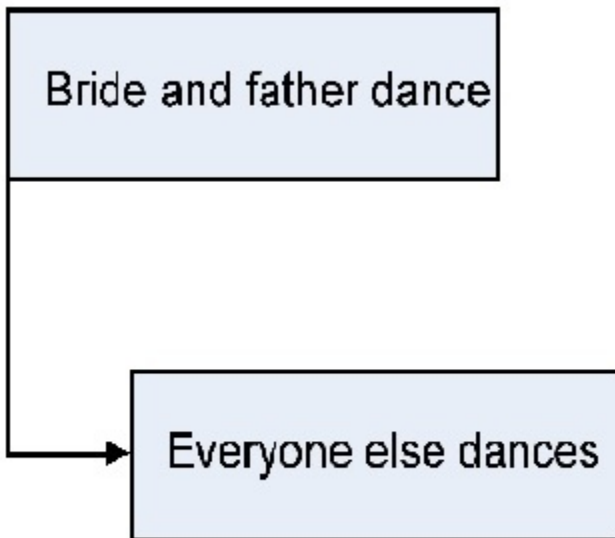


Figure 10.6 A lag means making sure that one task waits a while before it gets started.

All of the important checkpoints of your project are tracked as milestones. Some of them could be listed in your contract as requirements of successful completion; some could just be significant points in the project that you want to keep track of. The milestone list needs to let everyone know which milestones are required and which are not.

Some milestones for Susan and Steve's wedding might be:

- Invitations sent
- Menu finalized
- Location booked
- Bridesmaids' dresses fitted

As you figure out which activities will need to be done, you may

realize that the scope needs to change. When that happens, you need to create a change request and send it through the change control system.

Some things that could go wrong:

Wedding Planner: We just got the programs back from the printer and they're all wrong.

Steve: The quartet cancelled. They had another wedding that day.

Susan: Aunt Jane is supposed to sing at the service, but after what happened at her uncle's funeral, I think I want someone else to do it.

Steve: Should we really have a pan flute player? I'm beginning to think it might be overkill.

Susan: Apparently! Maybe we should hold off on printing the invitations until these things are worked out.

Wedding Planner: OK, let's think about exactly how we want to do this. I think we need to be sure about how we want the service to go before we do any more printing.

The Activity Sequencing Process

Now that we know what we have to do to make the wedding a success, we need to focus on the order of the work. Sally sat down with all of the activities she had defined for the wedding and decided to figure out exactly how they needed to happen. That's where she used the activity sequencing process.

The activity attribute list Sally created had most of the predecessors and successors necessary written in it. This is where

she thought of what comes first, second, third, etc. Sally's milestone list had major pieces of work written down, and there were a couple of changes to the scope she had discovered along the way that were approved and ready to go.

Example milestone list: Steve and Susan had asked that the invitations be printed at least three months in advance to be sure that everyone had time to RSVP. That's a milestone on Sally's list.

Example change request: When Sally realized that Steve and Susan were going to need another limo to take the bridesmaids to the reception hall, she put that change through change control, including running everything by Susan's mother, and it was approved.

Creating the Gantt Chart

A Gantt chart is a type of bar chart, developed by Henry Gantt, that illustrates a project schedule. Gantt charts are easy to read and are commonly used to display schedule activities. These charts display the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project. Some Gantt charts also show the dependency relationships (i.e., precedence network) between activities.

Gantt charts show all the key stages of a project and their duration as a bar chart, with the time scale across the top. The key stages are placed on the bar chart in sequence, starting in the top left corner and ending in the bottom right corner (Figure 10.8). A Gantt chart can be drawn quickly and easily and is often the first tool a project manager uses to provide a rough estimate of the time that it will take to complete the key tasks. Sometimes it is useful to start with the target deadline for completion of the whole project, because it is soon apparent if the time scale is too short or unnecessarily long. The detailed Gantt chart is usually constructed after the main objectives have been determined.

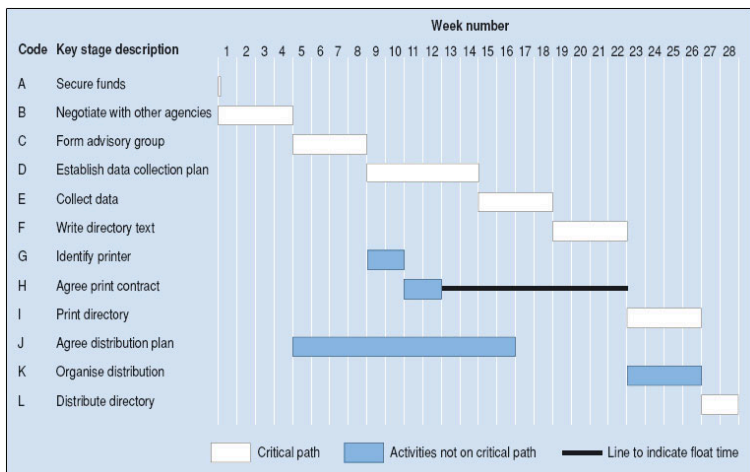


Figure 10.8 Gantt chart for directory production

In this example in Figure 10.8, key stage K (Organize distribution) starts at week 23 so that its end point coincides with key stage L (Distribute directory). However, K could begin as early as week 17, as soon as key stage J is completed. Key stage K is therefore said to have “slack.” Key stage H (Agree print contract) has been placed to end at week 12. However, it could end as late as week 22, because key stage I (Print directory) does not begin until week 23. Key stage H is therefore said to have “float.” Float time can be indicated on the chart by adding a line ahead of the bar to the latest possible end point. Slack and float show you where there is flexibility in the schedule, and this can be useful when you need to gain time once the project is up and running.

You can add other information to a Gantt chart, for example:

- Milestones could be indicated by using a symbol such as a diamond or triangle.
- Project meetings could be indicated by another symbol such as

a circle.

- Reviews of progress could be indicated by a square.

For a complex project, you may decide to produce a separate Gantt chart for each of the key stages. If you do this shortly before each key stage begins, you will be able to take any last-minute eventualities into account. These charts provide a useful tool for monitoring and control as the project progresses.

Gantt charts are relatively easy to draw by hand, but this doesn't offer the same level of flexibility during monitoring that you would get from a software package. Various programs are available to assist project managers in scheduling and control. Once the data have been entered, a program helps you to work on "what if" scenarios, showing what might happen if a key stage is delayed or speeded up. This is more difficult if you are working manually.

Creating the Network Diagram

Many project managers use network diagrams when scheduling a project. The network diagram is a way to visualize the interrelationships of project activities. Network diagrams provide a graphical view of the tasks and how they relate to one another. The tasks in the network are the work packages of the WBS. All of the WBS tasks must be included in the network because they have to be accounted for in the schedule. Leaving even one task out of the network could change the overall schedule duration, estimated costs, and resource allocation commitments.

The first step is to arrange the tasks from your WBS into a sequence. Some tasks can be accomplished at any time throughout the project where other tasks depend on input from another task or are constrained by time or resources.

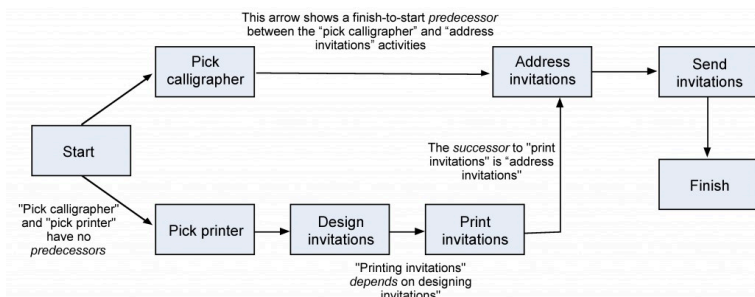


Figure 10.9: The relationship between the work breakdown structure (WBS) and the network diagram.

The WBS is not a schedule, but it is the basis for it. The network diagram is a schedule but is used primarily to identify key scheduling information that ultimately goes into user-friendly schedule formats, such as milestone and Gantt charts.

The network diagram provides important information to the project team. It provides information about how the tasks are related (Figure 10.9), where the risk points are in the schedule, how long it will take as currently planned to finish the project, and when each task needs to begin and end.

In our wedding planner example, Sally would look for relationships between tasks and determine what can be done in parallel and what activities need to wait for others to complete. As an example, Figure 10.10 shows how the activities involved in producing the invitations depend on one another. Showing the activities in rectangles and their relationships as arrows is called a precedence diagramming method (PDM). This kind of diagram is also called an activity-on-node (AON) diagram.

Another way to show how tasks relate is with the activity-on-arrow (AOA) diagram. Although AON is more commonly used and is supported by all project management programs, PERT is the best-known AOA-type diagram and is the historical basis of all network

diagramming. The main difference is the AOA diagram is traditionally drawn using circles as the nodes, with nodes representing the beginning and ending points of the arrows or tasks. In the AOA network, the arrows represent the activities or tasks (Figure 10.11).

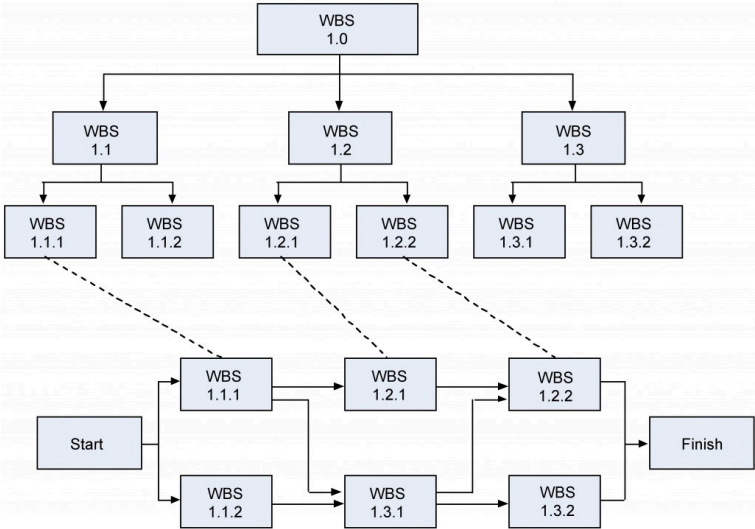


Figure 10.10: An example of an activity on node (AON) diagram.

All network diagrams have the advantages of showing task interdependencies, start and end times, and the critical path (the longest path through the network) but the AOA network diagram has some disadvantages that limit the use of the method.

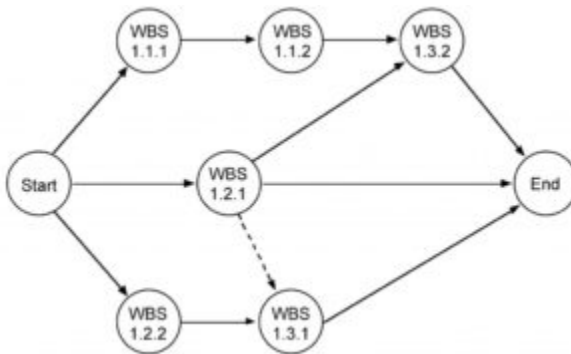


Figure 10.11: An example of an activity arrow (AOA) network diagram.

The three major disadvantages of the AOA method are:

- The AOA network can only show finish-to-start relationships. It is not possible to show lead and lag except by adding or subtracting time, which makes project tracking difficult.
- There are instances when dummy activities can occur in an AOA network. Dummy activities are activities that show the dependency of one task on other tasks but for other than technical reasons. For example, one task may depend on another because it would be more cost effective to use the same resources for the two; otherwise the two tasks could be accomplished in parallel. Dummy activities do not have durations associated with them. They simply show that a task has some kind of dependence on another task.
- AOA diagrams are not as widely used as AON diagrams simply because the latter are somewhat simpler to use, and all project management software programs can accommodate AON networks, whereas not all can accommodate AOA networks.

The Critical Path

The critical path describes the sequence of tasks that would enable the project to be completed in the shortest possible time. It is based on the idea that some tasks must be completed before others can begin. A critical path diagram is a useful tool for scheduling dependencies and controlling a project. In order to identify the critical path, the length of time that each task will take must be calculated.

Let's take a look at an example. The length of time in weeks for each key stage is estimated:

Table 10.1 Stages of the Critical Path

Key stage	Estimated time in weeks
A. Secure funds	0
B. Negotiate with other agencies	4
C. Form advisory group	4
D. Establish data collection plan	6
E. Collect data	4
F. Write directory text	4
G. Identify printer	2
H. Agree print contract	2
I. Print directory	4
J. Agree distribution plan	12
K. Organize distribution	4
L. Distribute directory	2

We have given the key stage “Secure funds” an estimated time of zero weeks because the project cannot start without the availability of some funding, although estimates would provide detail at a later stage. The stages can now be lined up to produce a network diagram that shows that there are three paths from start to finish and that the lines making up each path have a minimum duration (Figure 10.12).

If we now trace each of the possible paths to “Distribute directory” (the finishing point), taking dependencies into account, the route that has the longest duration is known as the critical path.

This is the minimum time in which it will be possible to complete the project.

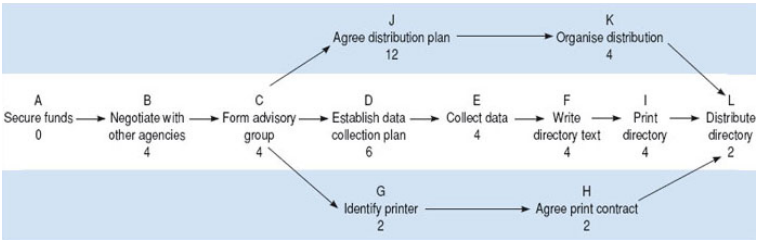


Figure 10.12: Critical Path Diagram

In this example, the critical path is A-B-C-D-E-F-I-L, and the earliest completion date for the project is the sum of the estimated times for all the stages on the critical path – 28 weeks – from the point of securing the funding. All the key stages on the critical path must be completed on time if the project is to be finished on schedule.

If the projected total time is much longer than the project sponsor’s expectations, you will need to renegotiate the time scale. Mapping the critical path helps to identify the activities that need to be monitored most closely.

Image Descriptions

Figure 10.2 image description:

0.0 Wedding

- 1.0 Invitations
 - 1.1 Create guest list
 - 1.2 Wait for RSVPs

- 1.3 Mail the invitations
- 1.4 Print the invitations
- 2.0 Food
 - 2.1 Find caterer
 - 2.2 Cater the wedding
 - 2.3 Finalize the menu
- 3.0 Bridal
 - 3.1 Shop for shoes
 - 3.2 Tailoring and fitting
 - 3.3 Shop for dress
 - 3.4 Choose the bouquet

[Return to Figure 10.2]

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35. Scheduling Terms

Making sure all stakeholders use the same terminology is crucial in all phases of project management, but it's especially important when you are trying to get a group of diverse people to agree to a schedule. After all, a schedule only works as a form of communication if it is written in a language everyone understands. And since contract terms are often tied to schedule, a lack of common agreement on the meaning of specific terms in a schedule can have far-ranging effects.

Terminology is so important that many state governments around the United States publish their own project management glossaries. As you embark on a new project, you'd be wise to find out if the organization you work for, or the vendors you will be working with, have compiled such a glossary. If such organizational resources exist, use them as a starting point for your own project glossary. Otherwise, you can always turn to the Project Management Institute's lexicon (available [here](#): "PMI Lexicon of Project Management Terms") or glossaries provided online by consulting firms or other project management resources such as the following:

Project Management Terms

- "Project Management Glossary of Terms"
- "Project Management Glossary"

The following definitions of scheduling-related terms are taken from a variety of sources.

- **milestone:** “A significant event in the project; usually completion of a major deliverable” (State of Michigan: Department of Technology, Management & Budget, 2013, p. 13). An important distinction is that a milestone is a zero-duration activity; e.g., “acceptance of software by client” is a milestone, preceded by many contributing activities.
- **activity:** “An element of work performed during the course of a project. An activity normally has an expected duration, an expected cost, and expected resource requirements” (Project-Management.com, 2016). Beware that some organizations subdivide activities into tasks while others use task and activity synonymously.
- **duration:** “The amount of time to complete a specific task given other commitments, work, vacations, etc. Usually expressed as workdays or workweeks” (State of Michigan: Department of Technology, Management & Budget, 2013, p. 9).
- **resource:** “Any personnel, material, or equipment required for the performance of an activity” (Project-Management.com, 2016).
- **cost:** “An expenditure, usually of money, for the purchase of goods or services” (Law, 2016).
- **slack:** “Calculated time span during which an event has to occur within the logical and imposed constraints of the network, without affecting the total project duration” (Project-Management.com, 2016). Or put more simply, slack, which is also called float, is the amount of time that a task can be delayed without causing a delay to subsequent tasks or the project’s overall completion date.

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36. Defining Activities

The activity definition process is a further breakdown of the work package elements of the work breakdown structures (WBS). It documents the specific activities needed to fulfill the deliverables detailed in the WBS. These activities are not the deliverables themselves but the individual units of work that must be completed to fulfill the deliverables. Activity definition uses everything we already know about the project to divide the work into activities that can be estimated. You might want to look at all the lessons learned from similar projects your company has done to get a good idea of what you need to do on the current one.

Expert judgment in the form of project team members with prior experience developing project scope statements and WBS can help you define activities. If you are asked to manage a project in a new domain, you might also use experts in that particular field to help define tasks so you can understand what activities are going to be involved. You may want to create an activity list and then have the expert review it and suggest changes. Alternatively, you could involve the expert from the very beginning and ask to have an activity definition conversation with him or her before even making your first draft of the list.

Sometimes you start a project without knowing a lot about the work that you'll be doing later. Rolling-wave planning lets you plan and schedule only the portion that you know enough about to plan well. When you don't know enough about a project, you can use placeholders for the unknown portions until you know more. These are extra items that are put at high levels in the WBS to allow you to plan for the unknown.

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37. Work Breakdown Structures

The WBS is a hierarchical outline of all the deliverables involved in completing a project. The WBS is part of a project scope statement. The creation of a WBS is one of the first steps in organizing and scheduling the work for a project.

The WBS is a breakdown of a project into sub-deliverables and eventually work-packages. Each level of the WBS, represents more detailed information about a project. Figure 5-1 shows how the project is broken down into major deliverables and then into sub-deliverables and work packages.

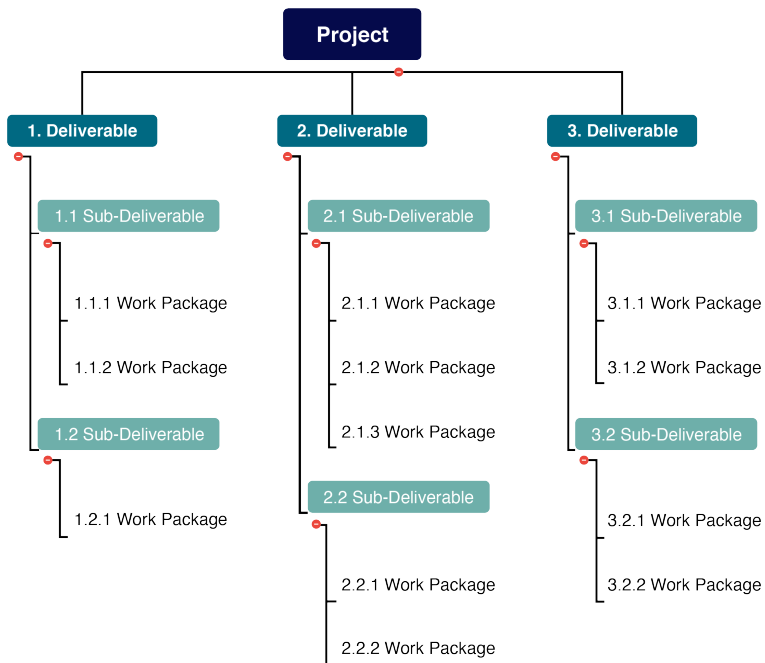


Figure 5-1: The WBS is an outline that shows how the deliverables, sub-deliverables and work packages relate to the final project.

Deliverables vs. Work Packages

Deliverables and sub-deliverables are things such as physical objects, software code, or events. In a WBS, deliverables and sub-deliverables are represented by nouns (see Figure 5-2). Work packages are assignable units of work that will be performed to create the related deliverable. A work package can be assigned to one particular project team member, one outside contractor, or another team. The work packages maybe further broken down into activities or tasks by the project team or the experts who will perform that work (see WBS dictionary later in this section).

Work packages are action oriented and will be represented by phrases containing verbs (see Figure 5-2). The cost of a deliverable is the sum of all of its related sub-deliverables.

In Figure 5-2, the cost of the Walls deliverable is the sum of the Stud Walls and the Electrical sub-deliverables ($\$17,740 + \$3,680 = \$21,420$). Likewise, the cost of a sub-deliverable is a summary of all of the work packages that must be completed to complete the sub-deliverable.

In Figure 5-2, the cost and duration of the Stud Walls deliverable is a sum of all the related work packages ($\$3,840 + \$1,340 + \$2,000 + \$10,560 = \$17,740$; $24\text{hrs} + 8\text{hrs} + 24\text{hrs} + 32\text{hrs} = 88\text{hrs}$).

Since the WBS provides a natural way to summarize (or “rollup”) the costs and labor involved for various sub deliverables, it also provides the project team with the information need to determine whether some deliverables would be better performed by an outside specialist who could deliver the item or service more cost-effectively.

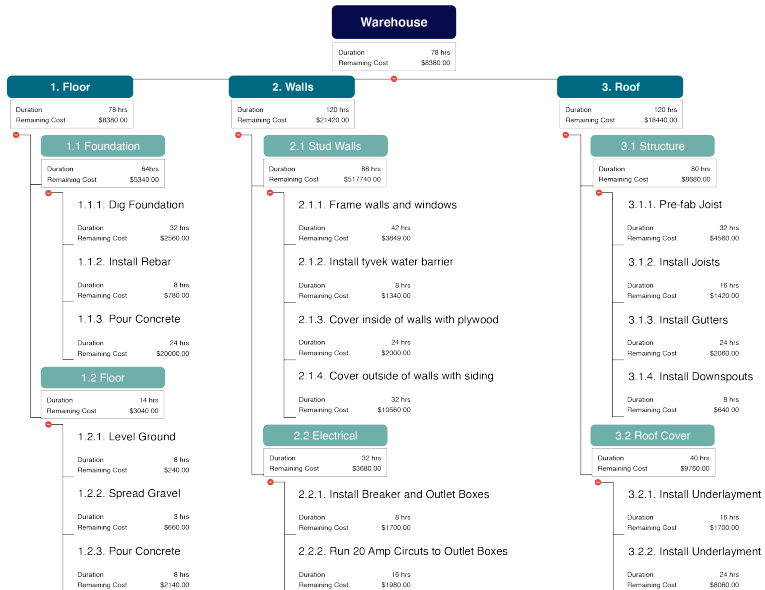


Figure 5-2: WBS for New Warehouse Project

In the example in Figure 5-2, if the project manager can find a roofing contractor that complete the roof in less than 15 days (120 hours) and for less than \$18,440, then it would be better to outsource that part of the project.

Note that work packages are independent of each other in a WBS, and do not summarize or include the work from other work packages. Work packages are the lowest level of the WBS.

WBS Numbering

Project managers use the WBS during project execution to track the status of deliverables and work packages. The items in a WBS are numbered so it is easy to understand the deliverable, or sub-

deliverable, to which any particular work package is related. Notice that in Figure 5-2 the Install Metal Roof item is numbered 3.2.2, so it is easy to see that this work package is related to the third major deliverable (Roof: 3.) and the second sub-deliverable (Roof Cover: 3.2.) and that it is also the second work package for creation of the roof covering (3.2.2).

This numbering system allows for easy reference and filtering. For example, an electrician working on the Warehouse project only needs to receive details and updates that are related to work packages that start with 2.2 (the Electrical sub-deliverable).

Decomposition

Decomposition is the process used to break the project scope of work into the deliverables, sub-deliverables, and work packages involved in completing the project.

The process of decomposition begins with identifying the highest-level deliverables. These deliverables are then broken into sub-deliverables. Many layers of sub-deliverables may be needed for a project. A general rule of thumb is that if the WBS has more than 5 layers of sub-deliverables, the project team should reassess and try to simplify the WBS structure (often by changing the way higher level deliverables are grouped and broken down).

Once the lowest level of deliverable has been reached, the next step is to break the sub-deliverables into work packages. The work packages describe the work that needs to be done to create the sub-deliverable. Remember that work packages typically contain verbs, and can be assigned to a person, team or contractor.

Once the project team has drafted the WBS, they should ask themselves: "If all the work packages were completed, and all the deliverables in this WBS were delivered, would the project be complete?" If the answer is no, then pieces of the WBS are still missing. If the answer is yes, then the project team can move on to

creating the WBS dictionary, getting bottom-up estimates on time and resource requirements, and planning how to schedule the work.

The WBS Dictionary

The WBS dictionary provides detailed documentation about each work package including;

- Who is responsible for completing the work package?
- What resources will be needed to complete the work package?
- What deliverable(s) is the work package contributing to?
- What deadlines or milestones are associated with this work package?
- What are the acceptance criteria for this work package?

When the WBS is created, not all of the information about the work packages is known (for example, the estimates for labor and material costs). Remember from Chapter One that the planning process continues throughout the execution of the project. As a result, the WBS dictionary is a “living document” that will be augmented, edited and updated as the project moves forward. Figure 5-3 is an example of a WBS Dictionary entry; note that several items will be added later in the planning process.

Hammer and Chisel Incorporation											
WBS Dictionary											
Item Number	Description	Constraints	Responsible	Milestone	Schedule	Resources	Cost	Quality	Acceptance Criteria	References	Guidelines
1.1											
1.1.1											
1.1.2											
1.1.3											

Figure 5-3: WBS Dictionary entry example.

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38. Managing the Schedule

The Gantt Chart

A Gantt chart is a type of bar chart, developed by Henry Gantt, that illustrates a project schedule. Gantt charts are easy to read and are commonly used to display schedule activities. These charts display the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project. Some Gantt charts also show the dependency relationships (i.e., precedence network) between activities.

Gantt charts show all the key stages of a project and their duration as a bar chart, with the time scale across the top. The key stages are placed on the bar chart in sequence, starting in the top left corner and ending in the bottom right corner (Figure 5-6). A Gantt chart can be drawn quickly and easily and is often the first tool a project manager uses to provide a rough estimate of the time that it will take to complete the key tasks. Sometimes it is useful to start with the target deadline for completion of the whole project, because it is soon apparent if the time scale is too short or unnecessarily long. Thus, the detailed Gantt chart is usually constructed after the main objectives have been determined.

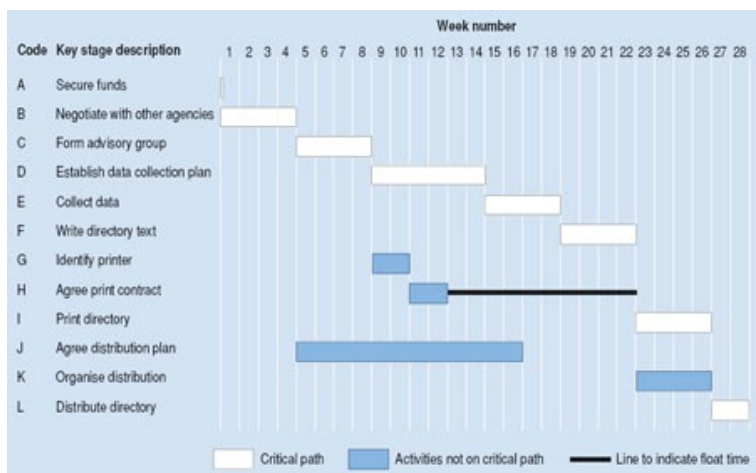


Figure 5-6: Gantt Chart

Network Diagram

Many project managers use network diagrams when scheduling a project. The network diagram is a way to visualize the interrelationships of project activities. Network diagrams provide a graphical view of the tasks and how they relate to one another. The tasks in the network are the work packages of the WBS. All of the WBS tasks must be included in the network because they have to be accounted for in the schedule. Leaving even one task out of the network could change the overall schedule duration, estimated costs, and resource allocation commitments.

The first step in creating a network diagram is to arrange the tasks from your WBS into a sequence. Some tasks can be accomplished at any time throughout the project where other tasks depend on input from another task or are constrained by time or resources.

The WBS is not a schedule, but it is the basis for one. The network diagram is a schedule but is used primarily to identify key

scheduling information that ultimately goes into user-friendly schedule formats, such as milestone and Gantt charts.

The network diagram provides important information to the project team. It provides information about how the tasks are related (Figure 5-7), where the risk points are in the schedule, how long it will take as currently planned to finish the project, and when each task needs to begin and end.

All network diagrams have the advantages of showing task interdependencies, start and end times, and the critical path (the longest path through the network) but the AOA network diagram has some disadvantages that limit the use of the method.

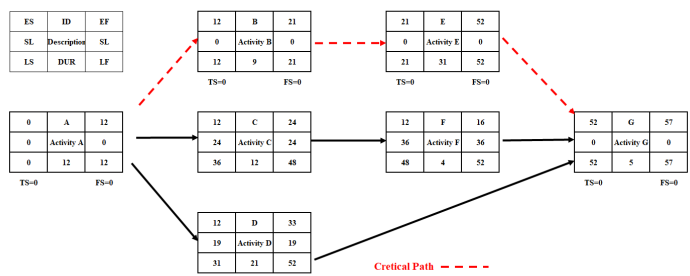


Figure 5-7: An example of an activity on node (AON) diagram

Forward and Backward Pass

Once a network diagram has been made and estimated activity durations have been assigned to each activity, the following attributes of each activity can be calculated:

- Early start time (ES)
- Late start time (LS)
- Early finish time (EF)
- Late finish time (LF)
- Slack or float (SL or FL)

These activity attributes are calculated using two processes: the forward pass and the backward pass. Watch the video: Project Management Networks Part 2: Forward and Backward Pass to learn how to make these calculations.



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=330#oembed-1>

The forward and backward pass are also used to fully calculate the critical path(s) in a project. Note: there can be instances where the start of an activity is on the critical path, but the finish is not on the critical path. This is unusual, but can happen depending on the types of relationships that are involved.

The Critical Path

The critical path (dashed red line as seen in figure 5-7) describes the sequence of tasks that would enable the project to be completed in the shortest possible time. It is based on the idea that some tasks must be completed before others can begin. A critical path diagram is a useful tool for scheduling dependencies and controlling a project. In order to identify the critical path, the length of time that each task will take must be calculated.

Milestones

One way to avoid getting lost in a sea of details is to focus on your project's milestones, which can serve as a high-level guide. You can use pull planning to identify your project's milestones, and then use the critical path to figure out how to hit those milestones. It gives a reality test to whether your milestones are in fact achievable. Then you're off and running, in living order.

In an excellent blog post on the usefulness of milestones,

Elizabeth Harrin (2017) explains that milestones should be used “as a way of showing forward movement and progress and also show people what is going on, even if they don’t have a detailed knowledge of the tasks involved to get there. In that respect, they are very useful for stakeholder communication and setting expectations” (Harrin, 2017). You can use milestones, she explains, to track your progress, focus on:

- starting of significant phases of work
- ending of significant phases of work
- marking the deadline for something
- showing when an important decision is being made. (Harrin, 2017)

Milestones are especially useful as a form of communication on the health of a project. A version of a project schedule that consists only of milestones allows stakeholders to get a quick sense of where things stand. You may want to report on milestones in the project’s dashboard, which should serve as an at-a-glance update for the project.

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PART VII

MODULE 8: COST & PROCUREMENT

39. Project Budgeting

Chapter Introduction

Learning Objectives

After reading this chapter, you will be able to:

1. Define basic terms such as budget, estimate, price, cost, and value.
2. Discuss the relationship between cost and budget.
3. Explain basic concepts related to budgeting.
4. Identify different types of costs, and discuss issues related to contingency funds, profit, and cost estimating.
5. Explain the benefits of contingencies.

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40. Budget Planning



Figure 12.1 Parametric Cost Estimate

Bottom-Up Estimating

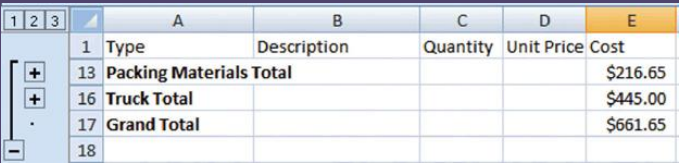
The most accurate and time-consuming estimating method is to identify the cost of each item in each activity of the schedule, including labour and materials. If you view the project schedule as a hierarchy where the general descriptions of tasks are at the top and the lower levels become more detailed, finding the price of each item at the lowest level and then summing them to determine the cost of higher levels is called **bottom-up estimating**.

After evaluating the bids by the moving companies, John decides the savings are worth his time if he can get the packing done with the help of his friends. He decides to prepare a detailed estimate of costs (Table 12.1) for packing materials and use of a rental truck. He looks up the prices for packing materials and truck rental costs on company websites and prepares a detailed list of items, quantities, and costs.

This type of estimate is typically more accurate than an analogous or

parametric estimate. In this example, the sum of packing materials and truck expenses is estimated to be \$661.25.

The estimate can be rolled up—subtotaled—to display less detail. This process is made easier using computer software. On projects with low complexity, the cost estimates can be done on spreadsheet software. On larger projects, software that manages schedules can also manage costs and display them by activity and category. For example, the subtotal feature could be used in Excel and collapsed to show the subtotals for the two categories of costs (Figure 12.2).



1	2	3	A	B	C	D	E
1	Type	Description	Quantity	Unit Price	Cost		
13	Packing Materials Total				\$216.65		
16	Truck Total				\$445.00		
17	Grand Total				\$661.65		
18							

Figure 12.2 Sum of detailed costs by type

Activity-Based Estimates

An activity can have costs from multiple vendors in addition to internal costs for labour and materials. Detailed estimates from all sources can be reorganized so those costs associated with a particular activity can be grouped by adding the activity code to the detailed estimate (Table 12.2).

Table 12.2 Costs Associated with Activities

Category	Activity	Cost
Packing Materials	2.1	\$216.65
Truck	2.2	\$445.00

The detailed cost estimates can be sorted and then subtotaled by activity to determine the cost for each activity.

Managing the Budget

Projects seldom go according to plan in every detail. It is necessary for the project manager to be able to identify when costs are varying from the budget and manage those variations.

Managing Cash Flow

If the total amount spent on a project is equal to or less than the amount budgeted, the project can still be in trouble if the funding for the project is not available when it is needed. There is a natural tension between the financial people in an organization, who do not want to pay for the use of money that is just sitting in a checking account, and the project manager, who wants to be sure that there is enough money available to pay for project expenses. The financial people prefer to keep the company's money working in other investments until the last moment before transferring it to the project account. The contractors and vendors have similar concerns, and they want to get paid as soon as possible so they can put the money to work in their own organizations. The project manager would like to have as much cash available as possible to use if activities exceed budget expectations.

Contingency Reserves

Most projects have something unexpected occur that increases

costs above the original estimates. If estimates are rarely exceeded, the estimating method should be reviewed because the estimates are too high. It is impossible to predict which activities will cost more than expected, but it is reasonable to assume that some of them will. Estimating the likelihood of such events is part of risk analysis, which is discussed in more detail in a later chapter.

Instead of overestimating each cost, money is budgeted for dealing with unplanned but statistically predictable cost increases. Funds allocated for this purpose are called **contingency reserves**. Because it is likely that this money will be spent, it is part of the total budget for the project. If this fund is adequate to meet the unplanned expenses, then the project will complete within the budget.

Management Reserves

If something occurs during the project that requires a change in the project scope, money may be needed to deal with the situation before a change in scope can be negotiated with the project sponsor or client. It could be an opportunity as well as a challenge. For example, if a new technology were invented that would greatly enhance your completed project, there would be additional cost and a change to the scope, but it would be worth it. Money can be made available at the manager's discretion to meet needs that would change the scope of the project. These funds are called **management reserves**. Unlike contingency reserves, they are not likely to be spent and are not part of the project's budget baseline, but they can be included in the total project budget.

Evaluating the Budget During the Project

A project manager must regularly compare the amount of money spent with the budgeted amount and report this information to managers and stakeholders. It is necessary to establish an understanding of how this progress will be measured and reported.

In the John's move example, he estimated that the move would cost about \$1,500 and take about 16 days. Eight days into the project, John has spent \$300. John tells his friends that the project is going well because he is halfway through the project but has only spent a fifth of his budget. John's friend Carlita points out that his report is not sufficient because he did not compare the amount spent to the budgeted amount for the activities that should be done by the eighth day.

As John's friend pointed out, a budget report must compare the amount spent with the amount that is expected to be spent by that point in the project. Basic measures such as percentage of activities completed, percentage of measurement units completed, and percentage of budget spent are adequate for less complex projects, but more sophisticated techniques are used for projects with higher complexity.

Earned Value Analysis

A method that is widely used for medium- and high-complexity projects is the **earned value management (EVM)** method. EVM is a method of periodically comparing the budgeted costs with the actual costs during the project. It combines the scheduled activities with detailed cost estimates of each activity. It allows for partial

completion of an activity if some of the detailed costs associated with the activity have been paid but others have not.

The **budgeted cost of work scheduled (BCWS)** comprises the detailed cost estimates for each activity in the project. The amount of work that should have been done by a particular date is the **planned value (PV)**. These terms are used interchangeably by some sources, but the planned value term is used in formulas to refer to the sum of the budgeted cost of work up to a particular point in the project, so we will make that distinction in the definitions in this text for clarity.

On day six of the project, John should have taken his friends to lunch and purchased the packing materials. The portion of the BCWS that should have been done by that date (the planned value) is shown in Table 12.3. This is the planned value for day six of the project.

Table 12.3 Planned Value for Lunch and Packing Materials

Description	Quantity	Cost
Lunch	3	\$45.00
Small Boxes	10	\$17.00
Medium Boxes	15	\$35.25
Large Boxes	7	\$21.00
Extra Large Boxes	7	\$26.25
Short Hanger Boxes	3	\$23.85
Box Tape	2	\$7.70
Markers	2	\$3.00
Mattress/Spring Bags	2	\$5.90
Life Straps per Pair	1	\$24.95
Bubble Wrap	1	\$19.95
Furniture Pads	4	\$31.80

The **budgeted cost of work performed (BCWP)** is the budgeted cost of work scheduled that has been done. If you sum the BCWP values up

to that point in the project schedule, you have the **earned value (EV)**. The amount spent on an item is often more or less than the estimated amount that was budgeted for that item. The **actual cost (AC)** is the sum of the amounts actually spent on the items.

Dion and Carlita were both trying to lose weight and just wanted a nice salad. Consequently, the lunch cost less than expected. John makes a stop at a store that sells moving supplies at discount rates. They do not have all the items he needs, but the prices are lower than those quoted by the moving company. They have a very good price on lifting straps so he decides to buy an extra pair. He returns with some of the items on his list, but this phase of the job is not complete by the end of day six. John bought half of the small boxes, all of five other items, twice as many lifting straps, and none of four other items. John is only six days into his project, and his costs and performance are starting to vary from the plan. Earned value analysis gives us a method for reporting that progress (Table 12.4).

Table 12.4 Planned Value, Earned Value, and Actual Cost

Description	Budgeted Cost of Work Scheduled (BCWS)		Budgeted Cost of Work Performed (BCWP)		Actual Cost (AC)	
	Quantity	Cost	Quantity	Cost	Quantity	Cost
Lunch	3	\$45.00	3	\$45.00	3	\$35.00
Small Boxes	10	\$7.00	5	\$8.50	5	\$9.50
Medium Boxes	15	\$35.25	15	\$35.25	15	\$28.00
Large Boxes	7	\$21.00				
Extra-Large Boxes	7	\$26.25				
Short-Header Boxes	3	\$23.85				
Box Tape	2	\$7.70	2	\$7.70	2	\$5.50
Markers	2	\$3.00	2	\$3.00	2	\$2.00
Mattress/Spring Bags	2	\$5.90	2	\$5.90	2	\$7.50
Life Straps per Pair	1	\$24.95	1	\$24.95	2	\$38.50
Bubble Wrap	1	\$19.95				
Furniture Pads	4	\$31.80	4	\$31.80	4	\$28.50

The original schedule called for spending \$261.65 (PV) by day six. The amount of work done was worth \$162.10 (EV)

according to the estimates, but the actual cost was only \$154.50 (AC).

Schedule Variance

The project manager must know if the project is on schedule and within the budget. The difference between planned and actual progress is the **variance**. The **schedule variance (SV)** is the difference between the earned value (EV) and the planned value (PV). Expressed as a formula, $SV = EV - PV$. If less value has been earned than was planned, the schedule variance is negative, which means the project is behind schedule.

Planning for John's move calls for spending \$261.65 by day six, which is the planned value (PV). The difference between the planned value and the earned value is the scheduled variance (SV). The formula is $SV = EV - PV$. In this example, $SV = \$162.10 - \$261.65 = (\$99.55)$. A negative SV indicates the project is behind schedule.

The difference between the earned value (EV) and the actual cost (AC) is the **cost variance (CV)**. Expressed as a formula, $CV = EV - AC$. A positive CV indicates the project is under budget.

The difference between the earned value of \$162.10 and the

actual cost of \$154.50 is the cost variance (CV). The formula is $CV = EV - AC$. In this example, $CV = \$162.10 - \$154.50 = \$7.60$.

Variance Indexes for Schedule and Cost

The schedule variance and the cost variance provide the amount by which the spending is behind (or ahead of) schedule and the amount by which a project is exceeding (or not fully using) its budget. They do not give an idea of how these amounts compare with the total budget.

The ratio of earned value to planned value gives an indication of how much of the project is completed. This ratio is the **schedule performance index (SPI)**. The formula is $SPI = EV \div PV$. In the John's move example, the SPI equals 0.62 ($SPI = \$162.10 \div \$261.65 = 0.62$). An SPI value less than 1 indicates the project is behind schedule.

The ratio of the earned value to the actual cost is the **cost performance index (CPI)**. The formula is $CPI = EV \div AC$.

In the John's move example, $CPI = \$162.10 \div \$154.50 = 1.05$. A value greater than 1 indicates that the project is under budget.

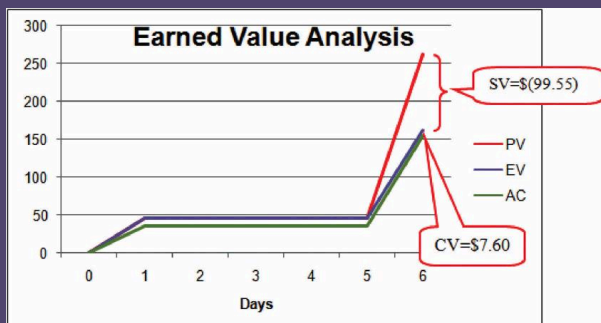


Figure 12.3 Schedule variance and cost variance.

The cost variance of positive \$7.60 and the CPI value of 1.05 tell John that he is getting more value for his money than planned for the tasks scheduled by day six. The schedule variance (SV) of negative \$99.55 and the schedule performance index (SPI) of 0.62 tell him that he is behind schedule in adding value to the project (Figure 12.3).

During the project, the manager can evaluate the schedule using the schedule variance (SV) and the schedule performance index (SPI), and the budget using the cost variance (CV) and the cost performance index (CPI).

Estimated Cost to Complete the Project

Part way through the project, the manager evaluates the accuracy of the cost estimates for the activities that have taken place and uses

that experience to predict how much money it will take to complete the unfinished activities—the **estimate to complete (ETC)**.

To calculate the ETC, the manager must decide if the cost variance observed in the estimates to that point are representative of the future. For example, if unusually bad weather causes increased cost during the first part of the project, it is not likely to have the same effect on the rest of the project. If the manager decides that the cost variance up to this point in the project is atypical—not typical—then the estimate to complete is the difference between the original budget for the entire project—the **budget at completion (BAC)**—and the earned value (EV) up to that point. Expressed as a formula, $ETC = BAC - EV$.

For his move, John was able to buy most of the items at a discount house that did not have a complete inventory, and he chose to buy an extra pair of lift straps. He knows that the planned values for packing materials were obtained from the price list at the moving company where he will have to buy the rest of the items, so those two factors are not likely to be typical of the remaining purchases. The reduced cost of lunch is unrelated to the future costs of packing materials, truck rentals, and hotel fees. John decides that the factors that caused the variances are atypical. He calculates that the estimate to complete (ETC) is the budget at completion (\$1,534) minus the earned value at that point (\$162.10), which equals \$1,371.90. Expressed as a formula, $ETC = \$1,534 - \$162.10 = \$1,371.90$.

If the manager decides that the cost variance is caused by factors that will affect the remaining activities, such as higher labour and material costs, then the estimate to complete (ETC) needs to be adjusted by dividing it by the cost performance index (CPI). For example, if labour costs on the first part of a project are estimated at

\$80,000 (EV) and they actually cost \$85,000 (AC), the cost performance (CPI) will be 0.94. (Recall that the $CPI = EV \div AC$.)

To calculate the estimate to complete (ETC), assuming the cost variance on known activities is typical of future cost, the formula is $ETC = (BAC - EV) \div CPI$. If the budget at completion (BAC) of the project is \$800,000, the estimate to complete is $(\$800,000 - \$80,000) \div 0.94 = \$766,000$.

Estimate Final Project Cost

If the costs of the activities up to the present vary from the original estimates, this will affect the total estimate of the project cost. The new estimate of the project cost is the estimate at completion (EAC). To calculate the EAC, the **estimate to complete (ETC)** is added to the actual cost (AC) of the activities already performed. Expressed as a formula, $EAC = AC + ETC$.

The revised estimate at completion (EAC) for John's move at this point in the process is $EAC = \$154.50 + \$1,371.90 = \$1,526.40$.

Table 12.5 Summary of Terms and Formulas for Earned Value Analysis

Term	Acronym	Description	Formula	John's Move
Actual Cost	AC	The money actually spent on projects up to the present.	–	\$154.50
Budget at Completion	BAC	Original budget for the project (same as BCWS)	–	\$1,534.00
Cost Performance Index	CPI	Ratio of earned value to actual cost	$CPI = \frac{EV}{AC}$	1.05
Cost Variance	CV	Difference between earned value and actual cost	$CV = EV - AC$	\$7.60
Earned Value	EV	Sum of estimates for work actually done up to the present	–	\$162.10
Estimate at Completion	EAC	Revised estimate of total project cost	$EAC = AC + ETC$	\$1,526.40
Estimate to Complete	ETC	Money to complete the project if early cost variance is atypical	$ETC = \frac{(BAC - EV)}{CPI}$	n/a

Term	Acronym	Description	Formula	John's Move
Planned Value	PV	Sum of the estimates for work done up to the present	–	\$261.65
Schedule Performance Index	SPI	Ratio of earned value to planned value	$SPI = EV \div PV$	0.62
Schedule Variance	SV	Difference between earned value and planned value	$SV = EV - PV$	\$99.55

To summarize (Table 12.5):

- Extra money is allocated in a contingency fund to deal with activities where costs exceed estimates. Funds are allocated in a management reserve in case a significant opportunity or challenge occurs that requires change of scope but funds are needed immediately before a scope change can typically be negotiated.
- Schedule variance is the difference between the part of the budget that has been spent so far (EV) versus the part that was planned to be spent by now (PV). Similarly, the cost variance is the difference between the EV and the actual cost (AC).
- The schedule performance index (SPI) is the ratio of the earned value and the planned value. The cost performance index (CPI) is the ratio of the earned value (EV) to the actual cost (AC).
- The formula used to calculate the amount of money needed

to complete the project (ETC) depends on whether or not the cost variance to this point is expected to continue (typical) or not (atypical). If the cost variance is atypical, the ETC is simply the original total budget (BAC) minus the earned value (EV). If they are typical of future cost variances, the ETC is adjusted by dividing the difference between BAC and EV by the CPI.

- The final budget is the actual cost (AC) to this point plus the estimate to complete (ETC).

Establishing a Budget

Once you have broken your project down into activities, you will be able to calculate your overall project costs by estimating and totaling the individual activity costs.

This process of subtotalling costs by category or activity is called **cost aggregation**.

Budget Timeline

Costs are associated with activities, and since each activity has a start date and a duration period, it is possible to calculate how much money will be spent by any particular date during the project. The money needed to pay for a project is usually transferred to the project account shortly before it is needed. These transfers must be timed so that the money is there to pay for each activity without causing a delay in the start of the activity. If the money is transferred too far in advance, the organization will lose the opportunity to use the money somewhere else, or they will have to pay unnecessary interest charges if the money is borrowed. A schedule of money transfers is created that should match the need to pay for the activities. The process of matching the schedule of transfers with the

schedule of activity payments is called **reconciliation**. Refer to Figure 12.4, which shows the costs of 10 major activities in a project. Funds are transferred into the project account four times. Notice that during most of the project, there were more funds available than were spent except at activity 6 when all the available funds were spent.

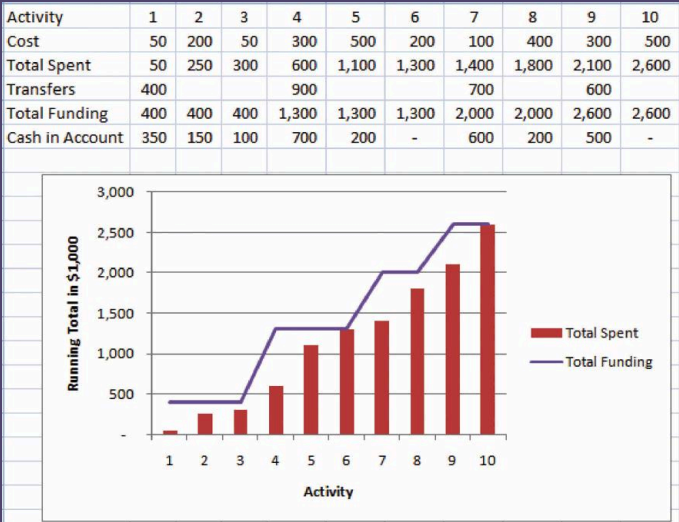


Figure 12.4: Fund transfers and expenditures.

In the project budget profile shown in Figure 12.4, there is no margin for error if the total of the first six activities exceeds the amount of funding at that point in the project.

Contractual agreements with vendors often require partial payment of their costs during the project. Those contracts can be managed more conveniently if the unit of measure for partial completion is the same as that used for cost budgeting. For example, if a graphic designer is putting together several pieces of artwork for a textbook,

their contract may call for partial payment after 25% of their total number of drawings is complete.

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4I. Resource Estimation

Resources are people, equipment, places, money, or anything else that you need in order to do all of the activities that you planned for. Every activity in your activity list needs to have resources assigned to it. Before you can assign resources to your project, you need to know their availability. Resource availability includes information about what resources you can use on your project, when they're available to you, and the conditions of their availability. Don't forget that some resources, like consultants or training rooms, have to be scheduled in advance, and they might only be available at certain times. You'll need to know this before you can finish planning your project. If you are starting to plan in January, a June wedding is harder to plan than one in December, because the wedding halls are all booked up in advance. That is clearly a resource constraint. You'll also need the activity list that you created earlier, and you'll need to know how your organization typically handles resources. Once you've got a handle on these things, you're set for resource estimation.

The goal of activity resource estimating is to assign resources to each activity in the activity list. There are five tools and techniques for estimating activity resources.

Expert judgment means bringing in experts who have done this sort of work before and getting their opinions on what resources are needed.

Alternative analysis means considering several different options for how you assign resources. This includes varying the number of resources as well as the kind of resources you use. Many times, there's more than one way to accomplish an activity and alternative analysis helps decide among the possibilities.

Published estimating data is something that project managers in a lot of industries use to help them figure out how many resources

they need. They rely on articles, books, journals, and periodicals that collect, analyze, and publish data from other people's projects.

Project management software such as Microsoft Project will often have features designed to help project managers estimate resource needs and constraints and find the best combination of assignments for the project.

Bottom-up estimating means breaking down complex activities into pieces and working out the resource assignments for each piece. It is a process of estimating individual activity resource need or cost and then adding these up together to come up with a total estimate. Bottom-up estimating is a very accurate means of estimating, provided the estimates at the schedule activity level are accurate. However, it takes a considerable amount of time to perform bottom-up estimating because every activity must be assessed and estimated accurately to be included in the bottom-up calculation. The smaller and more detailed the activity, the greater the accuracy and cost of this technique.

Resource Management

Resource management is the efficient and effective deployment of an organization's resources when they are needed. Such resources may include financial resources, inventory, human skills, production resources, or information technology (IT). In the realm of project management, processes, techniques, and philosophies for the best approach for allocating resources have been developed. These include discussions on functional versus cross-functional resource allocation as well as processes espoused by organizations like the Project Management Institute (PMI) through the methodology of project management outlined in their publication *A Guide to the Project Management Body of Knowledge (PMBOK)*. Resource management is a key element to activity resource estimating and project human resource management. As is the case with the larger

discipline of project management, there are resource management software tools available that automate and assist the process of resource allocation to projects.

HR Planning

The most important resource to a project is its people—the project team. Projects require specific expertise at specific moments in the schedule, depending on the milestones being delivered or the given phase of the project. An organization can host several strategic projects concurrently over the course of a budget year, which means that its employees can be working on more than one project at a time. Alternatively, an employee may be seconded away from his or her role within an organization to become part of a project team because of a particular expertise. Moreover, projects often require talent and resources that can only be acquired via contract work and third-party vendors. Procuring and coordinating these human resources, in tandem with managing the time aspect of the project, is critical to overall success.

Managing the Team

In order to successfully meet the needs of a project, it is important to have a high-performing project team made up of individuals who are both technically skilled and motivated to contribute to the project's outcome. One of the many responsibilities of a project manager is to enhance the ability of each project team member to contribute to the project, while also fostering individual growth and accomplishment. At the same time, each individual must be encouraged to share ideas and work with others toward a common goal.

Through performance evaluation, the manager will get the information needed to ensure that the team has adequate knowledge, to establish a positive team environment and a healthy communication climate, to work properly, and to ensure accountability.

Managing the project team includes appraisal of employee performance and project performance. The performance reports provide the basis for managerial decisions on how to manage the project team.

Employee performance includes the employee's work results such as:

- Quality and quantity of outputs
- Work behavior (such as punctuality)
- Job-related attributes (such as cooperation and initiative)

After conducting employee performance reviews, project managers should:

- Provide feedback to employees about how well they have performed on established goals
- Provide feedback to employees about areas in which they are weak or could do better
- Take corrective action to address problems with employees performing at or below minimum expectations
- Reward superior performers to encourage their continued excellence

Techniques for Managing Resources

One resource management technique is resource leveling. It aims at smoothing the stock of resources on hand, reducing both excess inventories and shortages. The required data are the demands for

various resources, forecast by time period into the future as far as is reasonable; the resources' configurations required in those demands; and the supply of the resources, again forecast by time period into the future as far as is reasonable. The goal is to achieve 100% utilization. However, that is very unlikely, when weighted by important metrics and subject to constraints; for example, meeting a minimum quality level, but otherwise minimizing cost.

Resource Leveling

Resource leveling is used to examine unbalanced use of resources (usually people or equipment) over time and for resolving over-allocations or conflicts.

When performing project planning activities, the manager will attempt to schedule certain tasks simultaneously. When more resources such as machines or people are needed than are available, or perhaps a specific person is needed in two tasks, the tasks will have to be rescheduled sequentially to manage the constraint. Resource leveling during project planning is the process of resolving these conflicts. It can also be used to balance the workload of primary resources over the course of the project, usually at the expense of one of the traditional triple constraints (time, cost, scope).

When using specially designed project software, leveling typically means resolving conflicts or over-allocations in the project plan by allowing the software to calculate delays and update tasks automatically. Project management software leveling requires delaying tasks until resources are available. In more complex environments, resources could be allocated across multiple, concurrent projects thus requiring the process of resource leveling to be performed at company level.

In either definition, leveling could result in a later project finish date if the tasks affected are in the critical path.

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42. Cost Estimation

Ultimately cost, the number management typically cares about most in a for-profit organization, is determined by price. For many projects, it's impossible to know the exact cost of an endeavor until it is completed. Stakeholders can agree on an intended value of a project at the beginning, and that value has an expected cost associated with it. But you may not be able to pin down the cost more precisely until you've done some work on the project and learned more about it.

To estimate and manage costs effectively, you need to understand the different types of costs:

- **Direct Costs:** “An expense that can be traced directly to (or identified with) a specific cost center or cost object such as a department, process, or product” (Business Dictionary, n.d.). Examples of direct costs include labor, materials, and equipment. A direct cost changes proportionately as more work is accomplished.
- **Direct Project Overhead Costs:** Costs that are directly tied to specific resources in the organization that are being used in the project. Examples include the cost of lighting, heating, and cleaning the space where the project team works. Overhead does not vary with project work, so it is often considered a fixed cost.
- **General and Administrative (G&A) Overhead Costs:** The “indirect costs of running a business,” such as IT support, accounting, and marketing” (Tracy, n.d., para. 1).

The type of contract governing your project can affect your consideration of costs. The two main types of contracts are fixed-price and cost-plus. Fixed price is the more predictable of the two with respect to final cost, which can make such contracts appealing to the issuing party. But “this predictability may come with a price.

The seller may realize the risk that he is taking by fixing a price and so will charge more than he would for a fluid price, or a price that he could negotiate with the seller on a regular basis to account for the greater risk the seller is taking” (Symes, 2018).

Many contracts include both fixed-price and cost-plus features. For example, they might have a fixed price element for those parts of the contract that have low variability and are under the direct control of the project team (e.g., direct labor) but have variable cost elements for those aspects that have a high degree of uncertainty or are outside the direct control of the project team (e.g., fuel costs or market driven consumables).

It is important to come up with detailed estimates for all the project costs. Once this is compiled, you add up the cost estimates into a budget plan. It is now possible to track the project according to that budget while the work is ongoing.

Often, when you come into a project, there is already an expectation of how much it will cost or how much time it will take. When you make an estimate early in the project without knowing much about it, that estimate is called a rough order-of-magnitude estimate (or a ballpark estimate). This estimate will become more refined as time goes on and you learn more about the project. Here are some tools and techniques for estimating cost:

- **Determination of Resource Cost Rates:** People who will be working on the project all work at a specific rate. Any materials you use to build the project (e.g., wood or wiring) will be charged at a rate too. Determining resource costs means figuring out what the rate for labor and materials will be.
- **Vendor Bid Analysis:** Sometimes you will need to work with an external contractor to get your project done. You might even have more than one contractor bid on the job. This tool is about evaluating those bids and choosing the one you will accept.
- **Reserve Analysis:** You need to set aside some money for cost overruns. If you know that your project has a risk of something

expensive happening, it is better to have some cash available to deal with it. Reserve analysis means putting some cash away in case of overruns.

- **Cost of Quality:** You will need to figure the cost of all your quality-related activities into the overall budget. Since it's cheaper to find bugs earlier in the project than later, there are always quality costs associated with everything your project produces. Cost of quality is just a way of tracking the cost of those activities. It is the amount of money it takes to do the project right.

Once you apply all the tools in this process, you will arrive at an estimate for how much your project will cost. It's important to keep all of your supporting estimate information. That way, you know the assumptions made when you were coming up with the numbers. Now you are ready to build your budget plan.

Estimating Costs to Compare and Select Projects

During the conceptual phase when project selection occurs, economic factors are an important consideration in choosing between competing projects. To compare the simple paybacks or internal rates of return between projects, an estimate of the cost of each project is made. The estimates must be accurate enough so that the comparisons are meaningful, but the amount of time and resources used to make the estimates should be appropriate to the size and complexity of the project. The methods used to estimate the cost of the project during the selection phase are generally faster and consume fewer resources than those used to create detailed estimates in later phases. They rely more on the expert judgment of experienced managers who can make accurate estimates with less detailed information. Estimates in the earliest stages of project selection are usually based on information from

previous projects that can be adjusted—scaled—to match the size and complexity of the current project or developed using standardized formulas.

Analogous Estimate

An estimate that is based on other project estimates is an analogous estimate. If a similar project cost a certain amount, then it is reasonable to assume that the current project will cost about the same. Few projects are exactly the same size and complexity, so the estimate must be adjusted upward or downward to account for the differences. The selection of projects that are similar and the amount of adjustment needed is up to the judgment of the person who makes the estimate. Normally, this judgment is based on many years of experience estimating projects, including incorrect estimates that were learning experiences for the expert.

Less-experienced managers who are required to make analogous estimates can look through the documentation that is available from previous projects. If projects were evaluated using the Darnall-Preston Complexity Index (DPCI), the manager can quickly identify projects that have profiles similar to the project under consideration, even if those projects were managed by other people.

The DPCI assesses project attributes, enabling better-informed decisions in creating the project profile. This index assesses the complexity level of key components of a project and produces a unique project profile. The profile indicates the project complexity level, which provides a benchmark for comparing projects and information about the characteristics of a project that can then be addressed in the project execution plan. It achieves this objective by grouping 11 attributes into four broad categories: internal, external, technological complexity, and environmental.

Comparing the original estimates with the final project costs on several previous projects with the same DPCI ratings gives a less-experienced manager the perspective that it would take many years to acquire by trial and error. It also provides references the manager can use to justify the estimate.

Example: Analogous Estimate for John's Move

John sold his apartment and purchased another one. It is now time to plan for the move. John asked a friend for advice about the cost of his move. His friend replied, “I moved from an apartment a little smaller than yours last year and the distance was about the same. I did it with a 14-foot truck. It cost about \$575 for the truck rental, pads, hand truck, rope, boxes, and gas.” Because of the similarity of the projects, John’s initial estimate of the cost of the move was less than \$700, so he decided that the cost would be affordable and the project could go forward.

Parametric Estimate

If the project consists of activities that are common to many other projects, average costs are available per unit. For example, if you ask a construction company how much it would cost to build a standard office building, the estimator will ask for the size of the building in square feet and the city in which the building will be built. From these two factors—size and location—the company’s estimator can predict the cost of the building. Factors like size and location are parameters—measurable factors that can be used in an equation to calculate a result. The estimator knows the average cost per square foot of a typical office building and adjustments for local labor costs. Other parameters such as quality of finishes are used to further refine the estimate. Estimates that are calculated by multiplying measured parameters by cost-per-unit values are parametric estimates.

Activity-Based Estimates

An activity can have costs from multiple vendors in addition to internal costs for labor and materials. Detailed estimates from all sources can be reorganized so those costs associated with a particular activity can be grouped by adding the activity code to the detailed estimate (Figure 6-1). The detailed cost estimates can be sorted and then subtotaled by activity to determine the cost for each activity.

Category	Description	Activity	Quantity	Unit Price	Cost
Packing Materials	Small Boxes	2.1	10	\$1.70	\$17.00
Packing Materials	Medium Boxes	2.1	15	\$2.35	\$35.25
Packing Materials	Large Boxes	2.1	7	\$3.00	\$21.00
Packing Materials	Extra Large Boxes	2.1	7	\$3.75	\$26.25
Packing Materials	Short Hanger Boxes	2.1	3	\$7.95	\$23.85
Packing Materials	Box Tape	2.1	2	\$3.85	\$7.70
Packing Materials	Markers	2.1	2	\$1.50	\$3.00
Packing Materials	Mattress/Spring Bags	2.1	2	\$2.95	\$5.90
Packing Materials	Lift Straps Per Pair	2.1	1	\$24.95	\$24.95
Packing Materials	Bubble Wrap	2.1	1	\$19.95	\$19.95
Packing Materials	Furniture Pads	2.1	4	\$7.95	\$31.80
Packing Materials	Rental	2.1			\$400.00
Packing Materials	Gas at 10mpg	2.1	200	\$2.25	\$45.00

Figure 6-1: John’s Move example – Detailed Costs Associated with Activities.
Source.

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43. Understanding Budget

Budgeting is an exercise in refining your focus. You start with a wide-angle estimate, in which the details are necessarily fuzzy, and bit by bit zero in on a sharper picture of project costs. You might be temperamentally inclined to try to nail down every figure in an early draft of a budget, but in fact you should only develop a budget at the precision needed for current decisions. Your overall precision can and should advance as the project advances.

This is especially important in the earliest stages of the budgeting process, when you are working out rough estimates. Take care to estimate at the appropriate level of precision: Don't make the mistake of thinking you can estimate costs to the exact penny or dollar. \$378,333.27 is not a realistic or intelligent estimate. Ultimately, overly precise budgets represent a communication failure. By proposing a budget to the customer that contains overly precise figures, you risk giving a false sense of accuracy regarding your understanding of and knowledge about the project.

In the early stages of the budgeting process, when you are still working out estimates, it's helpful to include an uncertainty percentage. A typical approach is to include a +/- percentage, such as \$400,000 +/- 10%. The percentage may initially be large but should gradually decrease as the project progresses and the level of uncertainty declines. For IT projects, which are notoriously difficult to estimate, consider going a step further and adding an uncertainty percentage to every line item. Some items, such as hardware, might be easy to estimate. But other items, such as labor to create new technology, can be extremely difficult to estimate. These line item variances can influence the total estimate variance by a significant amount in many projects.

But even when you have a final budget in hand, you need to prepare for uncertainty by including an official contingency fund,

which is a percentage of the budget set aside for unforeseen costs. Contingency funds are described in more detail later in this chapter.

Successful project managers use the budgeting process as a way to create stakeholder buy-in regarding the use of available resources to achieve the intended outcome. By being as transparent as possible about costs and resource availability, you'll help build trust among stakeholders. By taking care to use the right kinds of contracts—for example, contracts that don't penalize stakeholders for escalating prices caused by a changing economy—you can create incentives that keep all stakeholders focused on delivering the project value, rather than merely trying to protect their own interests. The relationship between costs and contracts is discussed in more detail later in chapter 7.

Creating a Project Budget

This blog post by Tim Clark includes some helpful tips on creating a project budget:

<https://www.liquidplanner.com/blog/7-ways-create-budget-project/>.

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44. Contingencies

In addition to creating the project plan, you need to create a contingency plan, which is a plan for addressing key possible obstacles to project success. A contingency plan defines alternate paths for the project in case various risks are realized. A contingency plan typically includes a contingency fund, which is an amount of resources set aside to cover unanticipated costs. Contingency plans and funds are necessary because even the most seasoned project planner sometimes succumbs to excessive optimism, assuming everything will go well and that all resources will be available when needed. Also, no matter how thoroughly you plan a project, you will inevitably miss at least a few small issues.

Examples of issues that might necessitate the use of a contingency fund:

- Inadequate initial estimates
- Small items not covered in planning
- Errors in initial estimates
- Small deviations due to inevitable delays

Note that a contingency fund is not designed to manage major deviations or scope changes.

A simple and effective form of contingency planning is setting aside a contingency fund consisting of a fixed percentage of all resources (time, money, people) in addition to the amounts spelled out in the final budget. Ten percent is a typical amount, but that can vary depending on the size and type of project, as well as the type of industry.

One of the chief difficulties of contingency planning is getting people to agree on exactly what is and is not covered by a contingency fund, and how it applies in specific circumstances. A considerable amount of research has been done on this topic, but there is still no clear consensus. For that reason, before launching a

major project, you would be wise to investigate the ins and outs of contingency planning at your organization in particular, and in your industry in general.

Contingency planning is closely related to risk management, which is discussed in chapter 9. When you are working on small projects of limited complexity, you can probably assume that a fixed percentage contingency plan will cover most risks. However, for highly complex, technically challenging projects, it's important to distinguish between generic budget planning contingencies (using a fixed percentage) and the more sophisticated modeling of risk for uncertainty.

If money is not available from other sources, then cost overruns typically result in a change in the project's scope or a reduction in overall quality. To prevent this, organizations build contingency funds into their budgets. Technically, a contingency fund is a financial reserve that is allocated for identified risks that are accepted and for which contingent or mitigating responses are developed. The exact amount of a contingency is typical 10% to 15% of the total budget.

Contingency funds are often available to pay for an agreed-upon scope change. However, some project managers make a practice of treating a contingency fund as a "Get Out of Jail Free" card that they can use to escape any cost limitations. Some, as a practical matter, will artificially inflate a contingency fund to ensure that they have plenty of resources to draw to manage any unforeseen future risks. But that is never a good idea because if you wind up with a large contingency fund that you ultimately don't spend, you have essentially held that money hostage (i.e., lost opportunity costs) from the rest of the enterprise. That can be as damaging to your organization's mission as a cost overrun that prevents you from finishing a project.

As explained, contingency funds are a form of risk management. They are a necessary tool for dealing with uncertainty. Unfortunately, as necessary as they are, it's not always possible to build them into your approved budget. For example, if you are

competitively bidding on a contract that will be awarded on the lowest cost, then including a contingency fund in your estimate will almost certainly guarantee that your company won't win the contract. It is simply not practical to include a contingency fund in a lump sum contract.

In the living order approach to this problem, the owner maintains a shared contingency fund instead and makes it available, upon justification, for all project stakeholders. This approach helps ensure that project participants will work collaboratively with the project sponsor to solve any problems they might notice, confident that there is money available to address problems that threaten project value or to leverage opportunities that will provide greater project value. For example, in a lecture on Lean and integrated project delivery, David Thomack, a long-time veteran of the construction industry, explained how the Boldt Company and other stakeholders involved in a \$2 billion healthcare project protected millions of dollars in contingency funding, which was then ultimately shared among all stakeholders (Thomack, 2018). Such shared contingency funds are typically spelled out in the project contract and are an effective tool to manage risk and uncertainty. Although some organizations only manage out-of-pocket project costs, the best practice is to manage total cost, including costs associated with staff (engineering, purchasing, testing, etc.) working on the project.

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45. Managing Budget

Projects seldom go according to plan in every detail. It is necessary for the project manager to be able to identify when costs are varying from the budget and manage those variations.

Evaluating the Budget During the Project

A project manager must regularly compare the amount of money spent with the budgeted amount and report this information to managers and stakeholders. It is necessary to establish an understanding of how this progress will be measured and reported.

Example: Reporting Budget Progress on John's Move

In the John's move example, he estimated that the move would cost about \$1,500 and take about 16 days. Eight days into the project, John has spent \$300. John tells his friends that the project is going well because he is halfway through the project but has only spent a fifth of his budget. John's friend Carlita points out that his report is not sufficient because he did not compare the amount spent to the budgeted amount for the activities that should be done by the eighth day.

As John's friend pointed out, a budget report must compare the amount spent with the amount that is expected to be spent by that point in the project. Basic measures such as percentage of activities completed, percentage of measurement units completed, and percentage of budget spent are adequate for less complex projects, but more sophisticated techniques are used for projects with higher complexity.

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46. Chapter Questions

Knowledge Check 1



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*[https://kirkwood.pressbooks.pub/
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PART VIII

MODULE 9: SWOT
ANALYSIS &
COMMUNICATION
MANAGEMENT

47. What Is a SWOT Analysis and How to Do it Right in 2021 (With Examples)

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What Is a SWOT Analysis and How to Do It Right (With Examples)

Posted February 2, 2021 By **NOAH PARSONS**

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A SWOT analysis is an incredibly simple, yet powerful tool to help you develop your business strategy, whether you're building a startup or guiding an existing company.

What is a SWOT Analysis?

SWOT stands for Strengths, Weaknesses, Opportunities, and Threats.

Strengths and weaknesses are internal to your company—things that you have some control over and can change. Examples include who is on your team, your patents and intellectual property, and your location.

Opportunities and threats are external—things that are going on outside your company, in the larger market. You can take advantage of opportunities and protect against threats, but you can't change them. Examples include competitors, prices of raw materials, and customer shopping trends.

A SWOT analysis organizes your top strengths, weaknesses, opportunities, and threats into an organized list and is usually presented in a simple two-by-two grid. Go ahead and download our free template if you just want to dive right in and get started.

Strengths, Weaknesses, Opportunities and Threats analyzed in a 2 by 2 grid to define them for your business.

Why do a SWOT Analysis?

When you take the time to do a SWOT analysis, you'll be armed with a solid strategy for prioritizing the work that you need to do to grow your business.

You may think that you already know everything that you need to do to succeed, but a SWOT analysis will force you to look at your business in new ways and from new directions. You'll look at your strengths and weaknesses, and how you can leverage those to take advantage of the opportunities and threats that exist in your market.

Who should do a SWOT Analysis?

For a SWOT analysis to be effective, company founders and leaders need to be deeply involved. This isn't a task that can be delegated to others.

But, company leadership shouldn't do the work on their own, either. For best results, you'll want to gather a group of people who have different perspectives on the company. Select people who can represent different aspects of your company, from sales and customer service to marketing and product development. Everyone should have a seat at the table.

Innovative companies even look outside their own internal ranks when they perform a SWOT analysis and get input from customers to add their unique voice to the mix.

If you're starting or running a business on your own, you can still do a SWOT analysis. Recruit additional points of view from friends who know a little about your business, your accountant, or even vendors and suppliers. The key is to have different points of view.

Existing businesses can use a SWOT analysis to assess their current situation and determine a strategy to move forward. But, remember that things are constantly changing and you'll want to

reassess your strategy, starting with a new SWOT analysis every six to 12 months.

For startups, a SWOT analysis is part of the business planning process. It'll help codify a strategy so that you start off on the right foot and know the direction that you plan to go.

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How to do a SWOT analysis the right way

As I mentioned above, you want to gather a team of people together to work on a SWOT analysis. You don't need an all-day retreat to get it done, though. One or two hours should be more than plenty.

1. Gather the right people

Gather people from different parts of your company and make sure that you have representatives from every department and team. You'll find that different groups within your company will have entirely different perspectives that will be critical to making your SWOT analysis successful.

2. Throw your ideas at the wall

Doing a SWOT analysis is similar to brainstorming meetings, and there are right and wrong ways to run them. I suggest giving everyone a pad of sticky-notes and have everyone quietly generate

ideas on their own to start things off. This prevents groupthink and ensures that all voices are heard.

After five to 10 minutes of private brainstorming, put all the sticky-notes up on the wall and group similar ideas together. Allow anyone to add additional notes at this point if someone else's idea sparks a new thought.

3. Rank the ideas

Once all of the ideas are organized, it's time to rank the ideas. I like using a voting system where everyone gets five or ten "votes" that they can distribute in any way they like. Sticky dots in different colors are useful for this portion of the exercise.

Based on the voting exercise, you should have a prioritized list of ideas. Of course, the list is now up for discussion and debate, and someone in the room should be able to make the final call on the priority. This is usually the CEO, but it could be delegated to someone else in charge of business strategy.

You'll want to follow this process of generating ideas for each of the four quadrants of your SWOT analysis: Strengths, Weaknesses, Opportunities, and Threats.

Questions that can help inspire your analysis

Here are a few questions that you can ask your team when you're building your SWOT analysis. These questions can help explain each section and spark creative thinking.

Strengths

Strengths are internal, positive attributes of your company. These are things that are within your control.

- What business processes are successful?
- What assets do you have in your teams? (ie. knowledge, education, network, skills, and reputation)
- What physical assets do you have, such as customers, equipment, technology, cash, and patents?
- What competitive advantages do you have over your competition?

Weaknesses

Weaknesses are negative factors that detract from your strengths. These are things that you might need to improve on to be competitive.

- Are there things that your business needs to be competitive?
- What business processes need improvement?
- Are there tangible assets that your company needs, such as money or equipment?
- Are there gaps on your team?
- Is your location ideal for your success?

Opportunities

Opportunities are external factors in your business environment that are likely to contribute to your success.

- Is your market growing and are there trends that will encourage people to buy more of what you are selling?
- Are there upcoming events that your company may be able to take advantage of to grow the business?
- Are there upcoming changes to regulations that might impact your company positively?
- If your business is up and running, do customers think highly of you?

Threats

Threats are external factors that you have no control over. You may want to consider putting in place contingency plans for dealing with them if they occur.

- Do you have potential competitors who may enter your market?
- Will suppliers always be able to supply the raw materials you need at the prices you need?
- Could future developments in technology change how you do business?
- Is consumer behavior changing in a way that could negatively impact your business?
- Are there market trends that could become a threat?

SWOT Analysis example

To help you get a better sense of what a SWOT example actually looks like, we're going to look at Upper Crust Pies, a specialty meat and fruit pie cafe in Michigan's Upper Peninsula. They sell hot,

ready-to-go pies and frozen take-home options, as well as an assortment of fresh salads and beverages.

The company is planning to open its first location in downtown Yubetchatown and is very focused on developing a business model that will make it easy to expand quickly and that opens up the possibility of franchising. Here's what their SWOT analysis might look like:

SWOT analysis for UPer Crust Pies

UPer Crust Pies SWOT analysis
example

How to use your SWOT Analysis

With your SWOT analysis complete, you're ready to convert it into a real strategy. After all, the exercise is about producing a strategy that you can work on during the next few months.

The first step is to look at your strengths and figure out how you can use those strengths to take advantage of your opportunities. Then, look at how your strengths can combat the threats that are in the market. Use this analysis to produce a list of actions that you can take.

With your action list in hand, look at your company calendar and start placing goals (or milestones) on it. What do you want to accomplish in each calendar quarter (or month) moving forward?

You'll also want to do this by analyzing how external opportunities might help you combat your own, internal weaknesses. Can you also minimize those weaknesses so you can avoid the threats that you identified?

Again, you'll have an action list that you'll want to prioritize and schedule.

UPer Crust Pies — Potential strategies for growth

Back to the UPer Crust Pies example: Based on their SWOT analysis, here are a few potential strategies for growth to help you think through how to translate your SWOT into actionable goals.

1. Investigate investors. UPer Crust Pies might investigate its options for obtaining capital.
2. Create a marketing plan. Because UPer Crust Pies wants to execute a specific marketing strategy—targeting working families by emphasizing that their dinner option is both healthy and convenient—the company should develop a marketing plan.
3. Plan a grand opening. A key piece of that marketing plan will be the store's grand opening, and the promotional strategies necessary to get UPer Crust Pies' target market in the door.

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Next steps with your SWOT Analysis

With your goals and actions in hand, you'll be a long way toward completing a strategic plan for your business. I like to use the Lean Planning methodology for strategic plans as well as regular business planning. The actions that you generate from your SWOT analysis will fit right into the milestones portion of your Lean Plan and will give you a concrete foundation that you can grow your business from. You can download our free Lean Plan template to help you get started.

If you have additional ideas for how a SWOT analysis can help your business and how it fits into your regular business planning, I'd love to hear from you. You can find me on Twitter @noahparsons.

Editor's note: This article was originally published in 2018 and updated for 2021.



Noah Parsons

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Noah is currently the COO at Palo Alto Software, makers of the online business plan app LivePlan. You can follow Noah on Twitter.

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48. SWOT Analysis Video



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49. Project Communication

Chapter Introduction

Learning Objectives

After reading this chapter, you will be able to:

1. Identify types of communications.
2. Recognize the importance of the level of detail in communication for project success.
3. Describe the role of communication in procurement process.
4. Discuss the special challenges of virtual teams.
5. Discuss the role of communication in building trust, and describe behaviors that help build trust.

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50. Role of Communication in PM

Communications management is about keeping everybody in the loop. The communications planning process concerns defining the types of information you will deliver, who will receive it, the format for communicating it, and the timing of its release and distribution. It turns out that 90% of a project manager's job is spent on communication, so it's important to make sure everybody gets the right message at the right time.

The first step in defining your communication plan is figuring out what kind of communication your stakeholders need from the project so they can make good decisions. This is called the communications requirements analysis. Your project will produce a lot of information; you don't want to overwhelm your stakeholders with all of it. Your job is to figure out what they feel is valuable. Furthermore, communicating valuable information doesn't mean you always paint a rosy picture.

Communications to stakeholders may consist of either good news or bad news. The point is that you don't want to bury stakeholders in too much information but you do want to give them enough so that they're informed and can make appropriate decisions.

Communications technology has a major impact on how you keep people in the loop. Methods of communicating can take many forms, such as written reports, conversations, email, formal status reports, meetings, online databases, online schedules, and project websites. You should consider several factors before deciding what methods you'll choose to transfer information. The timing of the information exchange or need for updates is the first factor. Do you need to procure new technology or systems, or are there systems already in place that will work? The technologies available to you should figure into your plan of how you will keep everyone notified of

project status and issues. Staff experience with the technology is another factor. Are there project team members and stakeholders experienced at using this technology, or will you need to train them?

Finally, consider the duration of the project and the project environment. Will the technology you're choosing work throughout the life of the project or will it have to be upgraded or updated at some point? And how does the project team function? Are they located together or spread out across several campuses or locations? The answers to these questions should be documented in the communication plan.

All projects require a sound communication plan, but not all projects will have the same types of communication or the same methods for distributing the information. The communication plan documents the types of information needs the stakeholders have, when the information should be distributed, and how the information will be delivered.

The types of information you will communicate typically include project status, project scope statements and updates, project baseline information, risks, action items, performance measures, project acceptance, and so on. It's important that the information needs of the stakeholders be determined as early in the planning phase of the project management life cycle as possible so that as you and your team develop project planning documents, you already know who should receive copies of them and how they should be delivered.

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51. Types of Communication

Completing a complex project successfully requires good communication among team members. If those team members work in the same building, they can arrange regular meetings, simply stop by each other's office space to get a quick answer, or even discuss a project informally at other office functions. Many projects are performed by teams that interact primarily through electronic communication and are, therefore, called virtual teams. To avoid miscommunication that can harm trust and to include team members in a project culture, the project team needs a plan for communicating reliably and in a timely manner. This planning begins with understanding two major categories of communication.

Synchronous Communications

If all the parties to the communication are taking part in the exchange at the same time, the communication is synchronous. A telephone or Skype conference call is an example of synchronous communication. The following are examples of synchronous communications:

- Live meeting: Gathering of team members at the same location
- Conference call: A telephone call in which several people participate
- Audio conference: Like a conference call, but conducted online using software like Skype
- Computer-assisted conference: Audio conference with a connection between computers that can display a document or spreadsheet that can be edited by both parties
- Video conference: Similar to an audio conference but with live video of the participants. Some laptop computers have built-in

cameras to facilitate video conferencing

- IM (instant messaging): Exchange of text or voice messages using pop-up windows on the participants' computer screens
- Texting: Exchange of text messages between mobile phones, pagers, or personal digital assistants (PDAs)—devices that hold a calendar, a contact list, a task list, and other support programs.

Modern communication technologies make it possible to assemble project teams from anywhere in the world. Most people work during daylight hours, which can make synchronous meetings difficult if the participants are in different time zones. However, it can be an advantage in some circumstances; for example, if something must be done by the start of business tomorrow, team members in Asia can work on the problem during their normal work hours while team members in North America get some sleep.

Asynchronous Communications

Getting a team together at the same time can be a challenge—especially if they are spread out across time zones. Many types of communication do not require that the parties are present at the same time. This type of communication is asynchronous. There are several choices of asynchronous communications.

- **Mail and Package Delivery**
- **Fax**
- **Email**
- **Project Blog:** A blog is an online journal that can be private, shared by invitation, or made available to the world. Some project managers keep a journal in which they summarize the day's challenges and triumphs and the decisions they made. They return to this journal at a later date to review their

decision-making process after the results of those decisions are known to see if they can learn from their mistakes. Many decisions in project management are made with incomplete knowledge; therefore, and reflecting on previous decisions to develop this decision-making skill is important to growth as a project manager.

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52. Communication and Project Manager

As a project manager, you might be responsible for writing RFPs for your organization's projects, or proposals in response to RFPs publicized by other organizations. You might also be responsible for drafting parts of a contract such as language describing the scope of work. At the very least, you will need to be conversant enough with contract terminology so that you can ensure that a contract proposed by your organization's legal department adequately translates the project requirements into legal obligations. Whatever form they take, to be useful, RFPs, proposals, and contracts must be specific enough to define expectations for the project, yet flexible enough to allow for the inevitable learning that occurs as the project unfolds in the uncertain, living order of the modern world. All three types of documents are forms of communication that express a shared understanding of project success, with the level of detail increasing from the RFP stage to the contract.

Throughout the proposal and contract stages, it's essential to be clear about your expectations regarding:

- Deliverables
- Schedule
- Expected level of expertise
- Price
- Expected quality
- Capacity
- Expected length of relationship (short- or long-term)

Take care to spell out:

- Performance requirements
- Basis for payment

- Process for approving and pricing changes to the project plan
- Requirements for monitoring and reporting on the project health

At minimum, a proposal should discuss:

- **Scope:** At the proposal stage, assume you can only define about 80% of the scope. As you proceed through the project, you'll learn more about it and be better able to define the last 20%.
- **Schedule:** You don't necessarily need to commit to a specific number of days at the proposal stage, but you should convey a general understanding of the overall commitment, and whether the schedule is mission-critical. In many projects, the schedule can turn out to be somewhat arbitrary, or at least allow for more variability than you might be led to believe at first.
- **Deliverables:** Make it clear that you have some sense of what you are committing to, but only provide as many details as necessary.
- **Cost/Resources:** Again, make clear that you understand the general picture, and provide only as many specifics as are helpful at the proposal stage.
- **Terms:** Every proposal needs a set of payment terms, so it's clear when payments are due. Unless you include "net 30" or "net 60" to a proposal, you could find yourself in a situation in which customers refuse to part with their cash until the project is complete.
- **Clarifications and Exclusions:** No proposal is perfect, so every proposal needs something that speaks to the specific uncertainty associated with that particular proposal. Take care to write this part of a proposal in a customer-friendly way and avoid predatory clarifications and exclusions. For example, you might include something like this: "We've done our best to write a complete proposal, but we have incomplete knowledge of the project at this point. We anticipate working together to

clarify the following issues”—and then conclude with a list of issues.

If you are on the receiving end of a proposal, remember a potential supplier probably has far more experience than you do in its particular line of business. Keep the lines of communication open and engage with suppliers to use their expertise to help refine deliverables and other project details.

Assessing New Communication Technologies

New technologies for communicating electronically appear with increasing frequency. Using a new technology that is unfamiliar to the team increases the technology complexity, which can cause delays and increase costs. To decide if a new technology should be included in a communications plan, seek answers to the following questions:

- Does the new communication technology provide a competitive advantage for the project by reducing cost, saving time, or preventing mistakes?
- Does the project team have the expertise to learn the new technology quickly?
- Does the company offer support such as a help desk and equipment service for new communication technology?
- What is the cost of training and implementation in terms of time as well as money?

Communication Plan Template

So how do you create a communication plan?

1. Identify your stakeholders (to whom).
2. Identify stakeholder expectations (why).
3. Identify communication necessary to satisfy stakeholder expectations and keep them informed (what).
4. Identify time-frame and/or frequency of communication messages (when).
5. Identify how the message will be communicated (the stakeholder's preferred method) (how).
6. Identify who will communicate each message (who).
7. Document items – templates, formats, or documents the project must use for communicating.

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53. Communication Planning



Figure 15.1: World Time Zones.

Time zones are calculated in reference to the time zone of the Royal Observatory in Greenwich, England. The time at that location is Greenwich Mean Time (GMT). More recent references designate it as Coordinated Universal Time (UTC) instead of GMT. The time zones advance from Greenwich in an easterly direction (Figure 15.1). However, at the international dateline (about the midpoint around the world from Greenwich), you subtract the time zone from GMT. To prevent confusion between a.m. and p.m., times are often given using a 24-hour clock. For example, midnight is indicated as 00:00, noon is 12:00 and 1 p.m. is 13:00.

A project manager for a software development project in Toronto is five time zones west of the reference zone, so the time is given as UTC-5 (or GMT-5). If it is noon in the reference zone, it is 7 a.m. (five hours earlier) in Toronto. The manager would like to contact a project team member in Paris, France. Paris is one time zone east of

the reference zone (UTC+1 or GMT+1). If it is noon (12:00) in the reference zone, it is 1 p.m. (13:00) in Paris. This means that there is a six-hour difference between Toronto and Paris. If the project manager waits until after lunch to place the call (1 p.m. in Toronto), it will be too late in the day in Paris (7 p.m.) to reach someone.

Asynchronous Communications

Getting a team together at the same time can be a challenge—especially if they are spread out across time zones. Many types of communication do not require that the parties are present at the same time. This type of communication is asynchronous. There are several choices of asynchronous communications.

Mail and Package Delivery

Many companies prefer that final contracts are personally signed by an authorized representative of each party to the agreement. If several signatures are required, this can take weeks to get all the signatures if the contracts are transferred by a postal service. If this process is holding up the start of the project, you can use an overnight delivery service to minimize the time spent transferring the documents.

Fax

Fax machines have been around a long time and enjoy a high level

of trust for transmitting documents accurately. Although it might seem archaic to still use fax transmissions, in many countries a fax of a signed contract is legal, but a computer-scanned image is not.

Email

Electronic mail (email) is widely used to coordinate projects and to communicate between team members. It has several valuable characteristics for project management:

- Information can be sent to a list of team members.
- Messages can be saved to document the process in case of a misunderstanding or miscommunication.
- Files can be attached and distributed.

Project Blog

A **blog** is an online journal that can be private, shared by invitation, or made available to the world. Some project managers keep a journal in which they summarize the day's challenges and triumphs and the decisions they made. They return to this journal at a later date to review their decision-making process after the results of those decisions are known to see if they can learn from their mistakes. Many decisions in project management are made with incomplete knowledge, and reflecting on previous decisions to develop this decision-making skill is important to growth as a project manager.

Really Simple Syndication (RSS)

Some projects are directly affected by external factors such as political elections, economic trends, corporate mergers, technological or scientific breakthroughs, or weather. To keep informed about these factors, you can subscribe to online news sources. A technology that facilitates this process is Really Simple Syndication (RSS). Web pages with RSS news feeds have labeled links.

If the user clicks on the RSS feed, news from the website is automatically sent to the user's news reader, such as Google Reader. The news reader can be set to filter the news for key words to limit the stories to those that are relevant to the project.

Assessing New Communication Technologies

New technologies for communicating electronically appear with increasing frequency. Using a new technology that is unfamiliar to the team increases the technology complexity, which can cause delays and increase costs. To decide if a new technology should be included in a communications plan, seek answers to the following questions (Business Dictionary):

- Does the new communication technology provide a competitive advantage for the project by reducing cost, saving time, or preventing mistakes?
- Does the project team have the expertise to learn the new technology quickly?
- Does the company offer support such as a help desk and equipment service for new communication technology?
- What is the cost of training and implementation in terms of time as well as money

Communication Plan Template

So how do you create a communication plan?

1. Identify your stakeholders (to whom)
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6. Identify who will communicate each message (who)
7. Document items – templates, formats, or documents the project must use for communicating.

Figure 15.2 shows a communication plan template.

Figure 1
Communication plan template

Communications Plan				
Project Name:		Beginning Date:		
Project Manager:		Completion Date:		
Plan Owner:				
Planning				
Project objective and key message points (high level):				
•				
•				
•				
Stakeholders – target audience (list)				
•				
•				
•				
Outline				
Timeline (date)	Team Member (responsible for communication)	Target (audience)	Tool (medium for communication delivery)	Message Points

Figure 15.2 Communications Plan Template

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54. Communications Planning

Communications management is about keeping everybody in the loop. The communications planning process concerns defining the types of information you will deliver, who will receive it, the format for communicating it, and the timing of its release and distribution. It turns out that 90% of a project manager's job is spent on communication so it's important to make sure everybody gets the right message at the right time.

The first step in defining your communication plan is figuring out what kind of communication your stakeholders need from the project so they can make good decisions. This is called the *communications requirements analysis*. Your project will produce a lot of information; you don't want to overwhelm your stakeholders with all of it. Your job is to figure out what they feel is valuable. Communicating valuable information doesn't mean you always paint a rosy picture. Communications to stakeholders may consist of either good news or bad news. The point is that you don't want to bury stakeholders in too much information but you do want to give them enough so that they're informed and can make appropriate decisions.

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at some point? And how does the project team function? Are they located together or spread out across several campuses or locations?

The answers to these questions should be documented in the communication plan.

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The types of information you will communicate typically include project status, project scope statements and updates, project baseline information, risks, action items, performance measures, project acceptance, and so on. It's important that the information needs of the stakeholders be determined as early in the planning phase of the project management life cycle as possible so that as you and your team develop project planning documents, you already know who should receive copies of them and how they should be delivered.

Types of Communication

Completing a complex project successfully requires good communication among team members. If those team members work in the same building, they can arrange regular meetings, simply stop by each other's office space to get a quick answer, or even discuss a project informally at other office functions. Many projects are performed by teams that interact primarily through electronic communication and are, therefore, called *virtual teams*. To avoid miscommunication that can harm trust and to include team members in a project culture, the project team needs a plan for

communicating reliably and in a timely manner. This planning begins with understanding two major categories of communication.

Synchronous Communications

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- *IM (instant messaging)*: Exchange of text or voice messages using pop-up windows on the participants' computer screens
- *Texting*: Exchange of text messages between mobile phones, pagers, or personal digital assistants (PDAs)—devices that hold a calendar, a contact list, a task list, and other support programs

Modern communication technologies make it possible to assemble project teams from anywhere in the world. Most people work during daylight hours, which can make synchronous meetings difficult if the participants are in different time zones. However, it can be an

advantage in some circumstances; for example, if something must be done by the start of business tomorrow, team members in Asia can work on the problem during their normal work hours while team members in North America get some sleep.

Remember Time Zones

It is important to remember time zones and calculate the difference between yours and your associates' zones correctly so as not to miss important meetings or deadlines. Cities and countries to the north or south of each other all observe the same local time. Be aware that many well-educated people in the United States and Canada think of South America as directly south of North America. As you can see, South American countries can be up to five time zones east of North America. A helpful site to convert local time to another time zone is [Time Zone Converter](#).

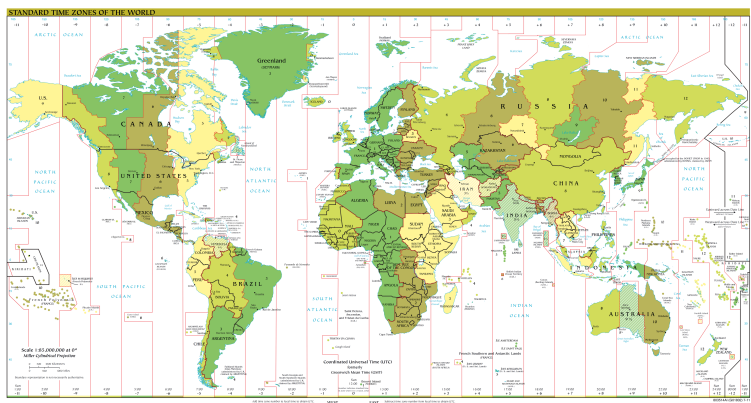


Figure 15.1: World Time Zones.

Time zones are calculated in reference to the time zone of the Royal Observatory in Greenwich, England. The time at that location

is Greenwich Mean Time (GMT). More recent references designate it as Coordinated Universal Time (UTC) instead of GMT. The time zones advance from Greenwich in an easterly direction (Figure 15.1). However, at the international dateline (about the midpoint around the world from Greenwich), you subtract the time zone from GMT. To prevent confusion between a.m. and p.m., times are often given using a 24-hour clock. For example, midnight is indicated as 00:00, noon is 12:00 and 1 p.m. is 13:00.

Example: Conference Call between Toronto and Paris

A project manager for a software development project in Toronto is five time zones west of the reference zone, so the time is given as UTC-5 (or GMT-5). If it is noon in the reference zone, it is 7 a.m. (five hours earlier) in Toronto. The manager would like to contact a project team member in Paris, France. Paris is one time zone east of the reference zone (UTC+1 or GMT+1). If it is noon (12:00) in the reference zone, it is 1 p.m. (13:00) in Paris. This means that there is a six-hour difference between Toronto and Paris. If the project manager waits until after lunch to place the call (1 p.m. in Toronto), it will be too late in the day in Paris (7 p.m.) to reach someone.

Asynchronous Communications

Getting a team together at the same time can be a challenge—especially if they are spread out across time zones. Many

types of communication do not require that the parties are present at the same time. This type of communication is asynchronous. There are several choices of asynchronous communications.

Mail and Package Delivery

Many companies prefer that final contracts are personally signed by an authorized representative of each party to the agreement. If several signatures are required, this can take weeks to get all the signatures if the contracts are transferred by a postal service. If this process is holding up the start of the project, you can use an overnight delivery service to minimize the time spent transferring the documents.

Fax

Fax machines have been around a long time and enjoy a high level of trust for transmitting documents accurately. Although it might seem archaic to still use fax transmissions, in many countries a fax of a signed contract is legal, but a computer-scanned image is not.

Email

Electronic mail (email) is widely used to coordinate projects and to communicate between team members. It has several valuable characteristics for project management:

- Information can be sent to a list of team members.
- Messages can be saved to document the process in case of a

misunderstanding or miscommunication.

- Files can be attached and distributed.

Project Blog

A **blog** is an online journal that can be private, shared by invitation, or made available to the world. Some project managers keep a journal in which they summarize the day's challenges and triumphs and the decisions they made. They return to this journal at a later date to review their decision-making process after the results of those decisions are known to see if they can learn from their mistakes. Many decisions in project management are made with incomplete knowledge, and reflecting on previous decisions to develop this decision-making skill is important to growth as a project manager.

Really Simple Syndication (RSS)

Some projects are directly affected by external factors such as political elections, economic trends, corporate mergers, technological or scientific breakthroughs, or weather. To keep informed about these factors, you can subscribe to online news sources. A technology that facilitates this process is Really Simple Syndication (RSS). Web pages with RSS news feeds have labeled links.

If the user clicks on the RSS feed, news from the website is automatically sent to the user's news reader, such as Google Reader. The news reader can be set to filter the news for key words to limit the stories to those that are relevant to the project.

Assessing New Communication Technologies

New technologies for communicating electronically appear with increasing frequency. Using a new technology that is unfamiliar to the team increases the technology complexity, which can cause delays and increase costs. To decide if a new technology should be included in a communications plan, seek answers to the following questions (Business Dictionary):

- Does the new communication technology provide a competitive advantage for the project by reducing cost, saving time, or preventing mistakes?
- Does the project team have the expertise to learn the new technology quickly?
- Does the company offer support such as a help desk and equipment service for new communication technology?
- What is the cost of training and implementation in terms of time as well as money

Communication Plan Template

So how do you create a communication plan?

1. Identify your stakeholders (to whom)
2. Identify stakeholder expectations (why)
3. Identify communication necessary to satisfy stakeholder expectations and keep them informed (what)
4. Identify time-frame and/or frequency of communication messages (when)
5. Identify how the message will be communicated (the stakeholder's preferred method) (how)
6. Identify who will communicate each message (who)

- 7. Document items – templates, formats, or documents the project must use for communicating.

Figure 15.2 shows a communication plan template.

Figure 1
Communication plan template

Communications Plan				
Project Name:		Beginning Date:		
Project Manager:		Completion Date:		
Plan Owner:				
Planning				
Project objective and key message points (high level):				
<ul style="list-style-type: none">				
Stakeholders – target audience (list)				
<ul style="list-style-type: none">				
Outline				
Timeline (date)	Team Member (responsible for communication)	Target (audience)	Tool (medium for communication delivery)	Message Points

Figure 15.2 Communications Plan Template

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PART IX

MODULE 10: RISK MANAGEMENT

55. Risk Management

Chapter Introduction

Learning Objectives

After reading this chapter, you will be able to:

1. Distinguish between risks and issues.
2. Describe the role of risk management in project success.
3. Identify types of risks based on the project phases.
4. Explain the risk management process.
5. Describe the five responses in risk management.

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56. Risk Management Planning

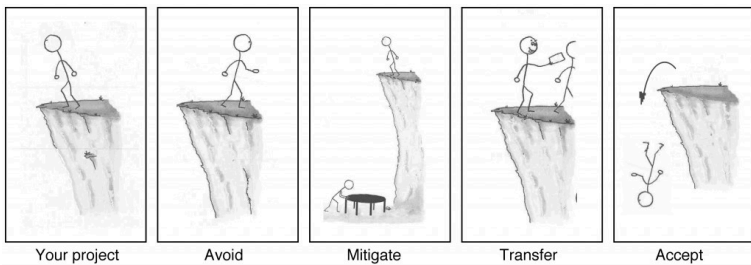


Figure 16.1 Risk Management Options

When you're planning your project, risks are still uncertain: they haven't happened yet. But eventually, some of the risks that you plan for do happen, and that's when you have to deal with them. There are four basic ways to handle a risk.

1. **Avoid:** The best thing you can do with a risk is avoid it. If you can prevent it from happening, it definitely won't hurt your project. The easiest way to avoid this risk is to walk away from the cliff, but that may not be an option on this project.
2. **Mitigate:** If you can't avoid the risk, you can mitigate it. This means taking some sort of action that will cause it to do as little damage to your project as possible.
3. **Transfer:** One effective way to deal with a risk is to pay someone else to accept it for you. The most common way to do this is to buy insurance.
4. **Accept:** When you can't avoid, mitigate, or transfer a risk, then you have to accept it. But even when you accept a risk, at least you've looked at the alternatives and you know what will happen if it occurs. If you can't avoid the risk, and there's nothing you can do to reduce its impact, then accepting it is

your only choice.

By the time a risk actually occurs on your project, it's too late to do anything about it. That's why you need to plan for risks from the beginning and keep coming back to do more planning throughout the project.

The risk management plan tells you how you're going to handle risk in your project. It documents how you'll assess risk, who is responsible for doing it, and how often you'll do risk planning (since you'll have to meet about risk planning with your team throughout the project).

Some risks are technical, like a component that might turn out to be difficult to use. Others are external, like changes in the market or even problems with the weather.

It's important to come up with guidelines to help you figure out how big a risk's potential impact could be. The impact tells you how much damage the risk would cause to your project. Many projects classify impact on a scale from minimal to severe, or from very low to very high. Your risk management plan should give you a scale to help figure out the probability of the risk. Some risks are very likely; others aren't.

Risk Management Process

Managing risks on projects is a process that includes risk assessment and a mitigation strategy for those risks. Risk *assessment* includes both the identification of potential risk and the evaluation of the potential impact of the risk. A **risk mitigation plan** is designed to eliminate or minimize the impact of the **risk events**—occurrences that have a negative impact on the project. Identifying risk is both a creative and a disciplined process. The creative process includes brainstorming sessions where the team is

asked to create a list of everything that could go wrong. All ideas are welcome at this stage with the evaluation of the ideas coming later.

Risk Identification

A more disciplined process involves using checklists of potential risks and evaluating the likelihood that those events might happen on the project. Some companies and industries develop risk checklists based on experience from past projects. These checklists can be helpful to the project manager and project team in identifying both specific risks on the checklist and expanding the thinking of the team. The past experience of the project team, project experience within the company, and experts in the industry can be valuable resources for identifying potential risk on a project.

Identifying the sources of risk by category is another method for exploring potential risk on a project. Some examples of categories for potential risks include the following:

- Technical
- Cost
- Schedule
- Client
- Contractual
- Weather
- Financial
- Political
- Environmental
- People

You can use the same framework as the work breakdown structure (WBS) for developing a **risk breakdown structure (RBS)**. A risk breakdown structure organizes the risks that have been identified into categories using a table with increasing levels of detail to the

right. The people category can be subdivided into different types of risks associated with the people. Examples of people risks include the risk of not finding people with the skills needed to execute the project or the sudden unavailability of key people on the project.

In John's move, John makes a list of things that might go wrong with his project and uses his work breakdown structure as a guide. A partial list for the planning portion of the RBS is shown in Table 16.1.

Table 16.1 Risk Breakdown Structure (RBS)

Task	Risk
Contact Dion and Carlita	<ul style="list-style-type: none">• Dion backs out• Carlita backs out• No common date available
Host planning lunch	<ul style="list-style-type: none">• Restaurant full or closed• Wrong choice of ethnic food• Dion or Carlita have special food allergies or preferences
Develop and distribute schedule	<ul style="list-style-type: none">• Printer out of toner• Out of paper

The result is a clearer understanding of where risks are most concentrated. This approach helps the project team identify known risks, but can be restrictive and less creative in identifying unknown risks and risks not easily found inside the WBS.

Risk Evaluation

After the potential risks have been identified, the project team then evaluates each risk based on the probability that a risk event will

occur and the potential loss associated with it. Not all risks are equal. Some risk events are more likely to happen than others, and the cost of a risk can vary greatly. Evaluating the risk for probability of occurrence and the severity or the potential loss to the project is the next step in the risk management process.

Having criteria to determine high-impact risks can help narrow the focus on a few critical risks that require mitigation. For example, suppose high-impact risks are those that could increase the project costs by 5% of the conceptual budget or 2% of the detailed budget. Only a few potential risk events meet these criteria. These are the critical few potential risk events that the project management team should focus on when developing a project risk mitigation or management plan. Risk evaluation is about developing an understanding of which potential risks have the greatest possibility of occurring and can have the greatest negative impact on the project (Figure 16.2). These become the critical few.

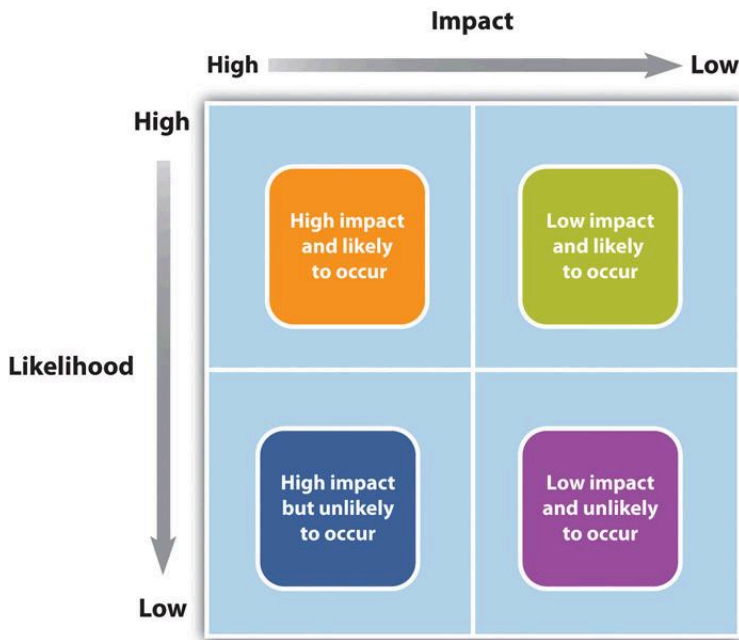


Figure 16.2 Risk and Impact

There is a positive correlation—both increase or decrease together—between project risk and project complexity. A project with new and emerging technology will have a high-complexity rating and a correspondingly high risk. The project management team will assign the appropriate resources to the technology managers to ensure the accomplishment of project goals. The more complex the technology, the more resources the technology manager typically needs to meet project goals, and each of those resources could face unexpected problems.

Risk evaluation often occurs in a workshop setting. Building on the identification of the risks, each risk event is analyzed to determine the likelihood of occurrence and the potential cost if it did occur. The likelihood and impact are both rated as high,

medium, or low. A risk mitigation plan addresses the items that have high ratings on both factors—likelihood and impact.

A project team analyzed the risk of some important equipment not arriving at the project on time. The team identified three pieces of equipment that were critical to the project and would significantly increase costs if they were late in arriving. One of the vendors, who was selected to deliver an important piece of equipment, had a history of being late on other projects. The vendor was good and often took on more work than it could deliver on time. This risk event (the identified equipment arriving late) was rated as high likelihood with a high impact. The other two pieces of equipment were potentially a high impact on the project but with a low probability of occurring.

Not all project managers conduct a formal risk assessment on a project. One reason, as found by David Parker and Alison Mobey in their phenomenological study of project managers, was a low understanding of the tools and benefits of a structured analysis of project risks (2004). The lack of formal risk management tools was also seen as a barrier to implementing a risk management program. Additionally, the project manager's personality and management style play into risk preparation levels. Some project managers are more proactive and develop elaborate risk management programs for their projects. Other managers are reactive and are more confident in their ability to handle unexpected events when they occur. Yet others are risk averse, and prefer to be optimistic and not consider risks or avoid taking risks whenever possible.

On projects with a low-complexity profile, the project manager may informally track items that may be considered risk items. On more complex projects, the project management team may develop a list of items perceived to be higher risk and track them during project reviews. On projects of even greater complexity, the process for evaluating risk is more formal with a risk assessment meeting

or series of meetings during the life of the project to assess risks at different phases of the project. On highly complex projects, an outside expert may be included in the risk assessment process, and the risk assessment plan may take a more prominent place in the project implementation plan.

On complex projects, statistical models are sometimes used to evaluate risk because there are too many different possible combinations of risks to calculate them one at a time. One example of the statistical model used on projects is the Monte Carlo simulation, which simulates a possible range of outcomes by trying many different combinations of risks based on their likelihood. The output from a Monte Carlo simulation provides the project team with the probability of an event occurring within a range and for combinations of events. For example, the typical output from a Monte Carlo simulation may indicate a 10% chance that one of the three important pieces of equipment will be late and that the weather will also be unusually bad after the equipment arrives.

Risk Mitigation

After the risk has been identified and evaluated, the project team develops a risk mitigation plan, which is a plan to reduce the impact of an unexpected event. The project team mitigates risks in various ways:

- Risk avoidance
- Risk sharing
- Risk reduction
- Risk transfer

Each of these mitigation techniques can be an effective tool in reducing individual risks and the risk profile of the project. The risk mitigation plan captures the risk mitigation approach for each

identified risk event and the actions the project management team will take to reduce or eliminate the risk.

Risk avoidance usually involves developing an alternative strategy that has a higher probability of success but usually at a higher cost associated with accomplishing a project task. A common risk avoidance technique is to use proven and existing technologies rather than adopt new techniques, even though the new techniques may show promise of better performance or lower costs. A project team may choose a vendor with a proven track record over a new vendor that is providing significant price incentives to avoid the risk of working with a new vendor. The project team that requires drug testing for team members is practising risk avoidance by avoiding damage done by someone under the influence of drugs.

Risk sharing involves partnering with others to share responsibility for the risky activities. Many organizations that work on international projects will reduce political, legal, labour, and others risk types associated with international projects by developing a joint venture with a company located in that country. Partnering with another company to share the risk associated with a portion of the project is advantageous when the other company has expertise and experience the project team does not have. If a risk event does occur, then the partnering company absorbs some or all of the negative impact of the event. The company will also derive some of the profit or benefit gained by a successful project.

Risk reduction is an investment of funds to reduce the risk on a project. On international projects, companies will often purchase the guarantee of a currency rate to reduce the risk associated with fluctuations in the currency exchange rate. A project manager may hire an expert to review the technical plans or the cost estimate on a project to increase the confidence in that plan and reduce the project risk. Assigning highly skilled project personnel to manage the high-risk activities is another risk-reduction method. Experts managing a high-risk activity can often predict problems and find solutions that prevent the activities from having a negative impact

on the project. Some companies reduce risk by forbidding key executives or technology experts to ride on the same airplane.

Risk transfer is a risk reduction method that shifts the risk from the project to another party. The purchase of insurance on certain items is a risk-transfer method. The risk is transferred from the project to the insurance company. A construction project in the Caribbean may purchase hurricane insurance that would cover the cost of a hurricane damaging the construction site. The purchase of insurance is usually in areas outside the control of the project team. Weather, political unrest, and labour strikes are examples of events that can significantly impact the project and that are outside the control of the project team.

Contingency Plan

The project risk plan balances the investment of the mitigation against the benefit for the project. The project team often develops an alternative method for accomplishing a project goal when a risk event has been identified that may frustrate the accomplishment of that goal. These plans are called contingency plans. The risk of a truck drivers' strike may be mitigated with a contingency plan that uses a train to transport the needed equipment for the project. If a critical piece of equipment is late, the impact on the schedule can be mitigated by making changes to the schedule to accommodate a late equipment delivery.

Contingency funds are funds set aside by the project team to address unforeseen events that cause the project costs to increase. Projects with a high-risk profile will typically have a large contingency budget. Although the amount of contingency allocated in the project budget is a function of the risks identified in the risk analysis process, contingency is typically managed as one line item in the project budget.

Some project managers allocate the contingency budget to the

items in the budget that have high risk rather than developing one line item in the budget for contingencies. This approach allows the project team to track the use of contingency against the risk plan. This approach also allocates the responsibility to manage the risk budget to the managers responsible for those line items. The availability of contingency funds in the line item budget may also increase the use of contingency funds to solve problems rather than finding alternative, less costly solutions. Most project managers, especially on more complex projects, manage contingency funds at the project level, with approval of the project manager required before contingency funds can be used.

Project Risk by Phases

Project risk is dealt with in different ways depending on the phase of the project.

Initiation

Risk is associated with things that are unknown. More things are unknown at the beginning of a project, but risk must be considered in the initiation phase and weighed against the potential benefit of the project's success in order to decide if the project should be chosen.

In the initiation phase of his move, John considers the risk of events that could affect the whole project. Lets assume that John's move is not just about changing jobs, but also a change of cities. This would certainly incur more risks for the project. He identifies the following

risks during the initiation phase that might have a high impact and rates the likelihood of their happening from low to high.

1. His new employer might change his mind and take back the job offer after he's given notice at his old job: Low.
2. The current tenants of his apartment might not move out in time for him to move in by the first day of work at the new job: Medium.
3. The movers might lose his furniture: Low.
4. The movers might be more than a week late delivering his furniture: Medium.
5. He might get in an accident driving from Chicago to Atlanta and miss starting his job: Low.

John considers how to mitigate each of the risks.

1. During his job hunt, John had more than one offer, and he is confident that he could get another job, but he might lose deposit money on the apartment and the mover. He would also lose wages during the time it took to find the other job. To mitigate the risk of his new employer changing his mind, John makes sure that he keeps his relationships with his alternate employers cordial and writes to each of them thanking for their consideration in his recent interviews.
2. John checks the market in Atlanta to determine the weekly cost and availability of extended-stay motels.
3. John checks the mover's contract to confirm that they carry insurance against lost items, but they require the owner to provide a detailed list with value estimates and they limit the maximum total value. John decides to go through his apartment with his digital camera and take pictures of all of his possessions that will be shipped by truck and to keep the camera with him during the move so he has a visual record and won't have to rely on his memory to make a list. He seals and numbers the boxes so he can tell if a box is missing.
4. If the movers are late, John can use his research on extended-stay motels to calculate how much it would cost. He

checks the moving company's contract to see if they compensate the owner for late delivery, and he finds that they do not.

5. John checks the estimated driving time from Chicago to Atlanta using an Internet mapping service and gets an estimate of 11 hours of driving time. He decides that it would be too risky to attempt to make the drive by himself in one day, especially if he didn't leave until after the truck was packed. John plans to spend one night on the road in a motel to reduce the risk of an accident caused by driving while too tired.

John concludes that the medium-risks can be mitigated and the costs from the mitigation would be acceptable in order to get a new job.

Planning Phase

Once the project is approved and it moves into the planning stage, risks are identified with each major group of activities. A risk breakdown structure (RBS) can be used to identify increasing levels of detailed risk analysis.

John decides to ask Dion and Carlita for their help during their first planning meeting to identify risks, rate their impact and likelihood, and suggest mitigation plans. They concentrate on the packing phase of the move. They fill out a table of risks, as shown in Table 16.2.

Legend:

- RA: Risk avoidance
- RS: Risk sharing
- RR: Risk reduction

- RT: Risk transfer

Table 16.2: Risk Breakdown Structure (RBS) for Packing John's Apartment

Task	Risks	Mitigation
Pack kitchen	Cuts from handling sharp knives	Buy small boxes for packing knives (RR)
	Cuts from cracked glasses that break while being packed	Discard cracked glasses (RA)
	Transporting alcoholic beverages	Give opened bottles to Dion or Carlita (RA)
	Damage to antique furniture	Supervise wrapping and loading personally (RR) and require movers to insure against damage (RT)
Packing living room	Lose parts while taking apart the entertainment centre	Buy box of large freezer bags with a marker to bag and label parts (RR)
	Break most valuable electronics—TV, DVD, Tuner, Speakers	Buy boxes of the right size with sufficient bubble wrap (RR)
Pack bedroom	Break large mirror	Buy or rent a mirror-box with Styrofoam blocks at each corner (RR)
	Lose prescription drugs or pack them where they cannot be found quickly	Separate prescription drugs for transportation in the car (RA)
Pack remaining items	Damage to house plants	Ask Carlita to care for them and bring them with her in her van when she visits in exchange for half of them (RS)
	Transportation of flammable liquids from charcoal grill	Give to Dion or Carlita (RA)

Implementation Phase

As the project progresses and more information becomes available to the project team, the total risk on the project typically reduces, as activities are performed without loss. The risk plan needs to be updated with new information and risks checked off that are related to activities that have been performed.

Understanding where the risks occur on the project is important information for managing the contingency budget and managing cash reserves. Most organizations develop a plan for financing the project from existing organizational resources, including financing the project through a variety of financial instruments. In most cases, there is a cost to the organization to keep these funds available to the project, including the contingency budget. As the risks decrease over the length of the project, if the contingency is not used, then the funds set aside by the organization can be used for other purposes.

To determine the amount of contingency that can be released, the project team will conduct another risk evaluation and determine the amount of risk remaining on the project. If the risk profile is lower, the project team may release contingency funds back to the parent organization. If additional risks are uncovered, a new mitigation plan is developed including the possible addition of contingency funds.

Closeout Phase

During the closeout phase, agreements for risk sharing and risk transfer need to be concluded and the risk breakdown structure examined to be sure all the risk events have been avoided or mitigated. The final estimate of loss due to risk can be made and recorded as part of the project documentation. If a Monte Carlo

simulation was done, the result can be compared to the predicted result.

To close out the risk mitigation plan for his move, John examines the risk breakdown structure and risk mitigation plan for items that need to be finalized. He makes a checklist to be sure all the risk mitigation plans are completed, as shown in Table 16.3. Risk is not allocated evenly over the life of the project. On projects with a high degree of new technology, the majority of the risks may be in the early phases of the project. On projects with a large equipment budget, the largest amount of risk may be during the procurement of the equipment. On global projects with a large amount of political risk, the highest portion of risk may be toward the end of the project.

Table 16.3 Closeout of Risk Mitigation Plan for John's Move

Risk	Mitigation	Closeout
Items lost by movers	Mover's insurance plus digital image inventory	Confirm all of the numbered boxes are present and still sealed.
Antique furniture damaged	Mover's insurance plus personal supervision of wrapping and loading	Supervise unloading and unwrapping; visually inspect each piece.
House plants	Ask Carlita to bring half of them in her van when she visits.	Confirm that the plants are healthy and that Carlita brought about half of them.

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Parker, D., & Mobey, A. (2004). Action Research to Explore Perceptions of Risk in Project Management. *International Journal of Productivity and Performance Management* 53(1), 18–32.

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Introduction

Life is full of risk and uncertainty and, as a result, life can often be unfair. These are statements of fact—the real point of interest is how one responds to them. Some people and organizations accept the unexpected, whereas others try to ensure that the unexpected never happens. The former situation is commonly termed risk and, in its extreme form, uncertainty—a relatively passive lack of knowledge of what might occur. The latter course of action is commonly termed risk management, an attempt to control what may (or may not) occur.

This range of conditions can be expressed as follows, where “P(X)” represents the probability of a state of knowledge.

img

There is a full body of literature on this spectrum of states and the associated topic of risk management. This paper, however, will briefly survey the primary principles to be found on this theme and will focus on the concept of “risk homeostasis” and the unintended consequences in behavior that frequently occur as a result of it.

The Meaning of Risk Management and Mitigation

Prior to delving too deeply into the topic of risk management, it is appropriate to define the terms under discussion. As a point of departure, it is useful to note that risk commonly has an adverse connotation, reflecting potential hazards, but it can also be construed as an opportunity with a positive perspective. Regardless of its nuance, risk reflects a potential occurrence as opposed to an issue, which denotes an actual event. This difference between a risk and an issue is an important one, because the former involves management through planning, forecasting, and analysis, whereas the latter requires administration and execution.

The actual management of risk begins with an appreciation of its myriad sources, which can be generally summarized by the representative, if abbreviated, list as shown below:

- Technology
- Business Structure (Organizational, Processes, etc)
- Critical Activities
- Scope, Cost, and Duration of Effort
- User Experience
- Externalities (Economy, Competitive Markets, etc)
- System Complexity
- Assumptions

Given that risk exists in virtually every aspect of individual and organizational endeavors, both entities spend a significant amount of time in the identification, analysis, and administration of risks and their anticipated outcomes in an attempt to manage and control them. This overall effort, conducted under the aegis of “risk management,” can take on many forms, but essentially addresses the following concerns (Exhibit 1):

Components of risk management

Exhibit 1: Components of risk management

Note that a risk priority is a function of the probability of occurrence times the impact of the outcome of that occurrence, or $P(X) \cdot \text{Impact}(X)$. Furthermore, active risk mitigation can take on many forms, but they all essentially revolve around the factors of reductions in the

- Probability of Occurrence and
- Impact of Occurrence

How is this accomplished? Again, boiled down to its essentials, risk management and mitigation have two, primary components:

- Risk Assessment – Identification, analysis, and prioritization of risks (as shown above)
- Risk Control – Taking steps to reduce risk, providing a contingency factor, and monitoring of improvements

The tasks of identification, analysis, prioritization, and mitigation in the name of risk management reflect the fact that, as previously noted, individuals and organizations spend a considerable amount of time and effort in these endeavors. Why? Simply stated, individuals and organizations tend to be risk adverse in general and openly apprehensive about the more severe circumstances of uncertainty in particular; however, because risk is everywhere, entities at all levels have come to develop a sense of *acceptable* risk, a sense of what constitutes degrees of comfort and relative safety.

Relationship to Quality

The ideas of comfort and relative safety can also be viewed from the perspective of quality. As discussed by Hyatt and Rosenberg (1996), there are at least five possible views of quality:-

- Transcendental –something that can be recognized but

difficult to specifically define

- User – fitness for intended purpose
- Manufacturer – conformance to specification
- Product – adherence to product features
- Value – dependent on what the end-user is willing to pay for it
-

Each of these views of quality can be expanded in much greater detail, but the point to note is that they each represents a type of risk if not met in its intended manner. A generalized individual/organizational point of view, though, is based on what has been identified as a sense of *acceptable* risk, a sense of what constitutes a degree of comfort and relative safety. Stated differently, there is a much more *pragmatic* view of quality (and risk)—does the product or service work well enough to serve its intended purpose and is it available when needed? Viewed from this perspective, quality measures can be seen to be a leavening mechanism for the development of a sense of relative comfort at an acceptable level of risk to the individual or organization.

Risk Homeostasis

The net result is that risk identification and analyses are conducted, priorities are established, and mitigation efforts (including quality testing and control) are put into place as parts of an overall risk management plan to increase reasonable and acceptable (i.e., pragmatic) individual and organizational levels of comfort and safety. However, the concept of *risk homeostasis* states that an individual/organization has an overall, inherent level of acceptable risk that is not easily altered; hence, when the general level of acceptable risk in one part of an organization's operations changes, there will almost always be a corresponding and opposing change in the level of acceptable risk elsewhere.

Despite the best intentions of risk *management*, a change in risk *behavior* frequently supports the impact of unintended consequences in that actions that actually result in greater risks are often generated in other areas. In turn, a conundrum is created in terms of what to measure and control without a complete stifling of individual/organizational leadership and creativity. Recognition of this distinct possibility leads back to the concept of risk management, with the addition of the need to account for changes in risk behavior beyond the immediate arena of a risk mitigation course of action. In short, a fifth general concern of risk management needs to be recognized:

- Outcome What might be the unintended behavior of a mitigation strategy?

To achieve a true increase in overall comfort and safety, organizations need to recognize that the simple identification of risks and application of controls is insufficient. It is an understanding of the changes in behavior generated by the institution of controls that must also be clearly recognized and measured for meaningful levels of comfort and safety to be achieved *while still permitting effective operations*. An organization can always ensure that it is completely comfortable and safe through the application and enforcement of rigorous controls and insulation from a volatile environment, but that same organization is then quite likely to become moribund and very slow to accept the necessary change in order to remain competitive in its industry.

Homeostatic Control Mechanisms

Since actual risk behavior can run counter to planned risk management expectations, it is important to digress for a moment to consider the homeostatic control mechanisms. All such mechanisms are based on three, primary elements:

- Receptor – the sensing component that monitors and responds to changes in the environment or process being measured
- Control Center – the analytical engine that receives stimuli from a receptor and determines an appropriate response
- Effector – the instrument that takes the necessary action to correct a deviation from a pre-determined standard (negative feedback) versus a positive action that seeks to enhance the deviation

Note that the “necessary action” taken by an effector in response to a receptor’s stimulus to the control center can be either negative or positive in nature. A negative action tends to suppress variation and return the condition to the desired standard. The degree of response is often dependent on the magnitude of variation from the standard. Positive actions, while generally viewed in a favorable light, can, if unchecked, lead to significant deviations from a desired norm, so upper bounds are frequently established to keep them within a reasonable, or manageable, level. The underlying concern is that, if left unchecked, positive actions may cause unintended changes to the rest of a system.

- Think of the recent financial crisis in this regard where unchecked investments and returns led to the well-known outcome for the financial industry and economy.
- When viewed from an information systems point of view, the collection and processing of transactional data can actually lead to the detriment of overall performance.

Balance of Risk – Risk Compensation

To repeat the core argument presented above, the theory of risk homeostasis states that an individual or organization has an

inherent target level of acceptable risk that does not readily change; this level can vary widely between individuals and organizations. When the level of acceptable risk in one part of an entity's environment or desired level of comfort and safety changes, there will often be a corresponding rise and/or drop in acceptable risk elsewhere. This is a process known as *risk compensation*. It is a tendency in individuals and organizations to increase risky behavior proportionately as safeguards are introduced and it is very common. It is so common, in fact, as to render predictions of how well any given aspect of risk management will work highly suspect, if not almost useless.

Consider several examples of the combined elements of risk management, risk homeostasis, and risk compensation, and the effectively unintended responses that they generate, as follows:

- A well-known study of Munich taxicab drivers was conducted while the taxicab fleet was being changed over to ABS braking systems. The drivers were tracked by observers unaware of which kind of brakes each cab had. Against the expectations of traffic experts who recommend ABS brakes as a safety advance, the drivers with ABS brakes actually had more accidents per vehicle mile than those without these brakes. The drivers braked more sharply, made tighter turns, drove at higher speeds, and made a number of other (negative) adjustments to their driving, all of which more than compensated for their supposedly safer vehicles.
- The National Football League (NFL) has recently been enforcing "safe" game activities by fining players who engage in risky behavior, such as helmet-to-helmet hits. However, the question has arisen as to whether these activities would be practiced if the players were not fully wrapped in equipment and padding meant to protect them from injury. If the players had the same limited protection that is found in such field sports as soccer, lacrosse, or rugby, would there be the same or reduced level of risky behavior?

- Motorists tend to give cyclists not wearing helmets a wider berth when passing, indicating that the act of wearing a helmet actually increases the chance that a cyclist will be hit by an automobile or incur a greater number of near misses.
- The use of birth control pills is widely known to prevent unwanted pregnancies, but the unintended consequence of their use seems to be a change in social mores in general and the increased practice of riskier sex in particular.
- In the area of project management, it is common to provide for a “management reserve” or contingency fund as a means of addressing risk. When discussed in this context, a “pad” can refer to a cushion (as suggested) or a de facto cushion provided by a contingency fund. The overall thought is that a “pad” is some source of extra allowance beyond a point estimate of scope, time, cost, quality, etc. If there is, in fact, a “pad” (or cushion or contingency fund or allowance) available to a team, there is reason to believe that it (the team) may be more willing to take risks that it would otherwise not take.

This list of examples could be extended, but these five examples bring forth the following two key aspects of risk management to consider:

- The first is that individuals and organizations may not base their actions on actual danger as much as their perception of risk to them. Recognition of this approach suggests that it may be better to adjust the individual/organizational sensitivity of risk instead of, or in addition to, improving the safety of the internal or external environment.
- Second, if risk homeostasis and compensation are based on perception, an argument can be made that transparent safety measures would have little, if any, effect on behavior. Thus, for example, the use of a hidden management reserve for projects would have little impact on the behavior of members of the project team.

Moral Risk/Hazard

Consideration of this overall discussion and its associated examples leads to the concept of *moral risk* or *hazard*. If one party (e.g., a project team or manager) has more information about a situation and/or takes what appears to be an unwarranted action by an unsuspecting second party (perhaps management), then it is not uncommon for the second party to feel that the first is acting in an inappropriate manner. This level of *informational asymmetry* can also be found in such diverse areas as producers versus consumers, software developers versus users, and so forth. The overall situation need not be a concern, because different levels of information, especially of a technical nature, are common unless the party that possesses greater information acts in a manner that does not recognize and assume responsibility for the full consequences of its actions. If this occurs, the knowledgeable party may have a tendency to act less carefully than otherwise, leaving another party to hold some degree of responsibility for the consequences of those actions.

This consideration could rapidly turn into a discussion of either ethics or the effects of economic externalities, but the point to be noted here is that risk management and its resulting (often unintended) behavior can be, and often is, a highly interactive process. Even though it can be argued that moral risk/hazard is a function of the effect of events outside the control of an entity's actions, or at least how others credit and blame that entity for those actions, the fact remains that risk management activities can have significant impacts on behavior and outcomes, whether intended or not.

Interim Conclusion

This entire discussion boils down to the recognition that the impact of unintended consequences is extraordinarily applicable when talking about risk management and control through mitigation and safety innovations. Actions intended to make an individual or organization more secure may not make any improvement at all to overall safety or a perceived level of comfort—they may actually create a less safe set of processes or environment. Stated bluntly, the tendency to take compensatory risks may trump all the efforts of risk analysts and safety engineers; so, perhaps in the end, no one can save us from ourselves.

Setting aside this fatalistic orientation, it would be easy enough to place greater emphasis on establishing and enforcing a set of rigorous rules to achieve a level of safety and/or comfort. Rules are measurable, so accountability is fairly easy; however, to achieve perfect success in training people to follow these rules, they will always depend on a system in which the rules are consistently clear, fair, and well enforced, a feat far easier said than done. This approach also runs the distinct risk of the unintended consequence of developing unthinking automatons. What is preferable is a model in which individuals and organizational entities use their best judgment and treat others as they would want to be treated. This attitude works well in most situations, but, of course, it hinges on people operating under good judgment and an acceptable level of risk, neither of which is guaranteed.

Risk Management Models

So, if the concept of risk homeostasis and compensatory actions is correct, are the role and purpose of risk management exercises in futility? As suggested above, this is a defeatist mindset. It is far

more appropriate to recognize and account for the elements of risk homeostasis and compensatory actions than to either ignore or blindly accept them. Stated differently, the full consideration and open communication of risk is crucial as a beginning step to effective risk management and its resulting behavior (de Bekker, et. al., 2011).

As a first step in this direction, it is necessary to develop a risk management plan that has the key components of identification, analysis, mitigation, and monitoring. This first step can be initiated through the development and use of a risk management plan template, similar to the one shown here (Exhibit 2):

Risk Management Plan Template

Exhibit 2 – Risk Management Plan Template

Note that this template, although quite satisfactory in that it explicitly addresses each major component of risk management and clearly promotes the open and full discussion of risk, it is missing one key item. It does not focus on the monitoring of individual or organizational activities *after* the actions taken to control probability and impact to avoid the occurrence of unintended consequences. What is also not shown by this template is who completes it and when it is completed; the schematic shown below addresses these omissions. Note that each of the four steps shown in this model promotes both analysis and communication through the use of different, but related and supporting, tools of analysis by varying entities.

Levels of risk management

Exhibit 3: Levels of risk management

Relationship to Change Management

Up to this point, it has been implicitly suggested that organizational change is a natural outcome of risk management. It is therefore

appropriate to explicitly consider how that change can be implemented and accepted by a target audience in its intended manner. The single most important factor in motivating a change of any type, but especially one whose necessity may not be immediately clear (as is often the case with risks before they become issues), is the provision of clear and convincing evidence of the need for the change and its associated behavior. Simply put, anyone who is expected to recognize the need for and adopt the change must be convinced that the benefits from the to-be system outweigh the individual and organizational costs of changing.

There are two major strategies used to providing a motivation for the adoption of a change: informational and political. Both strategies may be used simultaneously. With an informational strategy, the goal is to convince potential adopters that the changes in process and their behavior are for the better, more specifically, *their* better. This strategy works when the perception of the change to the target adopters has more benefits than costs. In other words, there are clear reasons for the potential adopters to welcome the change. This is often the case when risks have become issues, providing the basis for clear (and repeated) communication to the affected parties. In general, informational campaigns are more likely to be successful if they stress the reduction or elimination of problems/issues rather than focusing on the provision of new opportunities or the institution of new processes and procedures.

The other approach used to initiate change is a political strategy. With this method, organizational power, not information, is used to motivate a change in process and associated behavior. It is often used when there are more perceived costs than benefits to the target adopters. In other words, although the change may benefit the organization, there are no immediately apparent reasons for the potential adopters to welcome the change because the risk is not readily recognized. The political strategy is usually beyond the direct control of the project team, requiring someone in the organization, who holds legitimate power over the target group,

to influence it to adopt the change. In general, for any change that has true organizational benefits, approximately 20% to 30% of potential adopters will be ready adopters; they will recognize the benefits, quickly adopt the change, and become proponents of the new processes and system. Another 20% to 30% will be resistant adopters; they will simply refuse to accept the change and fight against it, either because the new system has more costs than benefits for them personally or because they place such a high cost on the transition process itself that no amount of benefits from the new system can outweigh the change costs. The remaining 40% to 60% can be termed reluctant adopters; they can be viewed as being the swing vote for the success of a change in process and intended behavior.

Typically, successful adoption of a change for a perceived need has signaled a confidence in its potential to alleviate a particular problem or to make a job easier or more efficient, which is the case with an “issue.” In contrast, it is much harder for the perception of a possible condition (a “risk”) to bring about new organizational and functional conditions. In essence, the adoption and diffusion of a change within an organization do not guarantee its successful integration into the organizational fabric for its continued use and reduction in risk through expected behavior. In addition to the strong, stable advocacy needed to ensure the conditions necessary for change adoption and diffusion, training in its technical aspects and application to real and *readily perceived* needs are crucial to its integration beyond the innovators and early adopters. Time for experimentation and the development of applications is essential for the institution of intended behavior through successful peer users to lead its integration into the organizational fabric. If the change is perceived as being difficult to learn and/or too time consuming to prepare and use, or is in some other way perceived as threatening, it probably will not be used. No amount of administrative force is likely to be effective in reversing a negative trend, giving rise, again, to unintended consequences of behavior and outcomes.

A Special Excursion into the Unknown – Black Swans

While the foregoing risk models are a step in the right direction, they also represent a potential hazard if their users assume that they have accounted for all known risks or that the process is sufficient to counter all anticipated risks. This reflects the dangerous sin of hubris and has been described by the phrase “black swan,” as taken from the title of the 2007 book by Nicholas Nassim Taleb, *The Black Swan: The Impact of the Highly Improbable*.

This new term has become popular among managers, including some risk specialists, when they talk about risk. As discussed by Hillson (2010), the way most people use this term is different from Taleb’s original definition. In popular conversation, the *black swan* event is something with an extremely low likelihood of occurrence and an extremely high potential effect. It is seen as the thing that is thought will never happen, but, if it did happen, then the individual/organization would be affected in a really big way. In contrast, Taleb states in his book that black swans have three characteristics: they are unexpected and unpredictable outliers, they have extreme impacts, and *they appear obvious after they have happened*.

The term comes from the idea that in the western world a few centuries ago, it was a known fact that all swans were white; by definition, any similar bird of a different color could not be a swan. Then, explorers travelled to Australia in 1697 and discovered true swans that were black, and the known fact had to be modified in light of the new evidence. In today’s world, the concept of a black swan changes the rules and creates a new paradigm. Examples include the fall of the Berlin Wall, the 11 September 2001 terrorist attacks in the United States, the rise of Google, the recent financial and housing crises, or the recent Japanese tsunami. However, events or circumstances with extremely low probability and extremely high impact are, in fact, still just risks, and they can

and should be tackled through the normal risk process. Given this perspective, it can be argued that there is no useful reason to give them the special name of *black swans*.

Another popular use for the *black swan* term is to describe “unknown unknowns,” which are things that we do not know, but where we are unaware of our ignorance. This is almost correct, but not quite; in fact, Hillson shows that “unknown unknowns” can be divided into two types, one of which is a true black swan and the other is not:

- The first group consists of “unknown-but-knowable unknowns.” There are some uncertainties that we currently do not know, but which we could find out about. This is where the risk process can help through creative risk identification, exploration, and education. The aim is to expose those unknowns that could be known so that we can deal with them effectively using a standard risk management approach. They are not black swans because we *could* know about them if our predictive or discovery processes were better.
- Second, there are “unknown-but-unknowable unknowns.” These are much more difficult to address, because, by definition, they can never be discovered unless and until they happen. These are the true black swans, which could not be predicted with even the best risk process. Risk management cannot help here because it only targets uncertainties that can be seen in advance and for which we can prepare or address proactively.

If risk management cannot be used to address black swans in advance, is there anything else that can be done? At the strategic level, business continuity is a form of risk management that can help deal with “unknown-but-unknowable unknowns.” This approach identifies areas of vulnerability and ensures that resilience and flexibility are built into the organizational structure so it can cope with the impact of the unexpected, whatever its source. Business

continuity also reflects risk analysis in that it looks for early warning indicators or trigger events to warn that something is different from the norm. Finally, it uses environmental scanning to help discover potential black swans before they strike. It is possible to apply this at other levels in the organization, including projects and programs or at an operational level, creating an “enterprise-wide continuity” approach.

In summary, the black swan is a valuable concept that can warn the project team or overall organization to expect the unexpected. The only certainty is uncertainty, and we know that we will continue to be surprised in all areas of life, both personal and professional. We should be careful to use the term properly and not dilute it through misuse or laziness. If we mistakenly think that all risks with very low probability and very high impact are black swans, then we are likely to remain blind to the existence of *true* black swans. That, in turn, will leave us unaware of how vulnerable we are to genuinely unknowable unknowns, and the real purpose of a risk management plan will be a failure.

Closing Thoughts

To re-state the beginning of this paper, life is full of risk and uncertainty, and, as a result, life is often unfair. These are statements of fact—the real point of interest is how one responds to them. The concepts of risk homeostasis and compensation, often leading to unintended consequences from efforts to make life and business operations safer and more comfortable, may appear to denigrate the efforts of risk management and the various ways used to mitigate risk. However, to paraphrase the old saying, it is better to light a single candle of risk assessment and control than to curse the darkness of uncertainty and unknown risk behavior. To do otherwise is to completely relinquish control to the vagaries of

fate—a situation of great angst and potential peril to the individual or organization.

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58. Risk Management and Project Success

Successful project managers manage the differing perceptions of risk, and the widespread confusion about its very nature, by engaging in systematic risk management. According to the Financial Times (n.d.), risk management is “the process of identifying, quantifying, and managing the risks that an organization faces”. In reality, the whole of project management can be thought of as an exercise in risk management because all aspects of project management involve anticipating change and the risks associated with it.

The tasks specifically associated with risk management include “identifying the types of risk exposure within the company; measuring those potential risks; proposing means to hedge, insure, or mitigate some of the risks; and estimating the impact of various risks on the future earnings of the company” (Financial Times, n.d.). Engineers are trained to use risk management tools like the risk matrix shown in figure 9-1, in which the probability of the risk is multiplied by the severity of consequences if the risk does indeed materialize.

		IMPACT				
PROBABILITY		A	B	C	D	E
		Negligible	Minor	Moderate	Minor	Severe
	E Very Likely	Low Medium	Medium	Medium High	High	High
	D Likely	Low	Low Medium	Medium	Medium High	High
	C Possible	Low	Low Medium	Medium	Medium High	Medium High
	B Unlikely	Low	Low Medium	Low Medium	Medium	Medium High
	A Very Unlikely	Low	Low	Low Medium	Medium	Medium

Figure 9-1: A risk matrix is a tool engineers often use to manage risk

This and other risk management tools can be useful because they

provide an objective framework for evaluating the seriousness of risks to your project. But any risk assessment tool can do more harm than good if it lulls you into a false sense of security, so that you make the mistake of believing you really have foreseen every possible risk that might befall your project. You don't want to make the mistake of believing that the tools available for managing risk can ever be as precise as the tools we use for managing budgets and schedules, even as limited as those tools are.

Perhaps the most important risk management tool is your own ability to learn about the project. The more you know about a project, the better you will be at foreseeing the many ways the project could go awry and what the consequences will be if they do, and the better you will be at responding to unexpected challenges.

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59. Risk Management Process

Managing risks on projects is a process that includes risk assessment and a mitigation strategy for those risks. Risk assessment includes both the identification of potential risk and the evaluation of the potential impact of the risk. A risk mitigation plan is designed to eliminate or minimize the impact of the risk events—occurrences that have a negative impact on the project. Identifying risk is both a creative and a disciplined process. The creative process includes brainstorming sessions where the team is asked to create a list of everything that could go wrong. All ideas are welcome at this stage with the evaluation of the ideas coming later.

Risk Identification

A more disciplined process involves using checklists of potential risks and evaluating the likelihood that those events might happen on the project. Some companies and industries develop risk checklists based on experience from past projects. These checklists can be helpful to the project manager and project team in identifying both specific risks on the checklist and expanding the thinking of the team. The past experience of the project team, project experience within the company, and experts in the industry can be valuable resources for identifying potential risk on a project.

Identifying the sources of risk by category is another method for exploring potential risk on a project. Some examples of categories for potential risks include the following:

- Technical
- Cost
- Schedule
- Client

- Contractual
- Weather
- Financial
- Political
- Environmental
- People

You can use the same framework as the work breakdown structure (WBS) for developing a risk breakdown structure (RBS). A risk breakdown structure organizes the risks that have been identified into categories using a table with increasing levels of detail to the right. The people category can be subdivided into different types of risks associated with the people. Examples of people risks include the risk of not finding people with the skills needed to execute the project or the sudden unavailability of key people on the project.

Example: Risks in John's Move

In John's move, John makes a list of things that might go wrong with his project and uses his work breakdown structure as a guide. A partial list for the planning portion of the RBS is shown in Figure 9-2. The result is a clearer understanding of where risks are most concentrated. This approach helps the project team identify known risks, but can be restrictive and less creative in identifying unknown risks and risks not easily found inside the WBS.

Level 1	Level 2	Level 3
Plan Move	Contact Dion and Carlita	Dion backs out
		Carlita backs out
		No common date available
	Host Planning Lunch	Resturant full or closed
		Wrong choice of ethnics food
		Dion or Carlita have special food allergies or preferences
	Develop and Distribute Schedule	Printer out of toner
		Out of paper

Figure 9-2: Risk Breakdown Structure (RBS)

Risk Evaluation

After the potential risks have been identified, the project team then evaluates each risk based on the probability that a risk event will occur and the potential loss associated with it. Not all risks are equal. Some risk events are more likely to happen than others, and the cost of a risk can vary greatly. Evaluating the risk for probability of occurrence and the severity or the potential loss to the project is the next step in the risk management process.

Having criteria to determine high-impact risks can help narrow the focus on a few critical risks that require mitigation. For example, suppose high-impact risks are those that could increase the project costs by 5% of the conceptual budget or 2% of the detailed budget. Only a few potential risk events meet these criteria. These are the critical few potential risk events that the project management team

should focus on when developing a project risk mitigation or management plan. Risk evaluation is about developing an understanding of which potential risks have the greatest possibility of occurring and can have the greatest negative impact on the project (Figure 9-3). These become the critical few.

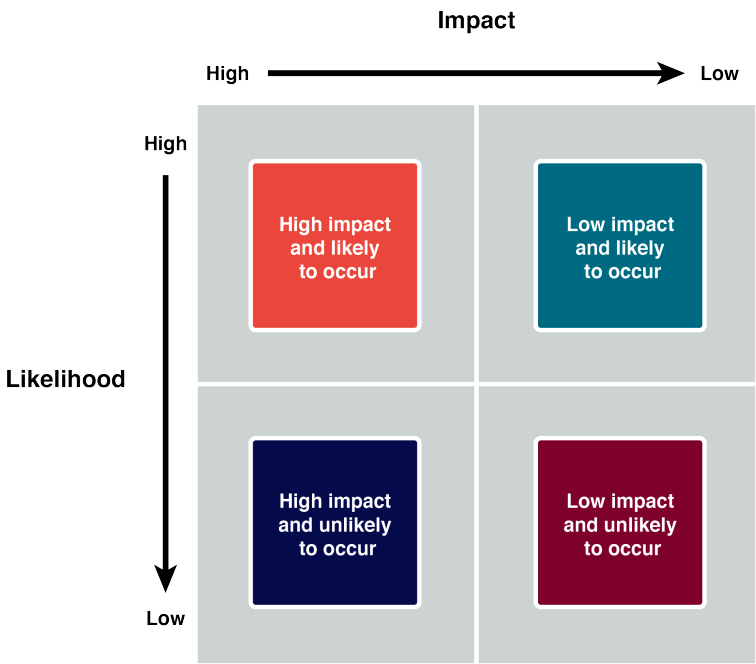


Figure 9-3: Risk and Impact

There is a positive correlation—both increase or decrease together—between project risk and project complexity. A project with new and emerging technology will have a high-complexity rating and a correspondingly high risk. The project management team will assign the appropriate resources to the technology managers to ensure the accomplishment of project goals. The more complex the technology, the more resources the technology

manager typically needs to meet project goals, and each of those resources could face unexpected problems.

Risk evaluation often occurs in a workshop setting. Building on the identification of the risks, each risk event is analyzed to determine the likelihood of occurrence and the potential cost if it did occur. The likelihood and impact are both rated as high, medium, or low. A risk mitigation plan addresses the items that have high ratings on both factors—likelihood and impact.

Example: Risk Analysis of Equipment Delivery

A project team analyzed the risk of some important equipment not arriving at the project on time. The team identified three pieces of equipment that were critical to the project and would significantly increase costs if they were late in arriving. One of the vendors, who was selected to deliver an important piece of equipment, had a history of being late on other projects. The vendor was good and often took on more work than it could deliver on time. This risk event (the identified equipment arriving late) was rated as high likelihood with a high impact. The other two pieces of equipment were potentially a high impact on the project but with a low probability of occurring.

Not all project managers conduct a formal risk assessment on a project. One reason, as found by David Parker and Alison Mobey in their phenomenological study of project managers, was a low understanding of the tools and benefits of a structured analysis of project risks (Parker et. al., 2004). The lack of formal risk management tools was also seen as a barrier to implementing a risk management program. Additionally, the project manager's personality and management style play into risk preparation levels. Some project managers are more proactive and develop elaborate risk management programs for their projects. Other managers are reactive and are more confident in their ability to handle unexpected events when they occur. Yet others are risk averse, and prefer to be optimistic and not consider risks or avoid taking risks whenever possible.

On projects with a low-complexity profile, the project manager

may informally track items that may be considered risk items. On more complex projects, the project management team may develop a list of items perceived to be higher risk and track them during project reviews. On projects of even greater complexity, the process for evaluating risk is more formal with a risk assessment meeting or series of meetings during the life of the project to assess risks at different phases of the project. On highly complex projects, an outside expert may be included in the risk assessment process, and the risk assessment plan may take a more prominent place in the project implementation plan.

Generally, for complex projects, statistical models are sometimes used to evaluate risk because there are too many different possible combinations of risks to calculate them one at a time. One example of the statistical model used on projects is the Monte Carlo simulation, which simulates a possible range of outcomes by trying many different combinations of risks based on their likelihood. The output from a Monte Carlo simulation provides the project team with the probability of an event occurring within a range and for combinations of events. For example, the typical output from a Monte Carlo simulation may indicate a 10% chance that one of the three important pieces of equipment will be late and that the weather will also be unusually bad after the equipment arrives.

Risk Mitigation

After the risk has been identified and evaluated, the project team develops a risk mitigation plan, which is a plan to reduce the impact of an unexpected event. The project team mitigates risks in various ways:

- Risk avoidance
- Risk sharing
- Risk reduction

- Risk transfer

Each of these mitigation techniques can be an effective tool in reducing individual risks and the risk profile of the project. The risk mitigation plan captures the risk mitigation approach for each identified risk event and the actions the project management team will take to reduce or eliminate the risk.

Risk Avoidance usually involves developing an alternative strategy that has a higher probability of success but usually at a higher cost associated with accomplishing a project task. A common risk avoidance technique is to use proven and existing technologies rather than adopt new techniques, even though the new techniques may show promise of better performance or lower costs. A project team may choose a vendor with a proven track record over a new vendor that is providing significant price incentives to avoid the risk of working with a new vendor. The project team that requires drug testing for team members is practicing risk avoidance by avoiding damage done by someone under the influence of drugs.

Risk Sharing involves partnering with others to share responsibility for the risky activities. Many organizations that work on international projects will reduce political, legal, labor, and others risk types associated with international projects by developing a joint venture with a company located in that country. Partnering with another company to share the risk associated with a portion of the project is advantageous when the other company has expertise and experience the project team does not have. If a risk event does occur, then the partnering company absorbs some or all of the negative impact of the event. The company will also derive some of the profit or benefit gained by a successful project.

Risk Reduction is an investment of funds to reduce the risk on a project. On international projects, companies will often purchase the guarantee of a currency rate to reduce the risk associated with fluctuations in the currency exchange rate. A project manager may hire an expert to review the technical plans or the cost estimate on a project to increase the confidence in that plan and reduce the

project risk. Assigning highly skilled project personnel to manage the high-risk activities is another risk-reduction method. Experts managing a high-risk activity can often predict problems and find solutions that prevent the activities from having a negative impact on the project. Some companies reduce risk by forbidding key executives or technology experts to ride on the same airplane.

Risk Transfer is a risk reduction method that shifts the risk from the project to another party. The purchase of insurance on certain items is a risk-transfer method. The risk is transferred from the project to the insurance company. A construction project in the Caribbean may purchase hurricane insurance that would cover the cost of a hurricane damaging the construction site. The purchase of insurance is usually in areas outside the control of the project team. Weather, political unrest, and labor strikes are examples of events that can significantly impact the project and that are outside the control of the project team.

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60. Contingency Planning

The project risk plan balances the investment of the mitigation against the benefit for the project. The project team often develops an alternative method for accomplishing a project goal when a risk event has been identified that may frustrate the accomplishment of that goal. These plans are called contingency plans. The risk of a truck drivers' strike may be mitigated with a contingency plan that uses a train to transport the needed equipment for the project. If a critical piece of equipment is late, the impact on the schedule can be mitigated by making changes to the schedule to accommodate a late equipment delivery.

Contingency funds are funds set aside by the project team to address unforeseen events that cause the project costs to increase. Projects with a high-risk profile will typically have a large contingency budget. Although the amount of contingency allocated in the project budget is a function of the risks identified in the risk analysis process, contingency is typically managed as one line item in the project budget.

Some project managers allocate the contingency budget to the items in the budget that have high risk rather than developing one line item in the budget for contingencies. This approach allows the project team to track the use of contingency against the risk plan. This approach also allocates the responsibility to manage the risk budget to the managers responsible for those line items. The availability of contingency funds in the line item budget may also increase the use of contingency funds to solve problems rather than finding alternative, less costly solutions. Most project managers, especially on more complex projects, manage contingency funds at the project level, with approval of the project manager required before contingency funds can be used.

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6I. Risks in Project Phases

Project risk is dealt with in different ways depending on the phase of the project.

Initiation

Risk is associated with things that are unknown. More things are unknown at the beginning of a project, but risk must be considered in the initiation phase and weighed against the potential benefit of the project's success in order to decide if the project should be chosen.

Example: Risks by Phase in John's Move

In the initiation phase of his move, John considers the risk of events that could affect the whole project. Let's assume that John's move is not just about changing jobs, but also a change of cities. This would certainly incur more risks for the project. He identifies the following risks during the initiation phase that might have a high impact and rates the likelihood of their happening from low to high.

1. His new employer might change his mind and take back the job offer after he's given notice at his old job: Low.
2. The current tenants of his apartment might not move out in time for him to move in by the first day of work at the new job: Medium.
3. The movers might lose his furniture: Low.
4. The movers might be more than a week late delivering his furniture: Medium.
5. He might get in an accident driving from Chicago to Atlanta and miss starting his job: Low.

John considers how to mitigate each of the risks.

5. During his job hunt, John had more than one offer, and he is confident that he could get another job, but he might lose deposit money on the apartment and the mover. He would also lose wages during the time it took to find the other job. To mitigate the risk of his new employer changing his mind, John makes sure that he keeps his relationships with his alternate employers' cordial and writes to each of them thanking for their consideration in his recent interviews.
6. John checks the market in Atlanta to determine the weekly cost and availability of extended-stay motels.
7. John checks the mover's contract to confirm that they carry insurance against lost items, but they require the owner to provide a detailed list with value estimates and they limit the maximum total value. John decides to go through his apartment with his digital camera and take pictures of all of his possessions that will be shipped by truck and to keep the camera with him during the move so he has a visual record and won't have to rely on his memory to make a list. He seals and numbers the boxes so he can tell if a box is missing.
8. If the movers are late, John can use his research on extended-stay motels to calculate how much it would cost. He checks the moving company's contract to see if they compensate the owner for late delivery, and he finds that they do not.
9. John checks the estimated driving time from Chicago to Atlanta using an Internet mapping service and gets an estimate of 11 hours of driving time. He decides that it would be too risky to attempt to make the drive by himself in one day, especially if he didn't leave until after the truck was packed. John plans to spend one night on the road in a motel to reduce the risk of an accident caused by driving while too tired.

John concludes that the medium-risks can be mitigated and the costs from the mitigation would be acceptable in order to get a new job.

Planning Phase

Once the project is approved and it moves into the planning stage, risks are identified with each major group of activities. A risk breakdown structure (RBS) can be used to identify increasing levels of detailed risk analysis.

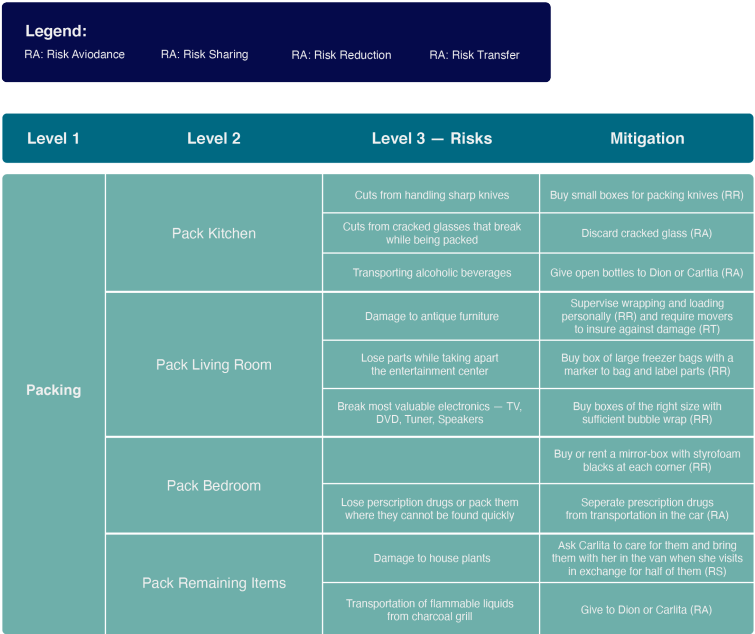


Figure 9-4: Risk Breakdown Structure (RBS) for Packing John’s Apartment

John decides to ask Dion and Carlita for their help during their first planning meeting to identify risks, rate their impact and likelihood, and suggest mitigation plans. They concentrate on the packing phase of the move. They fill out a table of risks, as shown in Figure 9-4.

Implementation Phase

As the project progresses and more information becomes available to the project team, the total risk on the project typically reduces, as activities are performed without loss. The risk plan needs to be updated with new information and risks checked off that are related to activities that have been performed.

Understanding where the risks occur on the project is important information for managing the contingency budget and managing cash reserves. Most organizations develop a plan for financing the project from existing organizational resources, including financing the project through a variety of financial instruments. In most cases, there is a cost to the organization to keep these funds available to the project, including the contingency budget. As the risks decrease over the length of the project, if the contingency is not used, then the funds set aside by the organization can be used for other purposes.

To determine the amount of contingency that can be released, the project team will conduct another risk evaluation and determine the amount of risk remaining on the project. If the risk profile is lower, the project team may release contingency funds back to the parent organization. If additional risks are uncovered, a new mitigation plan is developed including the possible addition of contingency funds.

Closeout Phase

During the closeout phase, agreements for risk sharing and risk transfer need to be concluded and the risk breakdown structure examined to be sure all the risk events have been avoided or mitigated. The final estimate of loss due to risk can be made and recorded as part of the project documentation. If a Monte Carlo

simulation was done, the result can be compared to the predicted result.

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62. Ethics and Risk Management

Engineering and ethics have been in the news a great deal in recent years, in stories about the BP oil spill, the Volkswagen emissions-control software scandal, and the General Motors ignitions switch recall. These stories remind us that decisions about risk inevitably raise ethical questions because the person making the decision is often not the one who will actually suffer the consequences of failure. At the same time, unethical behavior is itself a risk, opening an organization to lawsuits, loss of insurance coverage, poor employee morale (which can lead to more unethical behavior), and diminished market share, just to name a few potentially crippling problems.

An article on the website for the International Risk Management Institute explains the link between risk management and ethics as essentially a matter of respect:

Ethics gives guidelines for appropriate actions between persons and groups in given situations—actions that are appropriate because they show respect for others' rights and privileges, actions that safeguard others from embarrassment or other harm, or actions that empower others with freedom to act independently. Risk management is based on respect for others' rights and freedoms: rights to be safe from preventable danger or harm, freedoms to act as they choose without undue restrictions.

- Both ethics and risk management foster respect for others, be they neighbors, employees, customers, fellow users of a good or service, or simply fellow occupants of our planet—all sharing the same rights to be safe, independent, and hopefully happy and productive. Respect for others, whoever they may be, inseparably links risk management and ethics. (Head, 2005)

Why do people behave unethically? That's a complicated, interesting question—so interesting, in fact, that it has been the motivation for a great deal of human art over many centuries, from Old Testament stories of errant kings to Shakespeare's histories to modern TV classics like *The Sopranos*.

Sometimes, the upper managers of an organization behave, collectively, as if they have no empathy or conscience. They set a tone at the top of the organizational pyramid that makes their underlings think bad behavior is acceptable, or at least that it will not be punished. For example, the CEO of Volkswagen said he didn't know his company was cheating on diesel engines emission tests. Likewise, the CEO of Wells Fargo said he didn't know his employees were creating fake accounts in order to meet pressing quotas. One can argue whether or not they should have known, but it's clear that, at the very least, they created a culture that not only allowed cheating, but rewarded it. Sometimes the answer is to decentralize power, in hopes of developing a more open, more ethical decision-making system. However, Volkswagen is currently discovering as they attempt to decentralize their command-and-control structure that organizations have a way of resisting this kind of change (Cremer, 2017).

Still, change begins with the individual. The best way to cultivate ethical behavior is to take some time regularly to think about the nature of ethical behavior and the factors that can thwart it. Therefore, it is fair to say, "Let's start with the question of personal values, in order to reach an ethical society".

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63. Chapter Questions

Knowledge Check 1



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=390#h5p-20>

Knowledge Check 2



An interactive H5P element has been excluded from this version of the text. You can view it online here:

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PART X

MODUL II: PROJECT CLOSING

64. Project Completion

Every project needs to end and that's what project completion is all about in the last phase of the project life cycle. The whole point of the project is to deliver what you promised. By delivering everything you said you would, you make sure that all stakeholders are satisfied and all acceptance criteria have been met. Once that happens, your project can end.

Project completion is often the most neglected phase of the project life cycle. Once the project is over, it's easy to pack things up, throw some files in a drawer, and start moving right into the initiation phase of the next project. Hold on. You're not done yet.

The key activities in project completion are gathering project records; disseminating information to formalize acceptance of the product, service, or project; and performing project closure. As the project manager, you will need to review project documents to make certain they are up-to-date. For example, perhaps some scope change requests were implemented that changed some of the characteristics of the final product. The project information you are collecting during this phase should reflect the characteristics and specifications of the final product. Don't forget to update your resource assignments as well. Some team members will have come and gone over the course of the project. You need to double-check that all the resources and their roles and responsibilities are noted.

Once the project outcomes are documented, you'll request formal acceptance from the stakeholders or customer. They're interested in knowing if the product or service of the project meets the objectives the project set out to accomplish. If your documentation is up-to-date, you'll have the project results at hand to share with them.

Contract Closure

Contracts come to a close just as projects come to a close. Contract closure is concerned with completing and settling the terms of the contracts let for the project. It supports the project completion process because the contract closure process determines if the work described in the contracts was completed accurately and satisfactorily. Keep in mind that not all projects are performed under contract so not all projects require the contract closure process. Obviously, this process applies only to those phases, deliverables, or portions of the project that were performed under contract.

Contract closure updates the project records, detailing the final results of the work on the project. Contracts may have specific terms or conditions for completion. You should be aware of these terms or conditions so that project completion isn't held up because you missed an important detail. If you are administering the contract yourself, be sure to ask your procurement department if there are any special conditions that you should be aware of so that your project team doesn't inadvertently delay contract project closure.

One of the purposes of the contract closure process is to provide formal notice to the seller, usually in written form, that the deliverables are acceptable and satisfactory or have been rejected. If the product or service does not meet the expectations, the vendor will need to correct the problems before you issue a formal acceptance notice. Before the contract is closed, any minor items that need to be repaired or completed are placed on a *punch list*, which is a list of all the items found by the client or team or manager that still remain to be done. Hopefully, quality audits have been performed during the course of the project, and the vendor was given the opportunity to make corrections earlier in the process than the closing phase. It's not a good idea to wait until the very end of the project and then spring all the problems and issues on

the vendor at once. It's much more efficient to discuss problems with your vendor as the project progresses because it provides the opportunity for correction when the problems occur.

The project team will then work on all of the items on the punch list, building a small schedule to complete the remaining work. If the number of items on the punch list is too large or the amount of work is significant, the project team continues to work on the project. Once the punch list becomes smaller, the project manager begins closing down the project, maintaining only enough staff and equipment to support the team that is working on the punch list.

If the product or service does meet the project's expectations and is acceptable, formal written notice to the seller is required, indicating that the contract is complete. This is the formal acceptance and closure of the contract. It's your responsibility as the project manager to document the formal acceptance of the contract. Many times the provisions for formalizing acceptance and closing the contract are spelled out in the contract itself.

If you have a procurement department handling the contract administration, they will expect you to inform them when the contract is complete and will in turn follow the formal procedures to let the seller know the contract is complete. However, you will still note the contract completion in your copy of the project records.

Releasing the Project Team

Releasing project team members is not an official process. However, it should be noted that at the conclusion of the project, you will release your project team members, and they will go back to their functional managers or get assigned to a new project. You will want to keep their managers, or other project managers, informed as you get closer to project completion, so that they have time to adequately plan for the return of their employees. Let them know a few months ahead of time what the schedule looks like and how

soon they can plan on using their employees on new projects. This gives the other managers the ability to start planning activities and scheduling activity dates.

Final Payments

The final payment is usually more than a simple percentage of the work that remains to be completed. Completing the project might involve fixing the most difficult problems that are disproportionately expensive to solve, so the final payment should be large enough to motivate the vendor to give the project a high priority so that the project can be completed on time.

If the supplier has met all the contractual obligations, including fixing problems and making repairs as noted on a punch list, the project team signs off on the contract and submits it to the accounting department for final payment. The supplier is notified that the last payment is final and completes the contractual agreement with the project.

Post-Project Evaluations

Before the team is dissolved and begins to focus on the next project, a review is conducted to capture the lessons that can be learned from this project, often called a **lessons-learned meeting** or document. The team explores what went well and captures the processes to understand why they went well. The team asks if the process is transferable to other projects. The team also explores what did not go well and what people learned from the experience. The process is not to find blame, but to learn.

Quality management is a process of continual improvement that includes learning from past projects and making changes to improve

the next project. This process is documented as evidence that quality management practices are in use. Some organizations have formal processes for changing work processes and integrating the lessons learned from the project so other projects can benefit. Some organizations are less formal in the approach and expect individuals to learn from the experience and take the experience to their next project and share what they learned with others in an informal way. Whatever type of approach is used, the following elements should be evaluated and the results summarized in reports for external and internal use.

Trust and Alignment Effectiveness

The project leadership reviews the effect of trust—or lack of trust—on the project and the effectiveness of alignment meetings at building trust. The team determines which problems might have been foreseen and mitigated and which ones could not have been reasonably predicted. What were the cues that were missed by the team that indicated a problem was emerging? What could the team have done to better predict and prevent trust issues?

Schedule and Budget Management

The original schedule of activities and the network diagram are compared to the actual schedule of events. Events that caused changes to the schedule are reviewed to see how the use of contingency reserves and float mitigated the disruption caused by those events. The original estimates of contingency time are reviewed to determine if they were adequate and if the estimates of duration and float were accurate. These activities are necessary

for the project team to develop expertise in estimating schedule elements in future projects—they are not used to place blame.

A review of budget estimates for the cost of work scheduled is compared to the actual costs. If the estimates are frequently different from the actual costs, the choice of estimating method is reviewed.

Risk Mitigation

After the project is finished, the estimates of risk can be reviewed and compared to the events that actually took place. Did events occur that were unforeseen? What cues existed that may have allowed the team to predict these events? Was the project contingency sufficient to cover unforeseen risks? Even if nothing went wrong on this project, it is not proof that risk mitigation was a waste of money, but it is useful to compare the cost of avoiding risk versus the cost of unexpected events to understand how much it cost to avoid risk.

Procurement Contracts

The performance of suppliers and vendors is reviewed to determine if they should still be included in the list of qualified suppliers or vendors. The choice of contract for each is reviewed to determine if the decision to share risk was justified and if the choice of incentives worked.

Customer Satisfaction

Relationships with the client are reviewed and decisions about including the client in project decisions and alignment meetings are discussed. The client is given the opportunity to express satisfaction and identify areas in which project communication and other factors could be improved. Often a senior manager from the organization interviews the client to develop feedback on the project team performance.

A general report that provides an overview of the project is created to provide stakeholders with a summary of the project. The report includes the original goals and objectives and statements that show how the project met those goals and objectives. Performance on the schedule and budget are summarized and an assessment of client satisfaction is provided. A version of this report can be provided to the client as a stakeholder and as another means for deriving feedback.

Senior Management

The report to senior management contains all the information provided to the stakeholders in a short executive summary. The report identifies practices and processes that could be improved or lessons that were learned that could be useful on future projects.

Archiving of Document

The documents associated with the project must be stored in a safe location where they can be retrieved for future reference. Signed contracts or other documents that might be used in tax reviews or lawsuits must be stored. Organizations will have legal document

storage and retrieval policies that apply to project documents and must be followed. Some project documents can be stored electronically.

Care should be taken to store documents in a form that can be recovered easily. If the documents are stored electronically, standard naming conventions should be used so documents can be sorted and grouped by name. If documents are stored in paper form, the expiration date of the documents should be determined so they can be destroyed at some point in the future. The following are documents that are typically archived:

- Charter documents
- Scope statement
- Original budget
- Change documents
- DPCI ratings
- Manager's summary—lessons learned
- Final DPCI rating

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65. Lessons Learned - PMI

Introduction

Most project managers know the importance of capturing lessons learned; it is good for the team, organization, existing and future projects. Lessons learned are the documented information that reflects both the positive and negative experiences of a project. They represent the organization's commitment to project management excellence and the project manager's opportunity to learn from the actual experiences of others. However, we are all at different levels of lessons learned utilization. Some of us do not routinely capture lessons learned because there is no defined lessons learned process in place. Or we capture lessons learned at the end of a project and never do anything with them. Or finally, we capture lessons learned, review them prior to starting new projects but we do not generate metrics addressing the frequency of key word occurrence in failed or successful projects. This paper explores the different levels of lessons learned and provides solutions to assist with the transition from your current level to the next level.

Lessons Learned Overview

Learning occurs on every project. Lessons learned is the learning gained from the process of performing the project (PMI, 2004, p. 363). We learn from our own project experiences as well as the experiences of others. Project managers, team members and leadership can all participate in the lessons learned sessions, review the lessons learned reports and make decisions on how to use

the knowledge gained. Sharing lessons learned among project team members prevents an organization from repeating the same mistakes and also allows them to take advantage of organizational best practices. Innovative approaches and good work practices can be shared with others. Lessons learned can be used to improve future projects and future stages of current projects.

It is not necessary to wait until the end of the project for the learning to occur. Lessons can be identified at any point during the project. A lessons learned session should be conducted at different time frames based on the criticality and complexity of the project. Key times are at the end of the project, at the end of each phase and real time – when you learn the lesson. If you wait until the end the project for a large project you miss some of the key lessons. Because of the time that has elapsed, project team members may forget some of the things they learned or team members assigned to the project in the early phases may no longer be part of the project during the later phases. The best time to begin discussing lessons learned is during the project kick-off meeting.

Level 1: Lessons Learned Process

At level 1 organizations are not routinely capturing lessons learned partly because there is no defined process in place. Lessons learned are handled on a project by project basis with no standardized tools or consistency among projects. At a minimum level 1 organizations may have a meeting where lessons learned are discussed and produce a report summarizing the findings. This report is then shared with the immediate project stakeholders.

What organizations need at level 1 is a defined process and basic tools and techniques.

A *Guide to the Project Management Body of Knowledge* (PMBOK® *Guide*) defines a process as a set of interrelated actions and activities performed to achieve a specified set of products

results or services (2004, p. 367). The purpose of a lessons learned process is to define the activities required to successfully capture and use lessons learned. The lessons learned process shown in Exhibit 1 includes five steps: identify, document, analyze, store and retrieve. These steps are consistent for all three levels; however, the tools and techniques become more involved with each level. Regardless of the level, it is important for the team to view lessons learned as constructive. Leadership should encourage project stakeholders to use the process, tools and results.

Lessons Learned Process

Exhibit 1 – Lessons Learned Process

Step 1: Identify Lessons Learned

Step 1 of the lessons learned process is to identify comments and recommendations that could be valuable for future projects. The two activities for identifying lessons learned are: 1) prepare for lessons learned session and conduct lessons learned session.

Prepare for lessons learned session

The person who will be facilitating the lessons learned session should prepare in advance. In preparation for the lessons learned session the facilitator should have the participants complete a project survey. The project survey will help the participants to be better prepared to respond during the lessons learned session and will also give them the opportunity to provide input if they are unable to attend.

The project survey should be organized by category. The use of categories will ensure key information is not missed and will later help to focus the discussion. Standard categories for each project should be defined and additional categories specific to a project

can be added. Suggested categories include project management, resources, technical, communication, business processes, requirements, design and build, testing, implementation and external areas. These categories can be subdivided into more detailed categories. For example, project management can be divided into the process groups: initiating, planning, executing, monitoring and controlling and closing. Planning can then be further divided into project schedule, risk analysis, etc. A simple approach is to begin with a few categories such as project management, resources, technical and external areas and then add more categories as needed.

The project survey should also include specific questions for each category. These responses will be used by the lessons learned facilitator to guide the discussion during the lessons learned session. Three key questions should be included as part of the survey: 1) what went right, 2) what went wrong and 3) what needs to be improved.

Lessons Learned Session

A lessons learned session focuses on identifying project success and project failures, and includes recommendations to improve future performance on projects. Project managers have a professional obligation to conduct lessons learned sessions for all projects with key internal and external stakeholders, particularly if the project yielded less than desirable results (PMI, 2004, p. 230). The lessons learned session is a very important part of the lessons learned process. If the session is not successful, the organization loses out on the lessons learned opportunity.

To obtain optimum results, the lessons learned sessions should be facilitated by someone other than the project manager. If the project manager chooses to facilitate the session, the project survey results should be summarized by someone other than the project manager and shared with the participants during the session. This will ensure the

all the relevant items are included in the discussion. The facilitator should review key documents and project survey results, and then prepare a list of questions specific to the project. The facilitator should use lessons learned categories during the session to help focus the participants thinking and discussion. Finally, the facilitator should always ask the three key questions.

- What went right
- What went wrong
- What needs to be improved

Step 2: Document Lessons Learned

Step two of the lessons learned process is to document and share findings.

After lessons learned are captured, they should be reported to project stakeholders. Different types of reports can be produced based on the audience. The detailed lessons learned report consists of the data captured during the lessons learned session and any additional input from participants who were not able to attend. The facilitator should distribute the detailed lessons learned report to all participants and participants should be given time to respond to the accuracy of the report. After the report is finalized, the entire project team should receive a copy even if they did not participate in the lessons learned session. The final report should be stored with the other project documentation.

The facilitator should prepare a summary for leadership. This report should present an overview of the lessons learned process and a summary of project strengths – what went well, project weaknesses – what went wrong and recommendations – what we need to improve. The detailed report can be included as an attachment or made available in the event leadership needs more information.

Step 3: Analyze lessons learned

Step three of the lessons learned process is to analyze and organize the lessons learned for application of results. At level 1 analysis is more informal as the team decides what can be done with the lessons learned. Information is shared with other teams during organizational meetings. Project management process improvements or training needs are often identified as a result of lessons learned recommendations.

Step 4: Store lessons learned

Step four of the lessons learned process is to store in a repository. At level 1, organizations do not have a dedicated lessons learned repository in place. Lessons learned documents are stored along with other project documents, normally on a shared drive or in some form of project library. There is no easy means of retrieving the lessons. Organizations often set up a lessons learned folder on the shared drive to make the lessons learned reports available to other project teams.

Step 5: Retrieve lessons learned

Step five of the lessons learned process is to retrieve for use on current projects. This step is rarely used at level 1. Although lessons learned reports are stored on a shared drive, without key word search capability, it is difficult to retrieve the appropriate lesson.

Level 2: Evaluation of Lessons Learned Repository

At level 2 organizations have a defined process and basic tools for identifying and documenting lessons learned. The process has become part of the organization's culture and is consistently applied to projects and process documents have been revised to allow for more efficiency. Although organizations are consistently capturing lessons learned they are not fully utilizing them.

What organizations need at level 2 are effective tools and the beginning of analysis of stored lessons learned. Why collect lessons learned if the valuable information is not shared within an organization to either avoid reoccurrence of lessons learned or more importantly repeat best practices lessons learned.

Process to Evaluate Lessons Learned Collected in Organization's Repository

As mentioned earlier, the identification of lessons learned from each project is the primary responsibility of each project manager. During this level, organizations need to dedicate a resource or resource(s) to begin the analysis of documented lessons learned. The purpose of the analysis is to identify actions that can be taken within the organization to strengthen weak areas of knowledge and implementation during each project. This can be done through enhanced training of project managers and/or team members; this includes project sponsors and champions. It may mean added or improved procedures and processes.

The person(s) tasked with analysis of an organization's lessons learned should be located at a level within the organization that will enable the person(s) to implement approved solutions.

It is also important that gathering the original lessons learned data should be collected utilizing consistent processes and forms. Consistency of input information allows for speedier identification

of reoccurring issues and proactive resolutions. An example of an effective lessons learned tool would be a consistent lessons learned input form.

The lessons learned input form is a key tool. This document allows for more consistent data collection as well as provides a means for easier retrieval. The lessons learned template should include previously agreed to fields such as: category, lesson learned, action taken, how did you arrive at the action taken, root cause and key words. Key words should always be identified. Key words are ultimately one of the determinants of success in utilizing lessons learned (Prichard, 1997, p. 94), and are essential for easy retrieval. The data on the lessons learned input form is transferred to the organization's lessons learned repository. The lessons learned input form can also be shared with the project team during the lessons learned session. As a team member identifies a lesson, that needs to be included in the repository, the necessary information can be captured while the team member is available.

Types of Reports based on Lessons Learned Data

At level 1, organizations should be able to produce lessons learned detailed and summary reports from information gathered during the team sessions and share these reports with immediate project stakeholders. At level 2 more reporting options should be available.

Additional reporting options include:

- Detailed Report – organized by key fields from the lessons learned template and includes responses gathered during the session.
- Summary – a one-page brief summarizing the findings and providing recommendations for correcting the findings.
- Findings – a summary of the issues found during the review process.
- Recommendations – recommended actions to be taken to

correct findings. The approved actions should be documented and tracked to completion. In some cases the approved action may become a project due to high level of resources required to address the finding.

Level 3: Metrics

During Level 2 we noted that organizations should have identified process and templates in place to address lessons learned. Analysis of lesson learned data was discussed. During Level 3, it is important to be able to take the completed analysis and convert that data to metrics that are important to the organization's executive level action approvers.

A typical executive has a very busy schedule and most review their emails and reports utilizing the "Evelyn Woods Speed Reading Technique" or something similar. So the executive-level lessons learned report should be no more than 3 pages to ensure that the data is read and decisions should be easy to determine. The 3 page report should consist of: Page 1 – text overview of analyzed data including recommended next steps...improvement or recognitions. Page 2 and 3 should be clear graphical presentations that provide a clear picture for the executive to make a decision.

The most successful graphical presentations display either pie charts or bar charts with easily understood x-axis and y-axis titles. The graph legend should also be concise and easily understood.

It is appropriate to include more than one diagram on each page, but remember the intent of the graphs are to tell a visual story of what's wrong and/or what is successful in the completion of projects within the executive's area of responsibility.

Equally important, remember who your ultimate audience will be when preparing your metrics reports.

The key you want to achieve is *Effective Metrics Reports* which can

only be achieved if the capture of project lessons learned data is consistent and maintained in a centralized repository.

Achieving the Next Level

We have shared with you different levels of lessons learned utilization and solutions we hope you can utilize to either initiate or improve your lessons learned processes, repositories and metrics. We have also provided you with justification for the importance of a lessons learned repository and the long term value that can be gained if the stored lessons learned are reviewed and analyzed on a regular basis.

Capturing lessons learned should be an on-going effort throughout the life of the project. This mindset should be strongly encouraged by the project manager from day one. Whether we are using lessons learned to prepare for current projects or for identifying project management process improvements, we learn from project failures as well as project successes. By not learning from project failures we are doomed to repeat similar situations. By not maximizing on project successes, we miss opportunities to implement good processes and practices to successfully complete existing and future work. Make sure that capturing project lessons learned is part of your procedures and an expected deliverable from your project management and product methodologies. Ensure that project teams work together to document project best practices and areas of improvement for the next project.

The final important step to ensure a successful lessons learned program is a commitment from senior level management. That commitment is visible through regular repository metrics review, action taken to implement best practices, and support to improve negative or re-occurring project trends. In order to keep the value of lessons learned in front of executives, it is critical to keep executive level reporting brief and concise. Recommendations for

enhancements to organization processes and procedures and recognitions for best practices should be available on the Summary Page and in the first paragraph of any executive report.

Source

Lessons learned (pmi.org)

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66. Project Closure Chapter Introduction

Learning Objectives

After reading this chapter, you will be able to:

1. Discuss the importance of getting the fundamentals right and keeping them right throughout a project.
2. Explain the value of project reviews and audits.
3. Describe issues related to correcting course mid-project and decisions about terminating a project.
4. Discuss the project closure phase.
5. Recognise the importance of concluding a project with lesson learned.

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67. Reasons for Closing Projects

If an audit reveals the painful truth that it's time to terminate a project, then it's important to realize that this is not necessarily a bad thing:

- Canceling a project may seem like a failure, but for a project to be successful, it must provide value to all parties. The best value is to minimize the project's overall negative impact on all parties in terms of both time and money. If the only option is to proceed with a scaled-down project, one that delivers late, or one that costs significantly more, the result may be worse than canceling the It may be more prudent to invest the time and resources on an alternate endeavor or to reconstitute the project in the future using a different team and revised parameters. (Williams, 2011)

When considering terminating a project, it's helpful to ask the following questions:

- Has the project been made obsolete or less valuable by technical advances? For instance, this might be the case if you're developing a new cell phone and a competitor releases new technology that makes your product undesirable.
- Given progress to date, updated costs to complete, and the expected value of the project's output, is continuation still cost-effective? Calculations about a project's cost-effectiveness can change over time. What's true at the beginning of the project may not be true a few months later. This is often the case with IT projects, where final costs are often higher than expected.
- Is it time to integrate the project into regular operations? For

example, an IT project that involves rolling out a new network system will typically be integrated into regular operations once network users have transitioned to the new system.

- Are there better alternative uses for the funds, time, and personnel devoted to the project? As you learned in chapter 2, on project selection, the key to successful portfolio management is using scarce resources wisely. This involves making hard choices about the relative benefits of individual projects. This might be an especially important concern in the case of a merger, when an organization has to evaluate competing projects and determine which best serve the organization's larger goals.
- Has a strategic inflection point, caused by a change in the market or regulatory requirements, altered the need for the project's output?
- Does anything else about the project suggest the existence of a strategic inflection point—and therefore a need to reconsider the project's fundamental objectives?

Determining whether to terminate a project can be a very difficult decision for people close to a project to make. Your perspective on a project has a huge effect on your judgment of its overall success. That is why a review conducted by an objective, external auditor can be so illuminating.

Common Reasons for project Termination

- Low profitability and or lowered market potential
- Competing projects become a higher priority
- Sever delays to schedule
- Change of market needs
- Technical issues that can not be resolved
- Low profitability and or lowered market potential
- Increase in damaging cost
- High uncertainty of technical success or commercial gain

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68. Contract Closing

Just as a project comes to a close, a contract also comes to a close. Contract closure is concerned with completing and settling the terms of the contracts let for the project. It supports the project completion process because the contract closure process determines if the work described in the contracts was completed accurately and satisfactorily. Keep in mind that not all projects are performed under contract, so not all projects require the contract closure process. Obviously, this process applies only to those phases, deliverables, or portions of the project that were performed under contract.

Contract closure updates the project records, detailing the final results of the work on the project. Contracts may have specific terms or conditions for completion. You should be aware of these terms or conditions so that project completion isn't held up because you missed an important detail. If you are administering the contract yourself, be sure to ask your procurement department if there are any special conditions that you should be aware of so that your project team doesn't inadvertently delay contract project closure.

One of the purposes of the contract closure process is to provide formal notice to the seller, usually in written form, that the deliverables are acceptable and satisfactory or have been rejected. If the product or service does not meet the expectations, the vendor will need to correct the problems before you issue a formal acceptance notice. Before the contract is closed, any minor items that need to be repaired or completed are placed on a punch list, which is a list of all the items found by the client or team or manager that still remain to be done.

Hopefully, quality audits have been performed during the course of the project, and the vendor was given the opportunity to make corrections earlier in the process than the closing phase. It's not

a good idea to wait until the very end of the project and then spring all the problems and issues on the vendor at once. It's much more efficient to discuss problems with your vendor as the project progresses because it provides the opportunity for correction when the problems occur.

The project team will then work on all of the items on the punch list, building a small schedule to complete the remaining work. If the number of items on the punch list is too large or the amount of work is significant, the project team continues to work on the project. Once the punch list becomes smaller, the project manager begins closing down the project, maintaining only enough staff and equipment to support the team that is working on the punch list.

If the product or service does meet the project's expectations and is acceptable, formal written notice to the seller is required, indicating that the contract is complete. This is the formal acceptance and closure of the contract. It's your responsibility as the project manager to document the formal acceptance of the contract. Many times, the provisions for formalizing acceptance and closing the contract are spelled out in the contract itself.

If you have a procurement department handling the contract administration, they will expect you to inform them when the contract is complete and will in turn follow the formal procedures to let the seller know the contract is complete. However, you will still note the contract completion in your copy of the project records.

Procurement Contracts

The performance of suppliers and vendors is reviewed to determine if they should still be included in the list of qualified suppliers or vendors. The choice of contract for each is reviewed to determine if the decision to share risk was justified and if the choice of incentives worked.

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69. Releasing the Resources

Releasing the Project Team

Releasing project team members is not an official process. However, it should be noted that at the conclusion of the project, you will release your project team members, and they will go back to their functional managers or get assigned to a new project. You will want to keep their managers, or other project managers, informed as you get closer to project completion, so that they have time to adequately plan for the return of their employees. Let them know a few months ahead of time what the schedule looks like and how soon they can plan on using their employees on new projects. This gives the other managers the ability to start planning activities and scheduling activity dates.

Final Payments

The final payment is usually more than a simple percentage of the work that remains to be completed. Completing the project might involve fixing the most difficult problems that are disproportionately expensive to solve, so the final payment should be large enough to motivate the vendor to give the project a high priority so that the project can be completed on time.

If the supplier has met all the contractual obligations, including fixing problems and making repairs as noted on a punch list, the project team signs off on the contract and submits it to the accounting department for final payment. The supplier is notified that the last payment is final and completes the contractual agreement with the project.

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70. Lesson Learned

Project closure is traditionally considered the final phase of a project. It includes tasks such as

- Transferring deliverables to the customer
- Cancelling supplier contracts
- Reassigning staff, equipment, and other resources
- Finalizing project documentation by adding an analysis summarizing the project's ups and downs
- Making the documentation accessible to other people in your organization as a reference for future projects
- Holding a close-out meeting
- Celebrating the completed project

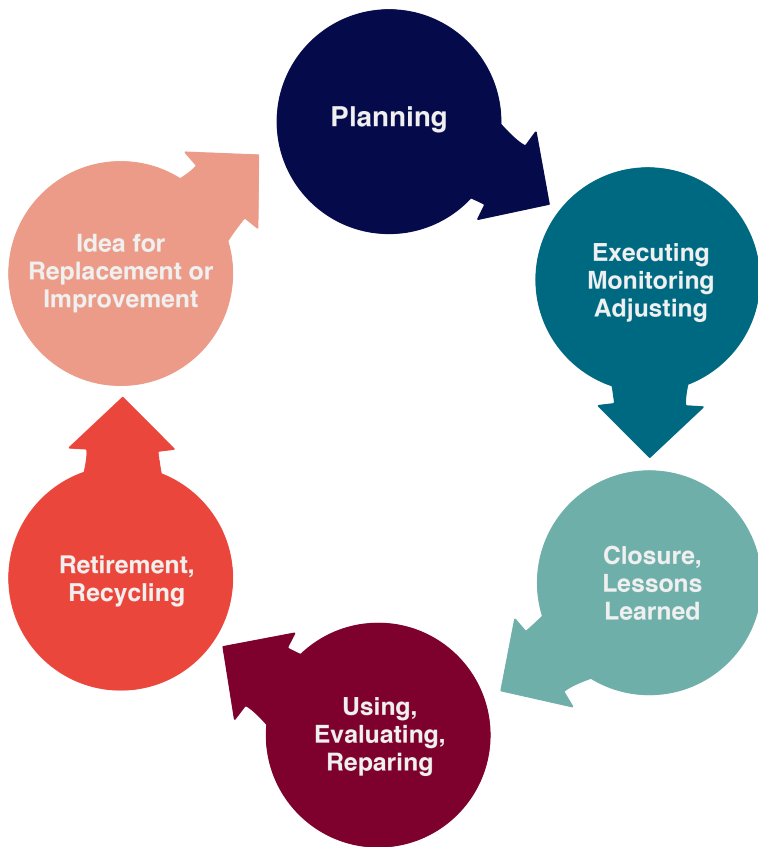


Figure 11-1: Seen from a living order perspective, closure is an extension of the learning and adjusting process that goes on throughout a project.

The Close-Out Meeting is an opportunity to end a project the way you started it—by getting the team together. During this important event, the team should review what went well, what didn't go well, and identify areas for improvement. All of this should be summarized in the final close-out report. A final close-out meeting with the customer is also essential. This allows the organization to formally complete the project and lay the groundwork for potential future work.

The Close-Out Report provides a final summary of the project performance. It should include the following:

- Summary of the project and deliverables
- Data on performance related to schedule, cost, and quality
- Summary of the final product, service, or project and how it supports the organization's business goals
- Risks encountered and how they were mitigated
- Lessons learned

Exactly where your work falls in the project's life cycle depends on your perspective as to what constitutes "the project" in the first place. The designers and constructors of a building might consider the acceptance of the building by the owner as project closure. However, the results of the project—that is, the building—lives on. Another contractor might be hired later to modify the building or one of its systems, thus starting a new project limited to that work.

If project closure is done thoughtfully and systematically, it can help ensure a smooth transition to the next stage of the project's life cycle, or to subsequent related projects. A well-done project closure can also generate useful lessons learned that can have far-reaching ramifications for future projects and business sustainability. The closeout information at the end of a project should always form the basis of initial planning for any future, similar projects.

Although most project managers spend time and resources on planning for project start-up, they tend to neglect the proper planning required for project closure. Ideally, project closure includes documentation of results, transferring responsibility, reassignment of personnel and other resources, closing out work orders, preparing for financial payments, and evaluating customer satisfaction. Of course, less complicated projects will require a less complicated close-out procedure. As with project audits, the smooth unfolding of the project closure phase depends to a great degree on the manager's ability to handle personnel issues thoughtfully and sensitively. In large, on-going projects, the team

may conduct phase closures at the end of significant phases in addition to a culminating project closure.

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7I. Chapter Questions

Knowledge Check 1



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Knowledge Check 3





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Knowledge Check 4



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Knowledge Check 5



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PART XI

MODULE 12: ETHICS

72. PMI Code of Ethics

Ethics is about making the best possible decisions concerning people, resources and the environment. Ethical choices diminish risk, advance positive results, increase trust, determine long term success and build reputations. Leadership is absolutely dependent on ethical choices.

PMI members have determined that **honesty, responsibility, respect and fairness** are the values that drive ethical conduct for the project management profession. PMI's Code of Ethics and Professional Conduct applies those values to the real-life practice of project management, where the best outcome is the most ethical one.

All PMI members, volunteers, certification holders and certification applicants must comply with the Code.

Source (Code of Ethics & Professional Conduct (pmi.org))

Code of Ethics & Professional Conduct

Please download and reference the 8-page PMI Code of Ethics PDF Document.

Webinars

- Coping Strategies for Bullying in Project Management 1 HR
- PMI's Global Code of Ethics and Professional Conduct 1 HR.
- PMI Ethics Review Process 1 HR.

73. Corporate Social Responsibility (CSR)

CSR—Concept and Rationale

With Corporate Social Responsibility (CSR), organizations take responsibility for the impact of their activities on customers, employees, shareholders, communities and the environment in all aspects of operations. This effort extends beyond simply obeying local laws, as organizations voluntarily take steps to improve the quality of life for employees and their families, as well as society at large. CSR is sometimes called “corporate citizenship,” meaning that a company should be a good neighbor to the communities that are affected by its presence (Catalyst Corporation, 2002).

There are compelling reasons why companies should engage in some form of effort aimed primarily at social welfare. Proponents of CSR have used four arguments to make their case: moral obligation, sustainability, license to operate, and reputation.

- *Moral obligation* means that stakeholders of a growing number of companies are only satisfied when the company balances the impact of its business with socially responsible practices.
- *Sustainability* involves meeting the present needs without compromising the capability for future generations. Substantial progress can be made by investing in solution that are socially, environmentally and financially sustainable (Arena, 2006, p. 9).
- The very *license to operate* and crucial contracts themselves, with governments and other entities, might be conditional upon such obligation.
- CSR initiatives may be supported due to *reputation* impact, on

the grounds that they will improve a company's image and even raise the value of its stock (Porter & Kramer, 2006). Examples of such reputation benefits include a greater clientele, the ability to charge premium prices, and the retention of more productive workers. Companies tend to manage risks to their reputation and brand in a reactive mode, only dealing with crisis events after they happen. Companies confronted with boycott threats, as Nike was in the 1990s, or with the threat of high-profile lawsuits, as McDonald's is over obesity concerns, may also see CSR as a strategy for presenting a friendlier face to the public (Doane, 2005).

The rising pressure for activities in CSR in the increasingly socially aware climate of developed countries has resulted in a substantial increase in investment in such activities in all OECD (Organisation for Economic Cooperation and Development) nations.

Why is Corporate Social Responsibility so Hard?

Milton Friedman, a notable critic, observed that CSR might ultimately pit corporate goals against social goals. "There is one and only one social responsibility of business—to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud" (Friedman, 1970). In his view, CSR creates impediments in the running of business and can make for confusion about the true goals of the firm. With growth in the complexity of business and concerns about sustainability, there may be conflict between the enhancement of a company's long-term profitability and its contribution to the public good. The situation is often exacerbated by the apparent lack of rewards in following a CSR strategy. For example, Wal-Mart is rewarded by the market for cutting costs; Costco, which offers better insurance and benefits to its workers, is penalized by the

market for not cutting costs as well, and therefore not being as profitable as Wal-Mart.

More recently, championing an active role for government, Robert Reich argued in his book “Supercapitalism” that companies who don’t embrace the principles of Corporate Social Responsibility are neither brutally insensitive nor ruthlessly greedy. “They’re doing what they’re supposed to do, according to the current rules of the game—giving their customers good deals and thereby maximizing the returns to their investors” (Reich, p. 12). Just as games require rules to define fair play, the economy relies on government to set the economic ground rules. If government wanted to change the way Wal-Mart does business, it would change the current rules—making it easier for employees to unionize, to get health insurance and pensions, and to grant a living wage. He posits that CSR is undermining democracy by giving companies an excuse to indulge in superficial social work and diverting government from taking action to address real and pressing social concerns.

One major problem is that CSR simplifies some rather complex arguments and fails to acknowledge that ultimately trade-offs must be made between the financial health of the company and ethical outcomes. And when they are made, profit frequently wins over principles (Doane, 2005). In her book “The High-Purpose Company,” Christine Arena uses wide-ranging research to show that a corporation does not have to choose between being socially responsible and making a profit. By studying public records, news articles and companyissued reports, and by interviewing stakeholders comprising employees, executives, consumers, watchdog groups and industry experts, Arena’s team found that contributing to the greater good is more than just a marketing tool—it is a market opportunity (Arena, 2006).

These results show that the absence of instant rewards in the form of profits should not be a justification for abstaining from CSR. Rather, if a company chooses a comprehensive strategy that capitalizes on CSR, then it not only minimizes a possible clash between corporate and social goals, but also is able to exploit

market opportunities that eventually bring in clear gains and rewards.

The Costs of Ignoring Corporate Social Responsibility

If the risk of losing profits is a motivation for some managers and entrepreneurs to desist from CSR, then it is also true that the risk of ignoring CSR is very likely to outweigh the risk of profit loss. The modern corporation is expected not just to adhere to ethical standards and norms but also to live up to its responsibility as a dynamic source of change in a globalizing world. Business organizations are not infallible, being liable to corruption and scandal that taint the corporate world even if only a few individuals can be held to account. The public has understandably a right to expect business to discharge its functions honorably within the social framework and play a conscientious role that commends it to public trust.

Moreover, in an economy where 70% to 80% of market value comes from hard-to-assess intangible assets such as brand equity, intellectual capital, and goodwill, organizations are especially vulnerable to anything that damages their reputations (Eccles, 2007). The company that has not invested in building a positive reputation through CSR is susceptible to being damaged when negative stories appear, as there is not a positive correlation in the consumer's mind to balance out the negative impacts of bad news.

Integration of CSR into Corporate Goals

Corporations create social and societal impacts, both positive and negative through the daily operations of their value chain. Corporations and the societies they operate in are already intertwined. Societies need corporations to give their people

employment and infrastructure, and corporations need healthy societies to provide a capable workforce. While society looks in many cases to the corporate world rather than government for the provision of employment and infrastructure (not to mention goods and services), it is only a healthy society that can create the kind of productive workers that every corporation seeks to hire.

Companies exist to create prosperity. Society in turn decides what limits to impose on how companies behave, and thus we have laws to protect the common good. Most of the world has reached the stage where good laws are in place, but poor enforcement exists for those laws. Poor enforcement has its roots in corruption and weak institutions, and poor governance perpetuates poverty. Corporate social responsibility programs try to bridge the gap between what laws are in place and enforced, and basic fundamentals of good business practice, such as obedience to local laws, avoidance of exploitative practices, and complete transparency.

For example, Nestle (2006) has stated that the true test of a business is whether it creates value for society in the long term. As much of Nestle's business takes place in developing countries, they need to improve business conditions, improve the capabilities of farmers, create a skilled workforce and develop improved standards in order to operate effectively. This example demonstrates that the welfare of society and environment is not the responsibility only of governments and NGOs; indeed, corporations can be often more effective in promoting lasting social change. Good CSR is not so much about prioritizing the environment over shareholder interests as much as it is about solving environmental problems in a way that serves shareholder interests (Arena, 2007, p. 12).

Moreover, as Porter and Kramer (2006) pointed out, "the more closely tied a social issue is to a company's business, the greater the opportunity to leverage the firm's resources—and benefit society."

The Project Manager and CSR

It's all too common to see corporations destroying communities in pursuit of economic expansion. The sense of urgent market opportunity, combined with the fact that professionals, from the executive suite to the project manager, are disconnected from the world and feel "the problem is too big for me to make a difference." This apathy leads to a lack of accountability, and the problem remains unaddressed. It doesn't help that social responsibility and ethics have not been successfully integrated into a curriculum of business and market leadership.

Direction from top management, especially in respect of social policy closely aligned to corporate strategy, plays a significant role in CSR. However, in the same way that social responsibility is not solely the government's job, corporate social responsibility is not only the task of the senior executive. Project managers are instrumental in achieving strategic goals, as they hold the path to execution. In this way, they can play a pivotal role in corporate social responsibility. Being familiar with the details of day-to-day operations and execution, the project manager is in a position to perceive and analyze socially relevant issues and situations that may not be obvious to senior management. The project manager knows from firsthand experience that norms and laws, culture and traditions may render a project very different in execution and outcome from what it is in other countries, including his or her company's home country.

The experienced project manager brings discipline in risk assessment and mitigation, which can be refocused to identify social risks that might go unnoticed by the top leadership. For example, companies may not uphold norms of behavior in developing countries, arguing instead that they operate within the local laws of the countries in which they are working. The project manager will have unique visibility into that disconnect, and will be able to escalate discrepancies between the minimums the law

requires and what's appropriate for the community before they turn into a crisis for the company's operation or reputation. Don't assume that company executives are aware of the social ramifications of a project—it's the project manager's responsibility to ensure these issues are raised appropriately. The data a project manager provides his or her leadership can help him or her make bold decisions, to go beyond what the law requires in developing ethical business practices.

For example, Levi Strauss and Company has a strict policy against underage workers. But when they discovered that two factories in Bangladesh had workers under the age of 15, executives in the U.S. did not shut down the factories or demand the workers be fired. Instead, the project managers in the field looked into the problem, and they recognized that in Bangladesh, families rely on the money brought in from a child worker to survive. So they helped come up with a creative solution. The workers who were already employed could remain, but the factory had to support their education, sending them to a local school, even hiring a teacher for the child workers if there were no local schools nearby. That way, the company could ensure the children were getting proper education, while not driving families into poverty. Ultimately, such actions set the standard for other local factories (Arena, 2006, p. 123).

How can the project manager evaluate CSR risk? He or she can rank social issues the same way he or she ranks all other project risk, by probability and impact. What is the likelihood a social, environmental or ethical issue will arise in this project? What is the potential impact, not just to the project, but also to the community and society? By integrating these considerations in project planning and execution, risk can be minimized and societal good promoted.

Project managers can influence their companies toward socially responsible behavior at the local level in areas such as human rights, employee rights, environmental protection and supplier relations. Projects that involve partnerships with the local community can create enduring relationships of respect, goodwill, and mutual benefit. For this to work, however, it is overwhelmingly important

to understand the needs of the local community through regular contact and dialogue so that the company becomes an integral part of community life.

To get started on the road to social responsibility, project managers should first determine the position of their organizations with regard to CSR. Guidelines on sustainability and corporate responsibility are available, and independent parties provide accreditation of company reports in the light of these criteria. Among the many tools made available by agencies and consultancies, project managers may refer to the self-assessment questionnaire of the WBCSD, which should help them know where the company presently stands and what its future needs are. The questionnaire is designed to show how closely such areas as company vision, policies, values, targets and performance measurement manifest themselves in CSR processes.

While executive management may determine a comprehensive blueprint that integrates CSR strategy with business strategy, the project manager can look specifically into how social responsibility impacts his or her existing projects. The desirability of a certain initiative would depend upon both its relation to the project as well as the likely impact on the firm, the community and society in general.

Because integrating corporate social responsibility into operations involves more than simple project execution, the next task is to generate a communication plan before social action can be undertaken. It will be critical to get buy in from key managers and influencers of the organization, explaining clearly the rationale for such action and demonstrating appropriate risk mitigation. The manager should ensure that key performance indicators and metrics are in place to ensure appropriate monitoring of any CSR activity.

So let's define the steps in a CSR initiative, from a project management standpoint. There are, broadly, six phases in any CSR project: introduction, identification, positioning (for managers who are introducing something very innovative and wish to see how it

stands in relation to other such initiatives), strategy development, implementation, and monitoring. The experienced project manager can easily develop a work breakdown structure to support these activities. In each phase, the project manager can utilize various tools ranging from policy reports to computer software to facilitate his task.

Levels of Corporate Social Responsibility

Porter and Kramer (2006) proposed a framework for understanding CSR as something that enhances the competitive edge of firms and ultimately benefits both business and society. “An affirmative corporate social agenda moves from mitigating harm to reinforcing corporate strategy through social progress.” In order to have a real impact, organizations need to determine where they can do the most good. Will a company undertake CSR efforts only for PR purposes? Or will it move beyond that to try to undertake efforts to offset the negative impacts of its supply chain? Or will the organization boldly move forward to use CSR for strategic advantage?

- Some companies, such as Gap, Inc., a US-based clothier, perform CSR efforts that are unrelated to its business, for PR purposes. An example is a recent campaign to sell a special line of “Red” shirts, from which half of the profits go to help victims of AIDS in Africa.
- While this campaign is positive, it will not be as positive as an effort that *offsets negative impacts* of the kind of work they do. Over the past few years, Gap has come under fire for indirectly employing sweatshop and child labor. Until they successfully address this issue, the PR whitewashing will not be effective in making consumers feel positively about shopping at Gap stores. Gap has recently embraced transparency around sweatshop issues, ultimately working to set higher standards

for the retailing industry as a whole (Arena, 2006, p. 119).

- For corporate social responsibility activities to be truly sustainable, a company should work to *build a strategic advantage around CSR*. A change in the activities of a market leader can cause stakeholders' expectations to shift quite rapidly, which can hurt the reputations of firms that stick to the old ways. For example, the "ecomagination" initiative launched by General Electric in 2005 is already raising the bar for other companies. The initiative committed GE to doubling its R&D investment in developing cleaner technologies, doubling the revenue from products and services that have significant and measurable environmental benefits, and reducing GE's own greenhouse emissions (Eccles, 2007).

Conclusion

True CSR requires systemic change. Speaking in an interview, Porter (2003, p. 2) said that business should go on the offensive and "move away from defensive actions into a proactive integration of social initiatives into business competitive strategy." When corporations make strict commitments and make substantial investments in a socially responsible strategy, then, in spite of the increased risk, there is greater likelihood of increased payoffs.

However, many business experts have stated that attention should be confined to tangible business operations with a social dimension that produce a competitive edge. If corporate philanthropy is independent of business competitiveness and skills, says Porter, then the task is better left to governments and philanthropic organizations. In a flat and globalizing world, however, there would not be many examples where a social cause that a firm might champion is absolutely not linked to its business interests. CSR can be a revolutionary way of contributing to systemic social changes in which investments can produce lasting

social benefits in areas such as health (Catalyst Corporation, 2002). In this context, the project manager, who is likely to have a greater degree of awareness about local or regional social issues, can make a significant and effective contribution to a company's CSR.

While CSR will become increasingly important to competitive business, it will take more than good intentions and strong leadership to integrate social and business needs. One must be prepared for adjustments in organization, reporting relationships, and incentives (Porter & Kramer, 2006). However, the financial necessity of maintaining good quarterly results is often the perceived limitation in CSR implementation. How can we ensure good CSR while maintaining appropriate financial and performance results? To make CSR sustainable for companies it is essential that a proper measurement system for corporate social achievement be put in place, accompanied by fitting celebration of and reward for accomplishments throughout the organization and into the broader community. Only then would CSR have a chance of becoming a lasting part of organizational culture.

CSR is too big of an issue to leave to someone else to address. Every company depends on a strong society, and project managers can play a key role in making that happen.

Source

What Corporate Social Responsibility Means to Project Manager
(pmi.org)

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74. PMI Ethics: APPENDIX A

History of this Standard

PMI's vision of project management as an independent profession drove our early work in ethics. In 1981, the PMI Board of Directors formed an Ethics, Standards and Accreditation Group. One task required the group to

deliberate on the need for a code of ethics for the profession. The team's report contained the first documented PMI discussion of ethics for the project management profession. This report was submitted to the PMI Board of Directors in August 1982 and published as a supplement to the August 1983 *Project Management Quarterly*.

In the late 1980's, this standard evolved to become the Ethics Standard for the Project Management Professional (PMP®). In 1997, the PMI Board determined the need for a member code of ethics. The PMI Board formed the Ethics Policy Documentation Committee to draft and publish an ethics standard for PMI's membership. The Board approved the new Member Code of Ethics in October 1998. This was followed by Board approval of the Member Case Procedures in January 1999, which provided a process for the submission of an ethics complaint and a determination as to whether a violation had occurred.

Since the 1998 Code was adopted, many dramatic changes have occurred within PMI and the business world. PMI membership has grown significantly. A great deal of growth

has also occurred in regions outside North America. In the business world, ethics scandals have caused the downfall of global corporations and non-profits, causing public outrage and sparking increased government regulations. Globalization has brought economies closer together but has caused a realization that our practice of ethics may differ from culture to culture. The rapid, continuing pace of technological change has provided new opportunities, but has also introduced new challenges, including new ethical dilemmas.

For these reasons, in 2003 the PMI Board of Directors called for the reexamination of our codes of ethics. In 2004, the PMI Board commissioned the Ethics Standards Review Committee [ESRC] to review the codes of ethics and develop a process for revising the codes. The ESRC developed processes that would encourage active participation by the global project management community. In 2005, the PMI Board approved the processes for revising the code, agreeing that global participation by the project management community was paramount. In 2005, the Board also commissioned the Ethics Standards Development Committee to carry out the Board-approved process and deliver the revised code by the end of 2006. This Code of Ethics and Professional Conduct was approved by the PMI Board of Directors in October 2006.

Process Used to Create This Standard

The first step by the Ethics Standards Development Committee [ESDC] in the development of this Code was to understand the ethical issues facing the project management community and to understand the values and

viewpoints of practitioners from all regions of the globe. This was accomplished by a variety of mechanisms including focus group discussions and two internet surveys involving practitioners, members, volunteers, and people holding

a PMI certification. Additionally, the team analyzed the ethics codes of 24 non-profit associations from various regions of the world, researched best practices in the development of ethics standards, and explored the ethics-related tenets of PMI's strategic plan.

This extensive research conducted by the ESDC provided the backdrop for developing the exposure draft of the PMI Code of Ethics and Professional Conduct. The exposure draft was circulated to the global project management community for comment. The rigorous, standards development processes established by the American National Standards Institute were followed during the development of the Code because these processes were used for

PMI technical standard development projects and were deemed to represent the best practices for obtaining and adjudicating stakeholder feedback to the exposure draft.

The result of this effort is a Code of Ethics and Professional Conduct that not only describes the ethical values to which the global project management community aspires, but also addresses the specific conduct that is

mandatory for every individual bound by this Code. Violations of the PMI Code of Ethics and Professional Conduct may result in sanctions by PMI under the ethics Case Procedures.

The ESDC learned that as practitioners of project management, our community takes its commitment to ethics very seriously and we hold ourselves and our peers in the global project management community accountable

to conduct ourselves in accordance with the provisions of this Code.

75. PMI Ethics: APPENDIX B

Glossary

Abusive Manner. Conduct that results in physical harm or creates intense feelings of fear, humiliation, manipulation, or exploitation in another person.

Conflict of Interest. A situation that arises when a practitioner of project management is faced with making a decision or doing some act that will benefit the practitioner or another person or organization to which the practitioner owes a duty of loyalty and at the same time will harm another person or organization to which the practitioner owes a similar duty of loyalty. The only way practitioners can resolve conflicting duties is to disclose the conflict to those affected and allow them to make the decision about how the practitioner should proceed.

Duty of Loyalty. A person's responsibility, legal or moral, to promote the best interest of an organization or other person with whom they are affiliated.

Project Management Institute (PMI). The totality of the Project Management Institute, including its committees, groups, and chartered components such as chapters, colleges, and specific interest groups.

PMI Member. A person who has joined the Project Management Institute as a member.

PMI-Sponsored Activities. Activities that include, but are not limited to, participation on a PMI Member Advisory Group, PMI standard development team, or

another PMI working group or committee. This also includes activities engaged in under the auspices of a chartered PMI component organization—whether it is in a leadership role in the component or another type of component educational activity or event.

Practitioner. A person engaged in an activity that contributes to the management of a project, portfolio, or program, as part of the project management profession.

PMI Volunteer. A person who participates in PMI-sponsored activities, whether a member of the Project Management Institute or not.

PART XII

MODULE 13: AGILE PROJECT MANAGEMENT

76. What is Agile?

What is Agile?

Agile is the ability to create and respond to change. It is a way of dealing with, and ultimately succeeding in, an uncertain and turbulent environment.

The authors of the Agile Manifesto chose “Agile” as the label for this whole idea because that word represented the adaptiveness and response to change which was so important to their approach.

It’s really about thinking through how you can understand what’s going on in the environment that you’re in today, identify what uncertainty you’re facing, and figure out how you can adapt to that as you go along.

What is Agile Software Development?

Agile software development is more than frameworks such as Scrum, Extreme Programming, or Feature-Driven Development (FDD).

Agile software development is more than practices such as pair programming, test-driven development, stand-ups, planning sessions, and sprints.

Agile software development is an umbrella term for a set of frameworks and practices based on the values and principles expressed in the Manifesto for Agile Software Development and the 12 Principles behind it. When you approach software development in a particular manner, it’s generally good to live by these values and principles and use them to help figure out the right things to do given your particular context.

One thing that separates Agile from other approaches to software development is the focus on the people doing the work and how they work together. Solutions evolve through collaboration between self-organizing cross-functional teams utilizing the appropriate practices for their context.

There's a big focus in the Agile software development community on collaboration and the self-organizing team.



That doesn't mean that there aren't managers. It means that teams have the ability to figure out how they're going to approach things on their own.

It means that those teams are cross-functional. Those teams don't have to have specific roles involved so much as that when you get the team together, you make sure that you have all the right skill sets on the team.

There still is a place for managers. Managers make sure team members have, or obtain, the right skill sets. Managers provide the environment that allows the team to be successful. Managers mostly step back and let their team figure out how they are going to deliver products, but they step in when the teams try but are unable to resolve issues.

When most teams and organizations start doing Agile development, they focus on the practices that help with collaboration and organizing the work, which is great. However, another key set of practices that are not as frequently followed but should be are specific technical practices that directly deal with developing software in a way that helps your team deal with uncertainty. Those technical practices are essential and something you shouldn't overlook.

A Short History of Agile

Here is a look at how Agile emerged, how it acquired the label Agile, and where it went from there. It's important to take a look at where Agile software development came from to get an understanding of where things are at today.

[Click To Read The History Of Agile](#)

Agile is a Mindset

Ultimately, Agile is a mindset informed by the Agile Manifesto's values and principles. Those values and principles provide guidance on how to create and respond to change and how to deal with uncertainty.

You could say that the first sentence of the Agile Manifesto encapsulates the whole idea: "We are uncovering better ways of developing software by doing it and helping others do it."

When you face uncertainty, try something you think might work, get feedback, and adjust accordingly.

Keep the values and principles in mind when you do this. Let your context guide which frameworks, practices, and techniques you use

to collaborate with your team and deliver value to your customers.

What are Agile Methodologies?

If Agile is a mindset, then what does that say about the idea of Agile methodologies? To answer this question, you may find it helpful to have a clear definition of methodology.

Alistair Cockburn suggested that a methodology is the set of conventions that a team agrees to follow. That means that each team will have its own methodology, which will be different in either small or large ways from every other team's methodology.

So Agile methodologies are the conventions that a team chooses to follow in a way that follows Agile values and principles.

“Wait,” you’re probably saying, “I thought Scrum and XP were Agile methodologies.” Alistair applied the term framework to those concepts. They certainly were born from a single team's methodology, but they became frameworks when they were generalized to be used by other teams. Those frameworks help inform where a team starts with their methodology, but they shouldn't be the team's methodology. The team will always need to adapt its use of a framework to fit properly in its context.



What about Agile Project Management or Agile Business Analysis?

As Agile Software Development became more popular, people involved with software development activities but who didn't personally develop software looked for some way to figure out how these Agile ideas applied in their line of work.

The Agile Manifesto and the 12 Principles were written by a group of software developers (and a tester) to address issues that software developers faced. When you think of Agile as a mindset, that mindset can be applied to other activities.

When you do that, Agile becomes an adjective. It describes how you perform some activity. It does not create a new methodology for the reasons explained above.

When you want to understand Agile project management, ask "How might we perform project management in a way that allows us to create and respond to change and deal with uncertainty?"

Agile Alliance and Project Management Institute (PMI) explored this question through a joint effort to create the Agile Practice Guide (Available to Agile Alliance Members).

When you want to understand Agile business analysis, ask “How might we perform business analysis in a way that allows us to create and respond to change and deal with uncertainty?” Agile Alliance and International Institute of Business Analysis (IIBA) explored this question through a joint effort to create the Agile Extension to the Business Analysis Body of Knowledge (Available to Agile Alliance Members).

What is Business Agility?

The two concepts noted above are examples of an attempt to move Agile “outside of software.” Those efforts have resulted recently in the Business Agility movement.

If you extend the idea of Agile as a mindset, then people seeking Business Agility ask themselves, “How might we structure and operate our organization in a way that allows us to create and respond to change and deal with uncertainty?”

You might say that business agility is a recognition that in order for people in an organization to operate with an Agile mindset, the entire organization needs to support that mindset. Agile software development was never truly Agile until the organization changed its structure and operations to work in an uncertain environment

Key Agile Concepts

Below are a few key Agile concepts. You can see more in our glossary section.

User Stories: In consultation with the customer or product owner,

the team divides up the work to be done into functional increments called “user stories.” Each user story is expected to yield a contribution to the value of the overall product. (see more)

Daily Meeting: Each day at the same time, the team meets so as to bring everyone up to date on the information that is vital for coordination: each team members briefly describes any “completed” contributions and any obstacles that stand in their way. (see more)

Personas: When the project calls for it – for instance when user experience is a major factor in project outcomes – the team crafts detailed, synthetic biographies of fictitious users of the future product: these are called “personas.” (see more)

Team: A “team” in the Agile sense is a small group of people, assigned to the same project or effort, nearly all of them on a full-time basis. A small minority of team members may be part-time contributors, or may have competing responsibilities. (see more)

Incremental Development: Nearly all Agile teams favor an incremental development strategy; in an Agile context, this means that each successive version of the product is usable, and each builds upon the previous version by adding user-visible functionality. (see more)

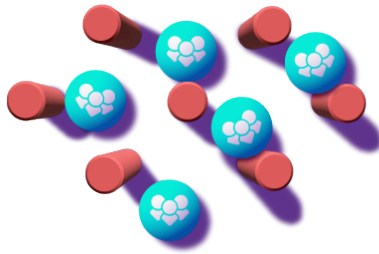
Iterative Development: Agile projects are iterative insofar as they intentionally allow for “repeating” software development activities, and for potentially “revisiting” the same work products. (see more)

Milestone Retrospective: Once a project has been underway for some time, or at the end of the project, all of the team’s permanent members (not just the developers) invests from one to three days in a detailed analysis of the project’s significant events. (see more)

77. Agile 101: A Beginner's Guide to Agile Methodology

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Agile 101: A Beginner's Guide to Agile Methodology

31, May 2021



Sean Blake

Written by Sean Blake, Head of Marketing

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We're here to talk about agile, and we don't mean your abilities on a sports field or in a yoga studio. If you're new to agile as a methodology, there's a lot to learn, but the basics are simple. Agile 101 begins with understanding that agile can be applied to anything. You can use agile practices to improve your personal task management, optimize workplace efficiency, or align software teams around product development.

No matter the application, the concepts remain the same: Agile creates a continuous improvement mindset that values flexibility, adaptability, collaboration, and efficiency.

In this post, we'll cover agile 101 basics, the benefits of agile, popular agile methodologies, and common mistakes to avoid.

Agile 101: How it compares to traditional project management

The concept of Agile has evolved, but it really took off and became popularized in software development. In recent years, the methods and guiding principles of Agile have expanded into a variety of industries that want to emphasize continuous improvement and growth.

How does agile compare to traditional project management? In short: It doesn't. Agile is just the opposite. One of our favorite ways to compare the agile approach to classical project management is to think of them as jazz vs. classical music.

In classical music, a conductor brings a previously composed and organized piece of music to an orchestra. Then, they dictate what happens and when. This is very much the same as traditional project management, where the project manager brings a plan they have conceived on their own to their team and then proceeds to tell the

team how to carry it out. The project manager lays out the steps and expects the team to follow them to the letter (or note). 🎵

Jazz, on the other hand, is collaborative. Each band member feeds off of the other, creating music in a flexible and iterative process — just like the agile process. The band, like an agile team, experiments together and freely creates music in the moment. Each iteration is a little bit different, and hopefully better, than the one that preceded it. 🎷

Project management doesn't allow for this kind of flexibility. It relies on following a strict sequential order. Each project element must be completed before moving on to the next. Just like a waterfall, the flow of work remains the same from project to project.

Agile is non-linear. It focuses on flexibility, collaboration between team members, and delivering consistent value to stakeholders. With each iteration comes new, actionable insights into what's working, what isn't, and what needs to change. It's a multidimensional way of working that removes the bottlenecks inherent in traditional project management.

Agile 101: The benefits of agile

agile 101: Thor GIF from Infinity War

There are many benefits to agile practices for software development projects, as well as many other industries. The general concepts of agile can be applied to all sorts of situations, and its versatility means it will evolve with the needs of your team.

Think of it as a methodology you can apply to any of your business processes for increased collaboration, optimized efficiency, and continuous improvement.

Agile helps teams and businesses:

- Work at optimal efficiency by eliminating waste
- Make more effective decisions

- Adjust as new information comes in or is discovered
- Continually meet stakeholder deliverable deadlines
- Focus on adding value for stakeholders and customers
- Understand the customer journey
- Build superior products
- Understand capacity to ensure no one over or under commits to work
- Identify roadblocks before they occur
- Spot bottlenecks that could delay work
- Collaborate and work better together
- Adapt with technological, economic, and cultural changes
- Prepare for the unexpected
- Establish processes tailored to your needs
- Improve morale and happiness
- Develop a continuous improvement mindset

Agile 101: Popular methodologies

Now that you have a better understanding of agile 101 basics and the benefits of agile, let's discuss some of the most popular agile methodologies.

Scrum

Scrum is extremely popular in agile software development. It's a fairly complicated process for those who are unfamiliar with it, but the basics revolve around recurring sprints that each focus on completing a set amount of work.

A Scrum is one sprint lasting 2-4 weeks. At the beginning of the sprint, the product owner decides which task will move from the main list (product backlog) to the sprint to-do list (sprint backlog).

The development team, led by a Scrum Master who understands the Scrum process, works to complete the sprint backlog in the allocated time.

The Scrum team meets for daily Scrums or stand-ups that ensure everyone is on the page about possible roadblocks and what work is to be completed next. This process repeats until a product is complete or stakeholders are fully satisfied. At the end of the sprint, a retrospective is held to help the team understand what went well and what they can improve upon.

Kanban

Kanban is a fairly simple agile process that is often partially utilized within other agile methods, such as Scrum. It's a task management tool designed to optimize efficiency by visualizing all of the required work and limiting works in progress. A Kanban workflow visually organizes tasks on Kanban boards so that work items can move forward smoothly, even as changes and adjustments are made along the way.

In its simplest form, a Kanban board is three columns (To-Do, Doing, and Done) that allow work to freely flow from one phase to the next. Trello is an example of an online Kanban board.

Kanban boards should be placed in an area of the office that's visible to the entire team. For virtual teams, this may look like an online resource that everyone can access. This helps everyone from the top down get on the same page about action items. If anyone is wondering what's the most important task of the day, they simply need to check the Kanban board.

Lean

Lean, along with the five lean principles, originally created by Toyota, is a guiding mindset that helps teams work more productively, efficiently, and effectively. It can be applied to various agile and software development methodologies.

Lean software development is all about improving efficiency by eliminating waste, such as reducing tasks and activities that don't add value. It provides a clear way to scale agile practices across large or growing organizations.

Extreme programming

Extreme programming (XP) is an agile approach centered around improving software quality and responsiveness while evolving with customer requirements. The ultimate goal of extreme programming is producing high-quality results throughout every aspect of the work, not just the final product.

XP decision-making is based on five values: communication, simplicity, feedback, courage, and respect. XP's specifics won't apply to all situations, but the general framework can provide value to any team.

Agile 101: Best practices and mistakes to avoid

Alexis Rose GIF from Shitts Creek

To get you started, here are our list of best practices and common agile mistakes.

Basic agile 101 best practices:

- ✓ See failures as a learning opportunity.

- ✓ Embrace change and improve your adaptability skills.
- ✓ Improve efficiency by eliminating tasks and activities that don't provide value.
- ✓ Continually improve upon your processes.
- ✓ Allow plans to live, breathe, and adapt.
- ✓ Use retrospectives to listen, learn, and improve.
- ✓ Prioritize the customer journey, and make decisions based on customer needs.
- ✓ Utilize agile tools and resources.

Common agile mistakes:

- ✗ Not adapting as new information is revealed or obtained.
- ✗ Not being on the same page as stakeholders.
- ✗ Not trusting the team to ideate and develop without supervision.
- ✗ Sitting down for sprint planning without enough information.
- ✗ Not incorporating retrospective insights in the following planning session.
- ✗ Skipping a retrospective due to lack of time or resources.
- ✗ Too much testing, or not knowing when the project is actually “done.”
- ✗ Choosing tools that don't take a customer-centric approach.

Agile made easy

Whether you apply agile principles to an agile task management system like a personal Kanban board or use agile to develop working software, the essence is the same. In basic terms, agile is about continuous improvement. It's a methodology, mindset, and way of viewing the world. Agile is flexible, adaptive, collaborative, and value-driven.

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Learn Agile First: Then How To Scale It

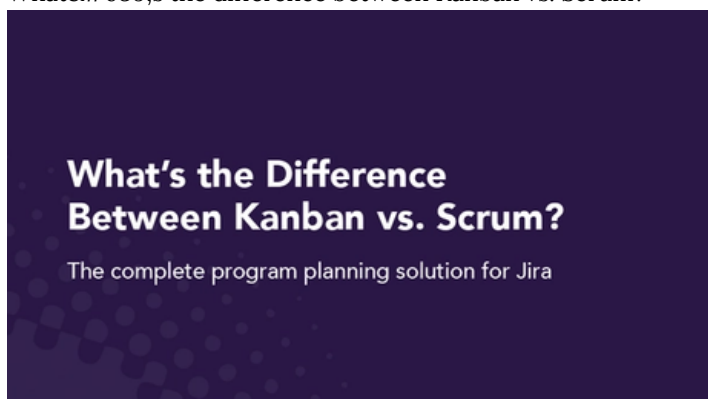


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78. Agile PM Chapter Introduction

Learning Objectives

After reading this chapter, you will be able to:

1. Understand the difference between traditional and Agile project management.
2. Explain fundamentals of Agile software development, including sprints and product stories.
3. Explain Agile project scope.
4. Discuss issues related to sustainable procurement in Agile project.
5. Explain the role of self-organizing teams in Agile.
6. Describe challenges related to resource allocation in Agile.

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79. About Scrum

A Management Framework

Scrum is a management framework for incremental product development using one or more cross-functional, self-organizing teams of about seven people each.

It provides a structure of roles, events, rules, and artifacts. Teams are responsible for creating and adapting their processes within this framework.

Scrum uses fixed-length iterations, called Sprints. Sprints are no more than 30 days long, preferably shorter. Scrum teams try to develop a potentially releasable (properly tested) product increment every Sprint.

An Alternative to Waterfall

Scrum's incremental, iterative approach trades the traditional phases of "waterfall" development for the ability to develop a subset of high-value features first, incorporating feedback sooner.

Requirements Analysis

Design

Code

Integration

Test

Deploy

Figure1:Traditional “waterfall” development depends on a perfect understanding of the product requirements at the outset and minimal errors executing each phase.

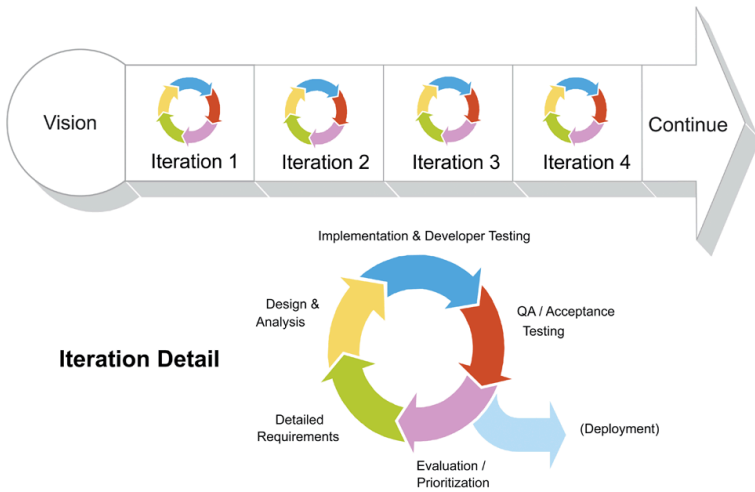


Figure2:Scrum blends all development activities into each iteration, adapting to discovered realities at fixed intervals.

The greatest potential benefit of Scrum is for complex work involving knowledge creation and collaboration, such as new product development. Scrum is usually associated with object-oriented software development. Its use has also spread to the development of products such as semiconductors, mortgages, and wheelchairs.

Doing Scrum, or Pretending to Do Scrum?

Scrum's relentless reality checks expose dysfunctional constraints in individuals, teams, and organizations. Many people claiming to do Scrum modify the parts that require breaking through organizational impediments and end up robbing themselves of most of the benefits.

Scrum Roles

Scrum Development Team

- Cross-functional (e.g., includes members with testing skills, and others not traditionally called developers: business analysts, designers, domain experts, etc.)
- Self-organizing / self-managing, without externally assigned roles
- Plans one Sprint at a time with the Product Owner
- Has autonomy regarding how to develop the increment
- Intensely collaborative
- Most successful when located in one team room, particularly for the first few Sprints
- Most successful with long-term, full-time membership. Scrum moves work to a flexible learning team and avoids moving people or splitting them between teams.
- 6 ± 3 members
- Has a leadership role

Product Owner

- Single person responsible for maximizing the return on

investment (ROI) of the development effort

- Responsible for product vision
- Constantly re-prioritizes the Product Backlog, adjusting any long- term expectations such as release plans
- Final arbiter of requirements questions
- Decides whether to release
- Decides whether to continue development
- Considers stakeholder interests
- Has a leadership role

Scrum Master

- Works with the organization to make Scrum possible
- Ensures Scrum is understood and enacted
- Creates an environment conducive to team self-organization
- Shields the team from external interference and distractions to keep it in group flow (a.k.a. the *zone*)
- Promotes improved engineering practices
- Has no management authority over the team
- Helps resolve impediments
- Has a leadership role

8o. Agile Definition

As described in chapter one, Agile is iterative short processes focused on customer feedback and satisfaction. In such processes, the customer is allowed to verify that the features are being developed as they want, and to suggest improvements. It also offers the customer the opportunity to release the product or software earlier than originally planned if the version presented at the end of a cycle is deemed good enough. This is one of the many reasons Agile is favored for software development. Agile products can be brought to market quickly and then continuously improved with subsequent updates. For many years, some “traditional” and Agile project managers viewed each other with a certain amount of skepticism about the value of each other’s methods. However, in recent years, project managers have seen the value of the techniques used in both of these two “camps” of project management. As a result, it is not unusual to see the design of a building using Agile techniques, and software development projects conducting a traditional risk analysis.



Figure 14-1: Agile projects are iterative

In the world of software development, a related methodology, Agile, is becoming increasingly popular. Although Agile had its roots in software development, companies have also expanded its use into a variety of project types, including product development, capital projects, and service projects.

The many flavors of Agile include:

- **Agile Scrum:** Designed for completing complex projects, as described on ScrumGuides, Scrum is the most widely used form of Agile. When people talk about Agile, they are usually talking about Scrum.
- **Extreme Programming:** Emphasizes short development cycles with frequent releases of software for evaluation, after which a new development cycle begins. You can read more about extreme programming at “Extreme Programming: A Gentle Introduction“
- **Rapid Product Development:** Emphasizes “simultaneous, coordinated activities by multi-functional teams, striving for smooth transitions between phases for the most rapid time-to-market” (ORC International: Expert Advisory Services). You can read more about Rapid Product Development in this “Introduction to Rapid Product Development.”

All forms of Agile emphasize an iterative approach (figure 14-1) to product development, with the project specifications evolving along with the customer’s notion of the software requirements. A project starts with a conversation between the developer and the product owner about what the customer wants the software to do. In Scrum terminology, the customer is the product owner, and the features that the product owner wants in the software are known as product stories.

With a description of the product stories in hand, the Agile developer gets to work, creating pieces of software that address individual product stories. After a one- to two-week cycle of development (known in Scrum as a sprint) the developer hands off the new software to the product owner so she can try it out and make suggestions for improvement. The developer then begins another sprint, incorporating those suggestions into a new iteration. After every sprint, the product owner has the chance to redirect the team to new product stories, or to revise the team’s understanding of the existing product stories. Through these repeated interactions, which provide fast, focused feedback, the

developer and the product owner zero in on a software application that does what the product owner needs it to do. If time and money are tight, as they often are, the product owner has regular opportunities to make choices about which product stories are the most important, and which can be dispensed with if necessary.

Agile development is essentially a learning process through which the developer and the product owner create a shared understanding of how many features they can create, given the allotted time and money. It's very much a living order approach to project management, in that the early stages involve some ambiguity and many unknowns. According to Robert Merrill (2017), a Senior Business Analyst at the University of Wisconsin-Madison, and an Agile coach, "Agile is a way to manage projects in the face of unpredictability and constraints—often very rigid time and budget constraints. The fast feedback allows the team to create the best possible software within the given constraints" (Merrill, 2017).

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8I. Scope in Agile

Robert Merrill, a Senior Business Analyst at the University of Wisconsin-Madison, and an Agile coach, advises taking a three-part approach to scope on Agile projects, determining the following:

1. Minimum viable features—If we can't deliver this much within schedule and budget constraints, the project should be cancelled.
2. Features we can't think about now—Although these might be featuring the client wants, they are not something we can create, and so we can't waste time and mental energy thinking about them.
3. Everything else—This is our unpredictability buffer, which we maintain to protect schedule and budget.

Note that these categories are not frozen; they can be changed during each iteration planning cycle. Scope in an Agile project is variable, but carefully and visibly managed.

The Agile Perspective on Scope Creep

Agile welcomes changes to product requirements even late in the development process. Indeed, the founders of Agile made an openness to late-breaking changes one of their “Principles behind the Agile Manifesto.” which you can read here: “Principles Behind the Agile Manifesto.”

In this environment of constant iterations and revisions, Agile developers have a different perspective on scope creep. A blog post for OptiSol spells out some ways to identify what is and isn't scope creep in Agile. Making changes “before the team has started to think about the details” would not be considered scope creep in Agile,

nor would replacing one feature with another, as long as the new feature doesn't add new work for the team. However, swapping a new feature for a feature that is already complete is definitely a form of scope creep, because it creates new work. The same is true of replacing a small feature with something more complex (OptiSol, 2015). You can read the complete blog post here: "What is Scope Creep in Agile Development?"

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82. Agile Procurement

Robert Merrill, a Senior Business Analyst at the University of Wisconsin-Madison, and an Agile coach, points out that “many procurement processes naturally follow or even mandate a negotiation-based approach that is directly at odds with the kind of living order thinking found in the Agile Manifesto, which emphasizes ‘collaboration over contract negotiation’” (pers. comm., June 15, 2018). Nevertheless, some organizations and governments are beginning to rethink their procurement processes in hopes of making them more Agile and, as a result, less costly.

One interesting example is an on-going overhaul of the State of Mississippi’s child welfare information system. After some initial missteps, the state decided to emphasize identifying and contracting with many qualified vendors on portions of the project, rather than attempting to hire a single entity to create the entire information system. A blog post published by 18F, an arm of the U.S. government’s General Services Administration, which provided guidance on the project, describes Mississippi’s new approach to an age-old software development dilemma:

- Mississippi’s initial response to solving this problem was a classic waterfall approach: Spend several years gathering requirements then hire a single vendor to design and develop an entirely new system and wait several more years for them to deliver a new complete solution. According to the project team at Mississippi’s Department of Child Protection Services (2016), this “sounds like a good option, but it takes so long to get any new functionality into the hands of our users. And our caseworkers are clamoring for new functionality.” Instead, they’re taking this opportunity to build the first Agile, modular software project taken on within Mississippi state government, and they’re starting with how they award the contracts to build it.

- Once this pool of vendors is selected, instead of awarding the entire contract to a single company, Mississippi will release many smaller contracts over time for different sections of the system. This is great for Mississippi. Inspired by the Agile approach, they'll only need to define what needs to be built next, rather than defining the entire system all up front.
- This is also great for vendors. Smaller contracts mean smaller vendors can compete. Small businesses can't manage or deliver on large multimillion-dollar software development contracts, and so are often precluded from competing. But with this approach, many contracts could end up in the single-digit millions (or less!). Smaller contracts mean more small businesses can compete and deliver work, resulting in a larger and more diverse pool of vendors winning contracts and helping the state.
- Approaching the project in a modular, Agile fashion can be more cost effective and less risky than a monolithic undertaking. To do it, they plan to take an approach called the "encasement strategy," under which they will replace the system slowly over time while leaving the legacy system in place. It will work like this: The old database will have an API layered on top of it and then a new interface will be built, one component at a time, without risking the loss of data or major disruptions to their workflow. Each module will be standalone with an API interface to interact with the data and the other modules. If they decide to replace a module five years from now, it won't really impact any of the others. (Cohn & Boone, 2016)

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83. Agile Teams

Agile software development was founded as a way to help team members work together more efficiently and companionably. In fact, three of the twelve founding principles of the methodology focus on building better teams:

- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly (Beedle et al., 2001).

The term “self-organizing teams” is especially important to Agile. Nitin Mittal (2013), writing for Scrum Alliance, describes a self-organizing team as a “group of motivated individuals, who work together toward a goal, have the ability and authority to take decisions, and readily adapt to changing demands” (Mittal, 2013).

But that doesn’t mean Agile teams have no leaders. On the contrary, the Agile development process relies on the team leader (known as the ScrumMaster in Scrum) to guide the team, ideally by achieving “a subtle balance between command and influence” (Cohn, 2010). Sometimes that means moving problematic team members to new roles, where they can be more effective, or possibly adding a new team member who has the right personality to interact with the problematic team member. In a blog for Mountain Goat Software, Mike Cohn (2010) puts it like this:

- There is more to leading a self-organizing team than buying pizza and getting out of the way. Leaders influence teams in subtle and indirect ways. It is impossible for a leader to

accurately predict how a team will respond to a change, whether that change is a different team composition, new standards of performance, a vicarious selection system, or so on. Leaders do not have all the answers. What they do have is the ability to agitate teams (and the organization itself) toward becoming more agile. (Cohn, 2010)

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84. Estimating Resources

In theory, resource management in Agile should be simple. After all, in Agile, resources and time are usually fixed. The team has a fixed budget, a fixed number of programmers, and a fixed amount of time to create working software. The variable in all this is the software itself. Throughout the cycle of sprints—as the customer tries out new software, and requests alterations—the software features can change dramatically. When the budget is exhausted, the project ends. However, because Agile developers create working software bit-by-bit, the customer is assured of having at least some usable features by that point.

So again, resource management in Agile should be simple—in theory. But in reality, the key resource in software development is the people who create the software. In addition, where people are concerned, things rarely go as planned. Some programmers work faster than others, and individuals can vary tremendously in their output from one week to the next, especially when dealing with personal problems, like illness or family conflict. Robert Merrill (2017), a Senior Business Analyst at the University of Wisconsin-Madison, and an Agile coach, puts it like this:

- Agile is more about people than computers. People are not interchangeable; they have good days and bad days. They get along or they don't. Cognitive abilities vary tremendously. If you aren't successful in helping teams' gel and stay focused, you're going to spend lots of extra money, or the project may blow up. You need to get the teams right. (Merrill, 2017)

As Gareth Saunders (2015) explains in a thoughtful blog post on the topic, this is all complicated by the amount of “business as usual” tasks that developers typically have to fit into their schedules on top of their work on specific Agile projects. This includes tasks like “admin, team communications, support, mentoring, meetings,

and consultancy—offering our input on projects managed by other teams” (Saunders, 2015). As a result, as a project manager, Saunders (2015) struggles to answer the following questions:

1. How do we know how much time each team member has to work on projects?
2. When we’re planning the next sprint, how do we track how much work has been assigned to a team member, so that they have neither too little nor too much work? (Saunders, 2015)

In theory, answering these questions should not be difficult. For instance, if you have, “five developers, each with 6 hours available for work each day”. That gives us 30 hours per day, and assuming 9 days of project work (with one full day set aside for retrospective and planning) then within each two-week sprint we should be able to dedicate 270 hours to development work” (Saunders, 2015). In reality, however, business as usual tasks can eat up 40% of a programmer’s working week, with that percentage varying from week to week or month to month.

Difficulties in estimating a team member’s capacity for work on a project is something every project manager faces. But in Agile, estimating capacity can be especially difficult. In Agile, project managers (or Scrum masters) ideally exert minimal direct influence on day-to-day work, because teams are supposedly self-organizing—that is, free to manage their work as a group, and pull work when they are ready for it. This means Agile project managers need to take the long view on resource management by practicing good resource capacity management, which involves “planning your workforce and building a skill inventory in exact proportion to the demand you foresee. It lets you optimize productivity and as a concept perfectly complements the Agile methodology” (Gupta, 2017).

Interested in learning more about managing resources in Agile? Start with these links:

- You can read more about resource capacity management from Project Management.com.
- Gareth Saunders' blog post, and the accompanying comments, walk you through some of the challenges of Agile resource management.

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85. Chapter Questions

Knowledge Check 1



An interactive H5P element has been excluded from this version of the text. You can view it online here:

*[https://kirkwood.pressbooks.pub/
projectmanagementbasics/?p=426#h5p-27](https://kirkwood.pressbooks.pub/projectmanagementbasics/?p=426#h5p-27)*

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86. Scrum Events

Product Backlog

Sprint Backlog

SprintRetrospective MeetingSprint Review MeetingDaily

ScrumSprint Planning MeetingBacklog Refinement Meeting

User login

User login

determine requirements for password policy

page layout (design)

get latest JBoss running

SSL enable

Selected Product Increment

choose persistence strategy (Hibernate?)

write code (using test-driven

development)

exploratory testing

Reset lost password

Account lockout

SSL enable

analyze example config file

get official

certificate from I.T.install certificate

exploratory testing (3 browsers)
update installation document

**LDAP
integr
ation**

Reset lost password

agree on best algorithm for randomizing passwords
decide where to put the link
code (using test- driven
development)

**Registe
r a new
login**

**Edit registration
Admin reporting**

Account lockout af ter three

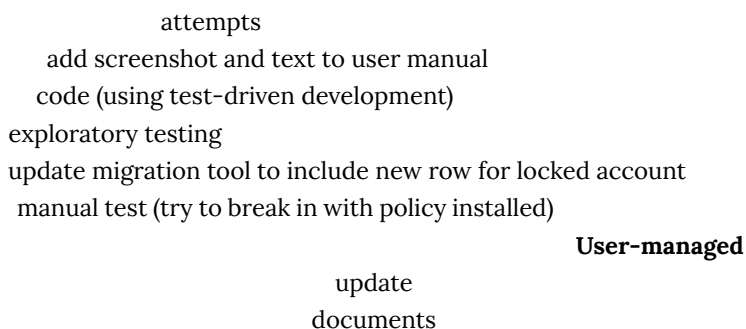


Figure 3: Scrum flow.

Sprint Planning

At the beginning of each Sprint, the Product Owner and team plan which Product Backlog Items they will attempt to convert to working product during the Sprint. The Product Owner is responsible for declaring which items are the most important to the business. The Development Team is responsible for selecting the amount of work they feel they can implement without accruing technical debt. The team “pulls” work from the Product Backlog to the Sprint Backlog.

When teams are given complex work that has inherent uncertainty, they must work together to intuitively gauge how much work to pull into a Sprint, while learning from previous Sprints. Planning their hourly capacity and comparing their estimates to actuals makes the team pretend to be precise and reduces ownership. Unless the work is truly predictable, they should discard such practices within the first few Sprints or avoid them altogether.

Until a team has learned how to complete a potentially releasable product increment each Sprint, it should reduce the amount of functionality it plans. Failure to change old habits leads

to technical debt and eventual design death, as shown in Figure 14.

If the top of the Product Backlog has not been refined, a portion of the event might be spent doing this.

Toward the end of the Sprint Planning Event, the team determines how it will accomplish the work. For example, they may break the selected items into an initial list of Sprint Tasks.

The maximum allotted time (a.k.a. *timebox*) for planning a 30-day Sprint is eight hours, reduced proportionally for a shorter Sprint.

Figure 4: *Sprint Planning outcome is selected Product Backlog Items (PBIs) and subordinate Sprint Tasks.*

Daily Scrum and Sprint Execution

Every day at the same time and place, the Scrum Development Team members spend a total of 15 minutes inspecting their progress toward the Sprint goal and creating a plan for the day. Team members may share with each other what they did the previous day to help meet the Sprint goal, what they'll do today, and what impediments they face.

Standing up at the Daily Scrum will help keep it short. Topics that require additional attention may be discussed by whoever is interested after every team member has spoken.

The team may find it useful to maintain a current Sprint Task List and a Sprint Burndown Chart. During Sprint execution, it is common to discover additional tasks necessary to achieve the Sprint goals.

Impediments caused by issues beyond the team's control are considered *organizational impediments*.

The Daily Scrum is intended to disrupt old habits of working separately. Members should remain vigilant for signs of the

old approach. For example, looking only at the Scrum Master when speaking is one symptom that the team hasn't learned to operate as a self-organizing entity.

Sprint Review

At the end of the Sprint, the Scrum Team holds Sprint Review to inspect and adapt the product as it emerges. They demonstrate a working product increment to everyone who is interested, particularly customers and end users, and get their feedback.

The team reviews the items selected during Sprint Planning and explains which items are considered *done*. For example, a software item that is merely “code complete” is considered *not done* because untested software isn't shippable. Incomplete items are returned to the Product Backlog and ranked according to the Product Owner's revised priorities as candidates for future Sprints.

The Scrum Master may help the Product Owner and stakeholders convert their feedback to new Product Backlog Items for prioritization by the Product Owner. Often, new scope discovery outpaces the team's rate of development. If the Product Owner feels that the newly discovered scope is more important than the original expectations, new scope displaces old scope in the Product Backlog. Some items will never be done.

External stakeholders and end users should participate. New products, particularly software products, are hard to visualize in a vacuum. Many customers need to be able to react to a piece of functioning software to discover what they will actually want. Iterative development, a *value-driven* approach, allows the creation of products that couldn't have been specified up front in a plan-driven approach.

Sprint Retrospective

Each Sprint ends with a retrospective. The team reflects on its own process. They inspect their behavior and take action to adapt it for future Sprints.

Dedicated Scrum Masters will find alternatives to the stale, fearful meetings everyone has come to expect. An in-depth retrospective requires an environment of psychological safety not found in most organizations. Without safety, the retrospective discussion will either avoid the uncomfortable issues or deteriorate into blaming and hostility.

A common impediment to full transparency on the team is the presence of people who conduct performance appraisals.

Another impediment to an insightful retrospective is the human tendency to jump to conclusions and propose actions too quickly. *Agile Retrospectives*, the most popular book on this topic, describes a series of steps to slow this process down: Set the stage, gather data, generate insights, decide what to do, close the retrospective.¹ Another guide recommended for Scrum Masters, *The Art of Focused Conversations*, breaks the process into similar steps: Objective, reflective, interpretive, and decisional (ORID).²

A third impediment to psychological safety is geographic distribution. Geographically dispersed teams usually do not collaborate as well as those in team rooms.

Retrospectives often expose organizational impediments. Once a team has resolved the impediments within its immediate influence, the Scrum Master should work to expand that influence, chipping away at the organizational impediments.

Scrum Masters should use a variety of techniques to facilitate retrospectives, including silent writing, timelines, and satisfaction histograms. In all cases, the goals are to gain a common understanding of multiple perspectives and to develop actions that will take the team and organization to the next level.

any allergy records exist.” While the engineers anticipated significant technical challenges in parsing the internal aspects of the allergy records, the presence or absence of *any* allergy was the most important thing the doctors needed to know. Collaboration between business people and technical people to split this epic yielded a story representing 80% of the business value for 20% of the effort of the original epic.

Since most customers don’t use most features of most products, it’s wise to split epics to deliver the most valuable stories first. While delivering lower-value features later is likely to involve some rework, rework is better than no work.

This activity has also been called “Backlog Grooming.”

Cut/ pasteplainCut/textpaste rich textCut/paste rich text and graphicsdatabase schema

Figure 5: During Backlog Refinement, large PBIs (often called “epics”) near the top of the Product Backlog are split into thin vertical feature slices (“stories”), not horizontal implementation phases.

87. Scrum Artifacts

Scrum defines three artifacts: Product Backlog, Sprint Backlog, and Increment.

Product Backlog

Backlog Refinement

Most Product Backlog Items (PBIs) initially need refinement because they are too large and poorly understood. While Backlog Refinement is not a required event, it is a required activity. Most Scrum Teams find it useful to take a short time out of every Sprint for this activity. They get together to prepare the Product Backlog for upcoming Sprints.

In Backlog Refinement, large vague items are split and clarified, considering both business and technical concerns. Sometimes a subset of the team, in conjunction with the Product Owner and other stakeholders, will compose and split Product Backlog Items before involving the entire team.

While refining items, the team may estimate the amount of effort they would expend to complete items in the Product Backlog and provide

top items are more granular

Figure6:*Product Backlog*

User login

SSL enable

Reset lost password

Account lockout after

LDAP integration

Register a new login

Admin reporting

only one item at a time
is top priority

other technical information to help the Product Owner
prioritize them.³

A skilled Scrum Master can help the team identify thin *vertical*
slices of work that still have business value, while promoting a

rigorous definition of “done” that includes proper testing and refactoring.

It is common to write Product Backlog Items in User Story form.⁴ In this approach, oversized PBIs are called *epics*. Traditional development breaks features into horizontal tasks (resembling waterfall phases) that cannot be prioritized independently and lack business value from the customer’s perspective. This habit is hard to break.

Agility requires learning to split large epics into user stories representing very small product features. For example, in a medical records application, the epic “display the entire contents of a patient’s allergy records to a doctor” yielded the story “display whether or not

- - Force-ranked (prioritized) list of desired functionality
- Visible to all stakeholders
- Any stakeholder (including the Team) can add items
- Constantly re-prioritized by the Product Owner
- Constantly refined by the Scrum Team
- Items at top should be smaller (e.g., smaller than 1/4 of a Sprint) than items at bottom

1 *Agile Retrospectives*, Pragmatic Bookshelf, Derby/Larson (2006)

2 *The Art of Focused Conversations*, New Society Publishers (2000)

3 The team should collaborate to produce a jointly-owned estimate for an item.

4 *User Stories Applied: For Agile Software Development*, Addison Wesley, Cohn (2004)

Product Backlog Item (PBI)

- Describes the *what* (more than the *how*) of a customer-centric feature
- Often written in *User Story* form
- Has a product-wide definition of *done* to prevent technical debt
- May have item-specific acceptance criteria
- Effort is estimated by the Development Team, ideally in relative units

Sprint Task (optional)

- Describes *how to achieve the PBI's what*
- Typically involves one day or less of work
- During Sprint Execution, a *point person* may volunteer to be primarily responsible for a task
- Owned by the entire team; collaboration is expected

Account lockout after three attemptsAcceptance Criteria:

....Small

(e.g., story points)

determine requirements for password policy

page layout (design)

get latest JBoss

running

write code (using test- driven
development
)

exploratory testing

Figure7: A PBI represents a customer-centric feature, usually requiring several tasks to achieve definition of done.

Sprint Backlog

- Consists of selected PBIs negotiated between the team and the Product Owner during Sprint Planning
- No changes are made during the Sprint that would endanger the Sprint Goal
- Initial tasks are identified by the team during Sprint Planning
- Team will discover additional tasks needed to meet the Sprint Goal during Sprint execution
- Visible to the team
- Referenced during the Daily Scrum

	Tasks Not Started		
Forecasted PBIs			Tasks Completed
User login	update installation document		determine latest requirements layout JBoss for password (design) policy
Acceptance Criteria:		Tasks In Progress	
S	agree on best decide code (using algorithm for where to test-driven randomizing put the link development passwords)		choose code persistence u test- explorator strategy driven tes (Hibernate?) development
SSL enable			
Acceptance Criteria:			
S			
Reset lost password	add screenshot exploratory and text to testing user manual	update ory deploy target in browsers) build.xml	explorat testing (3
Acceptance Criteria:			
M			
Lock account af ter three attempts	update man ual test code (using migration (try to test-driven tool to break in development) include new with policy row for installed)		
Acceptance Criteria:			
S			
	update documents		analyze official example confi certificate instal file from I.T. certifi

Figure8: *Sprint Backlog is best represented with an “information radiator” such as a physical taskboard.*

Increment

Figure9: *Sprint tasks required to complete one backlog item require a mix of activities no longer done in separate phases (e.g., requirements elicitation, analysis, design, implementation, deployment, testing).*

Sprint Burndown Chart (optional)

- Summation of total team work remaining within one Sprint
- Updated daily
- May go up before going down
- Intended to facilitate team self-organization
- Fancy variations, such as itemizing by point person or adding trend lines, tend to reduce effectiveness at encouraging collaboration
- Seemed like a good idea in the early days of Scrum, but in practice often misused as a management report, inviting intervention. The Scrum Master should discontinue use of this chart if it becomes an impediment to team self-organization.

25020015010050024-Jul 26-Jul28-Jul30-Jul 1-Aug
 3-Aug5-Aug7-Aug 9-Aug 11-Aug 13-Aug

Figure10:*Sprint Burndown Chart*

Product / Release Burndown Chart (optional)

- Tracks the remaining Product Backlog effort from one Sprint to the next
- May use relative units such as *Story Points* for Y axis
- Depicts historical trends to adjust forecasts

**Acme Rocket Sled
 Enhanced Product
 Burndown
 Projected completion in 1 –
 5 sprints**

- The product capabilities completed during the Sprints
- Brought to a usable, releasable state by the end of each Sprint
- Released as often as the Product Owner wishes
- Inspected during every Sprint Review

400

7/5/06

7/21/06

8/14/06

8/29/06
300

Effort units: story points
9/14/06
9/29/06
10/17/06
200

11/2/06
11/19/06
100

12/4/06
12/18/06
0

1/1/07
-100

-200

-300

-400

-500

1 2 3

4 5 6 7

8 9 10 11

(12) (13) (14) (15) (16) (17)

Sprint — Average Velocity: 47.36 story points/
sprint

Effort Remaining Backlog w/ unestimated items Velocity
Trendline Work Added/Removed Trendline New Baseline

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5 *Agile Estimation and Planning*, Cohn, Addison Wesley (2006)

88. Multiple Teams

Your Organization is Designed to Impede Agility

Introducing Scrum without simplifying the organization's structure and policies leads to *change theater* and no real improvement. Large organizations are usually just pretending.⁶ Successful adoptions of Large Scale Scrum are both top down and bottom up.

Scrum addresses uncertain requirements and technology risks by grouping people from multiple disciplines into one team — in one team room — to increase bandwidth, visibility, and trust.



Adding too many people to a team makes things worse. Grouping people by specialty also makes things worse. Grouping people by architectural components (a.k.a. component teams) makes things worse.



Figure 12: Communication pathways increase as a square of team size.

Feature Teams

Fully cross-functional “feature teams” are able to operate at all layers of the architecture in order to deliver customer-centric features. In a large system, this requires learning new skills.

As teams focus on learning — rather than short-term micro-efficiencies

— they can help create a *learning organization*.

Team 1Team 3UserLayerBusiness Logicersistence Layinformal
working grouperPeyerLaTeam 2Interface

Figure 13: Feature teams learn to span architectural components.

One Product Backlog, One Product Owner

In Large Scale Scrum, multiple teams share a single Product Backlog prioritized by a single Product Owner. They share the responsibility of maintaining this backlog. To avoid asynchronous dependencies, they collaborate across teams in one shared Sprint, using overall and multi- team versions of the events described in this card, often with team- appointed representatives.⁷ As in single-team Scrum, they attempt to develop one properly tested, integrated, shippable product increment every Sprint.

89. Related Practices

Lean

Scrum is a general framework coinciding with the Agile movement in software development, which is partly inspired by Lean manufacturing approaches such as the Toyota Production System.⁸

eXtreme Programming (XP)

While Scrum does not prescribe specific engineering practices, Scrum Masters are responsible for promoting increased rigor in the definition of *done*. Items that are called “done” should stay done. Automated regression testing prevents *vampire stories* that leap out of the grave. Design, architecture, and infrastructure must emerge over time, subject to continuous reconsideration and refinement, instead of being “finalized” at the beginning, when we know nothing.

Running (and Tested) Features

The Scrum Master can inspire the team to learn engineering practices associated with XP: Continuous Integration (continuous automated testing), Test-Driven Development (TDD), constant merciless refactoring, pair programming, mob programming, frequent check-ins, etc. Informed application of these practices prevents technical debt.

Robust “done”=Technical debtWeak “done”Waterfall
Time

Figure 14: The straight green line represents the general goal of Agile methods: early and sustainable delivery of valuable features.

*Doing Scrum properly entails learning to satisfy a rigorous definition of “done” to prevent technical debt.*⁹

6 “Seven Obstacles to Enterprise Agility,” Gantthead, James (2010)
<http://scrumreferencecard.com/7-obstacles-to-enterprise-agility/>

7 See <http://less.works> to learn about Large Scale Scrum

8 Agile movement defined at <http://agilemanifesto.org>

9 Graph inspired by discussions with Ronald E. Jeffries

90. Team Self-Organization

Engaged Teams Outperform Manipulated Teams

During Sprint execution, team members develop an intrinsic interest in shared goals and learn to manage each other to achieve them. The natural human tendency to be accountable to a peer group contradicts years of habit for workers. Allowing a team to become self-propelled, rather than manipulated through extrinsic punishments and rewards, contradicts years of habit for managers.¹⁰ The Scrum Master's observation and persuasion skills increase the probability of success, despite the initial discomfort.

Challenges and Opportunities

known

Self-organizing teams can radically outperform larger, traditionally managed teams. Family-sized groups naturally self-organize when the

91. When is Scrum Appropriate?

Technology

unknown

When the process is too complex for the defined approach, the empirical approach is the appropriate choice.*

right conditions are met:

- members are committed to clear, short-term goals

known

Requirements

unknown

- members can gauge the group's progress
- members can observe each other's contribution
- members feel safe to give each other unvarnished feedback

Psychologist Bruce Tuckman describes stages of group development as “forming, storming, norming, performing.”¹¹ Optimal self-organization takes time. The team may perform worse during early iterations than it would have performed as a traditionally managed working group.¹²

Heterogeneous teams outperform homogeneous teams at complex work. They also experience more conflict.¹³ Disagreements are normal and healthy on an engaged team; team performance will be determined by how well the team handles these conflicts.

Bad apple theory suggests that a single negative individual

("withholding effort from the group, expressing negative affect, or violating important interpersonal norms"¹⁴) can disproportionately reduce the performance of an entire group. Such individuals are rare, but their impact is magnified by a team's reluctance to remove them. This can be partly mitigated by giving teams greater influence over who joins them.

Other individuals who underperform in a boss/worker situation (due to being under-challenged or micromanaged) will shine on a Scrum team.

Self-organization is hampered by conditions such as geographic distribution, boss/worker dynamics, part-time team members, and interruptions unrelated to Sprint goals. Most teams will benefit from a full-time Scrum Master who works hard to mitigate these kinds of impediments.¹⁵

It is typical to adopt the defined (theoretical) modeling approach when the underlying mechanisms by which a process operates are reasonably well understood.

Figure 15: Scrum, an empirical framework, is appropriate for work with uncertain requirements and/or uncertain technology issues.¹⁶¹⁷

Scrum is intended for the kinds of work people have found unmanageable using defined processes — uncertain requirements combined with unpredictable technology implementation risks. When deciding whether to apply Scrum, as opposed to plan-driven approaches such as those described by the PMBOK® Guide, consider whether the underlying mechanisms are well-understood or whether the work depends on knowledge creation and collaboration. For example, Scrum was not originally intended for repeatable types of production and services.

Also consider whether there is sufficient commitment to grow a self-organizing team.

PART XIII

BUSINESS CASES & STUDIES

92. Project Termination Business Cases

The following are some examples of situations where projects have been terminated. Please read through the articles and answer the questions below.

- **The End of an Era – Greyhound Canada ends its operation in South Western Ontario. Article Link:** <https://lfpres.com/news/local-news/end-of-the-road-for-greyhound-canada>
- **\$2.4B Nuclear waste project terminated. Article Link:** <https://london.ctvnews.ca/nuclear-waste-plan-officially-terminated-1.5001876>
- **Renewable Energy Projects terminated in Ontario. Article Link:** <https://www.airdberlis.com/insights/blogs/energyinsider/post/ei-item/ontario-cancels-renewable-energy-projects-and-introduces-white-pines-project-termination-act-2018>

After reading the articles, conduct additional research and then write a paragraph (less than 500 words) incorporating the following:

1. State the reason(s) of termination.
2. Were they justifiable reasons?
3. Was the cause(s) of termination avoidable?
4. What steps a project manager will take to close the project?
5. Suggest lesson learned from these cases.

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93. Organizational Structures

Business Case

Toyota Motor Corporation

Toyota Motor Corporation (TYO: 7203) has often been referred to as the gold standard of the automotive industry. In the first quarter of 2007, Toyota (NYSE: TM) overtook General Motors Corporation in sales for the first time as the top automotive manufacturer in the world. Toyota reached success in part because of its exceptional reputation for quality and customer care. Despite the global recession and the tough economic times that American auto companies such as General Motors and Chrysler faced in 2009, Toyota enjoyed profits of \$16.7 billion and sales growth of 6% that year. However, late 2009 and early 2010 witnessed Toyota's recall of 8 million vehicles due to unintended acceleration. How could this happen to a company known for quality and structured to solve problems as soon as they arise? To examine this further, one has to understand about the Toyota Production System (TPS).

TPS is built on the principles of "just-in-time" production. In other words, raw materials and supplies are delivered to the assembly line exactly at the time they are to be used. This system has little room for slack resources, emphasizes the importance of efficiency on the part of employees, and minimizes wasted resources. TPS gives power to the employees on the front lines. Assembly line workers are empowered to pull a cord and stop the manufacturing line when they see a problem.

However, during the 1990s, Toyota began to experience rapid growth and expansion. With this success, the organization became more defensive and protective of information. Expansion strained resources across the organization and slowed response time.

Toyota's CEO, Akio Toyoda, the grandson of its founder, has conceded, "Quite frankly, I fear the pace at which we have grown may have been too quick."

Vehicle recalls are not new to Toyota; after defects were found in the company's Lexus model in 1989, Toyota created teams to solve the issues quickly, and in some cases the company went to customers' homes to collect the cars. The question on many people's minds is, how could a company whose success was built on its reputation for quality have had such failures? What is all the more puzzling is that brake problems in vehicles became apparent in 2009, but only after being confronted by United States transportation secretary Ray LaHood did Toyota begin issuing recalls in the United States. And during the early months of the crisis, Toyota's top leaders were all but missing from public sight.

The organizational structure of Toyota may give us some insight into the handling of this crisis and ideas for the most effective way for Toyota to move forward. A conflict such as this has the ability to paralyze productivity but if dealt with constructively and effectively, can present opportunities for learning and improvement. Companies such as Toyota that have a rigid corporate culture and a hierarchy of seniority are at risk of reacting to external threats slowly. It is not uncommon that individuals feel reluctant to pass bad news up the chain within a family company such as Toyota. Toyota's board of directors is composed of 29 Japanese men, all of whom are Toyota insiders. As a result of its centralized power structure, authority is not generally delegated within the company; all U.S. executives are assigned a Japanese boss to mentor them, and no Toyota executive in the United States is authorized to issue a recall. Most information flow is one-way, back to Japan where decisions are made.

Questions

Will Toyota turn its recall into an opportunity for increased participation for its international manufacturers? Will decentralization and increased transparency occur? Only time will tell.

1. What changes in the organizing facet of planning, organizing, leading, and controlling framework (or, simply, P-O-L-C) framework might you make at Toyota to prevent future mishaps like the massive recalls related to brake and accelerator failures?
2. Do you think Toyota's organizational structure and norms are explicitly formalized in rules, or do the norms seem to be more inherent in the culture of the organization?
3. What are the pros and cons of Toyota's structure?
4. What elements of business would you suggest remain the same and what elements might need revising?
5. What are the most important elements of Toyota's organizational structure?

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- *Management Principles (v1.1): Toyota Struggles with Organizational Structure* by Lumen Learning is licensed under Creative Commons by-nc-sa 3.0

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[/www.ipma-usa.org/articles/SelectionCriteria.pdf](http://www.ipma-usa.org/articles/SelectionCriteria.pdf)

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94. Risk Business Case

Aspen Music Festival and School

Disclaimer: This case study is formulated to be used solely for educational purposes and based on both factual and fictional information.

Background

The Aspen Music Festival and School (AMFS) is an annual classical music festival held in Aspen, Colorado. The history of this world-renowned music festival goes back to its inception in 1949. The 8-week long music extravaganza highlights more than 400 musical events. The event programming is diverse in size and type, ranging from orchestral performances to solo performances. The AMFS has four featured orchestras performing each summer; two are entirely composed of Aspen Music School students. This annual festival draws more than 70,000 attendees, young and old, to Aspen for many unforgettable summer days of classical music.

The festival occurs on the pastoral 38-acre Bucksbaum Campus located just outside of Aspen. The grounds are surrounded by groves of aspen and fields bordered by a little creek. The event features family concerts and other daytime programming designed specifically for children as pre-concert activities in the Meadows hospitality tent. One of the highlights of this year is *Beauty and the Beast* presented by The Aspen Musical Production Group.

Aspen has a public transportation system that is free within city limits. In the summer, it operates special routes and schedules to serve concertgoers until 7 p.m. on weekdays and 6 p.m. on weekends. Each night during the festival, two or three events are performed after dusk that end almost at the same time. The festival organizers states that many festival attendees have preferred to walk along the path between the venues and the town center after

the events, as the distances are short (about 20 minutes) and downhill for most visitors. The sidewalk is well lit after dark, but on one side of the two-lane road, and some sections of the sidewalk are too narrow for four people to walk comfortably abreast. There is no physical separation between the sidewalk and roadway except for the dividing lines. The speed limit in the area is 25 miles per hour; the local traffic is sparse after 6 p.m. Additional information about the festival is located in the Appendix.

Facilities

The facilities available are as follows:

- Benedict Music Tent accommodates 2,050 seats
- David Karetsky Music Lawn, open fields outside the Music Tent
- Harris Concert Hall holds 500 seats
- Castle Creek Campus, a 38-acre site with teaching studios, 68 practice rooms, two rehearsal halls

Food and Drinks

Food consumption is allowed only at the designated dining facilities in the concert venues. Food concessions, giveaways, and preparations are not permitted in the event area. No drinks are permitted in the event area. Similarly, no alcohol is distributed or sold in the event area. Bottled water is allowed in the concert venues.

Town of Aspen

Aspen is located in Pitkin County, Colorado, United States. As of 2015, 6,658 residents resided in Aspen. During the summer season however, the population can increase to more than 16,000. Aspen is 8,000 feet (2,400 m) above sea level and a 3.5-hour drive from Denver, Colorado. The average daily high is usually around 76 degrees.

Geologic Hazards

In table 9-3, the 2017 risk mitigation report prepared by the country officials lists the following hazards relative to their possible

occurrence and severity. For further information, please refer to tables 9-1 and 9-2 below.

Table 9-1: Categories for Estimating Probability of Future Hazard Occurrences

Probability Categories	
Highly Likely	Near 100% chance of occurrence next year or it happens every year.
Likely	10-100% chance of occurrence next year or it has a recurrence interval of 10 years or less.
Occasional	1-10% chance of occurrence in the next year or it has a recurrence interval of 11 to 100 years.
Unlikely	Less than 1% chance of occurrence next 100 years (recurrence interval of greater than every 100 years).

Table 9-2: Categories for Estimating Magnitude of Future Hazard Occurrences

Magnitude Categories	
Catastrophic	Multiple deaths; property destroyed and severely damaged; and/or interruption of essential facilities and service for more than 72 hours.
Critical	Isolated deaths and/or multiple injuries and illnesses; major or long-term property damage; and/or interruption of essential facilities and services for 24-72 hours.
Limited	Minor injuries and illnesses; minimal property damage; and/or interruption of essential facilities and services for less than 24 hours.
Negligible	No or few injuries or illnesses; minor quality of life loss; little or no property damage; and/or brief interruption of essential facilities and services.

Table 9-3: The 2017 Pitkin County’s Report of Aspen Natural Hazards – Estimated Probability and Magnitude

Hazard	Probability	Magnitude
Avalanche	Highly Likely	Critical
Wildfire	Likely	Critical
Flood	Occasional	Catastrophic
Winter Storm	Highly Likely	Limited
Lightning	Likely	Catastrophic
Dam Failure Flooding	Unlikely	Catastrophic
Drought	Occasional	Limited

Note. Probability refers to how likely the hazard is to occur in the future, accounting for historical frequencies or statistical assessment of probability. Magnitude is defined as the degree to which a hazardous event is severe in terms of its impacts on public

safety, community, and personal assets and properties, key infrastructures, and natural resources.

Questions

1. What types of risk are particularly pertinent to this event in the process of risk identification? Select all that apply
2. Once the types of risk are determined for an event, they can be organized according to two key dimensions of risk. This method of risk organization allows the event management team to conduct an accurate assessment of the risks. Which of the following are the two key dimensions of risk considered in the risk assessment?
3. Based on your answers to Questions 1 and 2, rate the likelihood and consequence of each risk identified in Question 1 on the scale of 1 (e.g., rare) to 5 (e.g., almost certain).
4. In the hierarchy of risk controls, which of the following is the measure of risk control applied when power cords and electrical wires are properly covered, and uneven surface areas are visibly marked.?
5. Which of the plans should contain the measures taken to safeguard files relevant to event management?

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- Risk Management: The Case of Aspen Music Festival and School (2020) by Heelye Park and Eric Olson is licensed under a Creative Commons Attribution-ShareAlike 4.0 International(CC BY 4.0).

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95. Communication Business Case

Discussion: The Ultimate Cost of Poor Communication

Preparation:

Research an example from the news of a situation in which a breakdown of teamwork and/or communication had serious or disastrous consequences. For example, in this article from the Daily Mail a two-year-old boy died from internal bleeding as the direct result of a total breakdown in communication between his physicians: <http://www.dailymail.co.uk/health/article-2286012/Toddler-bleeds-death-complete-failure-communication-doctors.html>

General Discussion Instructions:

Write a minimum of one short paragraph and a maximum of two paragraphs. Word totals for this post should be in the 100–200-word range. Whether you agree or disagree, explain why with supporting evidence and concepts from the readings or a related experience. Include a reference, link, or citation when appropriate.

For Discussion:

1. Provide a brief description of the situation. Include a link to the article or site, as I have above, where we can find and read the details. (In order to insert this link, copy and paste the URL from your browser window into the text box where you are making your post. You do not have to do anything special; it will automatically be converted to a Web link.)
2. Describe or discuss the result of the breakdown in communication and/or teamwork.
3. What, if anything, do you believe could have been done to prevent this breakdown?
4. What can we learn from your example?

Attribution

In addition to the resources listed in the acknowledgements page, the following resource was used in this chapter:

- The Ultimate Cost of Poor Communication by Linda Williams and Lumen Learning is licensed under CC BY: Attribution

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96. Design Thinking Business Case

Wedding Event for Cy's Catering

Background

Upon graduation, Jenny landed a junior marketing director position in the Cy's Catering department of a university in a midwestern state. As a division of the larger dining operation, Cy's Catering provides catering services for intermural events on campus and wedding events for off-campus clients (E. Laska, personal communication, August 14, 2018). Most off-campus clients are from the state's capital. Within a couple of months on the job, Jenny was asked to develop an income statement template for three new buffet menu themes developed for millennial clients. Jenny thought that this project would be a great opportunity for her to apply the concept of design thinking that she had learned from her event management class. The cost structure for each menu option will be first built based on the consultation with the catering and main kitchen managers. With the cost items laid out, she will incorporate them into an income statement template on a spreadsheet she will create. Then multiple simulations will be test-run by changing fixed costs and revenues for each menu item. The simulation results will be shared with the direct supervisors and kitchen management.

Design Thinking

Still a nascent idea in service management, design thinking is an effective iterative process for generating a new idea that focuses on customers (Liedtka, 2018). Today's customer demands change quickly, stemming from their constant exposure to trends through social media. Customers are increasingly looking for personalized

and memorable wedding experiences. To stay current with changing customer preferences, agility in service offering is the key if an event business is to step ahead of its competition. Event organizers are keenly aware of the need to adapt rapidly to changes in the marketplace. Design thinking emphasizes the customer-centric management of service innovation. Customer needs remain central to designing service offerings. An innovative approach to meeting customer needs is achieved through the iterative process of design thinking that involves defining problems, determining needs, brainstorming, prototyping, and testing. Following the basics of design thinking that she had learned, Jenny laid out the process map with the design thinking steps that must be taken when developing an income statement for the new buffet themes:

1. **Define the problem** –Create a new set of buffet menus that appeal to the growing segment of millennial wedding clients.
2. **Determine needs** –Millennial clients are more open to international tastes and prefer options for personalization.
3. **Brainstorming**–Consult with the dining managers and executive chefs from the main kitchen.
4. **Prototyping** –Build a prototype income statement template for three different menu options.
5. **Testing**–Test the prototypes and adjust if needed.

Once all the items are incorporated into her prototype income statement, Jenny decided to test the prototype with one of the new

menu options: East Meets West buffet. After a series of discussions with her two dining managers, she ran a simulation with an \$80 per meal option for 100 wedding guests. The total sales revenue from the event equals \$8,000(\$80 per meal \times 100 guests). The simulation also generated an estimated dollar amount for each of the line items of the income statement, expressed as a percentage value of the event revenue. Based on the estimated event revenue given, fill in the blanks in the income statement below and answer the following key questions.

1. What is the contribution margin (CM)?
2. What is the contribution margin per guest for this buffet meal option?
3. What is the net profit for this simulation and the break-even point with regard to the number of guests required?

INCOME STATEMENT

Total Sales Revenue (R)	\$8,000.00	\$80 (per guest)	
Variable Costs			
Catering Costs	\$_____	27.5%	of V
Facilities Costs	\$_____	22.5%	of V
Labor (Payroll)	\$_____	35.0%	of V
Overhead (Linen and tablecloth cleaning)	\$_____	15.0%	of V
Total Variable Costs (V)	\$_____	50%	of revenue
Contribution Margin (CM = R - V)	\$_____		
CM per guest	50%		
Fixed Costs			
Advertising/Promotion	\$_____	5.0%	of F
Payroll (Office personnel)	\$_____	15.0%	of F
Rent	\$_____	30.0%	of F
Supplies (Audio/Visual)	\$_____	25.0%	of F
Taxes	\$_____	7.5%	of F
Insurance	\$_____	7.5%	of F
Utilities (Water, Electric etc.)	\$_____	10.0%	of F
Total Fixed Cost (F)	\$_____	25.0%	of revenue
Profit (CM - F)	\$_____		
Break-even	_____	as number of guests served	

Specific Questions/Choices

1) Which of the following is NOT an activity of event financial management?

1. a) Securing financial resources

2. b) Monitoring financial resources
3. c) Allocating financial resources
4. d) Forecasting costs and benefits
5. e) Minimizing the recurring natural events

2) As a wedding planner, your recent wedding event had 120 guests in attendance and charged \$30 per guest.

Revenue: -----Costs: \$2,500 Profit: \$1,100

Based on your calculation, what is the percentage of the profit made on the wedding event?

30. a) 30.5%
31. b) 84%
32. c) 58%
33. d) 85%

The next two questions are related to the following information:

Emory gathered the following information from her recent wedding event that she had managed:

Flat fee per guest: \$200

Variable cost per guest: 50% of the fee

A total of 250 guests attended the wedding

The sales amounted to \$50,000

Variable cost: \$25,000

Net income: \$3,000

3) Calculate the contribution margin ratio.

1. a) 30%
2. b) 50%
3. c) 80%
4. d) 45%

4) Calculate the fixed expenses.

1. a) \$14,000
2. b) \$15,000

3. c) \$16,000
4. d) \$22,000

5) The average fixed assets were \$68,000 for Swartz's event planning company last year. The year's total revenues were \$330,000. What is the fixed asset turnover ratio for the last year?

1. a) 5
2. b) 3
3. c) 6.5
4. d) 4.85
5. e) 32.5

Attribution

In addition to the resources listed in the acknowledgements page, the following resource was used in this chapter:

- *Financial Management: The Case of a Wedding (2020) by Heeyle (Jason) Park and Eric Olson is licensed under a Creative Commons Attribution 4.0 International License.*

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97. Agile Business Case

Read the following case study: PM Governance Combined with Agile Tools Improves Delivery and Quality of Financial Services Programs and answer the questions below.

Questions

1. What are some of the agile tools and techniques that PM Solutions could have proposed?
2. What is the Kanban approach?
3. For the proposed solution to work, what style of governing should the team should adapt?

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Appendix

This is where you can add appendices or other back matter.

Versioning History

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This page provides a record of edits and changes made to this book since its initial publication. Whenever edits or updates are made in the text, we provide a record and description of those changes here. If the change is minor, the version number increases by 0.1. If the edits involve a number of changes, the version number increases to the next full number.

The files posted alongside this book always reflect the most recent version.

Version	Date	Change	Affected Web Page
1.0	03 January 2022	First Publication	N/A