IFMA's Project Management Course

Student Guide

IFMA™
International Facility Management Association
Empowering Facility Professionals Worldwide

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We would like to thank the following dedicated subject matter experts (SMEs) who shared their time, experience and insights during the development of the IFMA FMP Credential Program.

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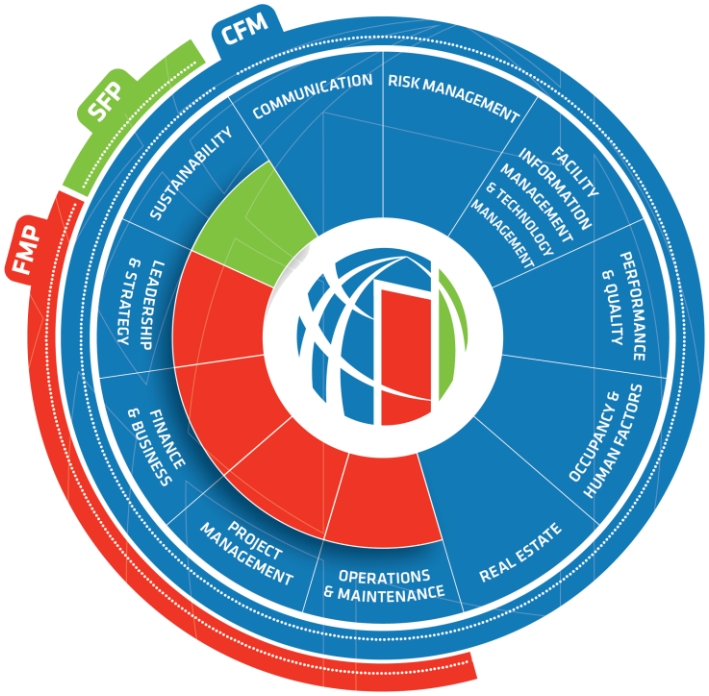
IFMA Credentials

About IFMA Credentials

After analyzing the work performed by facility managers, we have defined 11 competency areas. Our three world class FM credentials. — Facility Management Professional™ (FMP®), Sustainability Facility Professional® (SFP®), and Certified Facility Manager® (CFM®) — are based on these competencies.

1. The FMP is the foundational credential for FM professionals and industry suppliers looking to increase their depth-of-knowledge on the core FM topics deemed critical by employers.
2. The SFP is the leading credential for all facilities managers and like-minded professionals who are interested in the development of sustainable FM strategies.
3. The CFM is the premier certification for experienced FM professionals. A comprehensive exam assesses knowledge, skills, and proficiency across all FM competency areas.



Facility Management Professional (FMP) Program

IFMA's Facility Management Professional (FMP) credential is an assessment-based certificate program. This program demonstrates the fundamentals of facility management (FM). Developed from a foundation based on IFMA's global job task analysis (GJTA), the FMP Credential Program is continuously refreshed to align with current industry standards

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for FM knowledge, skills and tasks. The knowledge demanded by today's global employers is taught and tested online or in the classroom.

The four knowledge domains that the FMP Credential Program provides content and assessments on are:

- Operations and maintenance
- Project management
- Finance and business
- Leadership and strategy

This course focuses on project management. To receive the FMP credential, successfully complete all four courses (via elearning or instructor-led channels) and final assessments and submit an FMP application to IFMA for approval.

Course Overview

Course Audience

This course is designed for persons intending to earn their FMP credential or enhancing their FM industry professional development.

Course Chapters

This course consists of the following chapters:

- Introduction to Project Management
- Initiate Projects
- Plan Projects
- Execute, Monitor and Control Projects
- Close Projects

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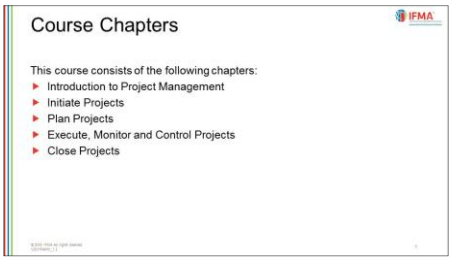
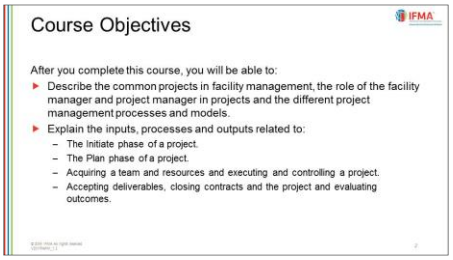


Course Objectives

After you complete this course, you will be able to:

- Describe the common projects in facility management, the role of the facility manager and project manager in projects and the different project management processes and models.
- Explain the inputs, processes and outputs related to:
  - The Initiate phase of a project.
  - The Plan phase of a project.
  - Acquiring a team and resources and executing and controlling a project.
  - Accepting deliverables, closing contracts and the project and evaluating outcomes.



Course Introduction

Facility Management (FM)

FM encompasses multiple disciplines which ensure functionality of the built environment, this profession requires a broad range of knowledge and skills.

IFMA conducts a global job task analyses (GJTA) to identify task, knowledge and skill areas that are important for competent performance by facility managers. The GJTA updates the core foundation of competency areas that contain the body of knowledge for FM and FM professionals.

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Role of Facility Managers as Related to Project Management

According to the IFMA GJTA:

> *Facility managers play a major role on all aspects of project management beginning with planning, scoping, scheduling and evaluating. Project planning and management are core skills in FM. The skills are particularly important because of the wide range of projects assigned to the FM organization. Projects vary in scope, complexity, duration and financial risk.*

Facility managers' project roles involve planning organizing, delegating, monitoring and controlling projects and ensuring that the interests of the FM organization and its customers are represented throughout the life-cycle of a project. However, a facility manager's role may vary depending on the specifics of the project and his or her capabilities and availability.

Common roles for facility managers include:

- Being the project manager.
- Delegating work to a project manager and being accountable for results.
- Being a team member on a project. For example, a different business unit's project or a project for its organization.

The first chapter of this book contains information on what makes a good project manager and how facility managers determine their optimal role on a given project.

Accurately estimating project costs, producing a feasible and properly organized project budget, and keeping a project on budget affects facility managers' credibility and their ability to get funding for future FM projects.

Benefits of Understanding Project Management

How can an understanding of projects and project management increase the capabilities of facility managers and FM staff?

The following are examples of FM organization successes when sound project management principles are applied:

- Effectively managed move or relocation projects can minimize organizational downtime and lost productivity and maximize profits or avoid costs.

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- Effectively managed MAC (move/add/changes) projects can lead to improved customer satisfaction.
- Well managed capital renewal projects can have a significant impact on the organization's bottom line.
- Well managed sustainability and energy conservation projects can significantly reduce costs and energy consumption.
- Careful and thoughtful completion of code- or safety-related projects can have a significant impact on the health and welfare of customers and building occupants.
- Well-managed manufacturing industry or laboratory and research projects can maximize profits and minimize production downtime.

Also, understanding project management helps FM staff more effectively contribute when they join project teams.

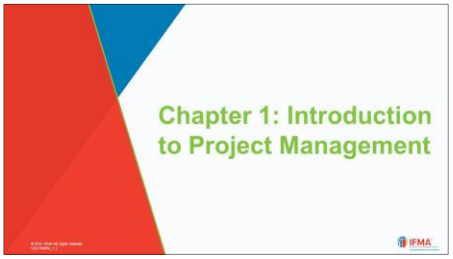
Furthermore, an understanding of projects and project management will help not only the project manager but also FM staff who join a project team so they can understand the overall purpose of the project and contribute to that purpose.

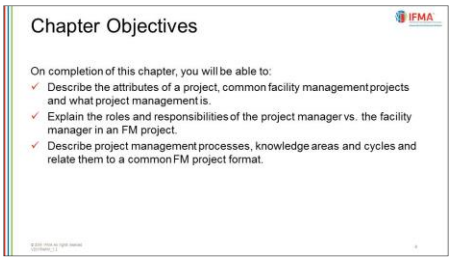
Chapter 1: Introduction to Project Management

Chapter Introduction

On completion of this chapter, you will be able to:

- Describe the attributes of a project, common facility management projects and what project management is.
- Explain the roles and responsibilities of the project manager vs. the facility manager in an FM project.
- Describe project management processes, knowledge areas and cycles and relate them to a common FM project format.





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The term **demand organization** is referenced throughout this document. ISO 41011 defines demand organization as an entity which has a need and the authority to incur costs to have requirements met.
The demand organization terminology is used to bring clarity to the relationship between the parties involved by focusing on the process itself. The demand organization and the FM organization to work together to clearly define needs to meet the core business strategy and to develop FM policies and practices that will enable the core business activities of the demand organization.

Lessons

- Project Management of Facility Projects
- The Project Manager
- Project Management Processes and Cycles

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Project Management of Facility Projects

Lesson Introduction

On completion of this lesson, you will be able to:

- Describe the attributes of a project, common facility management projects and what project management is.

This lesson contains the following topics:

- What are Projects?
- Facility Management Projects
- What is Project Management?

What are Projects?

The Project Management Institute (PMI) defines projects as,

> "*Temporary endeavors undertaken to create a unique product, service or result.*"

Projects can be abstract in subject matter, such as forecasting future facility needs or tangible, like renovations, new construction and demolitions.

Organizations will have their own criteria for what constitutes an FM project. For example, an organization could define forecasting future facility needs as a finite programming project, a component of a larger project or a regular (non-project) FM activity.

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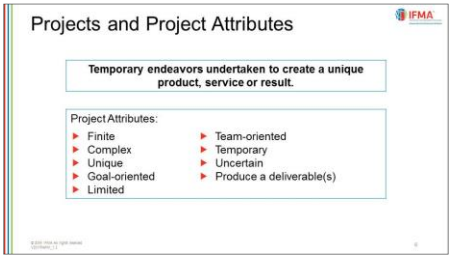
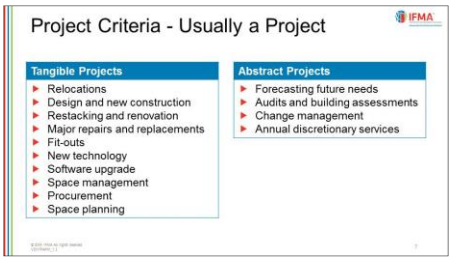
Project Attributes



Projects can also be defined by their common attributes. Projects are:

- **Finite** — have a beginning and an end
- **Complex processes** — numerous, sequenced tasks
- **Unique** — a one-time set of events
- **Goal-oriented** — designed to achieve specific objectives
- **Limited** — scope, time, resources and budget limitations
- **Team-oriented** — tasks and members of teams cross functional areas
- **Temporary** — teams are formed for the common purpose and disband when project completes
- **Uncertain** — assumptions and estimates are made increasing potential for risk
- Required to produce one or more **deliverables**, such as, end product(s) or service(s)

Project Criteria



FM organizations have policies, procedures and practices to define what is/is not considered as a project. There can be overlap or leeway allowed in this decision. While some FM activities can only be accomplished as a project, other tasks can be handled either as a project or as regular FM activities.

Examples of criteria for treating work as a project are:

- The work requires significant design and planning.
- The work exceeds organizational capital budgeting requirements.

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- The work requires external expertise.
- The work requires intra-departmental collaboration to ensure continuity and mitigate impact to other internal organizations.

Organizations with an implemented project management framework set the criteria defining what is considered a project. It is not necessarily set by the FM organization.

Exhibit 1-1 outlines activities that are usually treated as projects and regular FM activities that are not usually treated as projects.

Exhibit 1-1: Project versus non-project

Usually a Project		Usually Not a Project
Tangible projects: → Relocations → Design and new construction → Restacking and renovation → Major repairs and replacements → Fit-outs → New technology → Software upgrade → Space management → Procurement → Space planning	Abstract projects: → Forecasting future needs → Audits and building assessments → Change management → Annual discretionary services	• Cleaning and security services • Maintenance and small repairs - For example, preventive maintenance schedules • Leasing • Administration

It is important not to treat all FM activities as a project. Projects are temporary in nature and differ primarily in that regular (non-project) FM activities are ongoing and repetitive. For example, regularly scheduled preventive maintenance on an air conditioner.

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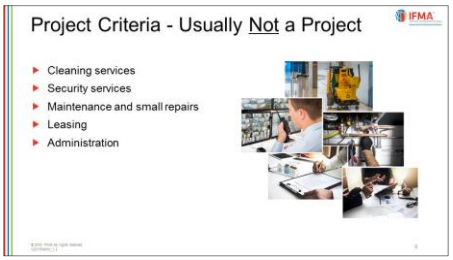

Facility Management Projects

Reasons FM Projects May Be Initiated

Facility management projects may be initiated to:

- Implement elements of the strategic facility plan and/or master plan.
- Implement tactical plans that exceed a cost or work limit for regular operations and maintenance.
- Act in response to a mandate from a project sponsor, such as a client or senior executive, supported by the release of capital funds, technology, new market opportunities and environmental factors.
- Resolve problems or implement performance improvements.
- Address the results of programming, that is, a statement of requirements.
- Implement planned changes, for example:
  - Compliance with a code, regulatory or legal requirement
  - Changes to existing organizational structure, staffing or systems
  - Facility renewal needs
  - Changes in the organization's strategy
  - Technology integration across the organization
- Respond to unplanned changes, for example:
  - Unscheduled lease termination

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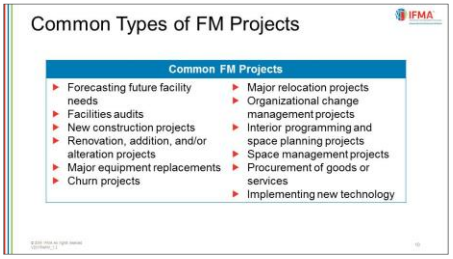
- Unoccupied space becomes leased
- Merger or acquisition
- Organizational change such as rapid growth or downsizing
- Emergencies such as urgent requirements from senior management, equipment failures or natural disasters

Common Types of FM Projects



The different types of projects facility managers may need to lead or be involved in include:

- Forecasting future facility needs, in other words, programming project
- Facilities audits and building assessments
- New construction projects
- Building restacking and renovation, addition and/or alteration projects
- Major equipment replacements
- Churn projects, for example, minor relocations
- Major relocation projects
- Organizational change management projects
- Interior programming and space planning projects
- Space management projects
- Procurement of goods or services
- Implementing new technology, for example, CMMS

The nature of some of these projects requires external expertise, while other types of projects could be done either internally or externally.

The type of project may also be defined by whether it is funded using capital funds or operational funds.

→ **Minor projects** are frequently funded using **operational funds** directly from the department being supplied the service or as a chargeback.

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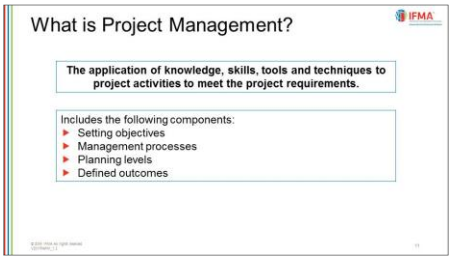
→ **Major projects**, such as those for construction, require release of **capital funds**, which are funds retained or raised for strategic business development needs.

Given an understanding of some common facility management projects, the next important concept is what is needed to manage these projects.

What is Project Management?



PMI defines project management as,

> "*The application of knowledge, skills, tools and techniques to project activities to meet the project requirements.*"

Project management can also be thought of as an organized process for increasing the chances of project success.

This organized process generally includes the following components:

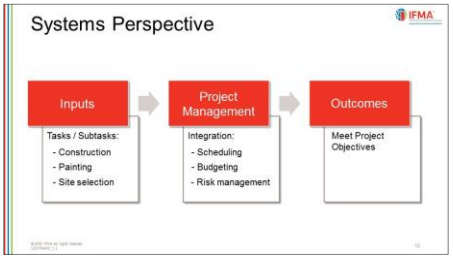
1. **Setting Objectives** — project management requires a set of results to achieve as defined through its scope and its constraints of cost, schedule and quality.
2. **Management Processes** — project management follows a predetermined set of processes, such as scheduling or budgeting, and follows a project cycle that encompasses initiating, planning, executing, monitoring and controlling and closing.
3. **Planning Levels** — project management incorporates both strategic and tactical planning levels.
4. **Defined Outcomes** — project management has a defined set of outcomes that can become the inputs for another phase/part of the project or represent the final project outcome at completion.

Additionally, project management is:

- The process of allocating necessary and sufficient resources at just the right time to achieve a specific purpose as early as possible.
- Distinct from regular FM activities but a subset of overall FM activities.

- Often clearly linked to executing strategy and may be the best possible way to achieve defined goals.
- More than just the use of project scheduling tools.
- An application of soft skills such as:
  - Communicating
  - Leadership
  - Influencing
  - Understanding behavior
  - Managing stakeholder relationships
- Integrated with quality tools such as checklists and questionnaires
- Able to incorporate flexibility, if planned for in advance, rather than asked for while the project is under way.
- Applied change management; projects create change.
- Timely conflict resolution.

Systems Perspective



A key element of project management is looking at the project from a big-picture view, including the project planning and the integration or coordination of plans from a systems perspective. A system is a set of interrelated or interacting activities. Project management from a systems perspective addresses the project as a whole rather than thinking of each set of activities separately.

- Project planning is the process of organizing the resources and tasks required to accomplish a unit of work.
- Plans reflect the anticipated use of resources and sequence of tasks necessary to accomplish project goals.
- Integration or coordination is the process of unifying the relatively independent project resources and tasks divided for project planning back into a seamless process.

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A project is made up of a system of tasks and subtasks that interconnect to form a network. Project management involves using processes to convert these task and subtask inputs into outputs to produce a predetermined result.

Exhibit 1-2 shows how integration or coordination is a key project management task. Project management is similar to a conductor keeping an orchestra in time to a musical score; in other words, the project manager integrates/coordinates the activities of a project team using a project management plan.

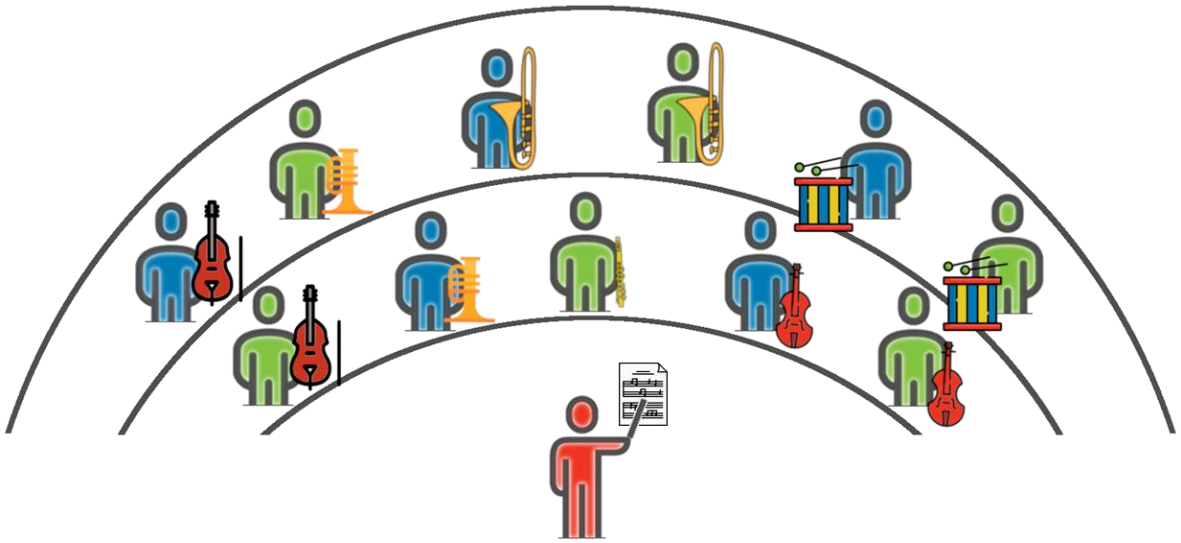
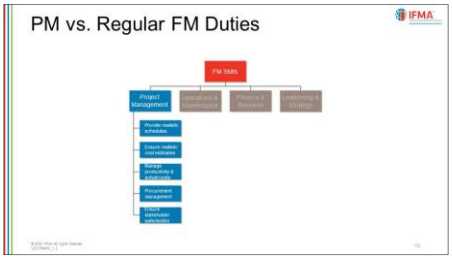


Exhibit 1-2: Integration or Coordination Is Like Conducting an Orchestra

Project Management Versus Regular FM Duties



For facility managers, project management is a subset of the full set of FM skills. When facility managers are managing regular FM activities, such as operations and maintenance, they apply a broad range of general management tools and techniques.

When functioning as a project manager, facility managers often perform the following tasks more frequently:

- Using scheduling to provide a high probability that a plan is realistic
- Ensuring cost estimates are realistic

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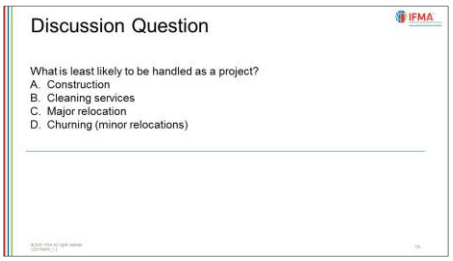
- Focusing on resource productivity and actual job costs
- Tracking permissions, materials and equipment (procurement management)
- Ensuring stakeholders are satisfied with the direction of the project and the project deliverables

Facility managers need to be familiar with a number of key terms often encountered on facility management projects including those for space planning, construction and contract administration. The appendix to this course lists a number of FM project terms related to these and other concepts.



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The Project Manager

Lesson Introduction

On completion of this lesson, you will be able to:

- Explain the roles and responsibilities of the project manager vs. the facility manager in an FM project.

This lesson contains the following topics:

- Facility Manager's Role
- Role of Project Manager
- Facility Manager's Role in FM Projects

Facility Manager's Role

The facility manager’s role on a given project may be as the project manager, as a team member or as the person accountable for project success who selects/hires/contracts and manages/supervises the project manager.

This lesson discusses the role of the project manager in general. As such, descriptions of the qualities of a good project manager may refer to qualities the facility manager should possess when acting in this role or to qualities a candidate should possess when the facility manager is responsible for choosing and supervising/managing a project manager.

Following the discussion of the role of project manager, the topic finishes by listing some factors facility managers use when deciding how best to fill the role of project manager and project team roles, for an FM project.

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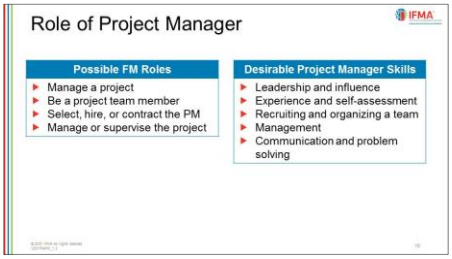
Role of Project Manager



The project manager role involves establishing consensus on:

- Project objectives
- Achieving project objectives
- Establishing, managing and leading the project team
- Integrating or coordinating the project management process throughout each of its phases

To fulfill this role successfully, the project manager should possess certain qualities.

First, the project manager role needs management authority, such as the ability to make purchases within certain constraints and the ability to hire, discipline and terminate employees or contractors who directly report to the project manager.

Second, the project manager role requires a balance of skills to effectively manage the projects:

1. Technical project management skills
2. Leadership skills
3. Strategic and business management skills

Some project managers receive a formal education where they learn how to balance these skills, while others learn this through on-the-job experience. The amount of experience or training a project manager has received is dependent on the projects they have worked on and their exposure.

Facility managers can assess of their own skills to determine if they would make a good project manager or if someone else should be brought in to take on the role. If facility managers are responsible for internally staffing, hiring or contracting out the project manager role, they should review and customize their organization's project manager job description to reflect the specific project work to be done.

In either case, the following skills are generally desired in the role of project manager:

- Leadership and influence

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- Experience and self-assessment
- Acquiring and organizing a team
- Management
- Communication and problem solving

Note that these topics are more fully addressed in IFMA's *Leadership and Strategy* course.

Leadership and Influence

The role of project manager requires development of leadership and influencing skills. Project managers take pride in ownership of the project and its mission. They apply principles of leadership and influence to acquire and develop a team. Depending on the situation and people involved, project managers modify their leadership style, from being assertive, to applying facts and reason, to listening, to being persuasive. They recognize that the goal of influence is to inspire others to do the right things rather than to tell them what to do, as the project manager is not always in a position of power.

Experience and Self-Assessment

Facility managers assess whether they or the project manager candidates they are considering possess the requisite theoretical knowledge and field experience for a particular project. This can be done by assessing their formal training in project management as a discipline and/or field experience in leading a number of projects.

Another key project management skill to assess is interpersonal skills. The ability to integrate and work well with others is a difficult skill to develop without certain inherent personality traits. It is vital that facility managers or project manager candidates have interpersonal skills and exhibit a trend of continual improvement in these soft skills.

Myers-Briggs and Neethling Brain Instruments (NBI) are tools that can be used to help perform these assessments.

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Project managers must be unbiased when evaluating their own skills and performance abilities in order to:

- Ask for help when needed.
- Admit to mistakes.
- Learn from mistakes and successes of past projects.
- Vary approaches to fit the personalities of team members and stakeholders.
- Revise approaches to identify the approach that works best for a given team.

Acquiring and Organizing a Team

The role of a project manager includes responsibility for acquiring and organizing the project team. To put together an efficient team requires the ability to assess the strengths and weaknesses of potential or assigned team members and organize staff/contractors to optimize teamwork and fill needed areas of expertise. For example, a project manager may ask a person who is a detail-oriented thinker to work on an audit and assign an outgoing person who understands verbal and non-verbal cues as a department liaison.

Project managers acquire and organize the project team to represent key stakeholders. The following are examples of these stakeholders:

- Customers, or the facility manager's client, including:
  - A project approval committee comprised of board of directors
  - A designated decision maker from management for issues that arise in regularly scheduled progress meetings
  - Department heads whose areas are affected by a move
  - End users are people who are most affected by the results of the project, such as employees working in the newly designed space.
  - Landlords are the owner or manager of real estate that is leased to individuals or businesses.
- Facility manager, if different from project manager, to approve final changes and supervise the "big picture"
- Project team members, for example, staff from FM organization, accounting, IT/telecommunications/networking, purchasing or marketing departments
- Contractors and subcontractors, for example, specialists, architects and engineers
- Professional services who provide expertise, for example, design firm

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Some project managers may not have the management authority to hire their project team and instead must acquire team members internally. Additionally, in some instances the project manager may be given a project team instead of having to acquire one.

Management

The role of a project manager is that of planning agent who integrates and coordinates the tasks of the project. Effective project managers can delegate appropriately and avoid any bottlenecks by delaying the approval process unnecessarily or micromanaging team members.

Project managers treat controlling and directing work as a full-time job. Project managers who take on individual project tasks have the added challenge of needing to manage the project as a whole and track its many components. For example, a project manager may brilliantly accomplish a task but miss that a team member has added an unauthorized feature.

Project managers manage people with the insight that they need to verify the completion of every task. For example, rather than simply accepting claims that team members are on schedule, project managers spot-check some details because they recognize that people who are behind schedule may report being on schedule thinking that they can make up the time. Although the project manager may trust their team, quality is ultimately the project manager's responsibility, so it is important to verify some details.

Project managers understand that accurate measurement is a prerequisite to management. For example, if an item in a progress report stays at 95 percent complete despite the continued expenditure of effort, project managers may further break down how the task is reported so it can be better measured and managed.

Communication and Problem Solving

The role of the project manager includes being the primary liaison between the project team and executive team. Effective project managers realize that regular, personalized communications and sensitivity to organizational culture are vital to maintaining productive relationships with the executive team.

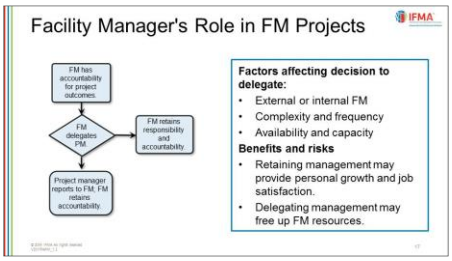
Project managers use written and oral communication and practice active listening. They apply multiple modes of communication to reinforce messages, including meetings,

reports, project management software, e-mail, printed bulletins, conversations and interpretation of non-verbal cues.

Project managers negotiate with stakeholders on a daily basis both to resolve conflicts and to help decision makers make choices that balance the needs of all constituents.

A communications directory made available to all project team members can be used to house all project communications.

Facility Manager's Role in FM Projects



Facility managers who satisfy all of the skill and knowledge requirements discussed previously may still choose to delegate the project management role to another individual for a particular FM project. For example, capital construction projects are generally fully delegated to a general contractor who supplies a project manager and separate project team. This project manager reports to the facility manager.

Facility managers must understand that it is important not to interfere with the project team member's authority and daily project management work. The facility manager can, and often should, delegate responsibility and project management duties but cannot delegate control of FM projects. In other words, the facility manager can delegate responsibility, but not accountability.

There are times when a facility manager is not the accountable party for a project but is a team member on a project run by someone outside the FM organization. For example, a project initiated by the corporate real estate group if it is a branch of the executive department. The facility manager should protect the organization's interest by making sure the project lead conforms to all the FM organization's requirements.

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Deciding who should fill the role of project manager and the roles of project team members may not be known until the project is defined and agreed to in the form of a project charter (discussed later). The facility manager may temporarily fill the role of project manager for FM projects until more information is available to make this decision.

When deciding whether to fill the role of project manager or to delegate it, the facility manager considers the following for the proposed project:

- Client representative (external) or coordinator (internal) role
- Complexity and frequency
- Availability and capacity
- Benefits and risks

Client Representative (External) or Coordinator (Internal) Role

Some FM organizations are externally contracted services hired to represent the client from the beginning to the end of a project.

An example of such an organizational structure is shown in *Exhibit 1-3*, where the dotted lines show contracted roles or firms.

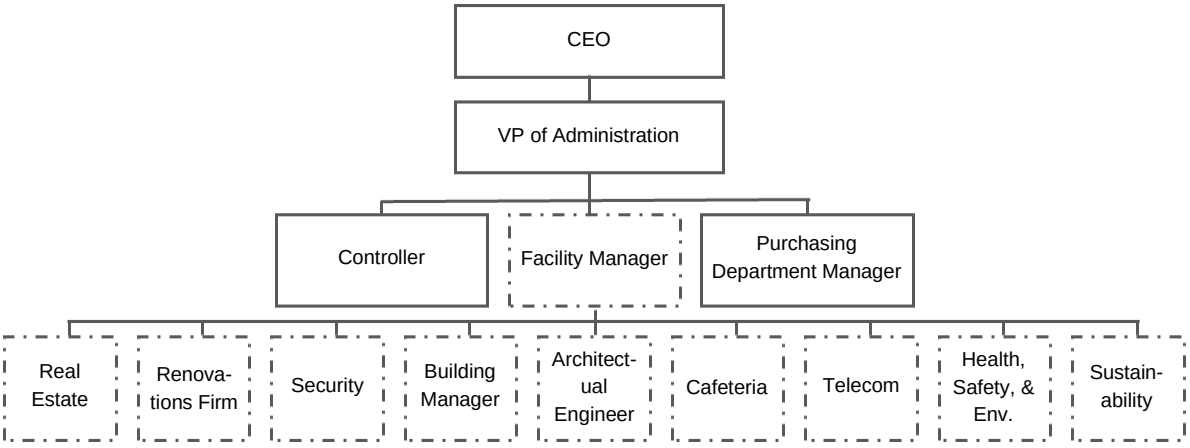

Exhibit 1-3: Organizational Structure for a Client Representative (External) Role

In other cases, the FM organization is an internal department or business unit in a larger organization, and the facility manager occupies a coordinator role. An example of this type of organizational structure is shown in *Exhibit 1-4*.

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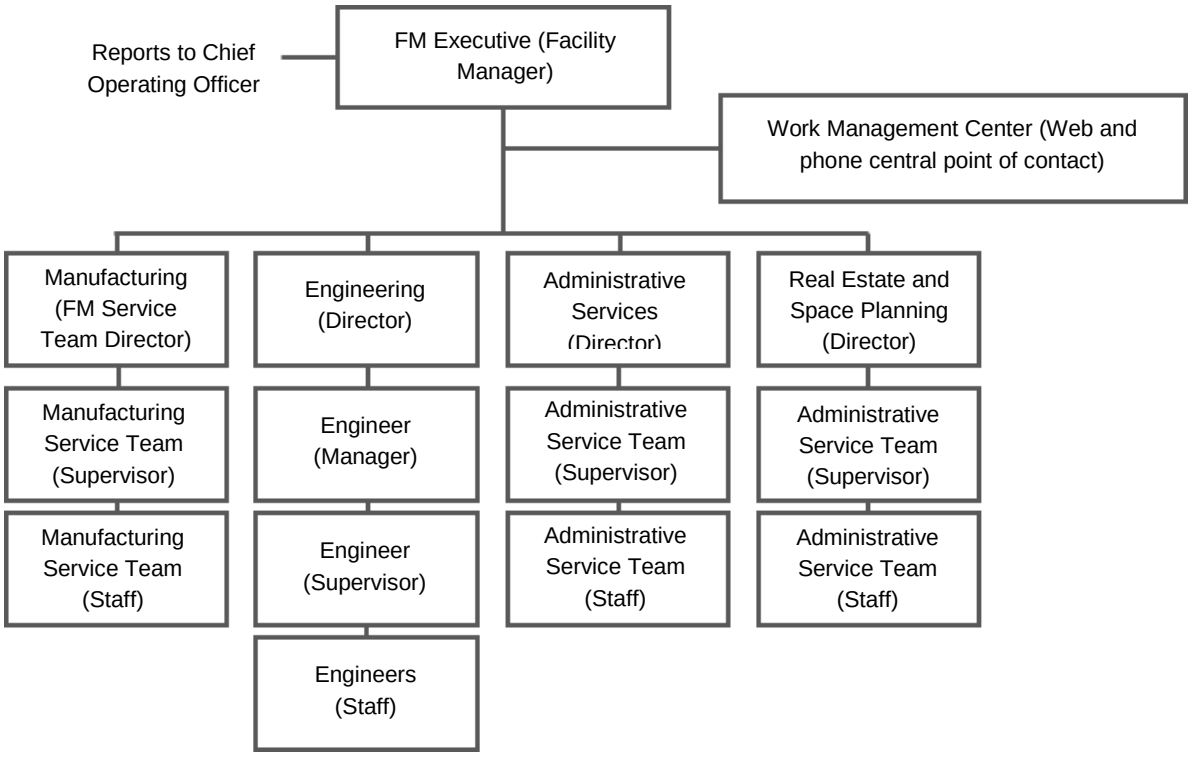

Exhibit 1-4: Organizational Structure for a Coordinator (Internal) Role

This factor may impact the options available to the facility manager and what the client/senior management tends to expect in terms of the use of external/internal project management and project teams.

Complexity and Frequency

Complexity refers to the many details of the project, such as tasks, sequence and quality. Frequency refers to how often the facility manager or FM organization has managed or will manage such a project. The facility manager assesses the technical complexity of the project and the frequency of such projects. Then the facility manager determines if the skills and experience of the proposed manager and project team members match the project's requirements

Complex capital projects usually need team members with specialized skills and education. These projects may require the use of professional services including architects, engineers and building contractors as well as hiring additional staff to exercise proper control, for example, construction accountants, construction procurement specialists, inspectors or expert estimators.

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Availability and Capacity

When a project is within the capabilities of the facility manager and the FM organization, the facility manager considers the impact of the project's demands on the workload of the total FM organization. The facility manager and FM organization could handle projects that require only a part-time commitment. Projects that require a full-time leader and/or a large proportion of available FM staff time are generally delegated to in-house or contracted resources. If the facility manager decides to run such a project, arrangements will need to be made for the management of regular FM activities while the project is ongoing.

Another consideration is whether or not there are any available fallback resources with applicable skills and experience in the event that problems occur with the project or an emergency requires diverting the attentions of the selected project manager or project team members.

Benefits and Risks

The benefits and risks of facility managers assuming the role of project manager and of FM staff becoming team members must be weighed against the benefits and risks of delegating these roles to internal or external resources. Some of the risks already mentioned involve relative experience levels, availability and capacity.

Benefits the FM organization may experience when the facility manager assumes the role of project manager include:

- Increased buy-in from the organization
- Someone who understands of the organizational culture
- Less risk of a security or confidentiality breach

Benefits that facility managers and FM teams may experience when getting involved in a project include that it may:

- Provide opportunities for personal growth.
- Increase job satisfaction by providing more responsibility.

Benefits of delegating the work could include:

- Reduced risk of project failure
- Freedom to pursue other strategic or tactical endeavors

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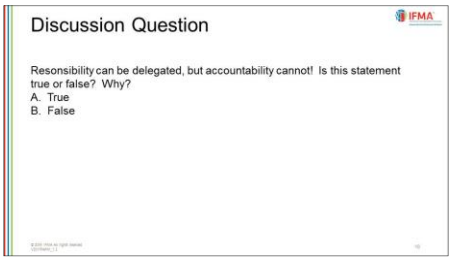


Project Management Processes and Cycles

Lesson Introduction

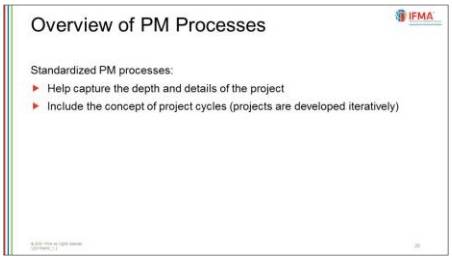
On completion of this lesson, you will be able to:

- Describe project management processes, knowledge areas and cycles and relate them to a common FM project format.

This lesson contains the following topics:

- Overview of Project Management Processes
- Standardized Project Management Processes
- Project Cycles
- Project Model for This Course

Overview of Project Management Processes



Project planning can be a formal or informal process depending on the scope and complexity of project tasks.

Formal project planning employs standardized project management processes and models that are similar across organizations and industries.

The foundation of any project planning is a process of asking questions about the project such as:

- What must be done?

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- Who will do it?
- How should it be accomplished?
- How long should it take to complete?
- How well should it be done?
- How much will it cost?

While asking these questions may be enough for a simple project, a more complex project will benefit from a standardized project management process that will capture the necessary depth and details of these answers. Most standardized processes include the concept of project cycles. This helps conceptualize that projects are developed iteratively, starting with a framework and returning to add details as they become known or changes as they are approved.

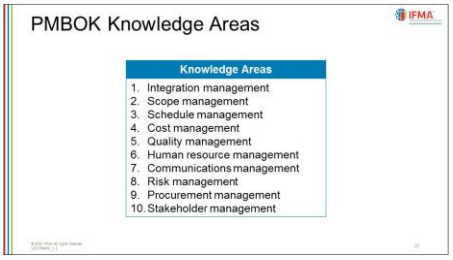
Standardized Project Management Processes

Standardized project management processes can be beneficial because they present consistent terminology and provide a framework that can be adapted to project specifics. Standardized processes can ensure no important project components are omitted.

Motivating an organization to adopt a standard set of processes and commit to an increased amount of planning work may be a process in itself. While the project manager is expected to provide expertise and structure to a project, organizational resistance to change cannot be underestimated.

If the project manager wants to follow a specific methodology for projects, they need to have buy-in from management and also sell the idea to the project team.

PMBOK Knowledge Areas



One of the oldest and more widely accepted standardized project management processes is the Project Management Body of Knowledge (PMBOK) of the Project Management Institute (PMI). The PMI website and the PMBOK are useful resources for more information on standard project management processes and available tools.

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The PMBOK includes a set of project management knowledge areas that aid in understanding the breadth of tasks involved in managing a project.

The knowledge areas can be described as follows:

1. **Integration management** — the coordination of tasks and persons, including control of project changes.
2. **Scope management** — the cataloging of tasks to determine and control the extent of work to be done.
3. **Schedule management** — making a schedule to complete the project on time, detailing when to start and finish each task.
4. **Cost management** — estimates costs, which, if accurate, help to develop a realistic budget that can be used to control costs.
5. **Quality management** — applies quality tools to measure and correct tasks and deliverables to suit the project's purpose.
6. **Human resource management** — identifies, acquires and manages the project team such as employees and/or contractors.
7. **Communications management** — maintains timely and appropriate communications with all stakeholders.
8. **Risk management** — produces and executes a plan for managing risks ranked by their likelihood, severity and manageability.
9. **Procurement management** — specifies contracts for and manages use of materials and professional services.
10. **Stakeholder management** — the process of forming and managing relationships with those who have an interest in the project or who will be affected by its deliverables or outputs.

Management of projects of any size will address these areas, for example:

- Producing formal plans for each area in an overall project management plan for complex projects.
- Addressing each as less formal considerations for smaller projects.

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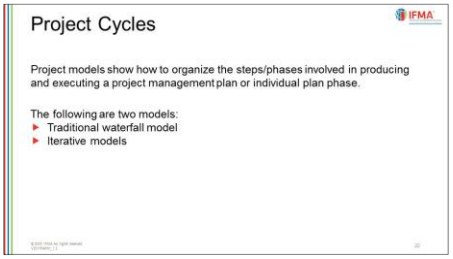
Project Cycles



Project models show how to organize the steps/phases involved in producing and executing a project management plan or individual plan phase.

The phases differ depending on the type of project and the areas that need to be controlled. Phases can also be defined as the points where work or deliverables are passed to a different group or individual. Models can be useful because they help organize work, deliverables and teams by what is needed for each phase.

Though there are numerous project models available, this course focuses on the following:

- Traditional waterfall model
- Iterative models

Traditional Waterfall Model

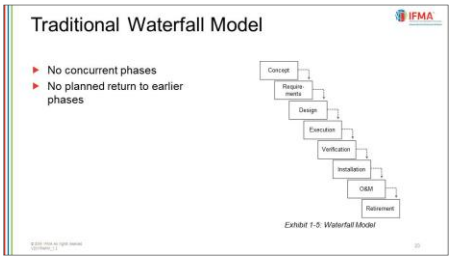


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Exhibit 1-5 shows how a traditional model illustrates a set of phases relevant to the type of project and how work flows from one phase to the next in sequence, without any concurrent phases or allowance for the possibility that a task would need to be revisited. For example, if a project verification process excluded the thorough review of equipment specifications during or after installation, this could result in costly change orders and impact project schedule.

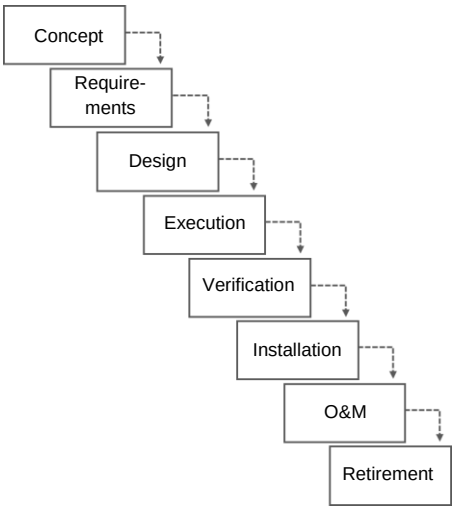

Exhibit 1-5: Waterfall Model

Iterative Models

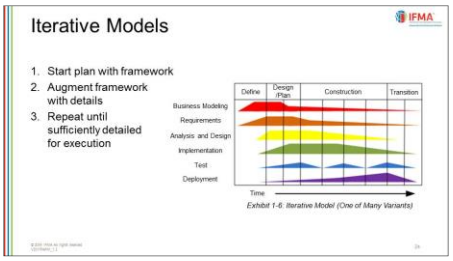

Exhibit 1-6 illustrates one version of an iterative model. Iterative models address deficiencies in the traditional waterfall model by incorporating concepts of concurrent work and planned iteration or a scheduled return to prior phases as new information is discovered.

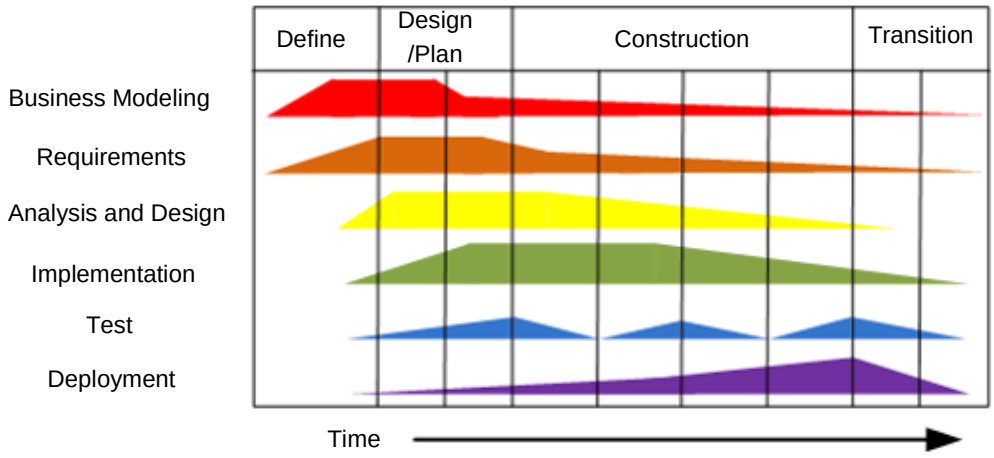

Exhibit 1-6: Iterative Model (One of Many Variants)

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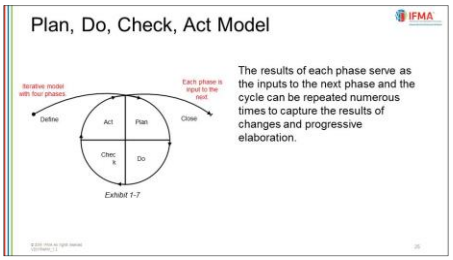
Iterative models start by defining a framework for a plan and, as the project progresses, greater and greater detail is added. Planned iteration is also called progressive elaboration because each pass further adds to the information gathered in the previous effort. The cycle is repeated until the plans are sufficiently detailed to enable execution. The process of moving from general to specific for each element of a project is captured in the Plan, Do, Check, Act model.

Most project models are iterative, in other words, they involve the repetition of a sequence of operations or procedures.

Plan, Do, Check, Act Model



The Plan, Do, Check, Act (PDCA) model is an iterative model that has four phases:

1. Plan
2. Do
3. Check
4. Act

The results of each phase serve as the inputs to the next phase and the cycle can be repeated numerous times to capture the results of changes and progressive elaboration. PDCA was defined by Shewhart and modified by Deming for use in quality management. Since projects always have a beginning and an end, Define and Close phases are added to the basic model in *Exhibit 1-7*.

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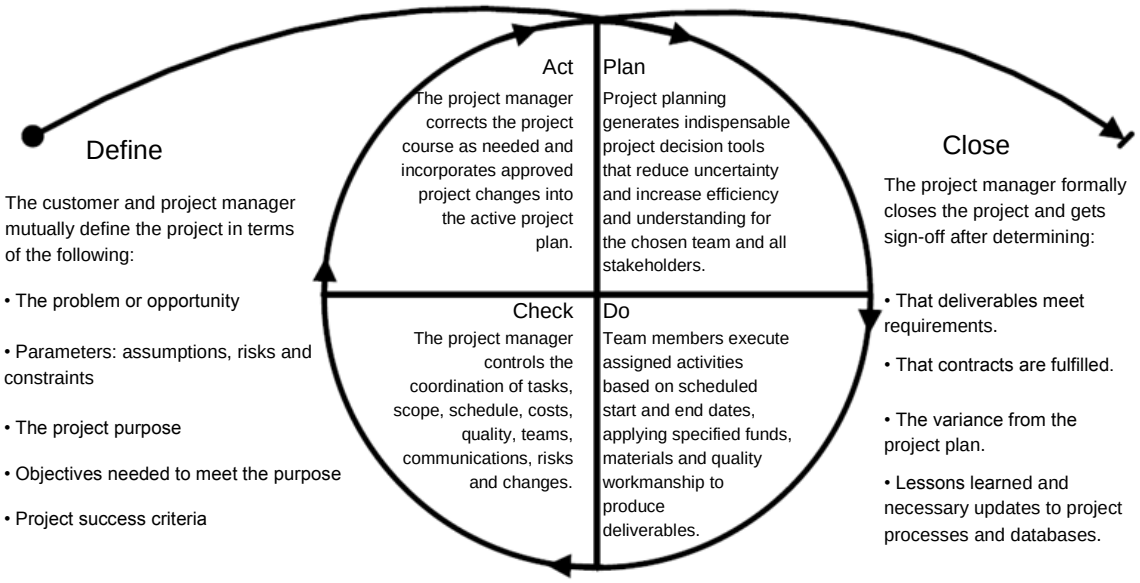
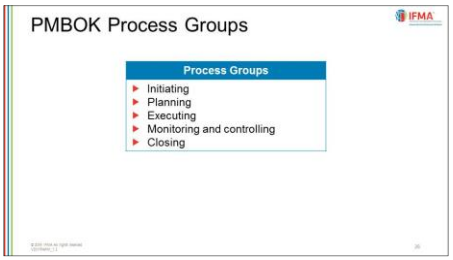
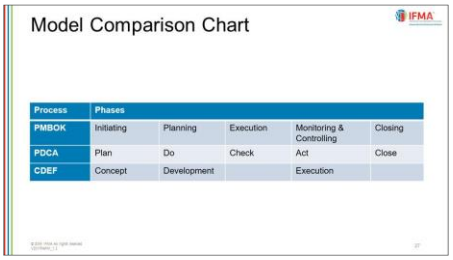
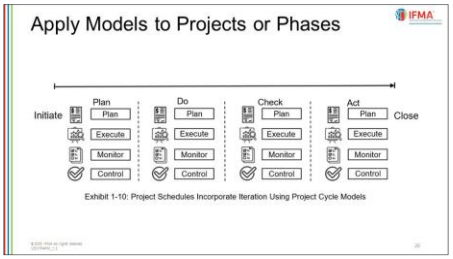


Exhibit 1-7: PDCA Model with Define and Close Phases for Projects

PMBOK Process Groups







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The PMBOK identifies five project management process groups as a way to categorize the key tasks or processes, performed within a project, as shown in *Exhibit 1-8*.

Exhibit 1-8: PMBOK Project Management Process Groups

Initiating	Processes that define a new project or phase by obtaining authorization to begin the project.
Planning	Processes that establish the scope of the project, refine objectives and define the course of action.
Executing	Processes that execute the plans defined to satisfy project specifications and produce work.
Monitoring and Controlling	Processes that track, review and regulate the progress and performance of the project and make adjustments to the work.
Closing	Processes that finalize all activities and archive information to formally close the project.

Every process that takes place within the project activities fits within a process group and knowledge area. There are often overlaps between the process groups, as some processes are performed iteratively and may be repeated multiple times throughout the project's life-cycle.

This discussion refers to the PMBOK process groups as project phases. Each organization may use its own terminology to describe these phases and they might be grouped differently.

For example, the PDCA model uses Define for Initiating, Plan for Planning, Do for Executing, Check/Act for Monitoring and Controlling and Close for Closing. The C, D, E, F model uses Concept (C) for Initiating, Development (D) for Planning, Execution (E) for Executing/ Monitoring and Controlling and Finish (F) for Closing. *Exhibit 1-9* compares the phases of each model.

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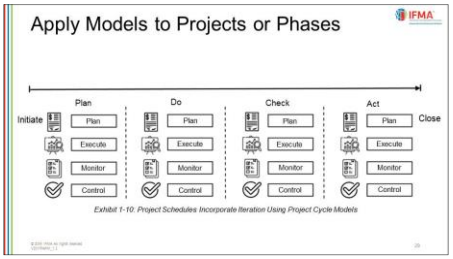
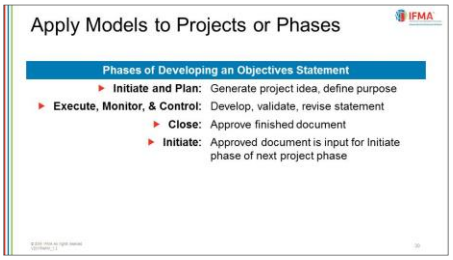
Exhibit 1-9: Model Comparison Chart

PMBOK	Initiating	Planning	Executing	Monitoring and Controlling		Closing
PDCA	Define	Plan	Do	Check	Act	Close
CDEF	Concept	Development	Execution			Finish

Apply Models to Entire Projects or Project Phases





The PMBOK process groups are not just a simple summary of a project. The model can be applied to the project process as a whole as well as to individual phases or elements within a project.

Exhibit 1-10 illustrates this concept using the PDCA model for the overall project phases and the PMBOK process group phases to show how each phase has its own internal cycle.

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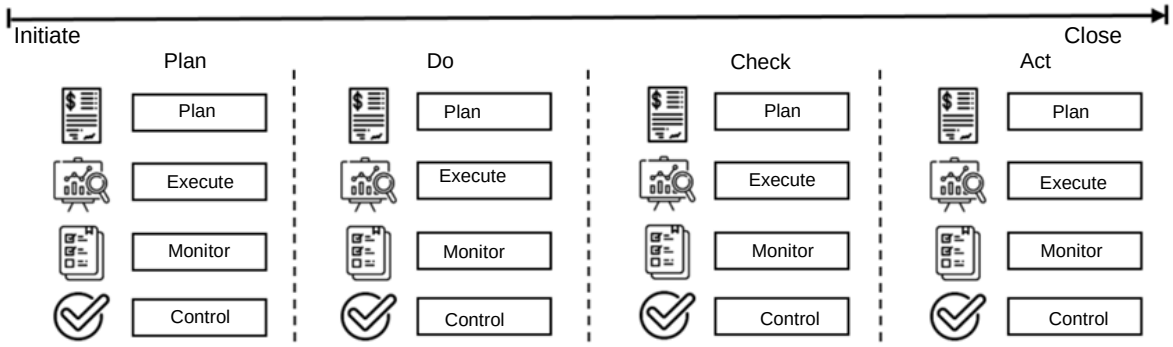
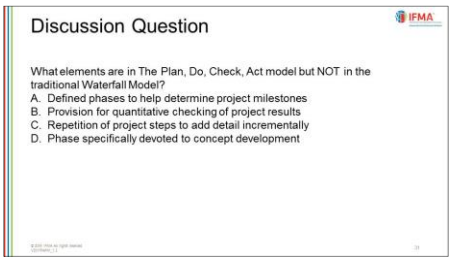


Exhibit 1-10: Project Schedules Incorporate Iteration Using Project Cycle Models

The Close phase of each interim cycle becomes the Initiate phase or input for the next project phase.

For example, when developing a project objectives statement, the process of generating an idea for a project and defining its purpose are the Initiate and Plan phases. Execute, Monitor and Control are performed as the objectives statement is developed, validated and revised. The finished document, output, is approved in the Close phase, and this becomes the Initiate phase or input for the next project phase.

Feasibility studies are often performed as a separate project when it is unclear whether to recommend a project or what the nature of a proposed project will be. Feasibility studies are sometimes conducted as part of project selection.



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Project Model for This Course

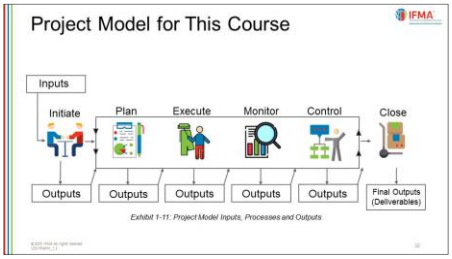

Exhibit 1-11 is an overview of the project model used for this course. It starts with the basic inputs to most projects, that include project initiation. It shows how the outputs for each phase become inputs to the next phase.

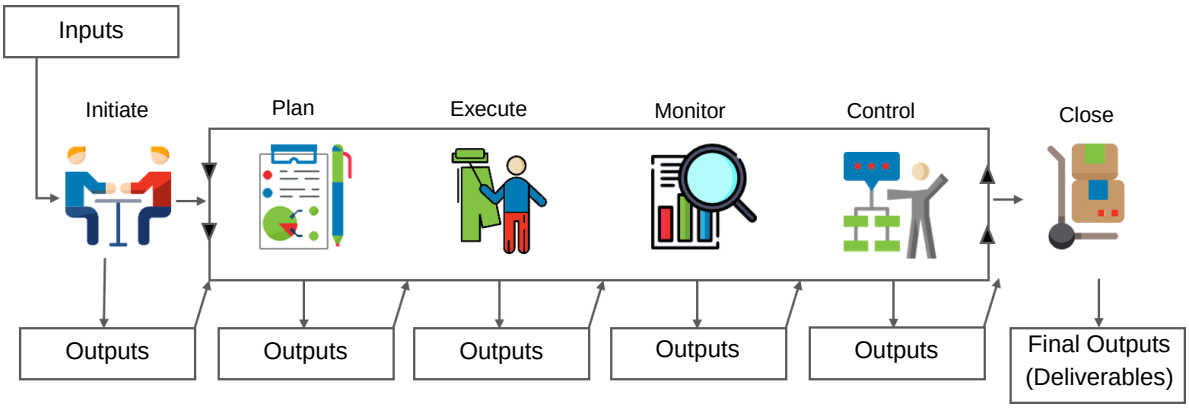

Exhibit 1-11: Project Model Inputs, Processes and Outputs

A version of this graphic is repeated in the remaining topics to show specific inputs, processes and outputs related to that topic.

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Lesson Activity

Relocation Case Study

The purpose of this activity is to introduce the relocation case study that will be used throughout this course.

This example is specifically for a relocation project, but there are many types of projects in facility management.

Introduction

The project management model helps facility managers see the theoretical big-picture of a complex project. However, often an organization will mandate a specific process for typical FM projects. The process may have predefined project steps and list the specific persons with approval authority. The project steps may not align directly with the Execute, Monitor, Control, and Close project phases.

To help facility managers move from theory to application, *Exhibit 1-12* introduces a case study of a relocation project that includes design and construction for the new location. Following the exhibit, there is an overview of the task-driven phases of this case study. This relocation project case study and each of the task-driven phases is revisited throughout this course to reinforce related concepts in the text.

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Exhibit 1-12: Relocation Case Study Scenario

The FM organization's facility strategic plan and its real estate master plan for the headquarters facility indicate a need for additional space and a reduction in maintenance and utility costs. Therefore, the organization decides not to renew the current lease, that expires on 9/1 which is in 18 months

Frank Jones has 18 months to do everything required for the relocation. This includes conduct programming to define user needs, plan a solution, conduct a site search, select a design firm, select and acquire a space, supervise the design, select a general contractor, supervise construction, plan and execute the relocation, and occupy the space.

Answer the following questions regarding the case study:

1. What do you think are some of the steps that would go into relocation?

2. What are some of the issues, challenges and risks that Frank Jones might experience with relocation?

3. What tasks come to mind that need to be completed for this project?

Project Format

The relocation case study assumes that the facility manager is required to use a predefined project management process.

The basic steps are:

1. Define need
2. Plan solution
3. Design and acquire space
4. Construct space
5. Occupy space
6. Close project

Exhibit 1-13 shows this format with some additional high-level tasks included in list form. This is called a work breakdown structure (WBS). The WBS is discussed later in this course, but it is basically a list of all of the component tasks to be performed on the project. The WBS in *Exhibit 1-13* is set to a calendar for the project duration, which has a hard relocation deadline of 9/1, so this milestone and the milestone indicating project kickoff are included.

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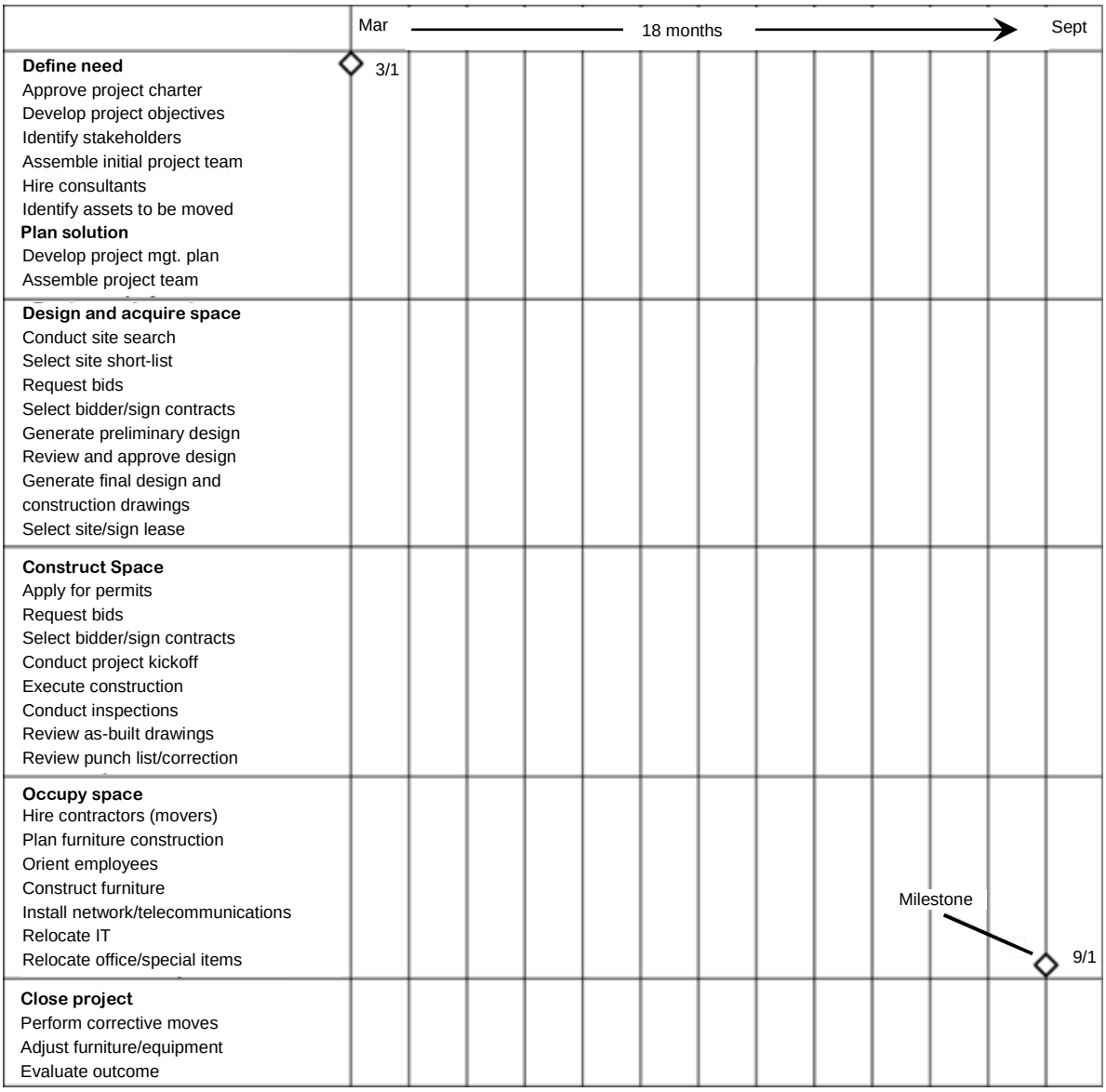

Exhibit 1-13: Relocation Case Study — Typical FM Project Format

Progress Check Questions

1. What is true of project management?

   a. Project management enables projects to have an indefinite end date.
   b. Projects can be summarized as the application of project scheduling tools.
   c. Project management for facilities is the same as facility management.
   d. Project management is distinct from but a subset of regular facility management activities.

2. What describes a problem scheduled for solution?

   a. Project management
   b. Programming
   c. Project
   d. Process model

3. What is true of projects?

   a. Projects can have an ongoing, indefinite charter.
   b. Projects are one-time, unique sets of events.
   c. Projects employ permanent teams.
   d. Projects are clearly distinct from and do not overlap with other facility work.

4. How is a minor project for a specific department frequently funded?

   a. By using capital funds.
   b. By using the FM organization's capital funds and no reimbursement is made.
   c. By using the FM organization's operational funds and no reimbursement is made.
   d. By using the affected department's operational funds.

5. When a facility manager is acting as a project manager, which task will NOT be performed more frequently?

   a. Using scheduling to provide a high probability that a plan is realistic
   b. Focusing on labor productivity and job costs
   c. Tracking permissions, materials and equipment
   d. Maintaining the direction of the project even if stakeholders are not satisfied

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6. What is a valid argument for having the facility manager and FM staff be the project manager and project team for a facility management project?

   a. This project is highly specialized and complex and thus will have a higher probability of project failure if contractors perform it.
   b. This type of project, while new to the FM organization, is growing ever more frequent and the facility manager and FM staff need opportunities for personal growth.
   c. Full-time devotion to this project will free up FM organization resources to pursue strategic goals.
   d. This project will increase the workload of the facility manager and FM staff, who will also need to continue regular duties and the added responsibility should increase job satisfaction.

7. In the Define, Plan, Do, Check, Act, and Close model, what do the outputs of the Close phase become?

   a. the inputs to the Plan phase.
   b. the inputs to the Do phase.
   c. the final project deliverables.
   d. the inputs to the Check phase.

8. What is returning to a prior project activity each time more data is available called?

   a. planned iteration.
   b. concurrent work.
   c. scope management.
   d. integration management.

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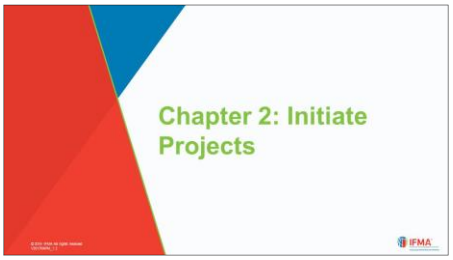
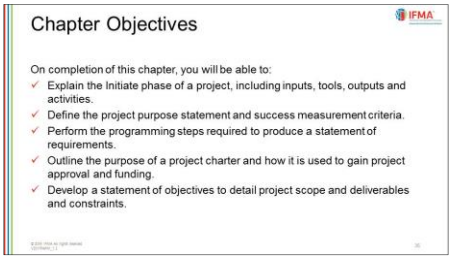
Chapter 2: Initiate Projects

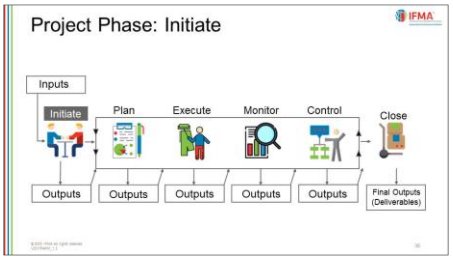
Chapter Introduction





On completion of this chapter, you will be able to:

- Explain the Initiate phase of a project, including inputs, tools, outputs and activities.
- Define the project purpose statement and success measurement criteria.
- Perform the programming steps required to produce a statement of requirements.
- Outline the purpose of a project charter and how it is used to gain project approval and funding.
- Develop a statement of objectives to detail project scope and deliverables and constraints.



Before beginning this chapter, it is important to note that the facility manager may:

- Be the project manager
- Oversee a contracted project manager
- Supervise an in-house project manager

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The facility manager has a key role to be both aware and familiar with the content covered in these chapters.

There are many types of projects facility managers will manage. The same process and steps as outlined in this chapter related to a construction/relocation project can be applied to any type of project.

Lessons

- Initiate Phase and Project Inputs
- Define Project Purpose
- Perform Programming
- Create Project Charter
- Create Project Objectives Statement
- Chapter Activity

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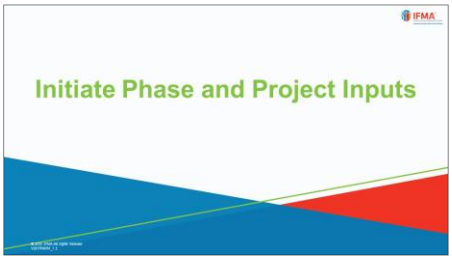
Initiate Phase and Project Inputs

Lesson Introduction



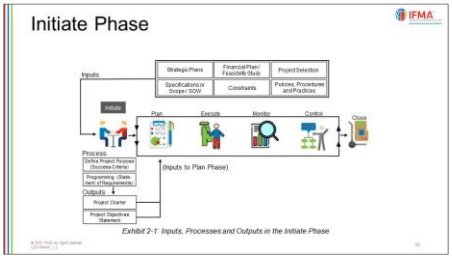
On completion of this lesson, you will be able to:

- Explain the Initiate phase of a project, including inputs, tools, outputs and activities.

This lesson contains the following topics:

- Initiate Phase
- Initiate Phase Inputs

Initiate Phase



The Initiate phase is when a project's purpose is defined and the project is approved and funded.

Describe the project outputs and objectives in the project charter.

At this phase, the project is not funded to completion unless it is a very small project. In the case of a large project, the funding may just be to get to the next milestone or go/no-go point. For example, getting the schematic design completed for the next phase of approvals.

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In the Initiate phase, projects begin with the end objective/result in mind and then plans are produced and executed to achieve that end. This end or purpose is explicit and:

- Has consensus from all stakeholders.
- Clearly indicates how the project will contribute to the core business objectives or strategic objectives of the demand organization.

While projects can range greatly in scope from simple landscaping or repairs to major acquisitions with design and construction, all projects require the following:

- A well-defined purpose and appropriate resources to achieve the objective
- A realistic, achievable schedule
- Adequate funding

Exhibit 2-1 shows the inputs, processes and outputs of a project during the Initiate phase.

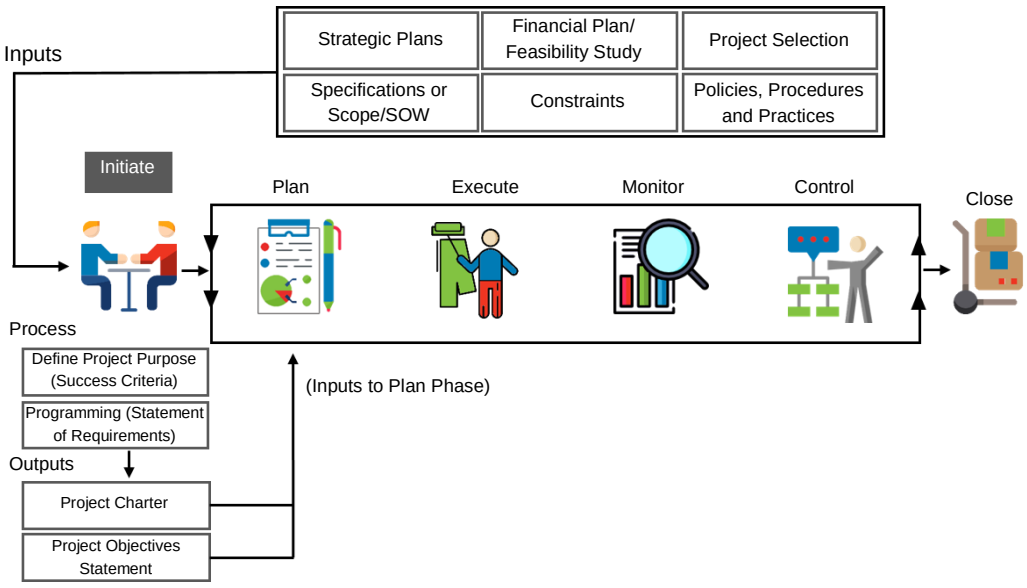

Exhibit 2-1: Inputs, Processes and Outputs in the Initiate Phase

The Initiate phase is made up of tasks typically performed before the project is officially approved. One of the key outputs of this phase, the project charter, is the document that officially approves and starts the project.

The project sponsor or person(s) who initiates the project is responsible for the development of the project charter. As a result, the assigned project manager may not be involved in this phase. The facility manager and/or project manager may be asked to assist in the process to create the business case for the project. Majority of this initial work can be applied in the Planning phase.

During this phase, the project sponsor performs or delegates the following tasks:

- Gather or produce the appropriate inputs
- Define project purpose, including generating a set of success criteria and objectives
- Perform programming, which includes generating a statement of requirements
- Develop the outputs of a project charter and a project objectives statement

Programming is a tool used to help develop the charter, but it can also occur after that point.

Initiate Phase Inputs

Inputs in the Initiate phase of the project are resources and constraints that:

- Provide the motivation and guidance for projects to be proposed.
- Affect whether or not a project will be approved and funded.
- Provide and apply useful tools and resources.
- Set the scope of a project within feasible limits.

Exhibit 2-2 shows details of the inputs discussed in this topic.

Exhibit 2-2: Initiate Phase Inputs

Strategic Plans	Financial Plan/Feasibility Study	Project Selection
• Facility strategic plan • Facility master plan or real estate master plan	• Conceptual costs • Estimated benefits • Financial analysis	• List and rank projects • Select project • Validate selection

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Specifications or Scope/SOWs	Constraints	Policies, Procedures and Practices
• Business case • Initial scope and requirements	• Facilities register • Resource capability and availability • Schedule constraints • Disruptions to customers or work processes • Organizational structure/culture • Standards and regulations • Macroeconomic and societal conditions • Organizational tolerance for risk • Available software • Site-specific constraints	• Estimation policy • Relevant permits, codes and standards • Project resources

Many of these inputs could be:

- Produced as independent projects.
- Taken from previously completed projects.
- Performed as preliminary project phases for the current project.

Additionally, most can be used for any project in one form or another. For example, a very simple equipment replacement project may:

- Be linked to FM strategy for preventive maintenance.
- Be assessed for feasibility, for example, repair or replace analysis.
- Have some constraints, for example, replace during non-core business hours.
- Follow relevant policies and procedures, for example, policy for approval and tracking of expenses.

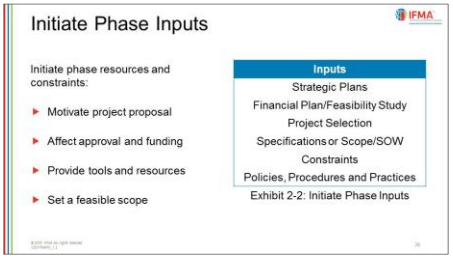


Exhibit 2-2: Initiate Phase Inputs

Strategic Plans

Strategic plans, if available and applicable to the given project, may include the facility strategic plan and/or the facility master plan or real estate master plan.

Facility Strategic Plan

Many projects are generated to execute the elements of a facility strategic plan. This plan aligns the FM organization's long-term strategy to the demand organization's mission, vision, goals and objectives. Moving strategy from theory into action is a challenge that can be facilitated through the use of projects and project management.

If a project addresses elements of a facility strategic plan, the relationship is made explicit in the project charter and project objectives statement. For example, if part of the facility strategic plan is to reduce the lease costs of the demand organization, a project to relocate all occupants of a leased facility into an owned building would be explicitly linked to that strategic goal. The success criteria would include the overall percent reduction in the use of the leased space.

Alignment to strategic goals is a major selling point when seeking project approval.

Facility Master Plan/Real Estate Master Plan

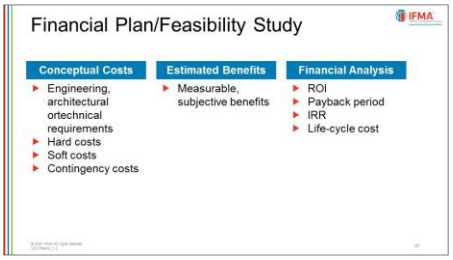
Facility master plans, real estate master plans or campus plans are detailed strategic-level analyses of particular sites and the specifications for their development. These plans cascade from the facility strategic plan.

These plans present scenarios that are alternative options for executing the goals of the facility strategic plan. If a facility master plan is used, the Initiate phase could be devoted to selecting an appropriate scenario and implementing it as a project. The detailed

information in a facility master plan can be used as inputs to the project objectives statement and the project management plan, the main planning document for the project.

See IFMA's *Leadership and Strategy* course for information on strategic plans and facility master plans.

Financial Plan/Feasibility Study



A financial plan or feasibility study is a critical element of any project because project funding is a critical go/no-go decision point. Projects are considered tentative until they have received funding approval. Without approval and allocation of capital or expense funds through a project charter, there is no project.

A financial plan or feasibility study specific to a project should address:

- Conceptual costs
- Estimated benefits
- Financial analysis

IFMA's *Leadership and Strategy* course provides general information on conducting a feasibility study.

Conceptual Costs

Conceptual project costs are expressed in ranges to allow for changes and updates realized in the planning stage but are based on a realistic/probable cost estimate. Costs are broken down by line items to provide an appropriate level of detail. In many cases, these line items are notated by categories. For example, plumbing, FFE, electrical and consultant.

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Conceptual costs include:

- Engineering, architectural or technical requirements costs
- Hard costs
- Soft costs
- Contingency funds

Engineering, architectural or technical requirements costs are an assessment of the expertise and specialized equipment, infrastructure or technology needed to complete a project. These costs are frequently addressed separately to prevent them from being underestimated and to demonstrate technological feasibility.

Hard costs are actual expenses that can be readily determined or estimated in advance.

Soft costs are costs that are difficult to determine or estimate because they relate to lost productivity, opportunity costs for use of organizational assets and internal staff, impact on customers, learning curves or employee morale.

Contingency costs are the funds set aside for scope or schedule adjustments and other changes.

Exhibit 2-3: Conceptual Cost Examples

Engineering, Architectural or Technical Requirements Costs	Hard Costs	Soft Costs
Costs for acquisition or use of: • Equipment • Machinery • Computers/software • Team expertise (training and/or contracting)	Costs for: • Construction • Furniture • Audio/video equipment • Moving • Telecommunications • Permits	Highly variable expenses, such as the cost for use of: • Internal staff • Shared resources for multiple projects

The financial plan addresses other costs, such as administrative and financing costs.

Estimated Benefits

Measurable benefits, including financial benefits that require subjective assessment, are provided in a range from conservative to optimistic for the project. The total probable benefit is also estimated.

Financial Analysis

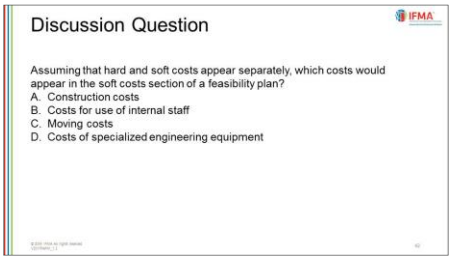
Financial analysis uses a variety of tools to indicate the financial value proposition of the project. Key measurements include the following:

- **Return-on-investment (ROI)** — a measure of how well the funds invested in a project increase, or are projected to increase, the financial resources of the organization.

  ROI = Annual Project Return ÷ Average Annual Project Investment

- **Payback period** — the length of time it will take to recoup the investment made on a project.
- **Internal rate of return (IRR)** — the return on investment a company typically realizes or targets, based on its past track record regarding asset investments.
- **Life-cycle cost** — the total cost of acquisition, operation, maintenance and support of an item throughout its useful life, including the cost of disposal. Life-cycle cost can provide a rationale for including maintainability and sustainability in plans.

Other financial measures, such as present value or net present value, are also used. These, in addition to other financial terms, are introduced in IFMA's *Finance and Business* course.



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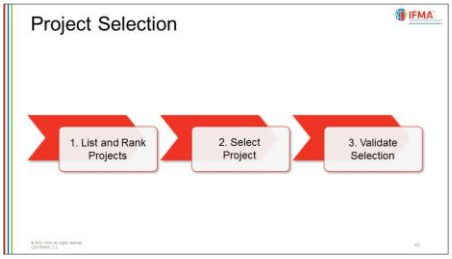
Project Selection



Project selection is done by listing and ranking projects under consideration. Projects are ranked based on the best return for the investment. The goal is to select the project with the highest return over a given period of time. Project selection could be treated either as a separate project or as a preliminary project phase. It may even be part of a feasibility study.

For example, if the FM organization needs to renovate a building, project options could be to:

1. only replace carpet and repaint walls or,
2. demolish and replace the facility interior.

Project selection has the following steps:

1. **List and rank projects** — potential projects are defined, and their pros, cons, risks, feasibility, costs and benefits are used to rank them.
2. **Select project** — the highest-ranked project is selected.
3. **Validate selection** — the choice is analyzed to determine if it is the project offering the best result.

An alternate project is selected if the first choice proves to be infeasible or too risky or if the project fails to win approval during the Initiate phase.

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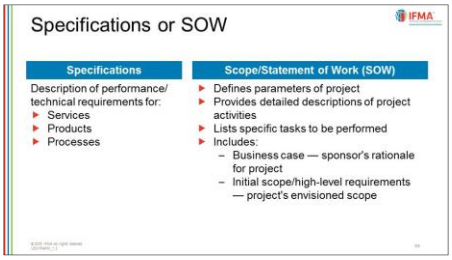
Specifications or Scope/Statements of Work (SOW)



A scope of work or statement of work (SOW):

- Defines the parameters of the project.
- Provides a detailed description of each project activity which includes verification criteria and measurement criteria for determining whether requirements are met.
- Is the part of a contract that lists the specific tasks to be performed and, in some cases, by sequential order.

A specification is a description of the essential performance and/or technical requirements for services, products and processes that includes verification criteria for determining whether the requirements are met.

If the FM organization serves internal customers, executives may provide specifications to initiate a project. If the FM organization serves external clients through contracts, the client may provide a scope/statement of work to initiate a project.

Internal executives or clients who initiate projects are collectively referred to in this document as project sponsors.

Elements of a specification/SOW may include the following:

- **Business case** — provides the sponsor's rationale for pursuing the project, such as:
  - Satisfaction of the sponsor's strategic goals
  - Expectation of profit or fulfillment of legal requirements
  - Impact of a decision not to implement the project

  The business case specifies the intended use of the deliverables and the project's purpose and success criteria.

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- **Initial scope and high-level requirements** — describes the project's envisioned scope in a narrative format to enable stakeholders to develop a common understanding of the purpose of the project. The following are usually included:
  - Tasks or activities involved
  - Primary objectives/goals
  - Constraints
  - Critical deadlines
  - Expected cost and quality
  - Final deliverables

The specification/SOW may include a statement of requirements. The scope and requirements should be detailed enough to develop a project objectives statement.

Constraints

Constraints are the organization's assets, attitudes and organizational structure that limit the extent of projects. It is important to identify constraints and recognize how each may affect the project so they can be dealt with in an early stage of the project.

Internal limitations play a major role in project constraints. There are external factors that can create constraints that influence a project.

Exhibit 2-4: Project Constraint Examples

Constraint	Influence on Project
Facilities Register or inventory of equipment	The inventory and relative condition of buildings and equipment may influence the project scope.
Resource capability and	The in-house project team candidates or departments. For

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Constraint	Influence on Project
availability	example, purchasing, are sorted by their skill set, experience and availability.
Schedule	Hard project deadlines or milestones are those that must be met for the project to be considered successful.
Disruptions to customers or work processes	Minimizing disruption may require limiting project tasks or hours/days of allowed project work.
Organizational structure	Plans may account for reporting structures, such as a project manager holding a line (vertical) or staff (horizontal) authority.
Organizational culture	Influences how projects are identified and prioritized, how communications occur and necessary sensitivity to internal politics.
Standards and regulations	Organizations may voluntarily apply quality or sustainability standards or be subject to government agency regulations, such as environmental impact restrictions.
Macroeconomic and societal conditions	The national or global environment may influence projects, prices or available credit.
Organizational tolerance for risk	Influences which projects get approved; higher risk usually requires higher potential return.
Available software	FM organizations may or may not have access to project software for scheduling, project management, design, building information modeling (BIM), information/data collection or document management.
Site-specific	May include the impact of weather or the initial terrain conditions of a site.
Permits	If permit requirements are not in place at the right time, this can cause a delay or result in corrective work.

Policies, Procedures and Practices

The organization may have project-specific policies, procedures, and practices that must be followed. Some policies may allow project managers to alter or omit resources or steps if they would hinder rapid project development. A best practice is to continually review and improve policies, procedures, and practices based on lessons learned from prior projects.

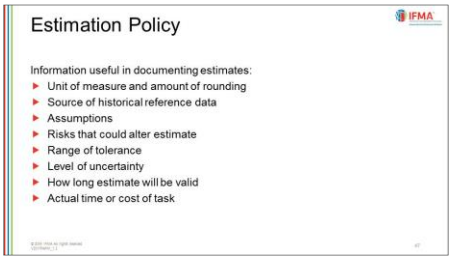
Policy, procedure and practice inputs to a project may include:

- Standard project phases and processes
- Health, safety and environmental (HSE) policies or regulations
- Quality policies and tools, such as facilities audits
- Sustainability policies
- Project tools, such as templates for task and schedule documents
- Financial audit and control procedures
- Guidelines for project communications
- Problem reporting and change control procedures
- Risk estimation tools and guidelines
- Final product or service evaluation, validation and acceptance process
- Estimation policy clearly denoting variability of estimates for each phase

In this topic, we will discuss the following inputs in detail:

- Estimation policy
- Relevant permits, codes and standards
- Project resources

Estimation Policy



Estimates are used in every aspect of initiating and planning a project. The accuracy of the estimates depends on the thoroughness of the plans used to calculate the estimate. An estimation policy sets rules for how to make estimates and how to record the precision of

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these estimates. Some organizations have specific policies as to how projects will be estimated and who will perform the estimate. For example, using an internal estimator or hiring external expertise. A consistent methodology for estimation is documented and the process is followed throughout the project.

Policy may dictate one of the following:

- The individual closest to a particular process perform estimates for that process
- Two or three individuals are required to produce individual estimates and then come to an agreement on a consensus estimate

When multiple estimators explain the rationale behind their estimates, the consensus estimate captures more relevant factors and is more likely to be or near, accurate.

Estimation is a skill that requires training and experience to develop, as well as specialized knowledge of the area being estimated. A best practice is to have the person who will perform the project work participate in making the estimate. To assist team specialists, organizations may hire or contract with formally trained estimators, for example, a cost estimator or quantity surveyor.

Estimates can vary widely; therefore, an estimation policy should require estimators to document the information and rationale used to determine the estimate. For example:

- Unit of measure and amount of rounding, for example, to the nearest day or $100
- Source of historical reference data, for example, from Project XYZ two years ago
- Assumptions that were made, for example, wiring is labeled prior to move
- Risks that could alter the estimated amount, for example, rising fuel prices
- A tolerance range, for example, ±5% for a time estimate or + 20% for a contingency on a conceptual budget
- Uncertainty level, for example, this is a conceptual budget and needs to be refined
- How long the estimate will be valid or will expire
- Actual time taken/cost for the task, which is recorded later to report on accuracy

The necessary facts for estimates are not always known at the time of the initial estimate. The estimation policy includes methods for refining estimates as new information is discovered.

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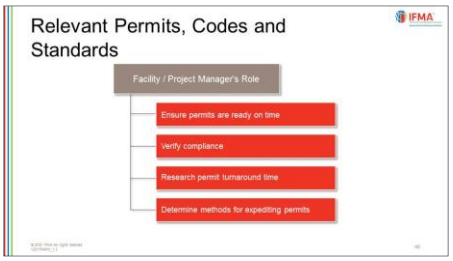
Relevant Permits, Codes and Standards



The project manager's role in regard to permits is to prevent delays or the need for corrective work that would negatively impact the schedule or costs by:

- Ensuring the appropriate/responsible person completes the necessary requirements in the planned time frame.
- Ensure the project activities comply with applicable codes and industry standards with the architect and engineers.
- Research the turnaround time for the current permit process in the jurisdiction of the project undertaken.
- Determine what fast-track methods of expediting permits may be available.

If a general contractor is involved in a capital construction project, the general contractor obtains the building permit, but the facility manager and design firm are involved to help prevent/resolve any building code or zoning issues.

Building departments or building authorities may require design changes before issuing a building permit. If a general contractor is not yet selected for a project, the facility manager could provide local officials with a preliminary set of documents for review or the project architect or a permit expediter can apply for the permit.

In this way, the process can be done concurrently with the general contractor bidding and award process. Providing this material or initiating the application during the early planning stages can optimize the permitting process. If inspectors find that intermediate and final work complies with all relevant requirements and codes, they issue a certificate of occupancy, which allows occupancy or use.

Model building codes adopted by states or local jurisdictions, such as the International Building Code (IBC), Plumbing Code (IPC) and Mechanical Code (IMC), usually refer to other codes and standards that must be followed.

Exhibit 2-5 displays codes and standards that may be referenced.

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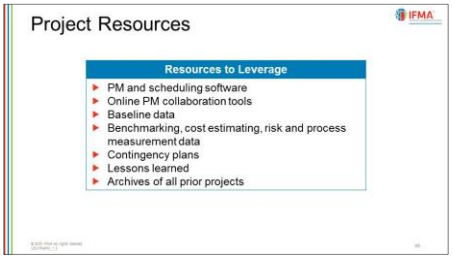
Exhibit 2-5: Codes and Standards

Codes and Standards That May be Referenced	
• National Electric Code (NEC or NFPA 70) • NFPA codes and standards, for example, NFPA 10, 13, 25, 72 and 101 • ASHRAE 62 (Ventilation for Acceptable Indoor Air Quality) • ASME A17.1 (Safety Code for Elevators and Escalators) • Disability access codes, for example, Americans with Disabilities Act, Barrier Free Act • Civil defense codes • International Mechanical Code (IMC)	• International Plumbing Code (IPC) • International Building Code (IBC) • Local building codes • Fire codes • HVAC codes • Gas codes • Life safety codes • LEED certification • International/national sustainability codes • Lighting energy efficiency codes (region/state/city) • Other legal and mandatory requirements

There are other codes and standards that may be country-specific. The facility manager needs to be aware of those agencies, ministries or commissions that have regulations that might be applicable for their locations.

Project Resources

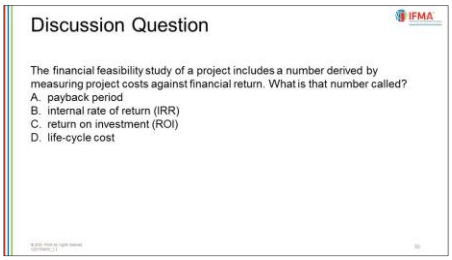


The organization may or may not have project resources such as software, archived electronic records, spreadsheets, and templates to leverage when developing project plans. Possible resources include:

- Project management software and scheduling software
- Online project management collaboration tools, usually for remote project team member management and collaboration

- Baseline data on project scope, labor and materials costs, quality, space planning, scheduling, performance measurement and prior similar projects
- Benchmarking data, cost estimating data, risk data and process measurement data
- Contingency plans
- Lessons learned from prior projects
- Archives of all prior projects, including documentation on prior versions or configurations of hardware and software
- Project Management Offices (PMO) with trained project managers

The facility manager/project manager can also gain an understanding of applicable local and national building codes by consulting with the project's architect or engineer.



Lesson Activity

The purpose of this activity is to review the inputs, constraints, policies, procedures and practice resources of the relocation case study.

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Relocation Case Study

Exhibit 2-6: Relocation Case Study — Inputs to Relocation Project

Frank Jones's primary input comes from the facility strategic plan, that includes the high-level goals of increasing space and energy efficiency. He also gets input from the real estate master plan for the headquarters site, that includes finding a new leased site and improving security systems, telecommunications, and the information technology infrastructure. Finally, Jones leverages the financial plans for interior space improvements and relocations. He shares all of this information with the project team members who are responsible for programming.

Jones lists currently known project constraints, including:

- The current facility must be vacated by September 1st.
- Most in-house team members will need training as they have no relocation experience
- The relocation should allow only one full workday of disruption for the majority of headquarters staff

Jones also specifies the following resources:

- Guidelines for building permit applications
- Guidelines for making project cost and time estimates
- Use of the FM organization's scheduling software
- Use of the demand organization's online project management/collaboration software
- Use of the organization's standard relocation project format
- Project plans and cost estimates from prior relocations

Answer the following questions regarding the case study:

1. Are there any other constraints that Frank Jones might need to consider?

2. What are constraints you have experienced in your organization?

3. Why are constraints so important to clearly define and communicate?

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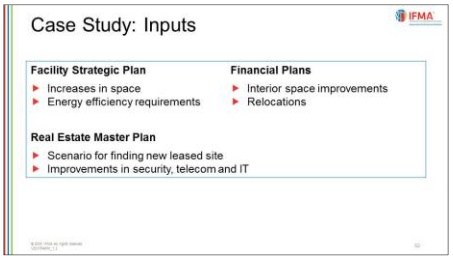
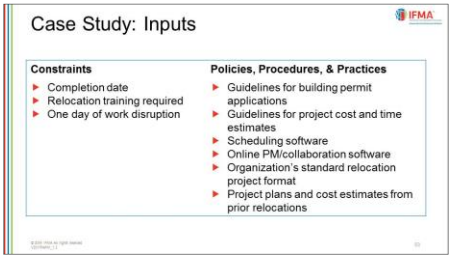
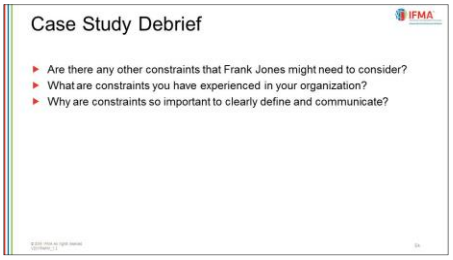






Define Project Purpose

Lesson Introduction

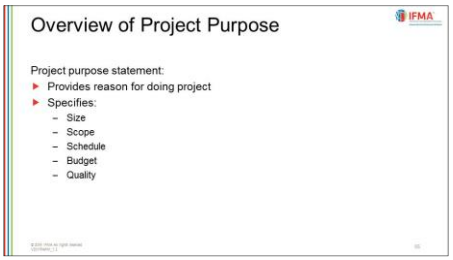
On completion of this lesson, you will be able to:

- Define the project purpose statement and success measurement criteria.

This lesson contains the following topics:

- Overview of Project Purpose
- Defining Project Purpose

Overview of Project Purpose

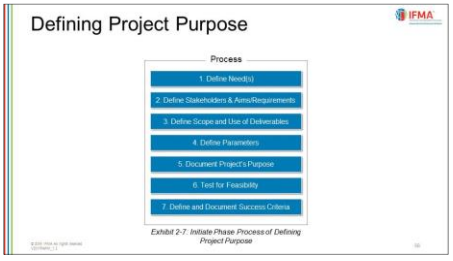


The purpose statement describes the rationale for the project. It also includes general information about the project's size, scope, schedule, budget, and quality.

For example, a project purpose statement may include:

- Schedule, resources, and quality constraints
- Applicable standards, regulations, and laws
- The size and specifics of the project

Defining Project Purpose



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The process of defining the project purpose requires the project manager to:

- Negotiate with the project sponsor, senior executive, or client to confirm what the priorities are and what is necessary compared to what is desired.
- Gain consensus with stakeholders on what is feasible.
- Document the project purpose including the success criteria.

Defining what constitutes a successful project goal and documenting the end result/outcome at the outset, helps project managers and team members create a realistic plan for accomplishing the project goal/objective. The odds of success are higher when the project manager guides sponsors in clearly defining the purpose of the project and what constitutes a successful project resolution.

Exhibit 2-7 shows details of the topics discussed in this lesson.

Exhibit 2-7: Initiate Phase Process of Defining Project Purpose

Define Project Purpose (Success Criteria)
1. Define need(s) 2. Define the stakeholders and their aims/requirements and expectations 3. Define the scope and intended use of deliverables 4. Define the parameters: - Assumptions - Risks and constraints of budget - Schedule - Quality 5. Document the project's purpose 6. Test for feasibility 7. Define and document the success criteria

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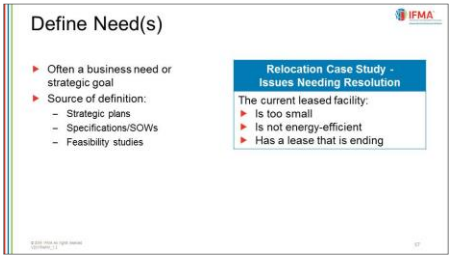
Define Need(s)



A project can be defined as an organizational need, a problem, or an opportunity. Reduce costs, implement a new initiative, or accomplish a specific strategic goal are examples of a need, a problem, or an opportunity.

The sources for these identified needs are usually inputs such as:

- Strategic plans
- Specifications/SOWs
- Financial plans/feasibility studies
- The results of a project selection process

Project managers work closely with project sponsors to develop a shared understanding of the nature of the need(s) to be addressed. Documenting the business need is the first step in ensuring the project has a clear purpose the stakeholders agree to and will work toward.

Exhibit 2-8 outlines documents the following issues needing resolution in the relocation case study.

Exhibit 2-8: Relocation Case Study — Issues Needing Resolution

The current leased headquarters facility:

- Is projected to be inadequate for desired growth needs.
- Is an energy-inefficient building.
- Has a lease that expires September 1, 20xx, at which time the premises must be vacated.

Any proposed solution must address these issues.

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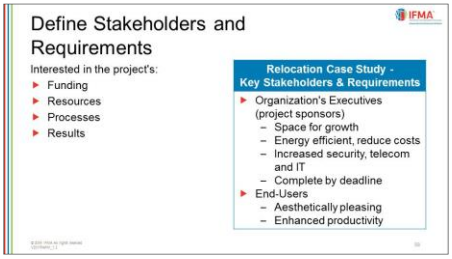
Define Stakeholders and Aims/Requirements



A project's stakeholders are persons or organizations that have an interest in the project's funding, resources, processes or results. It is important to understand who the key stakeholders are and their role in the project. This allows the project manager to identify who the decision makers are and how they may influence the project.

Key stakeholders include:

- Project sponsor
- Project manager
- Team members
- Users of the deliverables
- Larger community affected by the deliverables
- External clients
- Suppliers/contractors

At this point, only high-level aims/requirements are recorded. If programming is already complete, the statement of requirements is used as a resource. If not, the requirements are estimated and later refined.

Exhibit 2-9 outlines documents the key stakeholders and requirements in the relocation case study.

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Exhibit 2-9: Relocation Case Study — Key Stakeholders & Requirements

The organization's CEO is the project sponsor and his requirements are for a headquarters facility that:

- Has sufficient, but not excessive space for growth.
- Is energy efficient and has lower overhead costs.
- Has increased security, telecommunications, and IT capabilities.
- Is available for relocation by September 1ST.

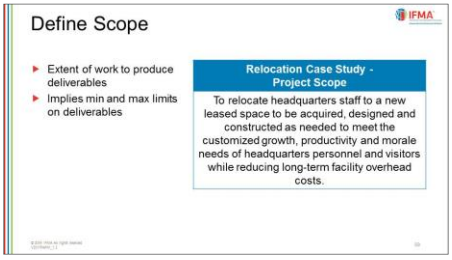
High-level end-user requirements for the relocation project are that the space should:

- Be aesthetically pleasing.
- Enable or enhance work productivity.

Define Scope and Intended Use of Deliverables

The project sponsors and the project manager must come to an agreement on the scope of the project and the intended use of the project deliverables.

Scope



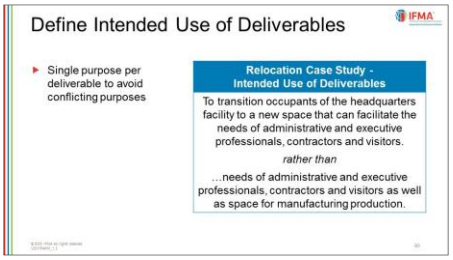
Scope is the extent of the work or tasks to be done to produce a project's deliverables. Scope implies minimum and maximum limits on deliverables. The intent is to satisfy the project purpose while only doing what is needed.

Exhibit 2-10 outlines the project scope in the relocation case study.

Exhibit 2-10: Relocation Case Study — Project Scope

The relocation project scope is to 1) relocate headquarters staff to a new leased space that is to be acquired, designed, and constructed if necessary to meet the customized growth, productivity, and morale needs of headquarters personnel and visitors and 2) reduce long-term facility overhead costs.

Intended Use of Deliverables



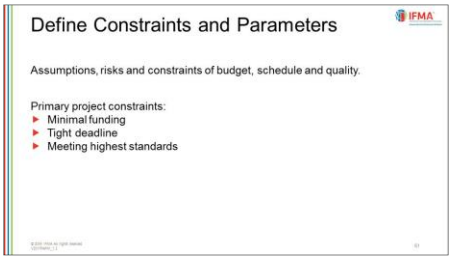
The intended use for deliverables should be as single-minded as possible. A deliverable with a single intended use represents a clear mission, while one intended for more than one purpose increases the potential for conflicting needs. A deliverable intended for more than one use tends to be more complex and expensive to develop than two separate deliverables each with a single intended use.

Exhibit 2-11 outlines the intended use of deliverables for the relocation case study.

Exhibit 2-11: Relocation Case Study — Intended Use of Deliverables

The intended use of the relocation project is to transition occupants of the headquarters facility to a new space that can facilitate the needs of administrative and executive professionals, contractors and visitors. *Rather than:* ... needs of administrative and executive professionals, contractors and visitors as well as space for manufacturing production.

Define Constraints and Parameters



The parameters of a project encompass the assumptions of project sponsors and other stakeholders, risks that could endanger project success, and key constraints. The primary constraints for a project include budget, schedule, and scope.

Budget	A limitation that affects the resources that can be purchased, leased,

(cost)	contracted or internally allocated.
Schedule	A constraint on the overall project duration or the timing of certain events, including compensation for resource availability or minimizing disruptions.
Scope	An overall definition of what the project is supposed to accomplish and a specific description of what the end result should be or accomplish.

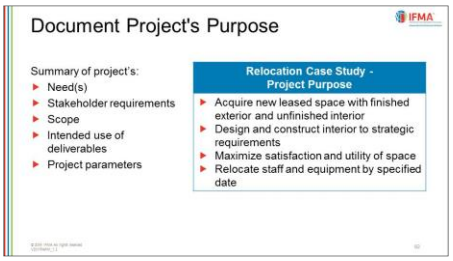
These three constraints form the basis for three common project parameters:

- The project needs to be completed on schedule.
- The project needs to be accomplished on budget.
- The project needs to be completed in scope.

Clearly stating if any parameters are nonessential is just as important as stating the project's priorities because the project manager can adjust accordingly.

For example, the expected useful life of a deliverable will impact the grade or quality of the material selected. A project may specify that a lower grade of materials is acceptable if the project deliverables have a shorter life-cycle.

Document Project's Purpose



The purpose for the project is a summary of the project's:

- Need(s)
- Stakeholder requirements
- Scope
- Intended use of deliverables
- Project parameters

A project purpose indicates what to achieve, not how to achieve it. The purpose states the essential and nonessential parameters.

Exhibit 2-12 outlines the project purpose in the relocation case study.

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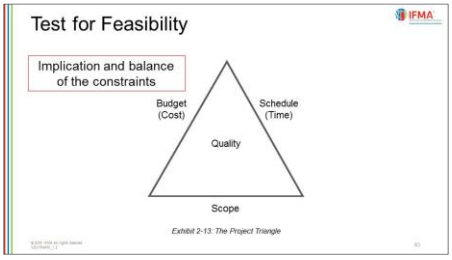
Exhibit 2-12: Relocation Case Study — Project Purpose

Acquire new leased space in the XYZ city area with a finished exterior and unfinished interior. Design and construct the interior to meet the strategic requirements specified in the new lease scenario of the real estate master plan and the requirements specified in a new headquarters statement of requirements. To maximize satisfaction and utility of the space, energy-efficient lighting, HVAC system upgrades and above-average grade of finish materials, security systems, telecommunications and IT infrastructure are specified. Average-grade construction materials are otherwise specified. Relocate staff and equipment by September 1, 20xx, but minimize disruption and maximize satisfaction with the move. To achieve this, construction must be substantially complete an adequate time prior to this date. Due to the priority of this relocation deadline, the project manager will develop a budget within their discretion.

Test for Feasibility



Once documented, the purpose is tested for feasibility because an unrealistic purpose or a purpose that leaves some elements undetermined increases the chance of project failure. Defining true priorities from the beginning avoids the problem of wanting it all and having to settle for less. What must be sacrificed later may not be what decision makers would have chosen in advance.

Given a feasible purpose, a realistic approach can be defined that will make project success highly probable.

The project triangle, illustrated in *Exhibit 2-13*, can be used to measure the feasibility of a purpose. It shows how the constraints on a project's purpose are interdependent and affect feasibility.

The triangle can be used to illustrate how the quality of work is constrained by the three sides of the triangle: budget/cost, schedule/time and scope. Other versions of the project graphic list constraints, such as schedule, resources and scope or time, cost and resource availability. In each version, the intent is to show that changes to one constraint affect the other constraints and the overall quality. There is a delicate balance for the optimums in price, time, scope and quality in a project. For example, if a project schedule must be expedited, costs are likely to increase, and the quality of work may also suffer.

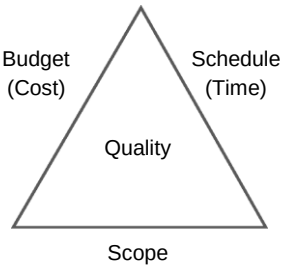
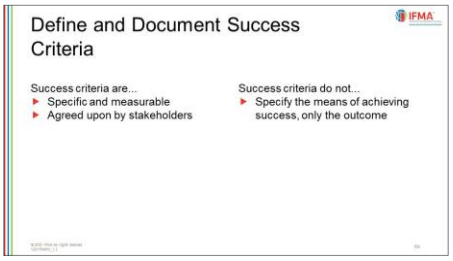


Exhibit 2-13: The Project Triangle

The project manager uses leadership and influence to guide project sponsors to create a purpose that optimizes all project constraints to the maximum amount that is feasible. Project managers achieve feasible optimization by helping sponsors determine only the most important objectives and leave the others to the project manager's discretion or provide a range that is acceptable.

For example, if cost is discretionary, the project manager develops a plan that includes a realistic budget that can achieve the non-discretionary items. If the discretionary items of the proposed plan, such as cost, are not acceptable, the project sponsor needs to revisit the purpose or cancel the project. If there is a critical project completion date, the project manager must consider the lead time requirements for materials and equipment and the administrative requirements, such as permitting, for the project.

Define and Document Success Criteria

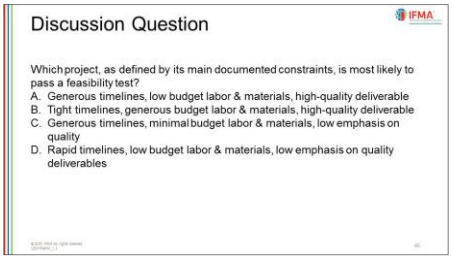


Success criteria:

- Are the combinations of conditions that must be met or satisfied for the project, plan or task to be considered a success.
- Are specific, measurable and agreed upon by all stakeholders and should be written explicitly and documented, leaving no chance for interpretation.
- Are directly linked to all the factors that make up the purpose of a project.

- Are vital to developing a shared understanding between the project sponsor and the project manager. Formal sign-off on the criteria can set reasonable expectations and prevent later misunderstandings.
- Have a higher likelihood of success if planned and executed effectively and efficiently.
- Avoid specifying the means by which the criteria are to be achieved, as success could occur through various means.

Sometimes it is necessary to document what will *not* be achieved in order to prevent misunderstandings.



Lesson Activity

The purpose of this activity is to review the success criteria for the relocation case study.

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Relocation Case Study

Exhibit 2-14: Relocation Case Study — Defining Relocation Project Success

Frank Jones meets with senior executives and they agree to the following success criteria.

1. The new headquarters interior space is designed and built to optimize the effectiveness and growth potential of the 500-employee headquarters staff as measured by fulfillment of:
   - The new lease scenario of the real estate master plan.
   - A new statement of requirements produced for the headquarters facility.

   The space:
   - Has a minimum of 6,000 square meters (~65,000 square feet) of usable area.
   - Is calculated for 600 employees (500 × 120%) at 10 square meters (~108 square feet) per person.

   Note: In the United States, this standard is usually closer to 120 to 150 square feet per person.
2. Minimizing construction duration takes priority over construction cost as measured by construction that is substantially complete prior to the execution of the relocation.
3. Construction cost is otherwise minimized with the exception of above-average:
   - Security systems.
   - Telecommunications and IT infrastructure.
   - Finish materials.
   - HVAC system upgrades.
   - Workstation furniture resulting in a space that at least 80% of occupants consider aesthetically pleasing and comfortable.
4. Relocation to the new facility is completed on or before September 1, 20xx, with:
   - A minimum of work disruption.
   - A priority on continuous operation of online services.
   - No more than the loss of one full day of work for staff.

   Site construction is minimal at the time of the move and the facility manager maximizes morale by:
   - Requiring no employee to move more than twice.
   - Communicating to employees before, during and after the move.
   - Providing modern, ergonomic workstations.

   No more funds are expended on the move than is needed to accomplish the specified priorities.

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Answer the following questions regarding the case study:

1. Is this time frame realistic? Why?

2. What is the most important success criteria that must be met?

3. How do you define success?

4. How do you balance multiple success criteria?

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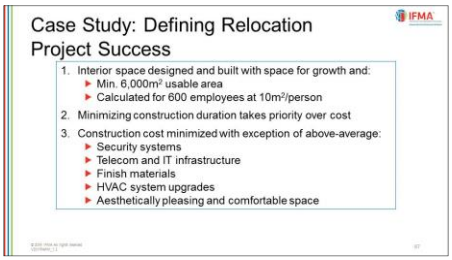
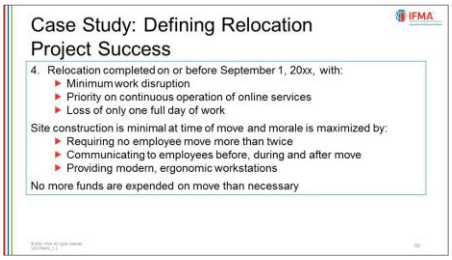
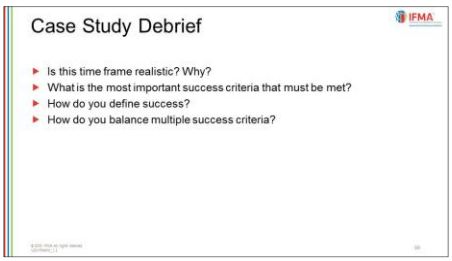






Perform Programming

Lesson Introduction

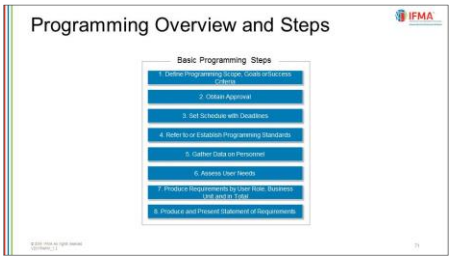
On completion of this lesson, you will be able to:

- Perform the programming steps required to produce a statement of requirements.

This lesson contains the following topics:

- Programming Overview and Steps
- Space Planning and Space Standards
- Needs Assessments
- Statement of Requirements

Programming Overview and Steps



After defining the project's purpose, including its general, high-level requirements, a more detailed statement of project requirements must be created. This process, referred to as programming, is typically completed after the project charter is approved and the project has officially been funded. Some organizations may require this work to be completed as part of the decision-making process and/or pre-project approval.

Creating the detailed statement of requirements is one of the final steps of project initiation as it provides additional information needed to begin the Plan phase.

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Programming and the statement of user requirements can be defined as follows:

- **Programming** – the process that defines the detailed project requirements of the end user that are needed to meet the project objectives and general project requirements.
  - Programming involves user observation, interviews and surveys to identify current and projected need, such as improving functionality of a space.
  - Programming results in a comprehensive statement of requirements for the project.
- **Statement of requirements or project requirements program** — a document that provides the interface between the customer/end user and the design professionals responsible for transforming space into a productive work environment. Programs include space utilization and criteria for support areas.

Programming enables the project to be designed and/or planned in the Plan phase. It is usually conducted by design professionals, who could be internal staff members such as space planners or contracted resources such as interior designers or architects.

In the Initiate phase, programming is performed at the macro-level where the objectives and requirements are defined. In later phases, programming is performed at the micro-level when architects and/or engineers are brought in to develop design and construction documents.

What programming is or is not can be clarified by relating it to other project concepts:

- Programming is similar to needs analysis because both determine user requirements. Programming is related to user needs and physical requirements, while needs analysis is broader, analyzing business processes or feasibility.
- Programming differs from feasibility studies. Statements of requirements initially list all user requirements without constraints. Feasibility studies or budgeting is needed to confirm that the requirements are feasible for the project.
- Programming makes projections of future user needs similar to forecasting.
- Programming is distinct from design or project planning; rather, it is a prerequisite for these tasks.

Some of the benefits of properly executing the Initiate phase process of programming include:

- Stakeholders are identified and appropriately represented within the project team.
- The impact on customers' work schedule, people and systems is determined.

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- Opposing or conflicting needs are identified and prioritized, and creative solutions are sought.
- User or occupant needs and requirements are identified. This is the actual programming process.

Exhibit 2-15 shows details of what is discussed in this topic.

Exhibit 2-15: Programming

Programming Statement of Requirements

• Programming steps
• Space planning and space standards
• Needs assessments: observation, interviews and surveys
• Statement of requirements
  - SMART and other feasibility tests
  - Documentation

While organizations may differ in their specific programming process and steps, the following are the basic steps in programming:

1. Define the programming scope, goals or success criteria.
   - The project's purpose and success criteria can be used.
2. Obtain approval for the programming from sponsors, executives/clients and from affected line managers to give the programming tasks specificity.
3. Set a schedule with deadlines for programming tasks.
4. Refer to or establish programming standards for the specific function, for example, space standards for space planning.
5. Gather data on personnel by role and business unit/department.
6. Assess user needs through observation, interviews or surveys.
   - Consider a top-down assessment process, where the executive project champion(s) and other key stakeholders are interviewed first and utilize those results to help set the tone and filter information used for other interviews.
7. Combine the user data and user requirements with the standards to produce requirements by user role, by business unit/department and in total.
8. Produce and present a statement of requirements. For example, a space planning statement of requirements or program for space design and in some cases office furniture configurations.

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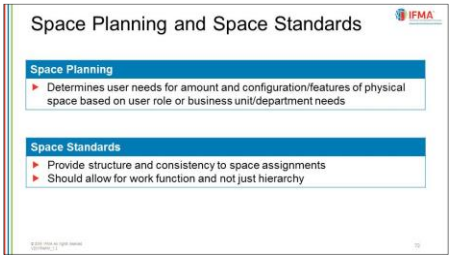
Space Planning and Space Standards



To illustrate how programming uses organizational programming standards, let's look at some organizational space standards.

Space planning determines user needs for the amount and configuration/features of physical space based on user role or business unit/department needs.

Corporate space standards are developed to generalize how much space is needed for a given task, user role or group function, such as standard sizes for executive offices, cubicle space providing two or three variants and conference space.

These standards are typically defined by specific dimensions per person or per specific role and then:

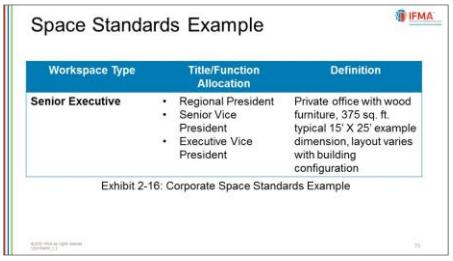
1. The dimensions are translated to square meters or square feet per person or role.
2. The corporate space standards are applied to the total number of persons in each internal demographic or role to develop requirements for all occupants to define consistency.
3. The auxiliary or support space requirements and circulation space requirements are added to determine the overall facility space requirements.

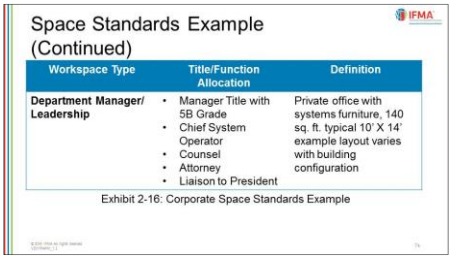
Exhibit 2-16 shows an example of a space standards.

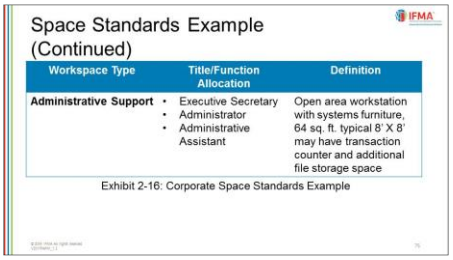
Exhibit 2-16: Corporate Space Standards Example

Workspace Type	Title/Function Allocation	Definition
Senior Executive	• Regional President • Senior Vice President • Executive Vice President	Private office with wood furniture, 375 sq. ft. typical 15′ X 25′ example dimension, layout varies with building configuration
Department Manager/ Leadership	• Manager Title with 5B Grade • Chief System Operator	Private office with systems furniture, 140 sq. ft. typical 10′ X 14′

Workspace Type	Title/Function Allocation	Definition
	• Counsel • Attorney • Liaison to President	example layout varies with building configuration
Administrative Support	• Executive Secretary • Administrator • Administrative Assistant	Open area workstation with systems furniture, 64 sq. ft. typical 8′ X 8′ may have transaction counter and additional file storage space







Facility space has its own terms and standards when measuring area to allocate for shared spaces, corridors and individual spaces. The following area-related terms are used when categorizing space and developing space standards:

Gross Area	The sum of the floor areas on all levels of a building that are totally enclosed within the building envelope. Measured to the outside face of exterior walls.

Rentable Area	The gross area minus exterior walls, major vertical penetrations and interior parking spaces. In leased space, this area includes shared spaces with other tenants. = Gross area – (Exterior walls + Major vertical penetrations + Interior parking space)
Usable Area	The portion of a building or floor available for occupants. In leased space, this is the area not shared with other tenants. = Rentable area – (Building core and service area + Primary circulation)
Core and Service Area	The area with common access or benefit, to all users within a gross space, for example, public corridors, restrooms, mechanical or utility rooms and vestibules. Also called common area, common support area or core area.
Primary Circulation	The portion of the building that is a public corridor or a lobby or is required for access by all occupants on a floor to stairs, elevators, restrooms and/or building entrances.
Secondary Circulation/Vacant Space	The portion of a building required for access to some subdivision of space, whether bounded by walls or not, that is not defined as primary circulation, for example, corridors between workstations.
Assignable Area	The portion of a floor or building used to house personnel, furniture and equipment. = Usable area – Secondary circulation
Core and Service Area Factor	The factor used to determine a tenant's pro rata share of the core and service area. Also called common area factor, core factor or loss factor. Also known as the rentable/usable ratio.
Circulation Factor	A percentage added to work space to allow for circulation patterns of persons or goods in usable space.

These terms sometimes differ for owned versus leased space and can vary across organizations. What is important is that there is agreement by all stakeholders on how space terms are defined.

Exhibit 2-17 provides a visual for how space is defined.

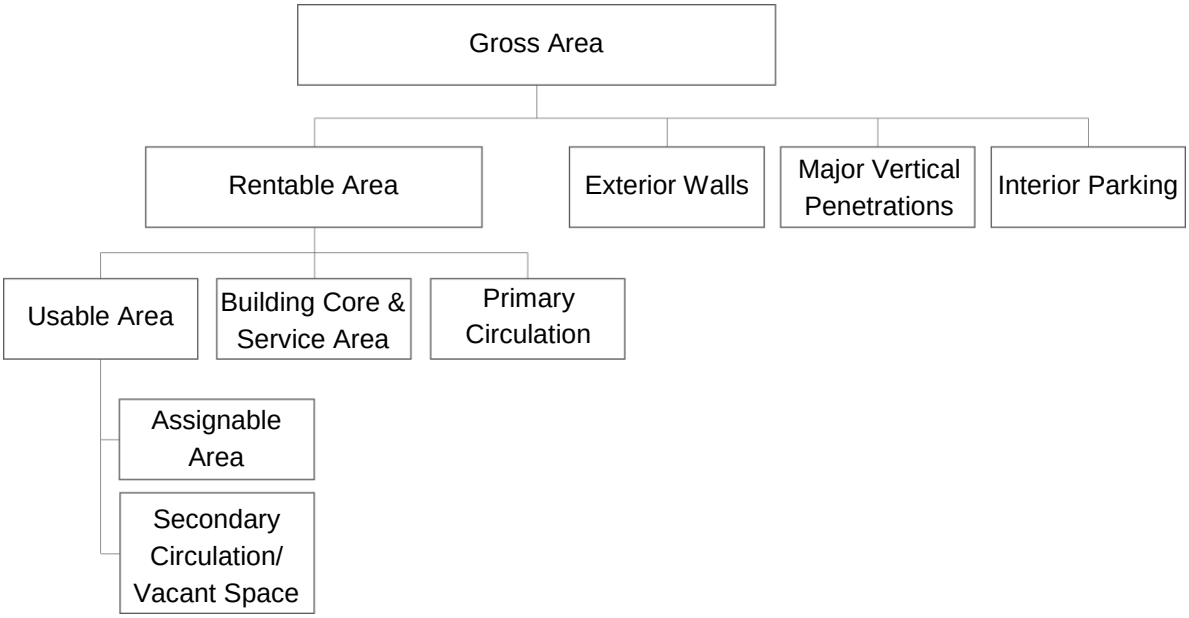
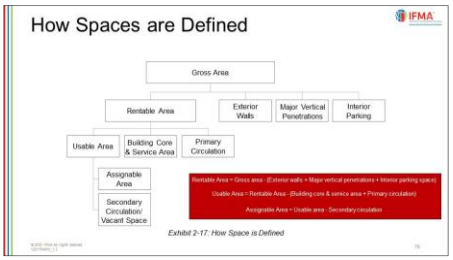
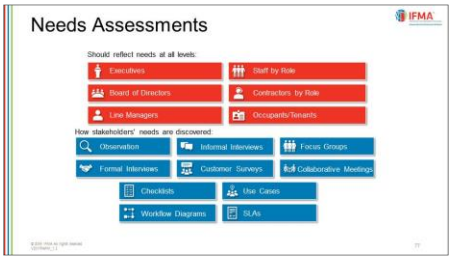


Exhibit 2-17: How Space is Defined

In addition, some facility strategies and programming standards are intended to accommodate more staff without increasing space, such as use of visitor space or hoteling/hot desks, which are allotments of unassigned space for consultants, employees from other offices or telecommuters. These spaces are often set up to be used on a first-come, first-served basis. Some organizations have programs to facilitate spaces to be reserved in advance.



Needs Assessments



Needs assessments are used to solicit inputs from multiple stakeholders to discover and document previously unstated needs. It is through a needs assessment that an organization finds out what users/customers really want. Experienced design professionals can distinguish needs from wants and incorporate that distinction into the statement of requirements.

Needs assessments is different from programming in that the analysis is broader, including business processes and feasibility.

Needs assessments take the form of observation, interviews or surveys:

Observation	Design professionals observe tasks and record the actual processes used. They ask questions to clarify their understanding.
Formal Interviews	Interviewers ask a set of predefined open- and closed-ended questions to ensure nothing is left assumed. Interviews are relevant for user requirements but tend toward big-picture information.
Informal Interviews/ Conversations	Interviewers use conversations to get a general picture and allow stakeholders to raise issues important to them.
Customer Surveys or Questionnaires	Surveys and questionnaires are useful for large user populations and can use open- or closed-ended questions. They are useful when an issue is well-defined and consensus needs to be established, but data compilation can be time-consuming.
Focus Groups	Requirements for a niche area could be discovered by assembling a select group of stakeholders.
Collaborative Meetings	Meetings for brainstorming or problem solving can be held either to get a high-level picture of requirements or resolve conflicts between requirements.
Checklists	Can be used to establish priorities or eliminate unnecessary requirements.
Workflow diagrams and process models	Diagrams and models can be provided to users for review or requested from experts.
Use cases	Use cases describe the interaction between people and systems and processes as a series of simple steps. Users can be asked to generate or review use cases.

Service level agreements (SLAs)	Users can be asked to review the contents of SLAs and comment on whether the agreement addresses all relevant service requirements.

If the user population is large, observation and interviews can be limited to a representative sample of the population. A representative sample refers to the number of persons contacted relative to the total number, but also requires that input be received from persons at all levels, including:

- Executives
- Board of directors
- Line managers/department or business unit heads, for example, finance
- Staff by role
- Contractors by role
- Occupants/tenants

Talking to stakeholders at all levels helps with eventual deliverable acceptance. The most emphasis for a needs assessment is on input from line managers and staff. For example, in space planning, line managers can be a valuable resource for indicating required interdepartmental and internal adjacencies or workflow. Staff members know details of the business processes and can provide information on exceptions to standards/rules.

While documentation on user needs and problems is unconstrained by cost feasibility at this point, trained observers still differentiate between what is necessary versus what is desired. Necessary requirements should relate to the project purpose and be driven by business needs, such as managing costs or increasing productivity or morale. Programming should maintain focus on those things required to perform, or possibly improve, the end user's function.

Programming objectives may require application of value engineering. Value engineering is a systematic approach to assessing and analyzing the user's requirements of a new asset and ensuring those requirements are met, but not exceeded. It consists of eliminating perceived "non-value-adding" features of a project or new equipment. It can be thought of as eliminating items whose value/benefit are not compensating for their associated cost, as shown in a cost-benefit analysis. Value engineering is needed because end users try to justify more requirements than are truly necessary.

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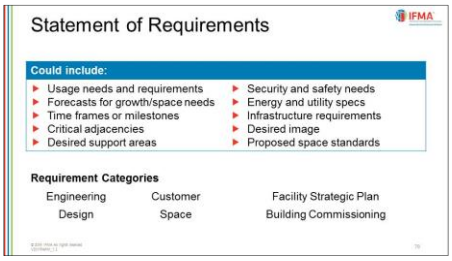
Facility managers need to be careful and have input in the value engineering process because there are items that might be value engineered out of the project, but that are critical for the operations and maintenance.

Statement of Requirements



A statement of requirements demonstrates an understanding of the current state and future state of the system being modeled. It expresses how to optimize and fulfill projected or forecasted system needs.

A statement of requirements generated solely for a project is used to define the project's requirements. It is also used as a benchmark throughout project planning to validate project objectives and the project management plan. If the statement of requirements is changed, the plans and contracts based on it will need to be modified.

A statement of requirements could include:

- Usage or occupant needs and requirements
- Forecasts for departmental growth and space needs
- Time frames or milestones associated with significant project results
- Desired support areas and amenities
- Critical adjacencies between and within departments
- Departmental security and safety needs
- Energy and utility specifications
- Infrastructure requirements
- Desired image of the organization
- Proposed space standards

Statements of requirements may address any number of facility areas, such as:

- Compliance with codes, regulations, laws, policies and standards
- Sustainability and environmental impact
- Interior environment
- Social and psychological impact of potential changes

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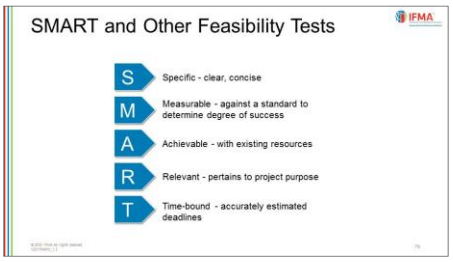
Exhibit 2-18 outlines requirement categories that may be included in a statement of requirements.

Exhibit 2-18: Requirement Categories

Requirement Category	Description
Facility Strategic Plan/ Facility Master Plan	Can be traced from strategic plans to project requirements as applicable.
Engineering Requirements	Detailed technical requirements of deliverables and the materials and expertise needed to produce them, including special civil or mechanical, electrical and plumbing (MEP) requirements for facilities. May specify required levels of maintainability and sustainability. The mechanical and electrical systems capacity and controls must be factored to meet the needs of the end-users.
Customer Requirements	Elicited from those who will manage, use and support the deliverables.
Design Requirements	Usually produced by a design firm for capital construction projects.
Space Requirements	Show details of space planning and relocation needs, including space for each occupant and department.
Building Commissioning Requirements	Document the life-cycle and operational requirements for a building. Commissioning is a systematic process to ensure building performance is in harmony with the intent and specifications of its design and the operational needs of its owner.

SMART and Other Feasibility Tests



Just as the project purpose is tested for feasibility, requirements are also tested individually and as a whole for feasibility. The SMART concept is used in a variety of applications such

as goal setting and project management feasibility testing. SMART applies multiple measures to assess feasibility.

It is an acronym that indicates the elements of this feasibility test, defined as follows for testing individual requirements:

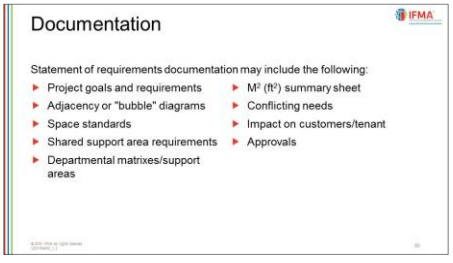
Specific	Each requirement is clear and concise and states how to enact a single element of the project purpose.
Measurable	Each requirement is defined in terms of how to measure whether it is satisfied — measure of success or degree of success or quality.
Achievable/ attainable	Each requirement does not conflict with other requirements and can be met using existing skills and assets or through training, purchasing or contracting.
Relevant	Each requirement pertains to the project purpose.
Time-bound	Requirements include accurately estimated deadlines to promote efficiency and provide a baseline for reporting and control.

Other feasibility testing can determine if the set of requirements as a whole is necessary and sufficient:

- **Necessary** — if any criterion or requirement were omitted, the purpose would not be fully expressed.
- **Sufficient** — no additional criteria or requirements need be or should be, added.

It is also advisable that the statement of requirements be "agreed upon" and signed. Getting stakeholders to commit to a set of requirements at the start encourages a detailed review and promotes buy-in at later stages by setting expectations and minimizing scope creep and midproject change.

Documentation



Statement of requirements documentation may include the following components:

- **Project goals and requirements** — expressed at an executive overview level.
- **Adjacency or "bubble" diagrams** — model department and work group primary and secondary adjacencies, as shown in *Exhibit 2-19*.

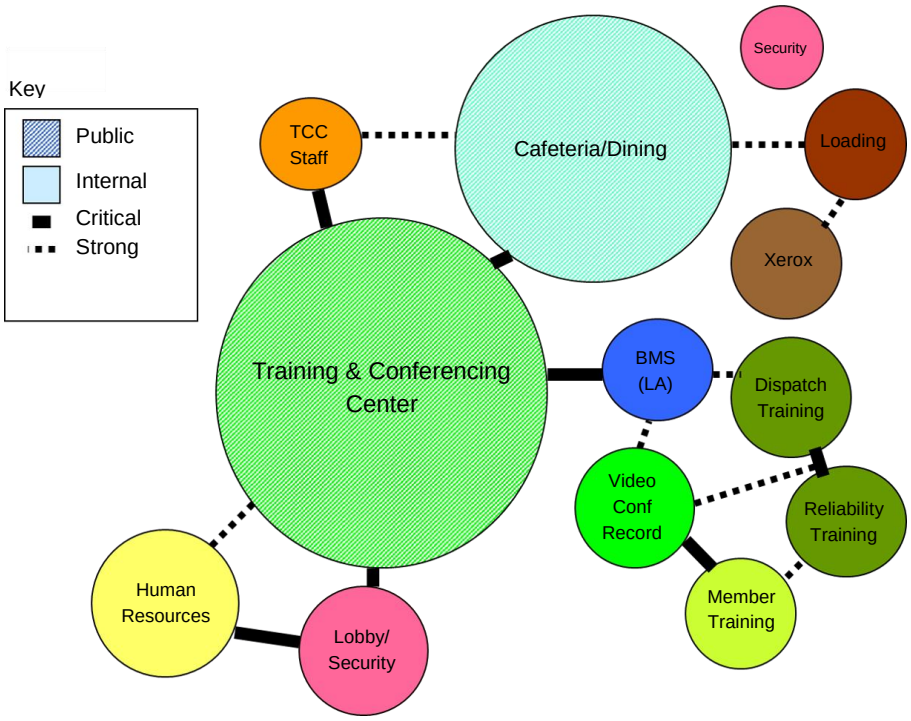
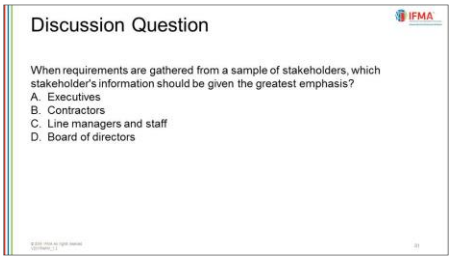


Exhibit 2-19: Adjacency Diagram

- **Space standards** — space standards list office and workstation standards.
- **Shared support area requirements** — documents shared space needs, such as new support area size and interior layout plans.
- **Departmental matrixes and departmental support areas** — combines current and future staffing count with job title or space standards to calculate total and usable space requirements for a department in square meters or square feet.
- **Square meter or square feet summary sheet** — summarizes the space needs of all departments and support areas based on space standards.
- **Conflicting needs** — lists incompatible and/or conflicting requirements from different user groups and may propose solutions.
- **Impact on customers/tenants —** customers/tenants indicate times and/or areas requiring special coordination for project work.
- **Approvals —** stakeholders review, comment on and sign off on the statement.



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Lesson Activity

The purpose of this activity is to review the details of the statement of requirements for the relocation case study and rewrite it to make it stronger.

Relocation Case Study

Instructions

1. Rewrite the existing statement of requirements to make it stronger.
2. Document your changes/improvements in the section below.
3. If in class, be prepared to share your findings.

State of Requirements

Read the statement of requirements portion of the relocation case study.

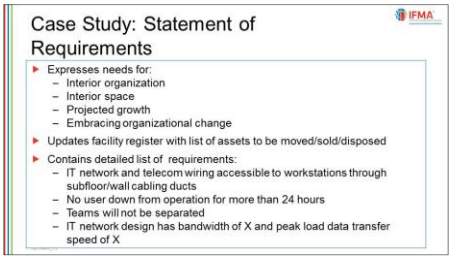
Exhibit 2-20: Relocation Case Study — Relocation Project Statement of Requirements

The relocation project statement of requirements:

- Expresses stakeholder needs for facility headquarters interior organization, space, projected departmental growth and willingness to embrace organizational change.
- Updates the facility register/equipment inventory with the list of assets to be moved/sold/disposed.

The relocation project statement of requirements contains a detailed list of both general and specific or operational requirements, for example:

- General requirement — information technology network and telecommunications wiring shall be accessible to all workstations through subfloor or wall cabling ducts.
- Specific requirement — no user shall be down from operation for more than 24 hours.
- Specific requirement — teams will not be separated and must be housed together.
- Operational requirement — information technology network design shall permit a bandwidth of X and peak load data transfer speed of X.



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Changes/Improvements

Debrief

1. What are the adjacency requirements for the organization?

2. What is the primary requirement?

3. How do you balance differing stakeholder requirements?

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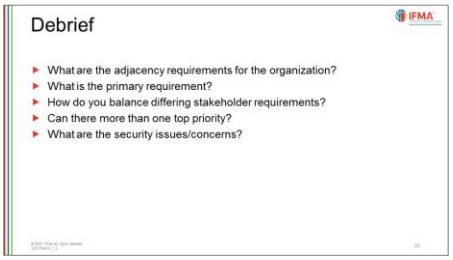
4. Can there more than one top priority?

5. What are the security issues/concerns?



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Create Project Charter

Lesson Introduction

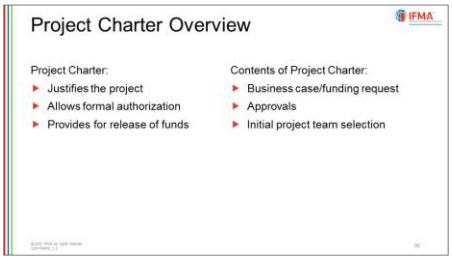
On completion of this lesson, you will be able to:

- Outline the purpose of a project charter and how it is used to gain project approval and funding.

This lesson contains the following topics:

- Project Charter Overview
- Business Case or Funding Request
- Approvals
- Initial Project Team Selection

Project Charter Overview



The first output of the Initiate phase is the project charter, which summarizes the project purpose and seeks approval and funding.

The project charter is used to:

- Justify and allow formal authorization of a project and release funds.
- Prove the project has a viable business case.
- List project requirements.

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- Link the project to strategy.
- Name persons responsible for the project, including the project manager.

It is good practice to have a project charter on every project and possibly for each project phase if the project has a long duration. Every organization has different requirements to satisfy in order to get approval and project funding.

The basic sections of a project charter typically include:

- Business case or funding request
- Approvals
- Initial project team selection

The project charter may also include an internal company policy regarding contractor safety and awareness guidelines.

Some organizations use a Project Request Form, specific project documentation or Capital Project Justification forms in lieu of a Project Charter. Additionally, some organizations use a project justification form or process that supersedes the project charter.

Business Case or Funding Request

A business case or funding request:

- Summarizes the project's scope, purpose and success criteria from an organizational perspective.
- Directly links the project to organizational and FM strategy, if applicable.

For example, it may outline the business need for the project such as legal requirements, customer requirements, market demand or social needs. It may refer to stakeholder needs in the form of a statement of requirements.

This portion of the document is primarily a financial cost summary and justification for those costs. A conceptual or preliminary budget is set out for project sponsor approval. Conceptual budgets are established prior to the preparation of a design solution. Broad

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industry standard unit pricing or historical costs are often used as the basis for developing a conceptual project budget.

Conceptual budgets can be developed using similar past projects. For example, for real estate projects, the conceptual budget would be expressed in a monetary amount per square meter/square foot plus an inflation factor or a geographic cost difference factor.

Due to the schematic nature of conceptual budgets, a contingency, expressed as a percentage of total anticipated costs, is included to cover unanticipated scope items that are added as the project is developed.

Approvals

Approvals name those accountable for the project and indicate whether these parties have formally signed off on the project.

Approval elements include, but are not limited to:

- The project sponsor/owner is identified, including their place in the approval process.
- The project manager is documented, including their level of authority and direct superior.
- The project manager gets funding approval, an initial project team and formal authorization for the project to proceed from all required sources.

At this point, the overall project gets a go/no-go. Depending on the nature and funding requirements of the project, subsequent approvals may be required. For example, at this point the schematic design is approved for a capital project. Further, approval will be needed for the detailed design, then the actual construction.

No approval equates to no project.

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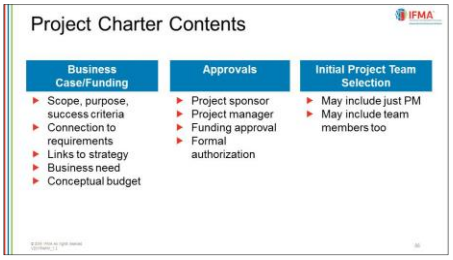
Initial Project Team Selection

The initial project team may consist of just the project manager or may include one or more persons, such as the project sponsor or other champions, responsible for development of the project objectives statement and project management plan.

The project charter may list one or more initial project team members and provide their basic qualifications, especially if the charter is being reviewed by a client.

Ideally, initial project team members are available for the entire project to provide continuity, with the exception of specialists such as contracted resources intended solely for a specific function, for example, producing a design.



Lesson Activity

The purpose of this activity is to review the details of the project charter for the relocation case study.

Relocation Case Study

Exhibit 2-21: Relocation Case Study-Relocation Project Charter

Frank Jones's relocation project charter specifies strategic reasons for the relocation.

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It explains how the:

- Site will be selected for its energy efficiency and room for expansion.
- Site will be designed, constructed and organized to optimize interdepartmental interaction in accordance with project requirements.
- Design will ensure the space is an improvement on the current physical environment such as better aesthetics, acoustics and productivity.
- Workspaces will be designed to optimize ergonomics.

The charter notes that energy efficiency is a major consideration since the organization will be responsible for utility costs, for example, as is the case in a triple-net lease. It notes the hard relocation deadline and provides some details on how tasks will be performed concurrently to ensure this deadline is met.

The charter's conceptual budget separates hard versus soft costs as follows:

Hard Costs

- Moving services, supplies and trucking expenses
- Costs for move materials, freight elevator and loading dock usage
- Special security guard services during the course of a move
- New stationary, business cards and move notices
- Other costs, such as design, food service, graphics, furniture and voice/data costs

Soft Costs

- Internal costs, such as salary/time of employees involved in managing the move
- Downtime and loss of productivity of employees being moved

Jones has performed two other office relocations in the past and decides to be the project manager. He plans to contract out design and development of the site interior, so construction will have its own design team, project manager and foreman who will periodically report to Jones.

For the relocation team, the charter indicates that Jones plans to use the facility organization staff as well as a number of other in-house employees, an IT moving company and a furniture moving company.

The initial project team consists of:

- Frank Jones
- Move consultant
- Expert in-house estimator
- One FM staff member

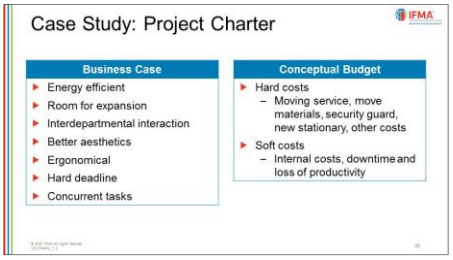
The approvals include sign-off by:

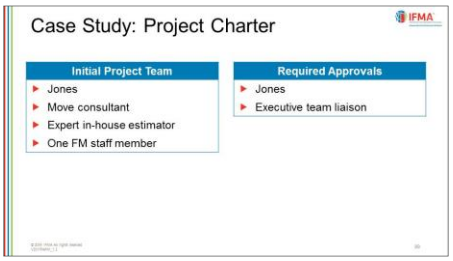
- Frank Jones
- Executive team liaison (champion)

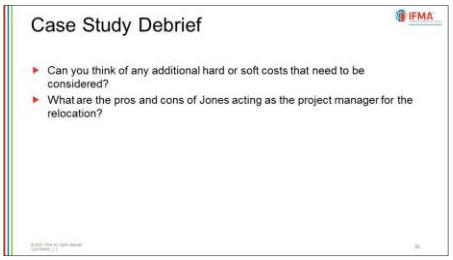
Answer the following questions regarding the case study:

1. Can you think of any additional hard or soft costs that need to be considered?

2. What are the pros and cons of Frank Jones acting as the project manager for the relocation?







Create Project Objectives Statement

Lesson Introduction

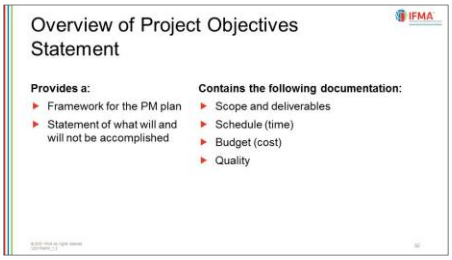
On completion of this lesson, you will be able to:

- Develop a statement of objectives to detail project scope and deliverables and constraints.

This lesson contains the following topics:

- Overview of Project Objectives Statement
- Elements of a Project Objectives Statement

Overview of Project Objectives Statement



The final output of the Initiate phase is the project objectives statement. This statement is the primary planning document for the project. It describes what the project will accomplish and includes any limitations in terms of scope and deliverables. It also includes a high-level schedule, a budget, and quality standards.

Note that organizations use various names for this document and it sometimes can be included as part of the project charter. For example, it may be called an initial project scope document, a project description document, or a project definition document.

The primary purpose of the project objectives statement is to provide a framework for developing the project management plan during the Plan phase. It may directly reference a

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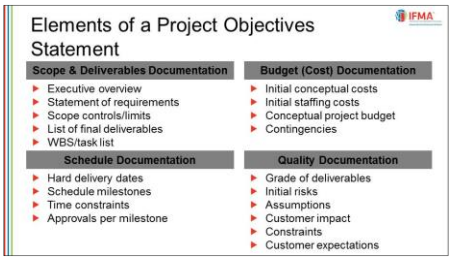
statement of requirements or select a subset of the requirements as dictated by what was approved in the project charter.

A project objectives statement may also include whether certain project-specific elements are included, for example:

- Initiating building commissioning during project design
- Initiating sustainability efforts during project design
- Programming for maintainability

The statement of objectives can be a brief document for simple projects or a detailed document for complex projects. Project managers and teams may have access to technology, such as scheduling tools or a Project Management Information System (PMIS) that can help develop the statement of objectives and position it as a framework for further development into a project management plan.

Elements of a Project Objectives Statement



A project objectives statement usually includes the following elements:

- Scope and deliverables documentation
- Schedule documentation
- Budget/cost documentation
- Quality documentation

Scope and Deliverables Documentation

The scope and deliverables documentation includes a preliminary scope estimate and lists the final deliverables, products or services.

The preliminary scope estimate includes:

- Acceptance criteria
- Broad scope controls

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- Limits to project tasks

The elements of scope documentation are high-level or general in nature, but the tasks are described in enough detail to allow development of a work breakdown structure (WBS) or task list during the Plan phase.

Exhibit 2-22 outlines the elements of the scope/deliverables portion of a project objectives statement.

Exhibit 2-22: Elements of Scope/Deliverables Portion

Element	Description
Executive Overview	High-level overview of the purpose of the project and its product or service deliverables. It defines the project in terms of what it should achieve and its limits and provides a rationale for the project such as a strategic, business or social need.
Statement of Requirements	May be included in the scope documentation.
Constraints and Parameters to Project Scope	Elaborated to guide later planning and reduce chances of miscommunication.
Project Deliverables	The final products or services are listed and characterized.
Initial Work Break Down (WBS)/Task List	The major tasks involved in the project are listed.

Schedule Documentation

During the Initiate phase, the time estimate is at a high level, but sets a schedule the project manager believes is realistic. Schedule documentation is sufficiently detailed to develop a project schedule in the Plan phase.

Exhibit 2-23 outlines the elements of the schedule documentation portion of a project objectives statement.

Exhibit 2-23: Elements of Schedule Documentation

Element	Description
Hard Delivery Dates	Tasks or deliverables that must be completed by a predetermined date for the project to proceed to the next task or be considered

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Element	Description
	successful. Such dates must be specified prior to the Plan phase. The documentation includes the reason for the dates, such as time-to-market, cost minimization or contractual obligation.
Schedule Milestones	The points in the schedule where major tasks are completed. Milestones are not set for a specific date at this point unless they are hard delivery dates.
Schedule Constraints	Includes resource availability or delays to compensate for impact on customers.
Approvals	Specifies the type of review and approvals needed at each milestone

Budget/Cost Documentation

Cost documentation provides a broad overview of how much the project will cost and may provide a range of estimates from conservative to optimistic. It is detailed enough to produce detailed cost estimates and budgets during the Plan phase.

Exhibit 2-24 outlines the elements of the budget documentation portion of a project objectives statement.

Exhibit 2-24: Elements of Budget Documentation

Element	Description
Initial Conceptual Costs	Costs are broken down into major categories or line items and are estimated in ranges. Conceptual costs may refer to quality documentation regarding the grade of materials or expert services.
Initial Staffing Costs	The needed staff or contractors are enumerated along with costs associated with persons at various positions.
Conceptual Project Budget	Aggregates the initial conceptual costs into a high-level budget reflecting resource requirements in terms of staff, equipment and materials, usually differentiating between hard and soft costs. The budget reflects realistic costs based on schedule and quality priorities or reflects a cost priority such as a not-to-exceed amount.
Contingencies	Budgets are usually expressed using the best available estimates and a contingency amount is usually added as a percentage of the total, typically approximately plus 10- 20 percent, rather than as individual estimates.

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Quality Documentation

Quality documentation describes the expected level of effort, inherent characteristics of deliverables, assumptions, risks and constraints in sufficient detail to produce numerous parts of the project management plan.

Exhibit 2-25 outlines the elements of the quality documentation portion of a project objectives statement.

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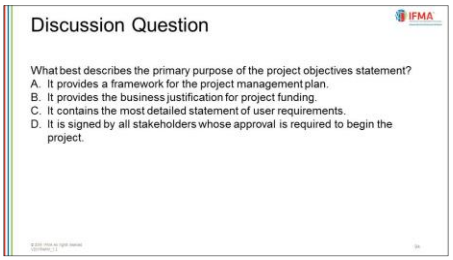
Exhibit 2-25: Elements of Quality Documentation

Element	Description
Grade of Deliverables	The technical features of deliverables are listed, broken down by the same line items as the initial conceptual cost
Initial Risks	Obstacles or risks to project success are identified.
Assumptions	Project assumptions, such as the use of specific facility equipment or in-house personnel or departments, the permit approval process duration and equipment lead time, are set forth.
Customer Impact	Impact of the project on customers' work schedules, people and systems is described, including communications, work interruptions or needed training. Methods to accommodate opposing or conflicting needs may also be discussed.
Constraints	Impact of constraints, such as those discussed previously as Initiate phase inputs.
Customer Expectations	The quality expectations defined by the stakeholders, senior management and sponsor.



Lesson Activity

The purpose of this activity is to review the details of the project objectives statement for the relocation case study.

Relocation Case Study

Exhibit 2-26: Relocation Case Study — Relocation Project Objectives Statement

The relocation project's scope documentation describes:

- Planned interior design and construction to fit the statement of requirements using an architectural design/MEP engineering firm and a general contractor.
- A list of relocation tasks, for example, reduction of outdated files and paperwork prior to the move.

The schedule documentation describes:

- First week of July estimated substantial construction completion and a hard relocation deadline of September 1.
- A high-level schedule indicating that design and planning for construction is to be performed concurrently with planning and communications for the move.

The cost documentation describes:

- Construction estimates with baseline data taken from the financial plan as a cost per unit of service, for example, network cabling, carpeting.
- Relocation estimates based on an estimated relocation cost per person.

The quality documentation describes:

- Use of average-grade general construction materials and above-average-grade finish materials.
- Electrical and HVAC modifications to be installed by licensed specialists.
- Use of a relocation consultant, professional movers and separate technology movers to increase quality of the move given an otherwise inexperienced in-house relocation team.

Answer the following questions regarding the case study:

1. What is the base document for detailed project management plan?

2. What details does the project charter contain about the project?

3. How do you ensure your project objectives are achievable?

4. How do you ensure your project objectives are complete and concise enough to meet your goals?

5. What is the best way to get concurrence of your project objectives from stakeholders?

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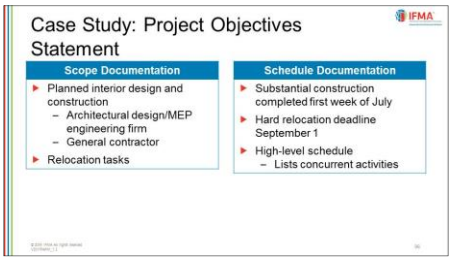
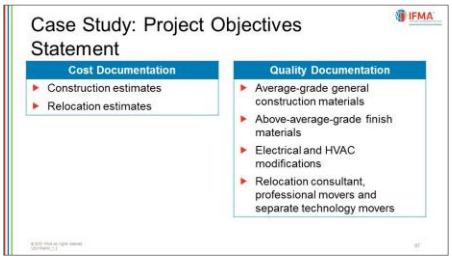
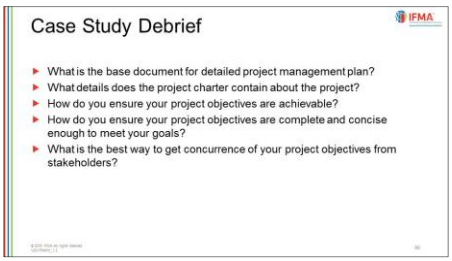






Chapter Activity

Project Overview Activity

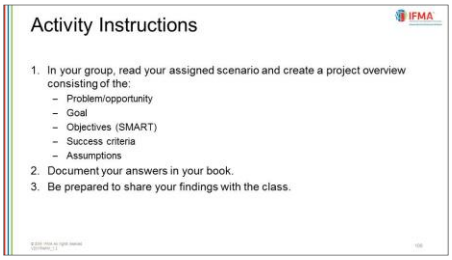
Instructions

Instructions

1. In your group, read your assigned scenario and create a project overview consisting of the:

   Note: If you are completing this course as a self-study, select one scenario and create the project overview.

   - Problem/opportunity
   - Goal
   - Objectives (SMART)
   - Success criteria
   - Assumptions
2. Document your answers in the *Worksheet* section below.
3. Be prepared to share your findings with the class.



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Scenarios

Scenario 1

Your project is to build out the infrastructure for a new $20M intensive care unit in a 30-year-old hospital. Your budget is more than adequate for your size of hospital, but you have a limited time to get the unit built. You have to rely heavily on outside designers and contractors, and you have the burden of constructing the unit while keeping the adjacent hospital areas up and running without disruption. As the facility manager, you are the in-house leader of the hospital team, but you have to interface and manage the designers and contractors while keeping the hospital administrators informed of budget, schedule and project progress toward the aggressive completion date.

Scenario 2

Your project is to build out a 50,000 square foot office space in your existing building in order to accommodate 200 people being relocated from another site. The move is expected to take place mid-next year. You have a fair amount of time, but a limited budget to accomplish your task. You already have a trusted design and construction team on-board that has worked with you on similar work over the past several years. You are leading the in-house management team responsible for managing the design and construction team and to keeping the project within the allotted budget.

Scenario 3

Your project is to evaluate your current FM technology system (CMMS) and procure a new CMMS work management system that will upgrade your capabilities to serve your 4-building corporate headquarters campus of about 2M square feet. Your task is to lead the in-house FM team in evaluating your existing/legacy work management system, defining the required capabilities of the new system, establishing the budget and schedule, selling the recommendation to senior management, then procuring and implementing the new system.

Scenario 4

You have been tasked with the creation and implementation of a campus-wide sustainability program. You are the director of facilities for a small campus of about 20 buildings for a mid-west liberal arts college. You have the backing of the college president, but your institution is not experienced in sustainable practices. Your task is to lead the FM team in researching, developing and rolling out a pilot sustainability project for the three most visible existing buildings on the campus. Funding is not yet established, and the president wants to see the pilot project well underway by the end of the year.

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Worksheet

Scenario #: _____

Problem/Opportunity

Goal

Objectives

Success Criteria

Assumptions

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Progress Check Questions

1. A corporation produces a long-range plan outlining its broad, high-level goals for serving its customers. What document is referenced to demonstrate how a facility management project is directly linked to this plan?

   a. Project charter
   b. Facility strategic plan
   c. Project objectives statement
   d. Success Criteria

2. What should a project manager do to expedite the permitting process on a capital construction project if the general contractor is not yet selected?

   a. Issue a certificate of occupancy.
   b. Perform the work in the expectation that a permit will eventually be issued.
   c. The project manager cannot expedite the process because a general contractor is required.
   d. Provide local officials with a preliminary set of construction documents.

3. What is done after defining a project's purpose and could be accomplished using a tool such as the project triangle?

   a. Test the purpose for feasibility.
   b. Define the priorities for the project.
   c. Define the intended use of the project deliverables.
   d. Develop a statement of objectives.

4. A project sponsor indicates that a project should build a facility at the lowest cost, in the least time, and with the highest quality. What should the project manager do?

   a. Implement the project with the given parameters.
   b. Work with the sponsor to define more feasible parameters.
   c. Tell the sponsor he will need to settle for lower quality.
   d. Agree to a definition of quality as assuming use of the lowest grade materials.

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5. What statement is true about success criteria?

   a. Success criteria can be partially met, and the project can still be considered a success.
   b. Success criteria defined by the project manager require no agreement by stakeholders.
   c. Success criteria specify the means by which success must be achieved (following plans).
   d. Success criteria must be measurable.

6. A relocation project involves moving several departments to different areas within the same facility. Who on the team would have specific details on user requirements?

   a. Lease owner
   b. General contractor
   c. Design professional
   d. Legal department

7. What is true of programming?

   a. Programming is a prerequisite for construction project architectural designs.
   b. Programming avoids making projections of future needs and so differs from forecasting.
   c. Programming is less detailed than macro-level programming.
   d. Programming differs from needs analysis because the latter does not determine user requirements.

8. Who among stakeholders generally needs to approve before programming can begin, so that interviews, observations, and surveys can be conducted?

   a. Senior executives or clients
   b. Expert design professionals
   c. Occupants/tenants
   d. Affected end users

9. Which term is defined as the facility rentable area minus the building core and service area and primary circulation?

   a. Useable area
   b. Gross area
   c. Hoteling area
   d. Common support area

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10. When developing a conceptual budget for a project charter, what can you use as the basis for the budget amounts?

    a. Industry standard unit pricing
    b. Winning contractor's bid
    c. Actual costs
    d. Data from design construction documents for completed projects

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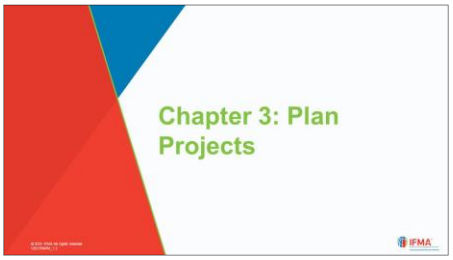
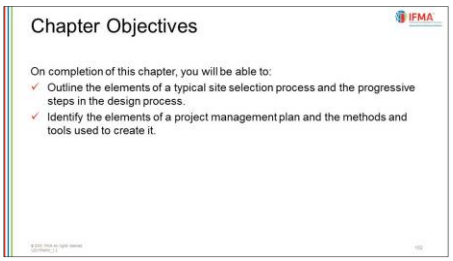
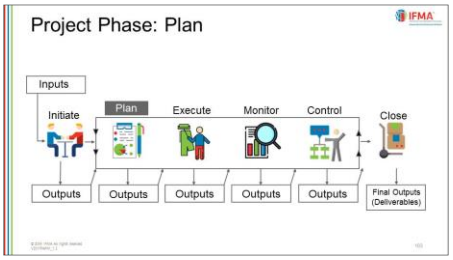
Chapter 3: Plan Projects

Chapter Introduction







On completion of this chapter, you will be able to:

- Outline the elements of a typical site selection process and the progressive steps in the design process.
- Identify the elements of a project management plan and the methods and tools used to create it.

There are many types of projects facility managers will manage. For example, implementation of a new IWMS system, a re-roofing project and a building re-stacking without construction. The same process and steps as outlined in this chapter related to a construction/relocation project can be applied to any type of project.

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Planning allows the necessary decisions for a project to be considered in advance. Project managers prioritize objectives and specify the what, why, who, how, where and when for the project to understand resource availability and other constraints. Project managers benefit from planning because it helps them make difficult decisions by design rather than by default.

Planning also:

- Creates a baseline for directing, measuring and controlling project progress.
- Helps determine and compensate for risks.
- Helps deliver consistent communications.

The sum of these benefits forms the primary rationale for planning: Without planning, the probability of project failure is quite high. Numerous studies on projects document that rework, project overruns and even project cancellations are common and cut across many industries, including engineering and construction. While the statistics themselves are best researched online, project managers should understand that the risks of failure are significant.

The most frequent lesson learned from inefficient, ineffective or cancelled projects is that the project was inadequately defined or planned. The projects fail from the start but often consume many resources before being declared a failure.

Without an adequate definition of the problem to be solved and a plan to solve the problem, projects can experience scope creep. Scope creep is an extension of the objectives of the project by external influences, resulting in undesirable and unplanned changes to a project's scope or constraints of time, cost and quality. Scope creep ultimately results in missed budgets, missed deadlines and/or unnecessary features. There will inevitably be changes, and the plan should accommodate useful change to support the project objectives. However, scope creep occurs when unnecessary changes are incorporated due to lack of appropriate change control on the part of the project manager.

Project managers can determine the difference between desirable and undesirable change using the following criteria:

- Does the change address the problem as originally defined? If not, defer.
- Does the change more closely align the project with the original plan? If it clarifies, completes or corrects, then accept. If not, reject.

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Without an adequate problem definition and plan, it becomes difficult for a project manager to answer these questions and the result of any change becomes uncertain. *Exhibit 3-1* shows how increased effort or "pain" up front can result in less total pain in the long run.

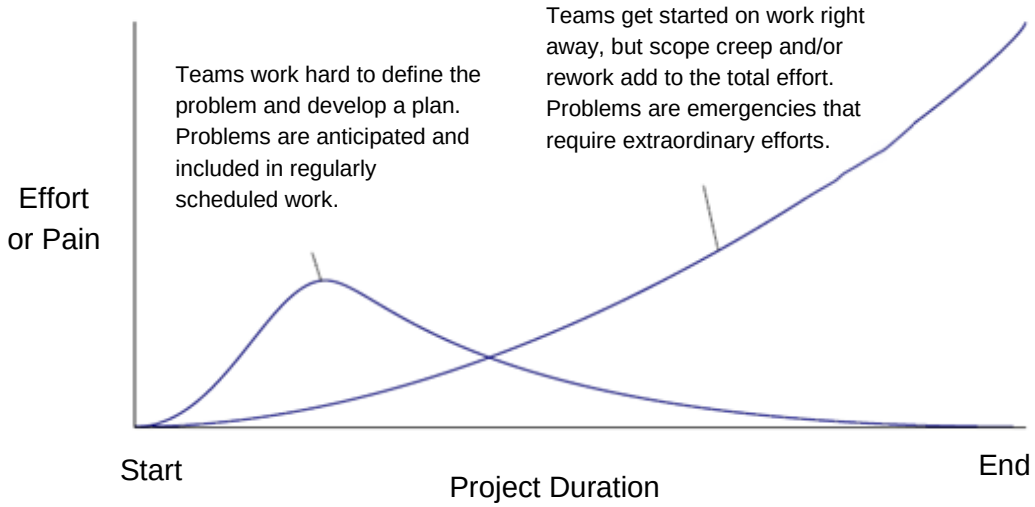


Exhibit 3-1: Adequate Planning Can Reduce Total Project Effort or "Pain"

Lessons

- Designing Deliverables or Space
- Create Project Management Plan

Designing Deliverables or Space

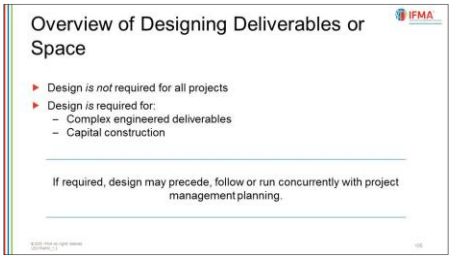
On completion of this lesson, you will be able to:

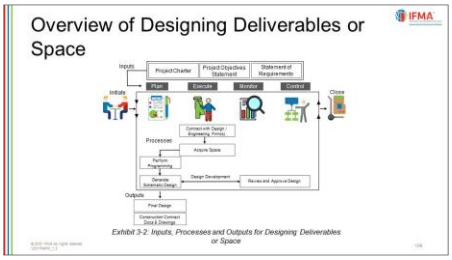
- Outline the elements of a typical site selection process and the progressive steps in the design process.

This lesson contains the following topics:

- Overview of Designing Deliverables or Space
- Acquire Space
- Design Process

Overview of Designing Deliverables or Space





Designing/engineering deliverables or space is necessary when projects require development of complex architectural and/or engineered designs or capital construction.

When design is required, development of the project management plan should be done prior to the design as a framework and revisited after the design is finalized. It could also

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be performed concurrently or initiated after the design is complete. Organizational practices or schedule optimization may dictate this decision.

The tasks discussed in this topic fit into the Plan, Execute, Monitor and Control project phases. *Exhibit 3-2* provides an overview of the inputs, processes and outputs for design tasks, showing how design work and engineering work are primarily Plan phase processes and outputs, but some activities continue into other phases.

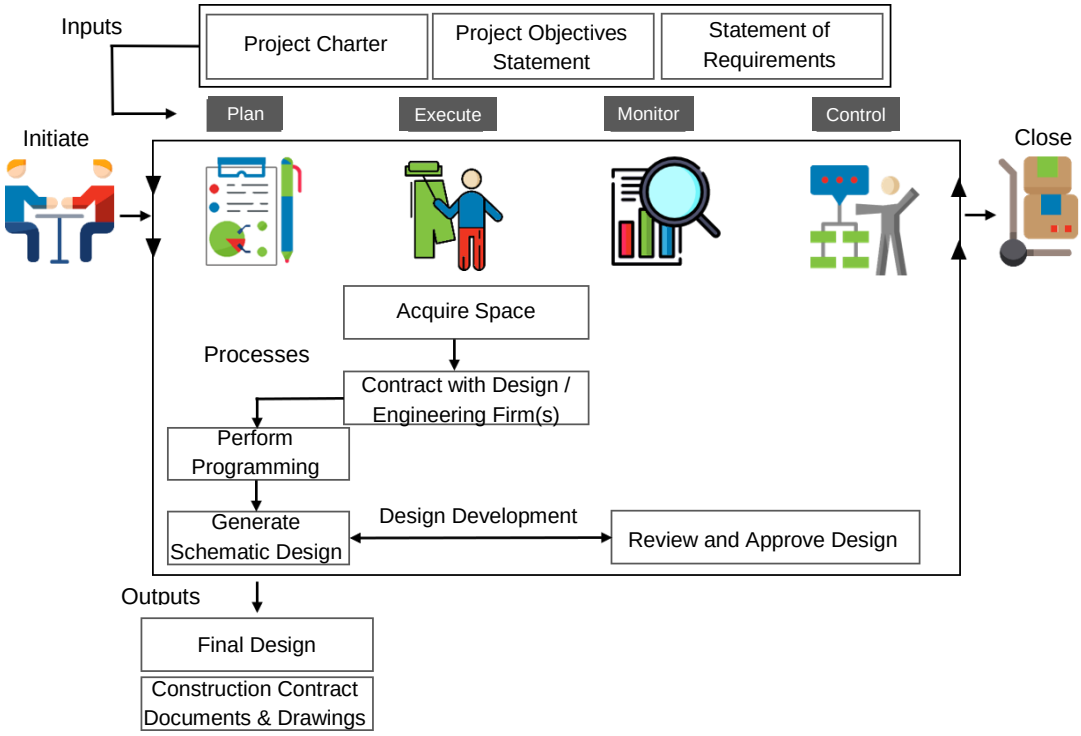
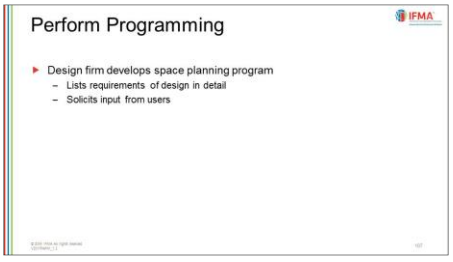


Exhibit 3-2: Inputs, Processes and Outputs for Designing Deliverables or Space

Perform Programming/Pre-Design



The design firm will provide a design professional(s) to develop the space planning program. The program will list the requirements the design must meet in detail. The design

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professional can use different programming techniques, such as soliciting input from end users, when defining the requirements.

A high-quality design requires high-quality inputs. If the statement of requirements is unambiguous and sufficiently detailed, then designers/engineers will have the necessary tools to evaluate and identify the deliverables. Ensuring designers or engineers are addressing the right problems/opportunities and controlling scope creep are the key tasks for the project manager throughout the design process.

In the Plan phase, programming is performed at the micro-level; whereas, in the Initiate phase, programming is performed at the macro-level.

Acquire Space

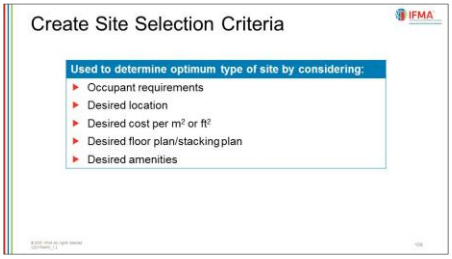
Acquiring space for an organization is a long-term strategic decision. The facility manager/project manager may be involved in recommending a site based on project requirements, with input from the architect, engineer, interior design consultants and other stakeholders, but the decision rests with senior executives/clients.

The steps in acquiring space typically include:

1. Creating site selection criteria
    - Is it new construction or is an existing structure being acquired?
2. Conducting a site search
3. Selecting a design/engineering firm
4. Conducting a building evaluation

Once a selection is made, the organization purchases or leases the space.

Create Site Selection Criteria



Site selection criteria are created to determine the optimum type of site for a facility. The project manager and existing protect team works with the demand organization to understand their site, facility and space requirements. From there, the selection criteria can be determined and then prioritized.

Site selection criteria address factors such as:

- Occupant requirements, including total square meters or feet and special spaces
  - For example, 1,000 square meters, or approximately 10,800 square feet, unobstructed space, identified in the programming interviews and reports
- Desired location
  - Transportation/logistics considerations
  - Reasonable commute for occupants
  - Zoning
  - Adjacencies
  - Tax implications
- Desired cost per square meter, or square foot, including:
  - Rent and operating expenses
    - Maintenance cost
    - Parking charges or other associated costs
    - Branding cost, for example, company signage
  - Construction costs
  - Allowance for tenant improvement, if facility is leased
- Desired floor plan/stacking plan
  - For example, a small floor size/high-rise facility or a large floor size/low-rise facility
- Desired amenities
- Corporate Space Standards and Guidelines

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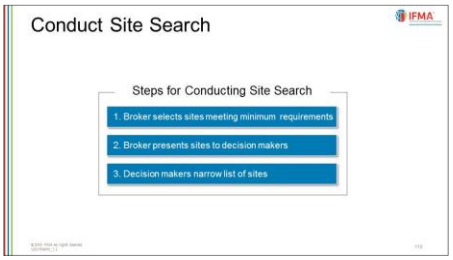
The total cost is weighed against the desired space configuration to determine a solution that fits organizational requirements and makes viable financial sense. For example, for new construction, site selection criteria may determine that although high-rise construction is more costly, its smaller floor size, or floor plate, could reduce total costs if land costs are at a premium. For acquisition of existing facilities, site selection criteria can help optimize the property search based on land/building costs versus location and site amenities.

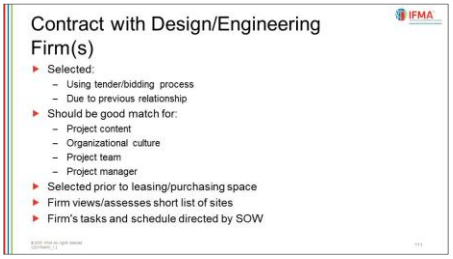
Conduct Site Search



The project manager contracts with a corporate real estate broker, who conducts a site search based on a summary of the requirements listed in the statement of requirements, statement of objectives and site selection criteria.

The broker presents a selection of sites that meet minimum requirements and works with decision makers to narrow the list of sites.

Contract with Design/Engineering Firm(s)



If an architectural design and/or engineering firm is needed to develop designs and construction documents and drawings, the firm(s) can be selected using a tender/bidding and selection process.

Examples of these firms include:

- Mechanical, electrical and plumbing (MEP) engineers
- Civil, structural or specialized engineering firms

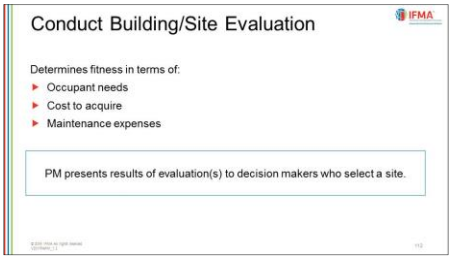
Sometimes the architectural/engineering firm is selected due to a previous working relationship or other qualifications instead of a tender/bidding process.

When selecting a design/engineering firm, the project manager ensures the selected firm is a good match for the specialized project content, the organizational culture, the project team and the project manager. Ideally, this step should be completed prior to leasing or purchasing the space. The architect and engineer should view and assess the proposed short list of sites under consideration to confirm the proposed space can meet the needs of the project.

The design/engineering firm's tasks are directed by a scope/statement of work, which includes a task schedule and deadlines for deliverables.

When working with design/engineering firms, project managers encourage an atmosphere of collaboration to ensure the best design possible. Even though this function is usually outsourced, the project manager is accountable for results and retains control over the design process.

Conduct Building/Site Evaluation



A building evaluation may be conducted when an existing facility might be acquired. The purpose of a building evaluation is to determine if an existing building will meet the infrastructure and occupant needs at an acceptable cost after purchase/lease, design/construction and maintenance costs are factored in. The decision factors involve making trade-offs between location, cost and satisfaction of occupant requirements.

Common steps in a building evaluation include:

1. Ensure occupant needs are satisfied in relation to established selection criteria
2. Compare/contrast floor size, or floor plate, configurations for each site

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3. Evaluate power and other physical infrastructure, such as HVAC, plumbing, communications and security
4. Evaluate general building condition, for example, roof and mechanical systems
5. Evaluate accessibility for persons with disabilities, for example, compliance with the Americans with Disabilities Act (ADA)
6. Evaluate parking capacity
7. Evaluate building code compliance and necessary local statutory compliance
8. Evaluate fire and life safety equipment, for example, sprinkler systems and fire and water leakage detection systems
9. Acquire data on prior building inspections and accessibility compliance
10. Evaluate building type compatibility with intended use and mechanical and electrical system compatibility with intended use
11. Evaluate roof rights and/or ground-level space availability for special equipment
12. Evaluate site zoning to ensure the planned occupancy can be accommodated
13. Generate a test fit, which is a scale drawing showing a proposed layout of space for business units or departments to determine if the space can adequately address space requirements with contingency space or room to expand

The designers/engineers should be involved in the building evaluation(s). The project manager presents the results of the evaluation(s) to decision makers, who select a site.

Purchase or Lease Space

The organization negotiates with the property owner through a broker and legal counsel when making an offer on a property. For purchases or leases, there may be a property or lease review by legal, risk management and environmental auditors. Organizations negotiate the purchase/lease price. In the case of leases, lease duration, tenant improvement allowance and other contract terms are also negotiated.

Given successful negotiation and legal review, the representatives of the organization and the owner sign the necessary contracts.

A tenant improvement allowance is money set aside by a landlord in accordance with a building standard for use by a tenant to make the space suitable for occupancy. The size of the allowance can vary by the duration or structure of the lease or other factors negotiated in the contract.

Exhibit 3-3 continues the relocation case study.

Exhibit 3-3: Relocation Case Study — Acquire Space Task

Frank Jones creates site selection criteria with the assistance of a corporate real estate broker, who provides data on the average cost per square meter, or square foot, for property in various XYZ city neighborhoods. The statement of requirements from programming shows a preference for a small floor plate, high-rise facility.

The broker shows a number of properties to Jones, who is authorized to make a short list. The project architect/engineer should review the short list to confirm the spaces will work with the project requirements. Then senior management representatives tour the vetted short-listed facilities and select three for building evaluations:

- One downtown
- One in a dense urban area
- One in a suburban area.

The winning location is in the dense urban area, 23 kilometers (14 miles) from the current facility. The location:

- Is a refurbished six-story facility with appropriate space.
- Has the most energy efficient windows of the three finalist sites.
- Features nearby freeway access.

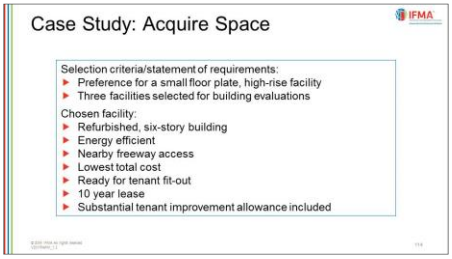
The cost per square meter, or square foot, is higher than that for the suburban location, but lower than that for the downtown location. However, the total cost is the lowest because the facility has a smaller total area than the suburban location. This is partly due to the fact that the dense urban location features an attached parking garage.

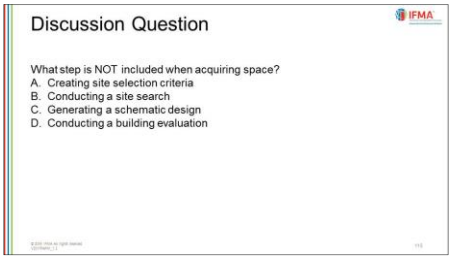
Another factor in the decision is that the selected facility is ready for tenant fit-out (TFO), meaning interior demolition is complete and the space is essentially an empty building shell ready for a tenant-defined custom interior construction project. It is ideal for this fast-track TFO project.

Senior management representatives have signed a ten-year triple-net lease on the facility and receive a substantial tenant improvement allowance for signing a longer lease.

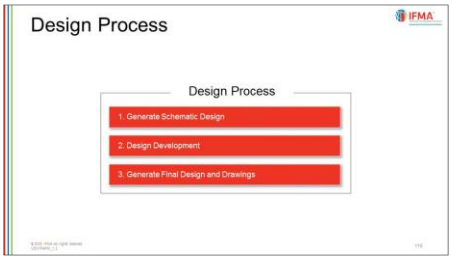
Consider the following questions:

- Are there any additional parameters Frank Jones should have considered when looking at the properties?
- What critical parameters do you always consider when acquiring space for your company?
- What might some of the selection criteria be?





Design Process



The design process normally follows several phases of progressive detail.

1. Generate schematic design
2. Design development
3. Generate final design and construction contract documents/drawings

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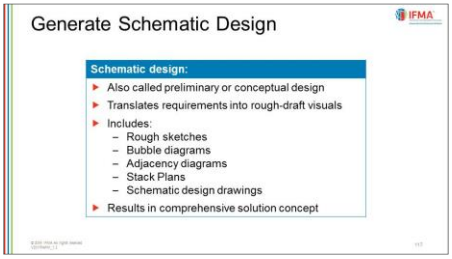
Generate Schematic Design



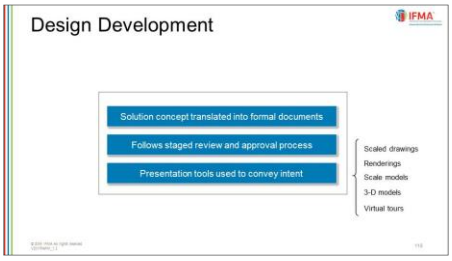
Schematic designs, also called preliminary designs or conceptual designs, are high-level conceptual design diagrams used to translate the statement of requirements into rough-draft visual plans.

Schematic designs include:

- Rough sketches
- Bubble diagrams
- Adjacency diagrams
- Stack plans
- Schematic design drawings

The intent of the schematic design phase is to arrive at a comprehensive conceptual solution, a design agreed to by all involved parties.

Design Development



During design development, the conceptual solution is translated into more formal drawings and documents following a staged review and approval process. Design professionals create and detail each aspect of the solution until a final design is achieved and approved.

They may employ a number of presentation tools to convey the intent of a design to decision makers, including:

- Architectural and engineering scaled drawings

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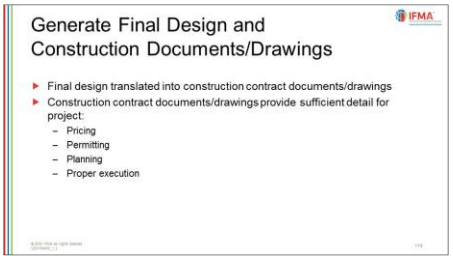
- Renderings
- Scale models
- Building Information Models (BIM)
  - The US National Building Information Model Standard Project Committee defines BIM as "...a digital representation of physical and functional characteristics of a facility... a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle..."
  - Contains important details about a building, such as:
    - → Spatial dimensions
    - → Locations of assets, for example, HVAC units
    - → Characteristics of objects
    - → Impact of time and schedules
    - → Related costs of operations
- 12d models
- Virtual tours or virtual reality models

Review and Approve Design

Design development drawings and documents are periodically presented to decision makers for review, modification and approval. Stakeholders typically review the design at predetermined progress stages such as at 30, 60 and 90 percent complete. Each organization will specify its own review format. Following each comment period, the design is updated, and a final design is generated once the designs are complete and approved.

Review and approval is an iterative process. The outputs are fed back into the development process as inputs until the expected final output is achieved.

Generate Final Design and Construction Documents/Drawings



The final design is translated into construction contract documents and construction drawings or as-built drawings, to provide qualified contractors with sufficient detail to bid on the project, or provide pricing if the contractor is sole-sourced, and build the deliverable or facility correctly using specified materials and practices. The construction contract documents contain the necessary specificity for a construction project to be priced, permitted, planned and properly executed.

Construction contract documents and construction drawings can be defined as follows:

- Construction contract documents — a portfolio of detailed documents that generally consist of:
  - A construction agreement
  - General terms and conditions
  - Supplementary conditions
  - Construction documents, including construction drawings and specifications
  - Addenda
  - A notice to proceed
  - Payment and performance bonds
  - Change order reviews, approvals and logs
- Construction drawings — scaled architectural or engineering drawings that include notations on the work required and the materials to be used, showing how to proceed with construction, usually provided as part of a larger set of construction contract documents

In addition to producing approved documents and drawings for construction contractors, designers/engineers may produce drawings intended for other stakeholders who require less detail. For example, schematic plans or drawings are scale drawings that include all basic design components of a space or facility, such as circulation corridors, partitions and work space areas, but omit construction details and dimensions.

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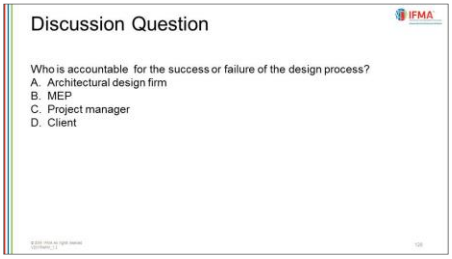
In the Plan Phase, before space is acquired, programming is performed at the macro-level.
In the Initiate phase, after space is acquired, programming is performed at the micro-level.



Lesson Activity

The purpose of this activity is to review the design space task of the relocation case study.

Relocation Case Study

Exhibit 3-4: Relocation Case Study — Design Space Task

The building owner for the new location has preselected an architectural design firm and an MEP engineering firm as well as a general construction contractor. The lease specifies use of these contracted resources. The design/engineering team generates schematic plans, which are approved. They then proceed to design development and submit these designs to senior management for review at 30 percent, 60 to 65 percent and 90 percent completion stages. The general contractor also consults on the review. To expedite permitting, Frank Jones submits drawings to local officials so any issues can be prevented or resolved early in the process.

The designs are based on a construction budget primarily funded by the tenant improvement allowance, but Jones's project charter authorizes additional funds above this amount to be invested to pay for all quality upgrades above building standard.

After some changes during design development, the executive team approves the firm's final design. During this time, Jones's initial project team concurrently works on the project management plan.

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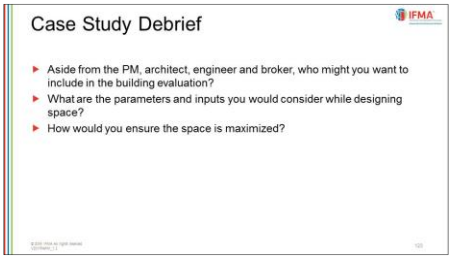
Jones's organization requires the use of American Institute of Architects (AIA) standard construction contract documents. The MEP engineering firm, therefore, produces specifications for the general contractor using these document formats.



Answer the following questions regarding the design space portion of the case study:

1. Aside from the PM, architect, engineer and broker, who might you want to include in the building evaluation?

2. What are the parameters and inputs you would consider while designing space?

3. How would you ensure the space is maximized?

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Create Project Management Plan

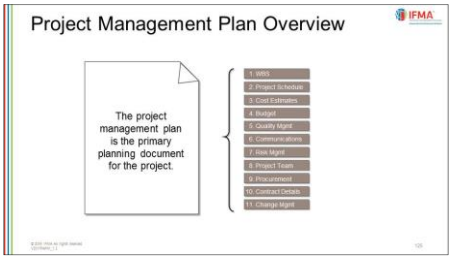
On completion of this lesson, you will be able to:

- Identify the elements of a project management plan and the methods and tools used to create it.

This lesson contains the following topics:

- Project Management Plan Overview
- Work Breakdown Structure/Task List
- Project Schedule
- Cost Estimates
- Budget Management
- Quality Management
- Communications Management
- Risk Management
- Project Team Staff and Contractor Specifications
- Procurement Management
- Contract Details
- Change Order Management

Project Management Plan Overview



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The project management plan:

- Is the primary planning document for the project.
- Identifies the scope of deliverables and tasks to be done.
- Includes a schedule, cost estimates and budget.
- Indicates how to manage quality, communications, risks, project team specifications, procurement and project changes.
- Is developed from the:
  - Project charter
  - Project objectives statement
  - Final design and construction documents, if used
- Is created using project management and/or scheduling software and other policy, procedure and practice tools, such as cost estimates from prior projects.

The project management plan continues to be refined throughout the planning process. Refinements could include incorporating approved changes or revealing constraints, risks, assumptions or requirements that need to be documented. The plan is not generated and shelved, but becomes a script for project execution, management, controlling and closure.

The project manager's primary task in project planning is integration or coordination of plan elements to form a cohesive project management plan. Development of one element usually affects the other elements. The project manager is responsible for ensuring that when a plan element is developed or changed, the effect of the change is reflected in the other parts of the plan.

Exhibit 3-5 shows the primary interdependencies between plan elements. For example, once project team staff and contractor specifications are settled, this may require updating the project schedule, contract details and budget.

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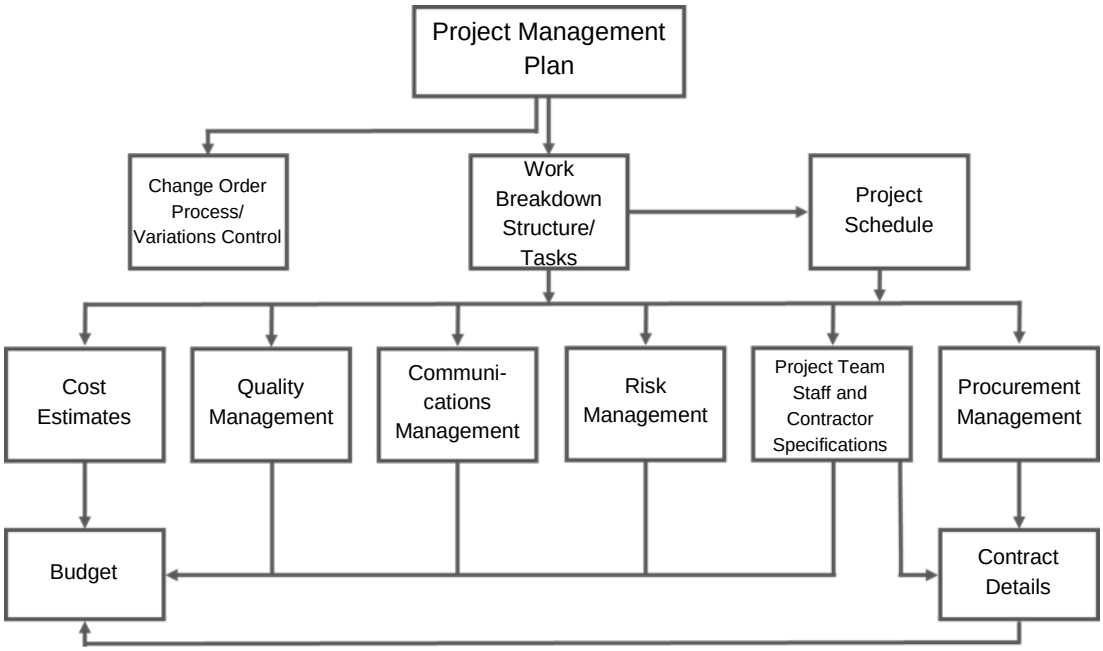
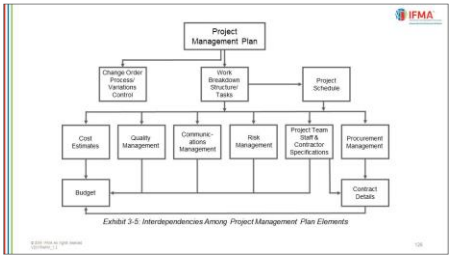


Exhibit 3-5: Interdependencies Among Project Management Plan Elements



The work breakdown structure (WBS)/task list is used as the basis for many other project elements. It is developed first, but after this, the other elements can be developed concurrently. Elements can also be developed incrementally. For example, the budget is developed incrementally because it may need to be updated after other element's costs become known.

A project management plan can be simple, but at a minimum, it specifies project resources, generates a schedule and sets the sequence of tasks.

Benefits of investing time in the development of a project management plan include:

- Tasks requiring long lead times are identified and initiated to avoid delaying the project
- Tasks contingent on other tasks, for example, approvals, are sequenced appropriately
- Potential risks are identified and steps to mitigate them are planned

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- The schedule accommodates the approved level of involvement by the project team and customer representatives
- Costs are identified
- The makeup of the project team is defined
- Resources are scheduled
- Principles of value engineering are practiced
- Approval points, milestones and go/no-go decision points are defined to allow for project review, evaluation, postponement and cancellation

Project planning bridges the gap between the statement of objectives or intent and the development/execution of deliverables or results. The process of generating a project management plan involves both individual work and a series of team meetings. *Exhibit 3-6* provides an overview of the inputs, planning processes and outputs for creating the project management plan.

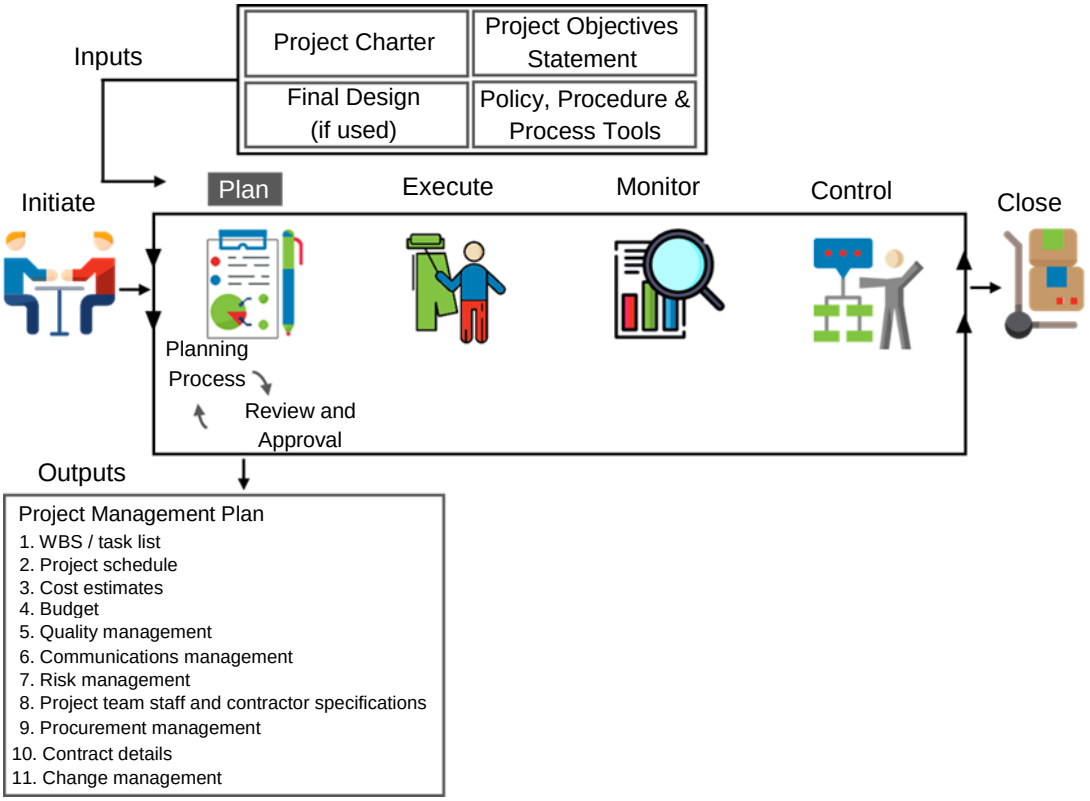


Exhibit 3-6: Inputs, Processes and Outputs for Creating Project Management Plan

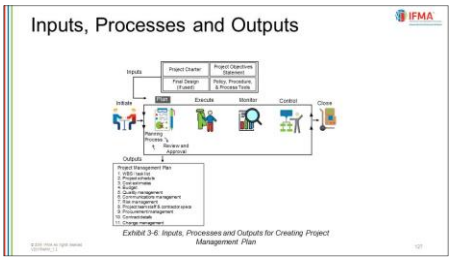
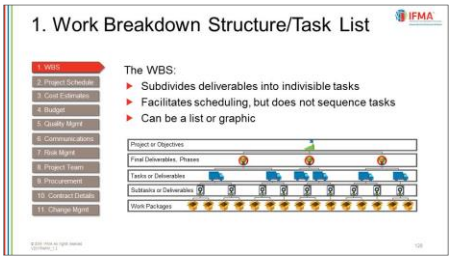


Exhibit 3-6 Inputs, Processes and Outputs for Creating Project Management Plan

1. Work Breakdown Structure/Task List



A WBS, or task list, is a:

- Common activity list to show what needs to be done, who will do each task to accomplish project objectives and ensure no tasks have been omitted.
- Method of dividing the project's deliverables and work into manageable or logical subdivisions so:
  - Project scope can be defined
  - Required work can be understood and assigned
- Hierarchy that branches out from general to specific and can be presented as an indented list or in a graphical format.

The list of tasks for a given project can be developed in many ways, including:

- Taking relevant tasks from a standard project format
- Using a prior WBS from a completed project
- By holding a project meeting

In general, the process works by dividing the broad deliverables or major tasks into smaller amounts of work until they cannot logically be subdivided further. This process of division is called decomposition. Logically, smaller tasks can be more accurately estimated for duration and cost. Defining the unit of measure for scheduling can help determine the required level of detail. For example, planning by hours requires more detail than by days.

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A WBS defers all sequencing until project scheduling, so team members need not place the tasks in a particular order at this stage. Scheduling too soon can result in an incorrect critical path because some important tasks could be omitted.

For smaller projects the WBS/task list and the schedule can be generated simultaneously using simple project scheduling software.

The indented list format for a WBS is a text-based outline that applies deeper levels of indentation to subdivisions of work. The graphical format for a WBS is shown in *Exhibit 3-7*.

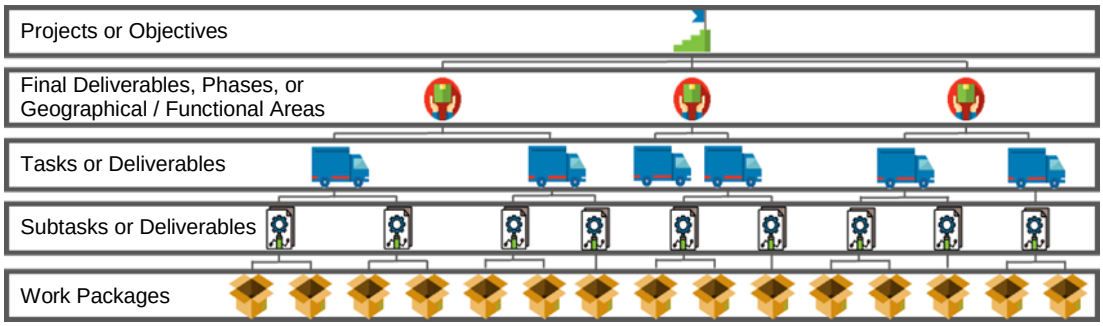
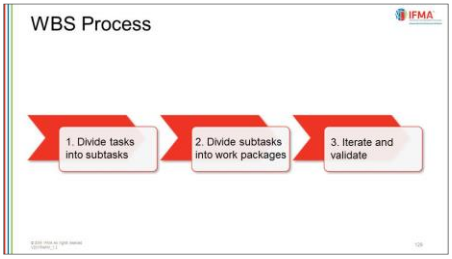


Exhibit 3-7: Work Breakdown Structure in Graphical Format

The following terms are related to a WBS:

Task	• A function to be performed that always consumes time and may consume resources. • Also known as an activity. • In contract proposals, a task is a unit of work that is sufficiently well defined so, within the context of related tasks, readiness criteria, completion criteria, cost and schedule can all be determined.
Subtask	A division of a task into units that are cohesive and relatively independent from each other.
Work package	Deliverable or component of work that can be cost-estimated, scheduled and measured. It is: • A division of a subtask into the smallest unit of work defined in a WBS. • Assigned to an individual and contains enough detail to allow for work execution

WBS Process



Dividing tasks down to the level of the work package requires the developers to have a detailed understanding of the tasks.

This may require expert judgment or developing the WBS on a phase-by-phase basis if:

- Later project phases are yet to be fully clarified, or
- Specialized team members are yet to join the team.

The following steps are used in developing a WBS:

1. **Divide tasks into subtasks**

   The project manager holds a meeting with the existing project team to identify, number and organize deliverables and high-level tasks into a hierarchical structure and split deliverables into major components.

   Subprojects, contract work and responsibilities may be identified.

2. **Divide subtasks into work packages**

   Project team members with specific expertise divide subtasks into activities that can be performed by an individual or cohesive group, or that facilitate estimates of cost or time. The work packages indicate how the work is done and controlled.

3. **Iterate and validate**

   The WBS is used in part to determine project team requirements. Once the full project team is on board, team specialists review the WBS and revise or augment it as needed. They validate work packages by asking questions such as:

   - Do all tasks/subtasks/work packages begin with an action word?
   - Can a specialist determine the effort required to perform this task?
   - Does each task result in a deliverable?
   - Does this subdivision create unnecessary management or control steps or inefficient use of resources?

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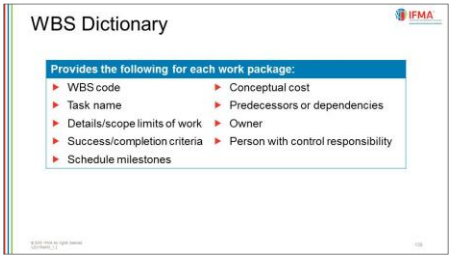
WBS Dictionary



A WBS dictionary itemizes and describes work packages and includes details, such as dependencies.

It supports the indented list or graphical hierarchy and lists the following data for each work package as data becomes available:

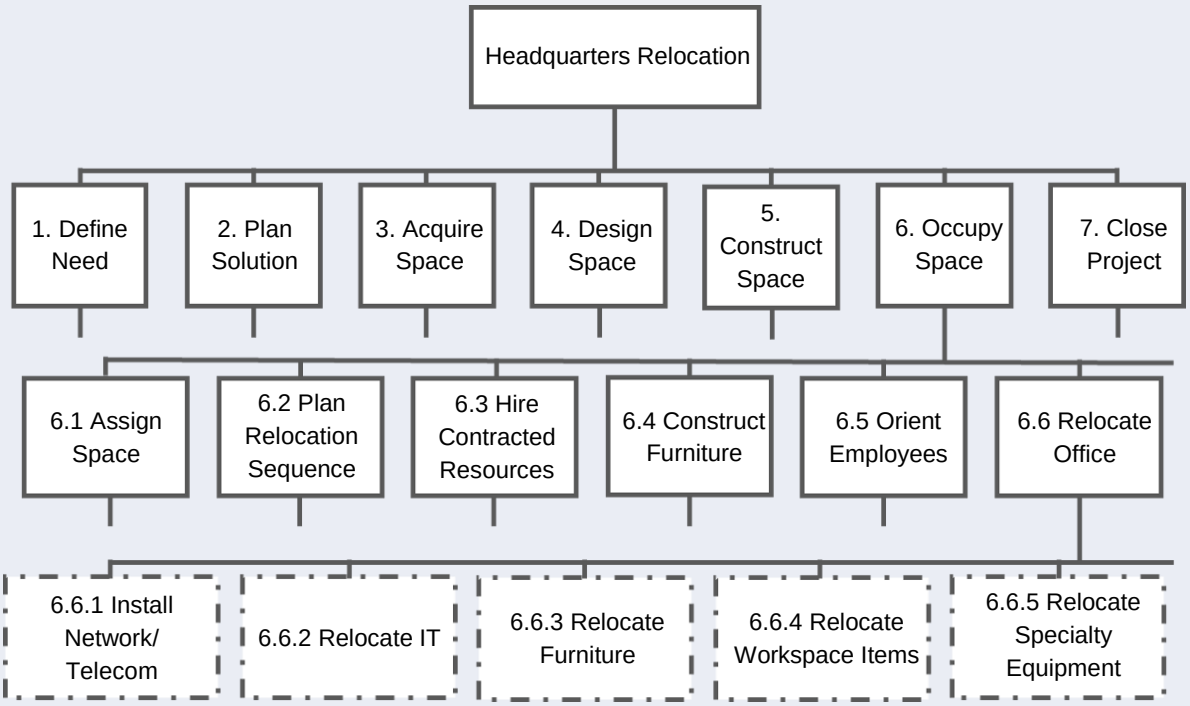
- A WBS code, or ID code, that may indicate a task and a subtask, for example, 5.2.2
  - This unique code is an easier way to organize and connect information rather than writing out the tasks themselves.
- Task name, a verb-noun combination
- Details of the work to be done and scope limits to the work
  - For example, 1.3.10 - Develop Communications Plan: Project manager determines how, when and by whom information about the project will be administered and disseminated.
- Success criteria or completion criteria
- Schedule milestones
- Conceptual cost
- Cross references to predecessors or dependencies, which are work packages that must be complete for work to start on the current work package
- Owner — individual responsible for execution and department for categorization. If a team is assigned, the team leader is the responsible individual
- Person with control responsibility

Some data for a WBS dictionary is not added until later when it is known, such as data on predecessors or dependencies, which is determined when creating the project schedule.

Exhibit 3-8 continues the relocation case study.

Exhibit 3-8: Relocation Case Study — Relocation Project WBS

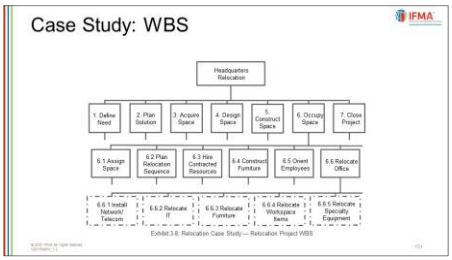
The existing planning team develops a work breakdown structure, a portion of which is shown below.

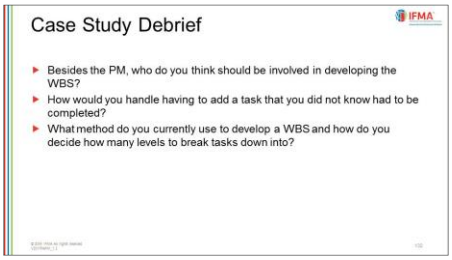


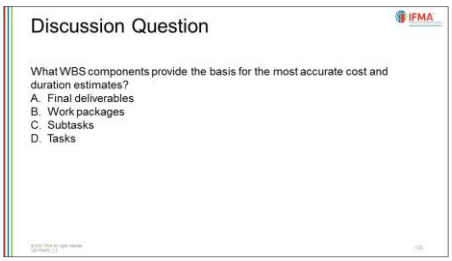
Note: The numbers in the WBS reflect the WBS dictionary.

Consider the following questions:

- Besides the PM, who do you think should be involved in developing the WBS?
- How would you handle having to add a task that you did not know had to be completed?
- What method do you currently use to develop a WBS and how do you decide how many levels to break tasks down into?



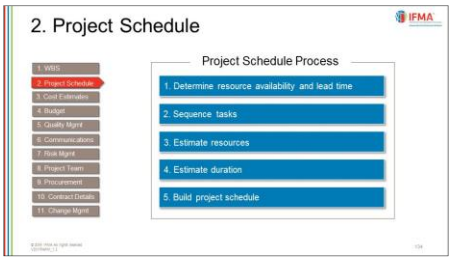




2. Project Schedule

A project schedule is a tool to organize tasks into a sequence with start and end dates for each task and assign responsibilities and resources. It may also link tasks by their predecessors or dependencies and communicate milestones and progress.

Project Schedule Process



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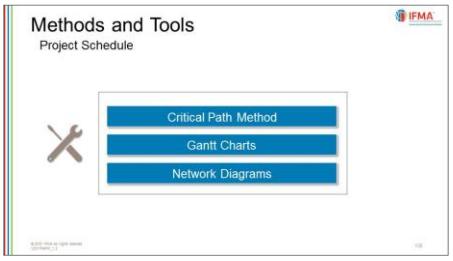
There are many ways in which to build a project schedule. The following describes some common scheduling activities:

1. **Determine resource availability and lead time** — required to assemble team members, professional services, equipment, materials or other resources are determined or estimated.
2. **Sequence tasks** — tasks from the WBS/task list are placed in a logical sequence that identifies predecessors or dependencies.
3. **Estimate resources** — team specialists create estimates of the resources, for example, human resources, materials and opportunity costs, required for each task. Since an expert may perform a task faster than a novice, it is important to determine who will perform a task and the person's availability.
4. **Estimate duration** — team specialists estimate of the duration of each task using data from past projects, expert judgment and estimation tools. Team meetings can be used to generate consensus on estimates. Failure to agree on an estimate may indicate the task needs to be further broken down or, in reality, needs additional time to complete the job compared to what is being scheduled.
5. **Build project schedule** — project schedule is assembled from the sequencing and estimation tasks. Schedules may be built from the start or end of a project or by finding the critical path. In the following types of scheduling, as many tasks as possible are concurrently performed, constrained by resource availability and predecessors.

Schedule Types	Description
Forward pass scheduling	• Takes tasks in sequential order in order to arrive at a realistic and reasonable completion date. • Used when there is no hard deadline or to indicate the most realistic schedule.
Backward pass scheduling	• Begins with a fixed completion date and arranges necessary tasks in order to allow enough time to complete all the project tasks. • More difficult than forward pass scheduling but is useful for determining when a project should start based on a fixed completion date or hard deadline, for example, a lease termination date dictated by contract.

Schedule Types	Description
Critical path scheduling	• Based on identifying predecessors and time frames; each process that requires a previous process to be completed before it can begin is entered in a time schedule so the minimum time for overall project completion can be determined. • Useful for identifying tasks that must be completed before the next task can begin. For example, if lead time on ordering carpet is miscalculated and the carpet is delivered late, the carpet degassing and installation, construction of movable walls and furniture and moving of furniture will also be delayed. If contractors and movers cannot be rescheduled in time, they may charge for the days they were not needed.

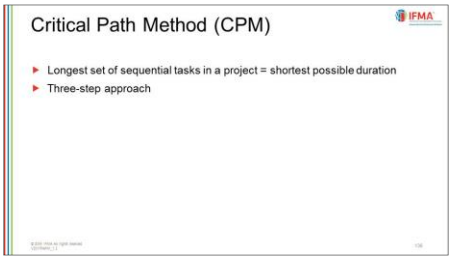
Methods and Tools

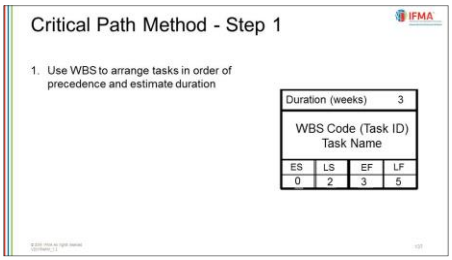


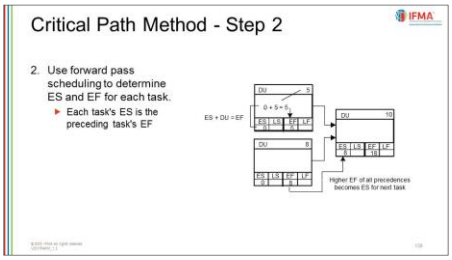
Numerous methods and tools exist to implement a schedule, such as:

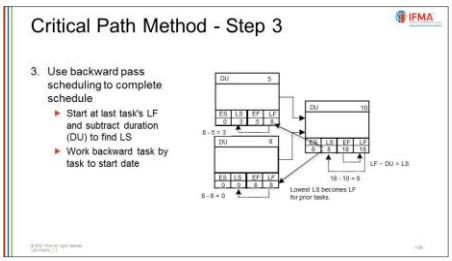
- Critical path method (CPM)
- Network diagrams
- Gantt charts

Critical Path Method









The critical path method (CPM) is a scheduling method that uses forward pass scheduling followed by backward pass scheduling to determine a critical path for the project on a modified network diagram. The critical path is the longest set of sequential tasks in a project, which has the shortest possible planned project duration.

Typical steps in the critical path method include the following:

1. Use the WBS/task list to arrange tasks showing precedence, with arrows and record the duration (DU). Duration is an estimate of how long the task will take specified in weeks, days or hours. The CPM box also contains the following time codes:

    - **ES: Early start** — the soonest the task can begin
    - **LS: Late start** — the latest time the task can begin
    - **EF: Early finish** — the soonest the task can end
    - **LF: Late finish** — the latest time the task can end

Duration (weeks)	3		
WBS Code (Task ID) Task Name			
ES	LS	EF	LF
0	2	3	5

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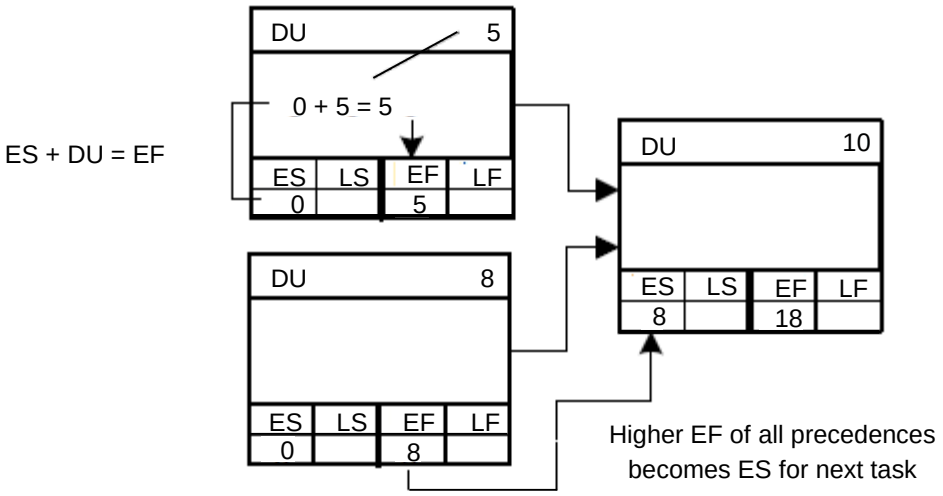
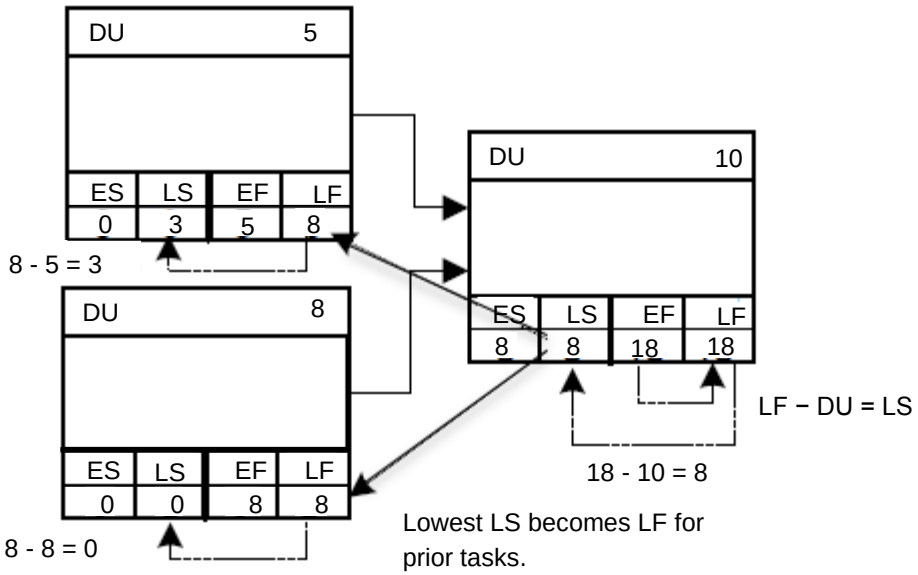
2. Perform forward pass scheduling, starting at the beginning and going to the end.
   a) Determine the ES and EF for each task successively. The ES for the first task in a project begins at 0.
   b) Add the amount from the ES to the task's duration to find its EF.
   c) The next task's ES is the prior task's EF. If a task has multiple precedences, the highest EF is used.



3. Perform backward pass scheduling, starting at the end and working back to the beginning.
   a) Determine the LF for the last task. Note that if a project has a hard deadline, this is used as the LF for the last task or the task's EF can be used as its LF.
   b) Subtract the task's duration from its LF to find its LS. For each task, the lowest LS value is entered as the prior activity's LF.



CPM scheduling using days as a measurement usually includes only workdays, so a calendar schedule will be of greater duration.

Each task on the critical path has the same early start and late start (ES = LS) and the same early finish and late finish (EF = LF). In other words, delays to tasks on the critical path delay the final end date. Tasks not on the critical path have a gap, or slack, between estimated starts and finishes. Slack, or float, is leeway allowed for starting or ending noncritical tasks sooner or later without affecting the overall schedule. Knowing which tasks have slack and which do not is a primary benefit of CPM.

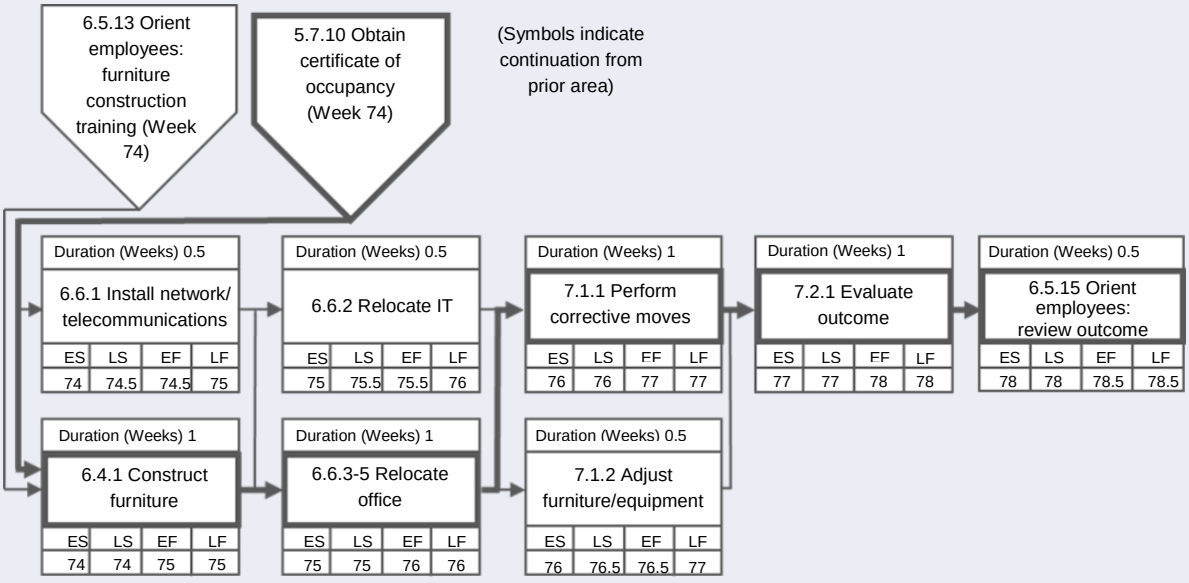
Exhibit 3-9 shows a sample critical path for the relocation project case study.

Exhibit 3-9: Relocation Case Study — Relocation Project Critical Path Method

The existing project team meets, and team members verify duration estimates for their tasks. The project scheduler uses this information and the hard relocation deadline of September 1, 20xx, to find the critical path for the relocation. The following data from the WBS dictionary is used to calculate the portion of the schedule that follows.

WBS Code	Task	Duration (Weeks)	Predecessor
6.6.1	Install network/ telecommunications	0.5	
6.4.1	Construct furniture	1	Orient employees: furniture construction training (6.5.13)
6.6.2	Relocate IT	0.5	6.4.1, 6.6.1
6.6.3-5	Relocate office	1	6.4.1, 6.6.1
7.1.1	Perform corrective moves	1	6.6.2, 6.6.3–5
7.1.2	Adjust furniture/equipment	0.5	6.6.2, 6.6.3-5
7.2.1	Evaluate outcome	1	7.1.1, 7.1.2
6.5.15	Orient employees: review outcome	0.5	7.2.1

A partial network diagram using the prior data follows, showing the critical path in bold.



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Case Study: Critical Path

Code	Task	DU	Pred.
6.6.1	Install network/telecom	0.5	
6.4.1	Construct furniture	1	Orient employees (6.5.13)
6.6.2	Relocate IT	0.5	6.4.1, 6.6.1
6.6.3-5	Relocate office	1	6.4.1, 6.6.1
7.1.1	Perform corrective moves	1	6.6.2, 6.6.3–5
7.1.2	Adjust furniture/equipment	0.5	6.6.2, 6.6.3-5
7.2.1	Evaluate outcome	1	7.1.1, 7.1.2
6.5.15	Orient employees: review outcome	0.5	7.2.1

Exhibit 3-9: Relocation Case Study

Case Study: Critical Path

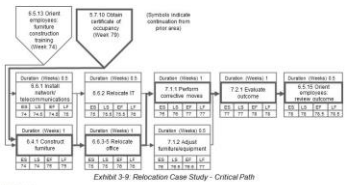


Exhibit 3-9: Relocation Case Study - Critical Path

Network Diagram

Network Diagram

- Graphic depiction of tasks in sequence
- Show dependencies and concurrent activities without unnecessary detail
- Do not indicate duration

Network diagrams are methods of graphically illustrating the sequence of events and activities, or tasks. In network diagram terminology, events are singular points in time, such as milestones, and activities are processes that have a duration.

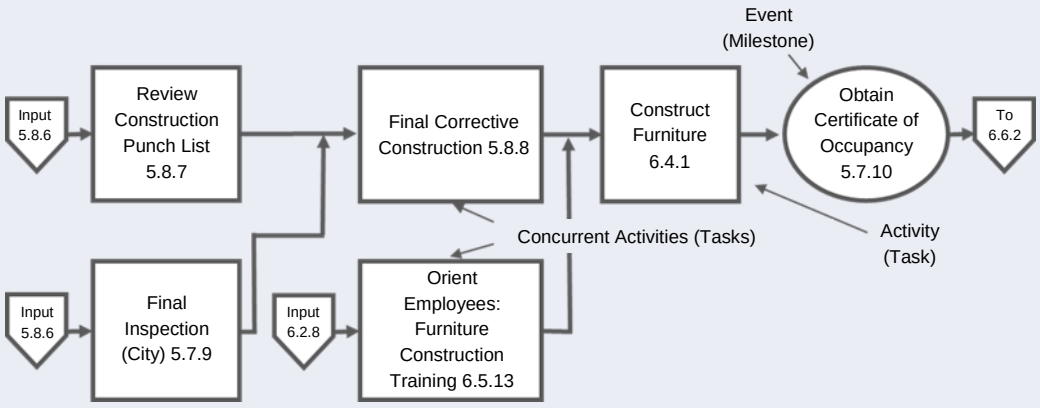
Exhibit 3-10 shows a sample network diagram for the relocation case study. This type of network diagram is called an activity-on-node network. It uses boxes for activities, or tasks, and circles for events, but events are not shown unless they are milestones. Activities that are parallel with each other occur concurrently.

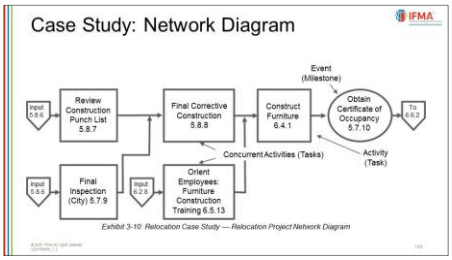
The primary advantage of a network diagram is its ability to communicate simple dependencies and concurrent activities without unnecessary detail. The diagram's simplicity can be a disadvantage as well. For example, there is no way of knowing how long an activity, or task, takes using a network diagram, unless it is modified to list duration, as is done in the CPM.

Exhibit 3-10: Relocation Case Study — Relocation Project Network Diagram

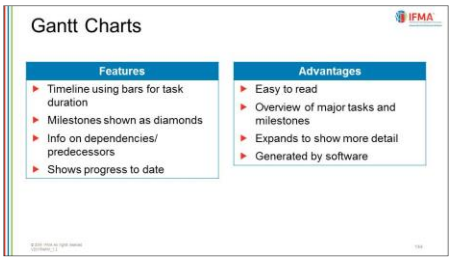
In a joint project planning (JPP) meeting, project schedulers and team members generate a project network diagram to show dependencies and concurrent tasks as the first step in

generating a more detailed schedule. The numbers are WBS codes for work packages. The following is an excerpt from a larger diagram with off-page input and output references.





Gantt Charts (Bar Charts)



Gantt charts, or bar charts, show a timeline that graphically illustrates the duration of tasks using bars. Milestones on the timeline are usually indicated with a diamond shape. Gantt charts also include information on dependencies/predecessors, usually using lines connecting one bar to another. Progress to date or the current date may be indicated by a line or color coding.

Many software packages automatically generate Gantt charts and other project schedule types based on a single set of inputs. Such systems automatically adjust items as needed when other parts of the schedule change, for example, automatically adjusting all items on the critical path when a deadline is missed.

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Gantt charts are frequently used in projects even if other methods are also used because they are easy to read and can present information at an executive overview level by showing only the major tasks and milestones. They can also be expanded to show detail down to the level of the work packages.

Exhibit 3-11 shows the Gantt chart for the relocation project at an executive overview level. The darker-shaded bars indicate progress to date. Milestones are marked by diamonds and dependencies are shown using connecting lines.

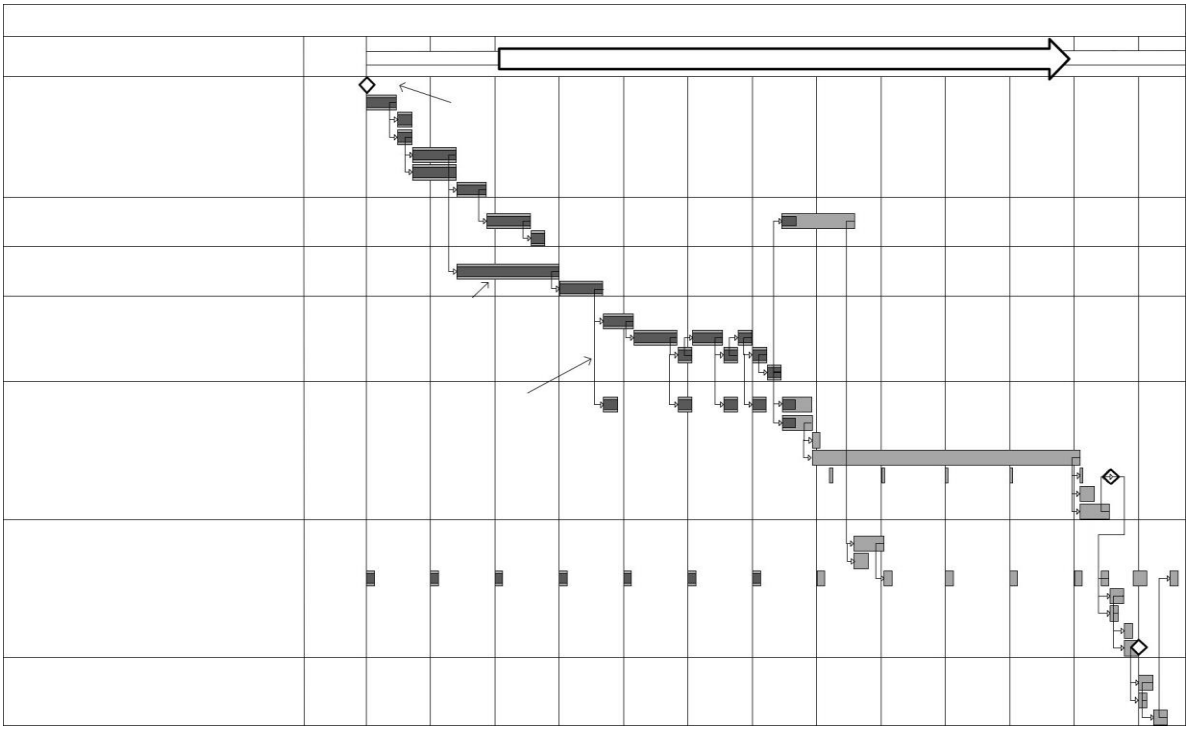

Exhibit 3-11: Relocation Case Study — Relocation Project Gantt Chart

Consider the following questions:

- Who do you think should be involved in developing the project schedule?
- What scheduling tools do you generally use in projects?
- What parameters or activity attributes do you consider while scheduling?

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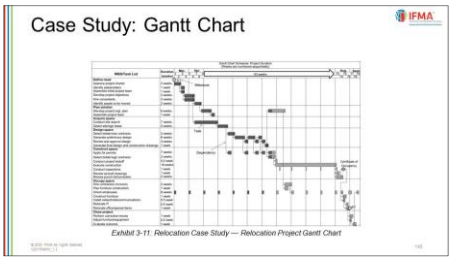
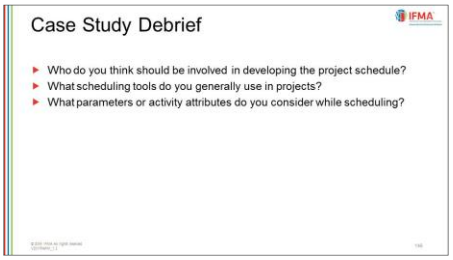
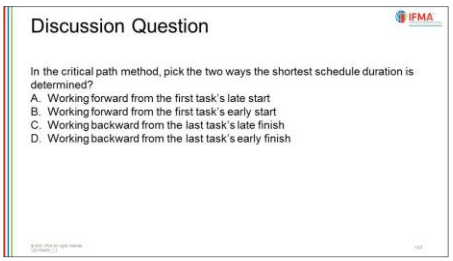
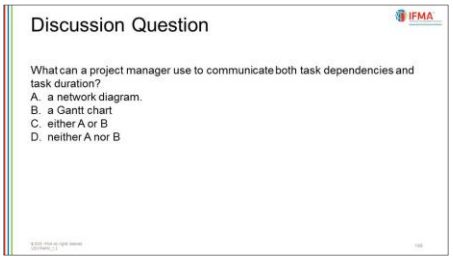
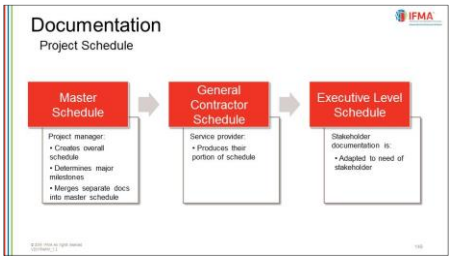








Documentation



The project manager or a scheduler is responsible for producing the overall project schedule and major milestones. When projects require professional services, these specialists are often responsible for producing their portion of the schedule. For example, on a construction project, design/engineering firms, the general contractor and

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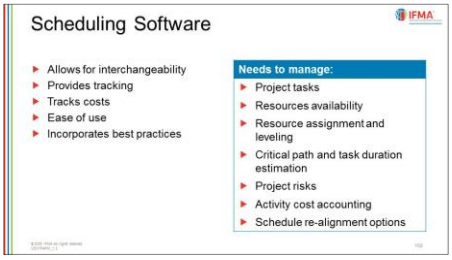
subcontractors usually produce schedules. The project manager merges these schedules into the master schedule for the project.

Schedule documentation is adapted to the needs of each specific stakeholder. The master schedule can contain numerous details; an executive may receive only a high-level Gantt chart, and a particular team member with no training in reading a schedule may receive only a set of deadlines.

Scheduling Software



To aid in the creation of a project schedule and provide ease of documentation, project management software can be used. Such software is designed to help organize and manage projects more efficiently. There are many types of project management software tools; some are basic organizers, while others help to plan and track all aspects of a project.

Project managers should consider the advantages and disadvantages of these tools before determining if using one would be a wise investment. *Exhibit 3-12* outlines some of the advantages and disadvantages of scheduling software.

Exhibit 3-12: Advantages and disadvantages of scheduling software

Advantages	Disadvantages
Interchangeability • Once all of the project information, including deadlines and project phases, are entered into the software, the program manages notifications and organizes the tasks for you • Allows others to be brought up to speed on project status and ensures each small detail is not forgotten or overlooked	**Cost** • Can also be an advantage depending on the type of tool purchased • Software is available in two ways: - Web-based - Desktop • Licensing fees and/or monthly access charges should be considerations for use
Tracking team member tasks • When project team members use a collaboration tool, the project manager is able to see who is doing what and when they are doing it • Transparency and communication assist in identifying if task deadlines are being missed as well as pointing out top performers	**Ease of use** • Some software tools can add complexity to a project • Steps involved in using the tool and updating the schedule may be cumbersome for simple projects
Best Practices • Many project management software programs are designed around best practices, including criteria that promote quality schedules • Some include wizards, or step-by-step guides, that will show potential issues with a schedule and clear definitions, explanations and suggestions on next steps	

Before purchasing a software package, it is critical to evaluate the requirements of the organization. Knowing exactly which functions will be needed will help to streamline the decision-making process. Developing a list of "required" and "optional" functions and characteristics will help to determine which packages most closely fit the needs of the company.

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Evaluation with common use cases is a critical step before implementation. This provides a good sense of whether the software will behave as expected. Licensing restrictions and cost, technical support, time for installation and training and user support should also be considered when choosing software.

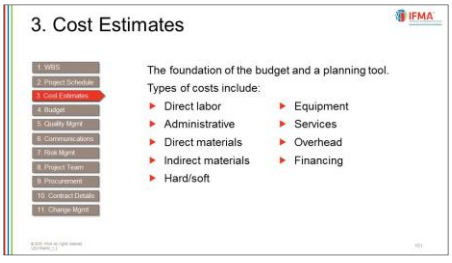
While the goal of this text is not to advise on specific software tools to purchase, the following primary functions should be considered in your research and evaluation process.

Project management scheduling tools need to manage the following types of data:

- **Project tasks** — describing the activities required to produce each key deliverable, which are commonly labeled as milestone tasks
- **Resource availability** — team members, professional services, equipment, materials, or other resources necessary to complete the project
- **Resource assignment and leveling** — work estimates needed to achieve each task by resource
- **Critical path and task duration estimation** — dependency relationship types between activities
- **Project risks** — red flags, symptoms of possible risk events. For example, order tracking system red flag; missed delivery date, contractor wants to re-negotiate contract, stakeholder dissatisfaction, inclement weather alert
- **Activity cost accounting** — rates needed to compute the actual costs against the value of the work done to be compared with the budget
- **Schedule realignment options** — amendments to the critical path components if delays occur

A list of popular project management applications has been included online in the *FMP Credential Program Resource Center*.

3. Cost Estimates



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Cost estimates are the foundation for the project budget and for cost control during project execution. To produce reliable cost estimates, a project needs estimators or quantity surveyors with appropriate expertise, specialization and a sound cost estimation policy. Estimators or quantity surveyors can be individual specialists or cost estimates can be accomplished by teams working to achieve consensus.

The cost estimation policy:

- May specify the use of standard published cost estimating guides and software tools.
- Usually addresses methods of avoiding overestimating costs, such as requiring the use of contingency reserves for unanticipated costs rather than building the cost into each uncertain task.
- Specifies the amount of a contingency to apply to a given type of task.

Estimation policy was discussed in the previous chapter as a policy input to the Initiate phase.

Cost estimates need to account for the following types of costs for a task:

- Direct labor, or work directly performed for a task
- Administrative costs, or indirect labor
- Direct materials, or materials directly consumed by a task
- Indirect materials, such as peripheral or bulk materials, for example, toner for printers
- Machinery and equipment
- Any other outsourced services or activities
- Overhead, for example, cost of facility use, electricity, water, shared resources and technology
- Financing costs

Some costs are charged to the project overall and not to a specific task.

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Cost estimating can be used as a planning tool. For example, an estimate can be made to determine the cost reduction if additional planning is performed, or estimators can perform life-cycle costing to estimate the total cost of a product or service over its lifetime.

When performing cost estimates, estimators:

- Survey the current prices for materials from their approved sources or the open market.
- Refer to organizational databases that list standard costs.
- Refer to the project objectives statement to determine the grade or quality of materials or services to include in the estimates.

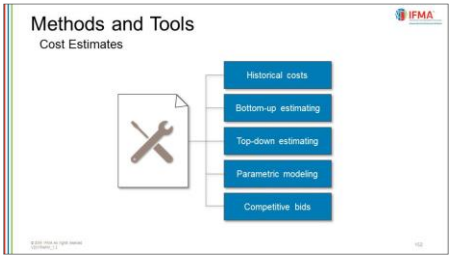
Cost estimates are also closely tied to the schedule and project team and contractor specifications, for example, seasonal availability/cost of materials or availability of staff.

Exhibit 3-13 shows a sample of a cost estimate for a simple construction project.

Exhibit 3-13: Cost Estimate Example

Description	Vendor/Subcontractor	Estimated Cost		
		Labor	**Materials**	**Total**
Plans and Specifications		$ -	$ -	$ -
Permits		$ -	$ -	$ -
Impact Fee		$ -	$ -	$ -
Administrative Costs		$ -	$ -	$ -
Financing Costs		$ -	$ -	$ -
Legal Fees		$ -	$ -	$ -
Engineering Fees		$ -	$ -	$ -
Insurance		$ -	$ -	$ -
	Subtotal	$ -	$ -	$ -

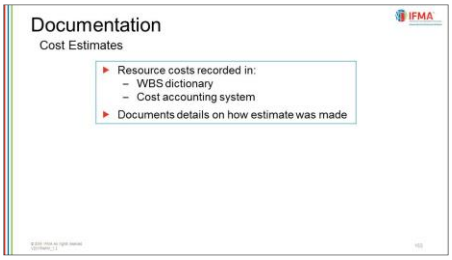
Methods and Tools



Cost estimating methods and tools may include the following:

- **Historical costs** — costs adapted from similar prior projects. They are economical to gather but require expert judgment. Historical costs require inflation and/or geographic unit cost adjustments.
- **Bottom-up estimating** — estimates start at the work package level and are summed up for subtask, task and project levels.
- **Top-down estimating** — task-level estimates are used when work packages are insufficiently defined. Alternately, a hard budget is set at the top and costs are divided among the components.
- **Parametric modeling** — cost per person-hour, square meter or foot, or another rate is gathered from provider quotes or historical costs. The rate is multiplied by the quantity of the resource used to form an estimate.
- **Evaluation of competitive bids** — outsourced projects, tasks, subtasks and work packages can be estimated by reviewing submitted bids, and independent costing can be done for comparing the evaluation of competitive bids.

Documentation



The cost of the resources needed to complete each scheduled task is determined separately and recorded in the WBS dictionary for that task, and possibly, in a cost accounting system.

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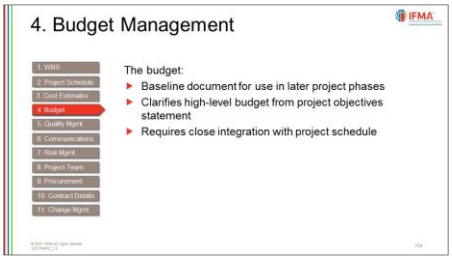
Cost accounting systems may have codes to record the types of costs involved, for example, a code for labor costs. The documentation includes details on how the estimate was made, as addressed previously in the discussion of estimation policy.

4. Budget Management



Cost estimates plus contingency reserves are aggregated into a budget, which is a baseline document for use in later project execution, monitoring and control.

The budget clarifies and refines the high-level budget from the project objectives statement. It is updated:

- To reflect scope changes as the project scope is refined during design/engineering and development of the project management plan.
- As actual prices and costs are gathered.

A budget derived from scope refinement and detailed cost estimation that differs significantly from what was previously defined is an important scope issue that needs to be communicated to and discussed with all stakeholders.

Development of the budget requires close integration with the project schedule, because costs are allocated to the period in which they are incurred. Similarly, budget constraints can require changes to the project schedule, such as completing a task more quickly to minimize financing costs.

It is important that the project manager understand the organization's or client's budget process and budget approval policy. There are situations in which a project could have an approved budget, but due to the economy, merger activity, sales/revenue, or internal politics, the ability and authority to spend this approved budget could be restricted by management or the client.

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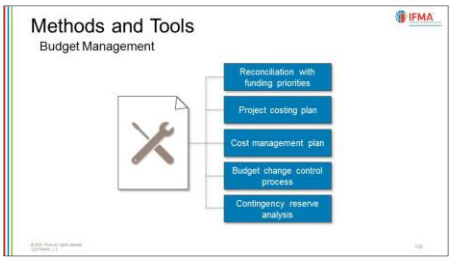
In later iterations of the project management plan, budgeting is concerned with finalizing costs based on resource availability and other constraints.

Methods and Tools



Budgeting methods and tools may include the following:

- **Reconciliation with funding priorities** — if a project's priorities express a not-to-exceed cost for the project and the estimated total exceeds the funding limit, the deliverable scope, schedule or quality needs revision or approval is requested for increasing the project budget.

  If funds are released periodically, schedule adjustments may have some tasks with slack occurring in different periods to smooth out incurred costs.

- **Project costing plan** — the project costing plan specifies how costs are applied.

  Costs are applied to a work package at the start of work, called front-end loading; or at the end, called back-end loading; or they are prorated.

- **Cost management plan** — project managers create a plan for analyzing the variance between the budget and actual costs and set limits for what constitutes acceptable variance.

  Costs significantly over or under budget are investigated and types of corrective actions are planned.

- **Budget change control process** — a process for reviewing and approving or denying changes to the budget is established.

- **Contingency reserve analysis** — financial specialists analyze the adequacy of reserves set aside for unplanned but necessary project changes.

  Note that budget contingencies can become smaller as the project is better defined and specifications are developed and estimated.

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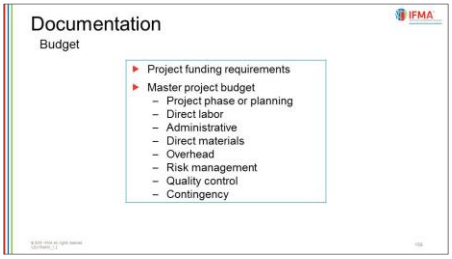
Documentation



The following may be included in documentation for budgets:

- **Project funding requirements** — summary of conceptual costs per period is compared to funding requirements to indicate funding shortfalls.
- **Master project budget** — summary-level budget that expresses the work breakdown structure from a financial perspective.

  It may include costs for each of the following budgets:

Project phase or planning budgets	Break down costs by milestone or phase or hard versus soft costs
Direct labor budget	Itemizes staff and contracted resource costs for the project team
Administrative budget	Allocates a portion of the cost of executive and administrative salaries to the project
Direct materials budget	Itemizes the cost of materials that are directly used in deliverable creation
Overhead budget	Allocates a portion of the cost of facilities, utilities and other general costs to the project
Risk management budget	Itemizes costs of all project risk mitigation efforts, including insurance and bonding
Quality control budget	Itemizes intended expenses for monitoring, testing and inspection and controlling quality
Contingency budgets	Indicates the amount of funds set aside for scope or schedule adjustments and other changes

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Small projects may not budget to this level of detail.

Exhibit 3-14 continues the relocation case study.

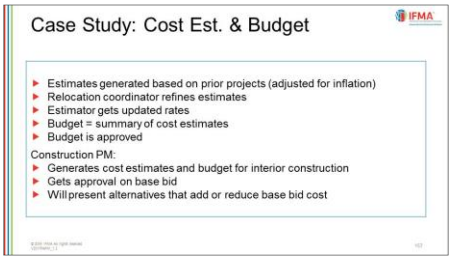
Exhibit 3-14: Relocation Case Study — Cost Estimates and Budget for Relocation Project

Frank Jones's project team generates estimates for the move based on his two prior relocation projects, adjusted for inflation/geography. They also contract with a relocation coordinator who helps refine these estimates. The team's estimator calls up several moving companies to get updated rates. Since cost is to be controlled but is not the primary constraint, Jones's relocation budget is a summary of the cost estimates. Since the budget makes use of staff for many details, the relocation budget meets corporate cost control goals and is approved.

The construction project manager is responsible for generating cost estimates and a budget for the interior construction. He meets with Jones and the building owner periodically to get approval on a base bid and then later to present alternatives for approval or rejection, for example, birch or oak doors, that would add to or reduce the base bid cost.

Consider the following questions:

- Are there any additional costs in the budget that need to be identified?
- How do you perform estimating for projects?
- Have you worked on a project where the cost escalated? If so, how did you respond?



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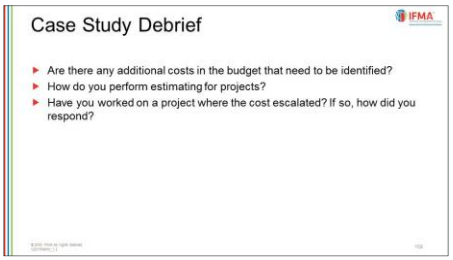
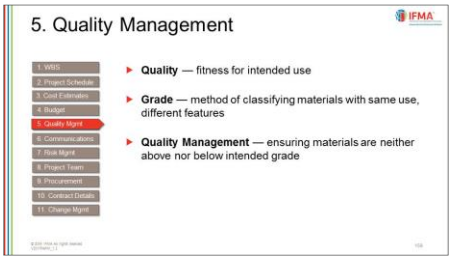


5. Quality Management



Quality management has two goals:

- To create a plan to meet the overall scope of the project in terms of quality, in other words, deliverable features and level of effort to be expended.
- To establish and maintain quality standards.

Meeting the first goal requires understanding the difference between quality and grade:

- **Quality** is fitness for intended use.
- **Grade** is a method of classifying materials or deliverables that have the same functional use, but differences in technical features or perceived value.

Quality management ensures the grade of materials is appropriate for the intended use, as defined in the statement of requirements and project objectives statement. The grade is neither greater nor less than what was intended. If costs need to be cut to fit a budget limit, quality management can ensure the grade, not the quality, of materials or services is reduced in scope.

The second goal, establishing and maintaining quality standards, involves:

- Selecting appropriate quality standards
- Integrating quality standards into plans
- Monitoring team member and contractor compliance

Quality standards define minimum acceptable performance for a particular type of deliverable or process and provide methods and tools to monitor, test and inspect for compliance.

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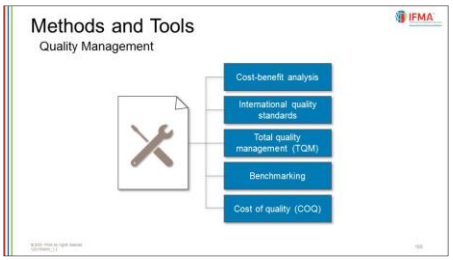
Quality tasks are integrated throughout the project management plan. They are included in the WBS, schedule, budgets and other elements. For example, if quality is to be part of every team member's job, the communications plan addresses quality in meetings and communications.

When generating a quality management plan, project team members:

1. Refer to applicable organizational policy on quality
2. Determine if there are any government regulations or codes applicable to the project
3. Specify required testing and inspection
4. Generate a commissioning plan, if applicable
5. Use "lessons learned" information to justify quality expenses

The project objectives statement may also list constraints or risks that affect quality planning.

Methods and Tools



Methods and tools for quality management in projects may include the items outlined in *Exhibit 3-15*.

Exhibit 3-15: Methods and tools for quality management in projects

Method/Tool	Description
Cost-benefit analysis	Can determine if the benefit of tests related to quality exceeds the cost of performing those tests
International quality standards	Many sources of quality standards exist: • The International Organization for Standardization (ISO) issues

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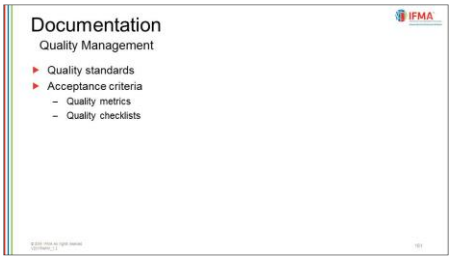
Method/Tool	Description
	internationally recognized quality standards • Quality standards may provide tools and templates • ISO 10006, "Quality management in projects," specifically addresses project management
Total quality management (TQM)	Formal quality process that has an intense focus on the customer, involves all stakeholders and employs continual improvement. FM projects could use selected elements of TQM
Benchmarking	Quality tools and lessons learned from prior projects that used the same metrics can help when planning quality management
Cost of quality (COQ)	• Measures the cost of quality by category: - Prevention of non-conformance to requirements - Requirement conformance appraisals - Internal and external failures to meet requirements • Quantifies the observation that it is less costly to prevent errors than to correct them later through inspection

Documentation



Documentation for quality management may include quality standards that apply to the project and acceptance criteria.

Acceptance criteria are the metrics and checklists taken from the project's statement of requirements, success criteria and objectives that are required to be satisfied before a deliverable is approved.

- **Quality metrics** define how to measure a specific aspect of quality, such as failure rate or reliability.
- **Quality checklists** are methods of determining whether all required tasks in a process have been done.

Exhibit 3-16 continues the relocation case study.

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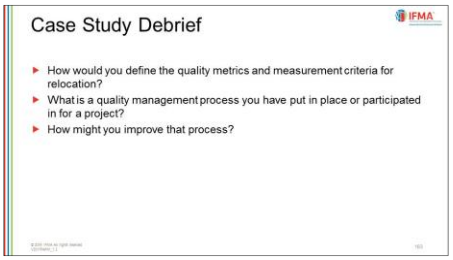
Exhibit 3-16: Relocation Case Study — Quality Management in Relocation Project

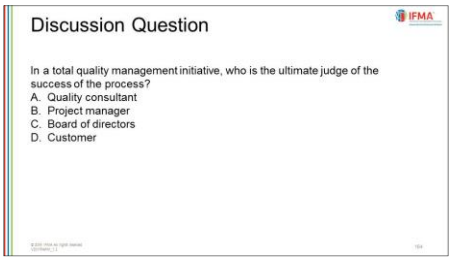
Relocation Coordinator, Sarah Wu, includes quality management in the weekly project meetings. In the planning meetings, she assigns tasks such as the following to team members:

- Conducting preplanning surveys to determine employee concerns such as job security, commuting or leaving the old neighborhood
- Coaching the relocation team to treat the move as a move of people, not things
- Providing space planning designs to employees for comment
- Planned inspections and detailed punch-list review of construction
- Conducting post-move evaluations on employee comfort with the move and new space

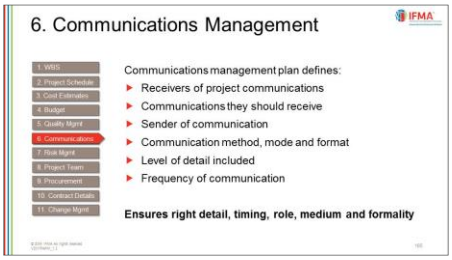
Consider the following questions:

- How would you define the quality metrics and measurement criteria for relocation?
- What is a quality management process you have put in place or participated in for a project?
- How might you improve that process?





6. Communications Management



The communications management plan is part of the project management plan and defines the following:

- Receivers of project communications
- Communications they should receive
- Sender of communication
- Communication method, mode and format
- Level of detail included in the communications, for example, communications to an executive might be at a high-level while communications to a PM will be much more detailed
- Frequency of the communication

The purpose of communications management is to consult with or inform each stakeholder to ensure they receive:

- Neither too much nor too little project information
- Information at the right time so it can be useful for decision making
- Either one-way (inform) or two-way (consult) communications
- Communications in an appropriate media format and level of formality

Learn what stakeholders need to know and by when. Then give stakeholders the right amount of information at the right time. For example, executives generally do not want a high-level of detail but do require frequent progress updates. If a project manager feels

that executives are interfering in the project's management, it is often a symptom that they lack appropriate or timely information.

Communications management distinguishes between consulting and informing relationships. Some stakeholders are designated as persons with whom to consult on a given subject, while others are kept informed but not asked for input.

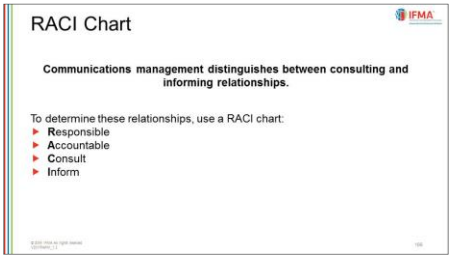
One way of designating who should be able to provide opinions on a subject and who should not, is to place all stakeholders on a RACI chart. RACI stands for **R**esponsible, **A**ccountable, **C**onsult, **I**nform.

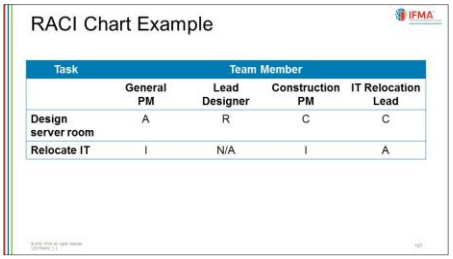
These are the four possible levels of interaction an individual can have with a given task. Project managers ensure all parties understand and agree to their given role.

Communications management specifies appropriate communication channels for particular stakeholders. For example, plans may specify use of e-mail rather than phone or in-person visits to contact an expert who desires minimal interruption.

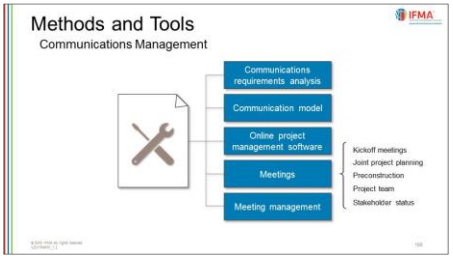
The level of formality in communications requires developing sensitivity to individual preferences and an awareness of what is appropriate in a given situation. Lack of formality when appropriate could reduce credibility, while too much formality with a project team could hinder team building.

A huge part of the project manager's role is integration and communication. Communication is a critical part of the project and better communication management can increase the success rate of project.





Methods and Tools



Methods and tools for developing a communications management plan may include the following:

- **Communications requirements analysis** — the following should be analyzed and documented:
  - Who should receive project communications and how should they receive them?
  - What communications should they receive and how often?
- **Communication model** — defines:
  - How communications are sent and received. For example, telephone, email, fax, messaging software; or meetings or video conferencing.
  - The responsibilities between the sender and receiver.
- **Online project management software** — project teams can communicate and collaborate using online systems that can be password-protected to allow select information to be available to each user or to selected users
- **Meetings** — are of primary importance for many projects because they help establish consensus on issues. Meeting types include:

Meeting Type	Description
Kickoff meeting	Each time persons join the project team, a kickoff meeting can be used to introduce the project to new members
Joint project planning (JPP)	• A method of project planning that takes place in a series of meetings, one or two for each element of the project management plan • Can help generate consensus and increase estimation accuracy given adequate team preparations • Can include pre-bid meetings
Preconstruction meeting	• Construction projects require a preconstruction meeting between the customer, project team, general contractor

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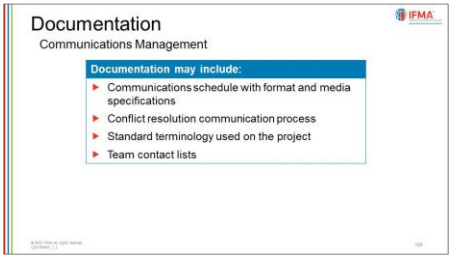
Meeting Type	Description
	and major subcontractors • The project manager: - Leads the meeting and focuses on management of time and information through a detailed schedule review - Addresses items of mutual concern for contractors and customers, such as permits, the change order process, payments, progress inspections and trash removal
Project team meetings	• Regularly scheduled meetings with the project team where the project manager reviews the status of the project schedule, scope and budget • Opportunity for team members to provide other project updates and identify issues and risks
Stakeholder status meetings	• The primary way stakeholders are informed of project progress and issues • The project manager addresses problems, proposed solutions, resolution of prior issues and schedule adjustments

- **Meeting management techniques** —
  - Ensuring the right attendees are at a meeting
  - Holding attendees accountable for being prepared, such as completion of required readings or promised deliverables
  - Setting the ground rules before the meeting
  - Setting a clear agenda and sending it out before the meeting
  - Ensuring the meeting stays on schedule and on subject by having a clear agenda and meeting goals
  - Documenting and communicating the meeting results

Documentation



Documentation for communications management may include the items outlined in *Exhibit 3-17*.

Exhibit 3-17: Documentation for communications management

Documentation	Description
Format and media type used for each communication	Detailed schedule of communications may specify: • Stakeholder relationships, such as consult or inform • Project team meeting schedule and format • Stakeholder status meeting schedule and format • Email frequency and list of persons to include • Virtual meeting frequency and format • Persons responsible for distributing reports or information
Conflict resolution communication process	Informal and formal conflict resolution processes are defined and communicated to all parties
Standard terminology used on the project	A glossary of terms can reduce the chances of miscommunications
Team contact lists	A directory of all team members and stakeholders, including contact information and preferences

Exhibit 3-18 continues the relocation case study.

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Exhibit 3-18: Relocation Case Study — Communications Management in Relocation Project

Frank Jones considers the quality of communications management to be of primary importance to relocation success. Various communications have occurred or are planned.

Preliminary communications — preliminary company meetings include:

- A meeting announcing the intent to relocate and the business case for moving
- A meeting announcing the selected site and promoting it with photographs and maps
- A meeting to show the results of programming, indicating departmental space allocation

Communications during relocation planning — communications differ by stakeholder:

- **Executives** — meetings occur to approve plans; regular updates address schedule, cost and contractor performance and how the organization, clients and customers are affected
- **Consultants and contractors** — plans include daily contact with contracted resources as well as formal on-site review meetings to verify work is progressing as planned
- **Customers and suppliers** — the company keeps external groups informed of their relocation plans and plans for business continuity
- **Employees to be relocated** — communications media chosen include:
  - A hard copy and e-mail relocation newsletter, including a progress report with photos, department relocation contacts and stacking plans with department floor locations
  - Regular employee meetings, for example, one to review the employee relocation and change survey results
  - Videos from executives championing the move and reporting progress
  - One-on-one relocation assistance offered by appointment
  - Online resources such as a commute analysis site or a confidential comment area
  - Posters and flyers to update employees and encourage excitement for the move

Communications during the move — the same media are used, and the same groups are kept informed as during planning, but the content addresses information, such as:

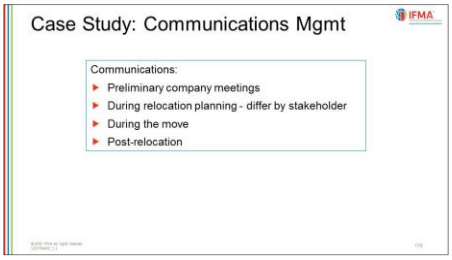
- How to pack and label boxes and furniture
- Discarding, recycling or archiving unneeded files and papers and the sites of bins and dumpsters
- Color-coded maps and signage in elevators and halls to direct movers
- Furniture placement maps showing orientation and placement of furniture
- General move progress
- Relocation team meetings to continually improve the move and address problems

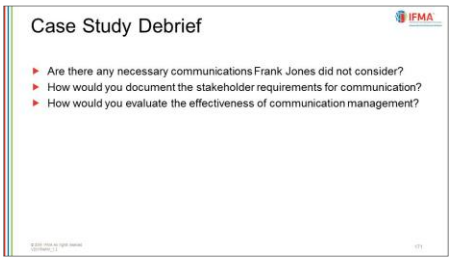
Post-relocation communications — following the move, communications involve:

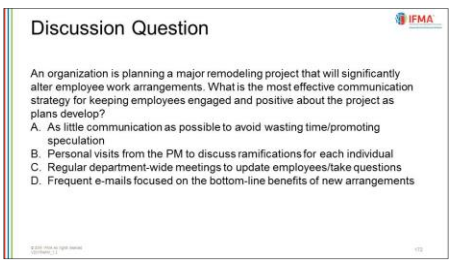
- Orientation training and brochures to help employees find their way around
- Whom to contact regarding needed changes to workspace or corrective moves
- Department-specific and demand organization welcome meetings
- Small relocation gift and welcome card thanking employees for their patience
- Feedback surveys to collect information on the success of the move

Consider the following questions:

- Are there any necessary communications Frank Jones did not consider?
- How would you document the stakeholder requirements for communication?
- How would you evaluate the effectiveness of communication management?







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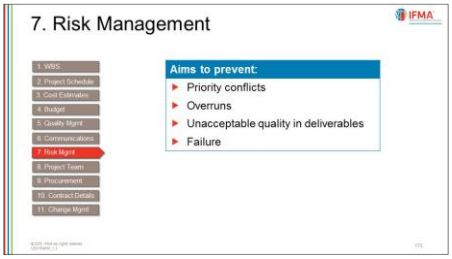
7. Risk Management



There are many reasons why projects fail. The following is a list of some common reasons for project failure:

- The project is a solution in search of a problem.
- Only the project team is interested in the end result.
- No one is in charge.
- The project plan lacks structure.
- The project plan lacks detail.
- The project is underbudgeted or underfunded.
- Insufficient human or equipment resources are allocated to the project.
- The project is not tracked against its plan.
- The project team is not communicating.
- The project strays from its original goals, in other words, scope creep.

Risk is the potential for the realization of unwanted, negative consequences of an event. It is the product of the conditional probability of an event and the event outcomes.

Risk management addresses how risks are identified, assessed and managed during the course of the project.

It is intended to prevent the following project problems:

- Conflicting priorities, for example, highest quality at lowest cost and time
- Project time/cost overruns
- Unacceptable quality deliverables
- Project failure

To prevent these and other failures, project team members prepare by:

- Studying the results of prior projects and performance records for or complaints lodged against current or prior contracted resources.
- Analyzing constraints, such as the impact of the economic and social environment.

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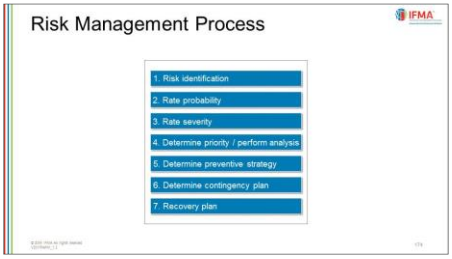
Risk Management Process



The following are the typical steps in the risk management process:

1. **Risk identification** — involves a brainstorming meeting to list all of the potential project risks, for example:
    - Mid-project scope changes
    - Inaccurate time or cost estimates, underestimating is common
    - Budget cuts or unrealistic deadlines
    - Factors outside of team's control, for example, material delays or bad weather
    - Too few or unqualified team members
    - High turnover or illness
    - Not validating assumptions
    - Morale issues or internal conflict
    - Equipment failure or lack of equipment
    - Material cost increases or unavailability
2. **Rate probability** — for each identified risk, planners arrive at a consensus on the probability of occurrence, often on a scale of one to five, low to high
3. **Rate severity** — for each identified risk, planners arrive at a consensus on the severity or impact on the project if the event were to occur, giving more weight to risks that affect the critical path or budget; uses the same scale as the probability rating
4. **Determine priority and perform quantitative analysis** — teams prioritize risks based on the combination of probability and severity. Managing high probability, high severity risks increases the chances of project success
5. **Determine preventive strategy** — the team lists proactive actions available for reducing the likelihood or severity of risks that are within the team's power to enact given limited resources
6. **Determine contingency plan/strategy or risk mitigation** — for risk events that could occur regardless of preventive planning, contingent responses can be

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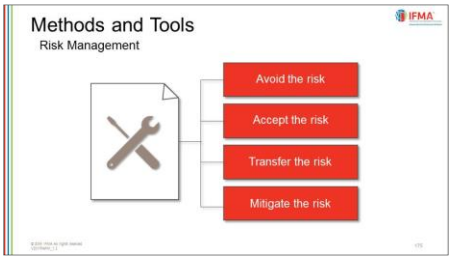
planned. Responses are planned only if a response can be implemented in time to make a difference. Contingent responses include:

- Preapproved plan to extend a deadline or use a contingency reserve
- Tasks that can be delayed or cancelled if needed
- Best team members or backup personnel assigned to high-risk tasks

7. **Recovery plan** — a fallback plan for a project to get the project back on track following an adverse event that could not be prevented or when the initial response was insufficient

Conflicting needs among stakeholders should be identified very early on in the project management process. A matrix identifying the stakeholders, their concerns and the solutions can be created to track these conflicts. The conflicts should be weighted and their ability to impact the project identified so priority can be quantitatively decided.

Methods and Tools



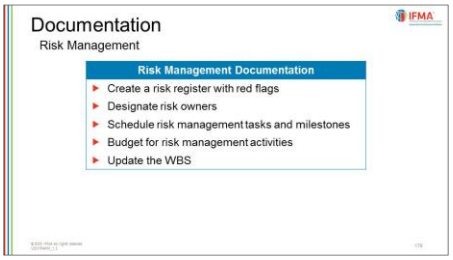
Risk management methods and tools may include basic strategies for dealing with any identified risk, as outlined in *Exhibit 3-19*.

Exhibit 3-19: Basic strategies for dealing with identified risk

Strategy	Description
Avoid	Clarify or change plans to omit the risk
Accept	Do nothing, for example, low risk/high response cost
Transfer	Move the financial or resource effects of a risk to a third party, for example, contractor or insurance. Note that it is difficult to transfer the schedule risk of tasks on the critical path

Strategy	Description
Mitigate	Apply preventive measures to reduce probability and/or severity of identified risks

Documentation



Documentation for risk management may include the items outlined in *Exhibit 3-20*.

Exhibit 3-20: Documentation for risk management

Documentation	Description

Risk register with red flags	• Project risks are included in a register that includes:
	  - Probability
	  - Severity
	  - Priority
	  - Results of quantitative analysis
	  - Likely root causes
	  - Planned preventive responses for each risk
	• Lists red flags, or symptoms that a risk event is occurring, along with the appropriate contingent response

Risk owners	Persons assigned to monitor risks, perform preventive tasks or initiate contingent responses to risks
Risk management tasks and milestones	Preventive risk management tasks and milestones are added to the project schedule
Risk budget	Ensures risk responses are cost-effective. The percentage of the risk budget to spend on each risk item is tracked
WBS elements affected by particular risks	WBS is updated with the results of risk management

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Exhibit 3-21 continues the relocation case study.

Exhibit 3-21: Relocation Case Study — Risk Management in Relocation Project

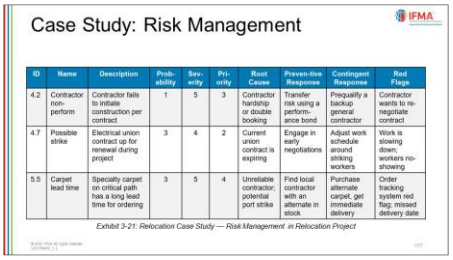
The relocation project team generates a risk plan with rankings of 1 to 5, low to high, for probability, severity and priority. The following shows samples from the risk register:

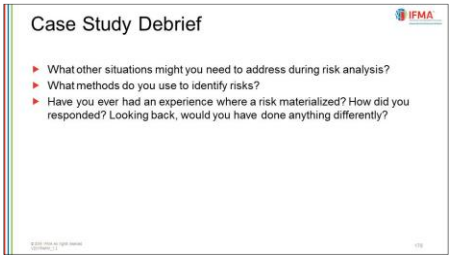
ID	Name	Description	Probability	Severity	Priority	Root Cause	Preventive Response	Contingent Response	Red Flags
4.2	Contractor non-perform	Contractor fails to initiate construction per contract	1	5	3	Contractor hardship or double booking	Transfer risk using a performance bond	Prequalify a backup general contractor	Contractor wants to re-negotiate contract
4.7	Possible strike	Electrical union contract up for renewal during project	3	4	2	Current union contract is expiring	Engage in early negotiations	Adjust work schedule around striking workers	Work is slowing down; workers no-showing
5.5	Carpet lead time	Specialty carpet on critical path has a long lead time for ordering	3	5	4	Unreliable contractor; potential port strike	Find local contractor with an alternate in stock	Purchase alternate carpet, get immediate delivery	Order tracking system red flag; missed delivery date
6.7	Dock double booking	Docks double-booked for moves at old or new location	2	4	3	Poor communications and follow-up	Check dock schedules with current and new facility owners	Negotiate delay with other party that is double-booked	No published dock schedule; dock occupied on move day
7.1	Contractor bankruptcy	Contractor goes bankrupt and fails to	2	5	3	Over-extended contractor	Performance and surety bond	Prequalify a backup general contractor	Complaints from subcontractors;

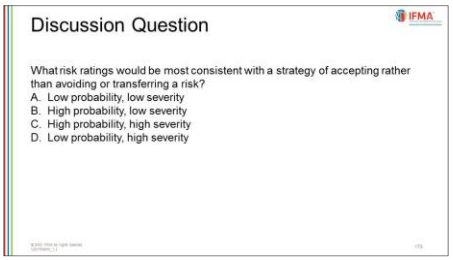
ID	Name	Description	Probability	Severity	Priority	Root Cause	Preventive Response	Contingent Response	Red Flags
		pay sub-contractors					contingency		missed deadlines
8.2	Unforeseen weather event	Unpredictable weather event occurs delaying production	1	5	4	Weather event beyond control	Ensure force majeure provision is in contracts	Monitor critical path; adjust schedule	Follow weather alerts

Consider the following questions:

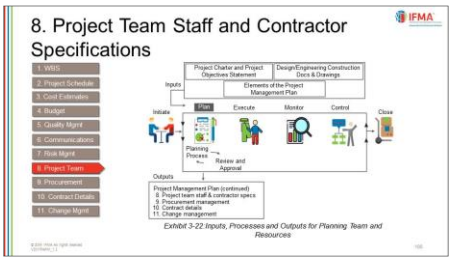
- What other situations might you need to address during risk analysis?
- What methods do you use to identify risks?
- Have you ever had an experience where a risk materialized? How did you respond? Would you have done anything differently?







8. Project Team Staff and Contractor Specifications



Planning the team and resources addresses organization and work assignment planning for internal staff and contracted resources assigned to a project.

"Contracted resources" is a term used in this course to describe contracted project team members, material resource contracts or professional services.

When developing plans for teams and resources, the scope and type of project strongly influences the:

- Type of team that will be needed
- Amount of planning required to organize the team
- Amount of detail and legal review needed for contracts

There is a large difference in each of these details between service delivery projects, minor construction or alterations and major construction or renovations.

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Properly designing roles and organizing reporting structures optimizes the production capacity of the project team, improving performance and minimizing labor costs. Properly specifying procurement contracts for materials or professional services ensures the right resources or services will be provided at the right time and at a fair price. The process of acquiring the team and resources is an important part of this activity. In some instances, staff or contracted resources are acquired first so they can participate in designing specifications or scope/statements of work (SOWs) for their role.

Exhibit 3-22 provides an overview of the inputs, processes and outputs of the Plan Team and Resources portion of the project management plan.

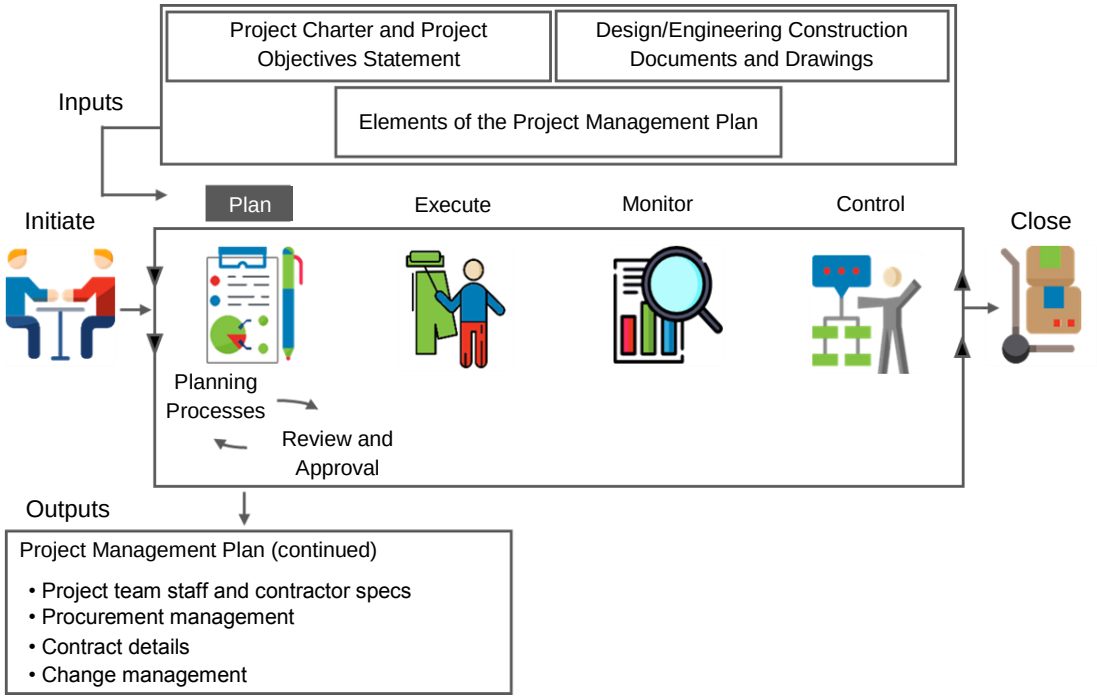

Exhibit 3-22: Inputs, Processes and Outputs for Planning Team and Resources

Outputs from prior phases become inputs for planning the team and resources. As such, these inputs may include the project charter and the project objectives statement, design/engineering construction documents and drawings and elements of the project management, plan as outlined in *Exhibit 3-22*.

Exhibit 3-22: Inputs for planning the team and resources

Input	Description
Project Charter and Project Objectives Statement	Indicate the human and material resources required to complete the project according to its scope, schedule, budget and quality requirements

Input	Description
Design/Engineering Construction Documents and Drawings	If architectural design or civil engineering construction documents and drawings are needed for a project, they become a direct input for the specifications or SOWs for a general contractor and subcontractors, for some project team members and for procurement of materials
Elements of the Project Management Plan	Each element of the project management plan contains information that can be used when developing plans for the project team and resources: • WBS/task list • Project schedule • Cost estimates • Budget • Quality management • Communications management • Risk management • Change order management

Project team staff and contractor specifications are the part of the project management plan. The plan lists all the team members and their roles. The project manager uses this information to assign the tasks. Staff get assignments in the form of specifications. Contractors' assignments are in the form of scope/statements of work (SOWs).

The goals of this process are to organize the project team roles/positions so:

- The team is of sufficient size and makeup to complete all WBS tasks
- The team roles represent all stakeholders
- Each role specifies necessary skills and competencies
- The number of positions needed for each role and when those positions start and end work on the project are defined
- The reporting relationship among the roles is clearly communicated, for example, organizational charts
- The optimum mix of internal staff and contracted resources is used
- Specific positions to be occupied by staff and by contractors are decided
- Specific task responsibilities are assigned to each position in the form of specifications/SOWs
- Plans for management are based on performance criteria specified in the tasks assigned to each position

Project managers assign the work packages to each role. To do this they:

1. Group the packages based on the similarity of the required technical and social skills.

2. Next, they divide the packages so each team member avoids having too much or too little work

Depending on the type and scope of a project, some of the various roles may include:

- Planners
- Schedulers
- Estimators
- Budget specialists
- Risk estimators
- Quality managers
- Other roles to support the elements of the project management plan

On a small project, one person, possibly the project manager, could occupy several or all of these roles.

The bulk of the roles on a project are devoted to production of the project's deliverables and these roles could include engineers, specialists or laborers.

Another role for major projects is a project champion, occupied by a member of senior management or a client. The champion:

- Remains aware and involved during the project
- May attend only presentation/critical decision-making meetings
- Is kept informed of progress, important issues and any conflicts
- Has status and authority that often helps to ensure continued senior management/client support of a major project

Project managers must understand the capabilities and availability of staff when deciding whether to assign a position to staff or a contractor.

Staff versus contractor decisions may be preliminarily decided and then revisited during the Acquire Teams and Resources process because this is when staff/contractor availability is determined.

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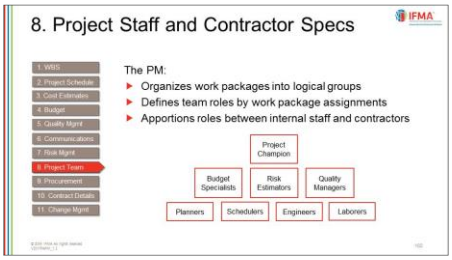

Methods and Tools

Methods and tools for developing project team and contractor specifications may include the items outlined in *Exhibit 3-23*.

Exhibit 3-23: Methods and tools for developing project team and contractor specifications

Method/Tool	Description
Project organizational charts	Can be produced to: • Identify team positions to be filled by internal staff/contractors • Clarify reporting relationships
Position descriptions	Can be used or created: • For complex roles and include qualifications, competencies, authority and responsibilities • To select or hire staff or contractors
Project	• Software that provides an integrated performance-oriented view of

Method/Tool	Description
management office (PMO)	the project and a central point of contact for teams • Automates work authorizations and WBS task division by functional area or team role • Track performance using a discussion and review forum and earned value metrics • Can also be referred to as an automated work order desk or help desk
Communication and control	Project managers communicate expectations and use the measurements specified in work packages to track performance
Allocation of resources	Project managers ensure team members have exactly the required resources at their disposal at the right time
RACI chart	Shows the task designations: • **Responsible** — position/person who does the actual work • **Accountable** — position/person who directs the responsible party, approves/rejects the work and is answerable for its success • **Consult** — roles/persons who provide opinions and information in a two-way communication with the responsible party • **Inform** — roles/persons who are updated on task progress

Exhibit 3-24 continues the relocation case study.

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Exhibit 3-24: Relocation Case Study — Planning Charts for Relocation Project Team

The planning team generates a RACI chart for the design of the IT server room and the relocation of IT.

Task: 4.2.5. Design Server Room				
Team member	Responsible	Accountable	Consult	Inform
Frank Jones, General PM		**X**		
Dave Wilson, Lead Design	**X**			
John Miner, Construction PM			**X**	
Alex DuPont, IT Relocation Lead			**X**	
Ron Chang, IT Relocation				**X**
Task: 6.6.2. Relocate IT				
Frank Jones, General PM				**X**
John Miner, Construction PM				**X**
Alex DuPont, IT Relocation Lead		**X**		
Ron Chang, IT Relocation	**X**			

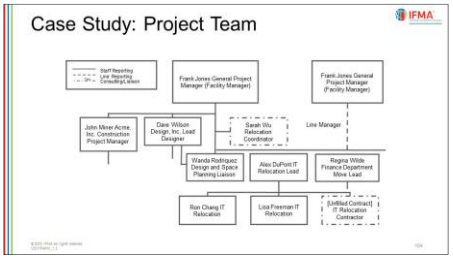
The planning team determines individual team member relationships using a RACI chart, a sample of which is shown below:

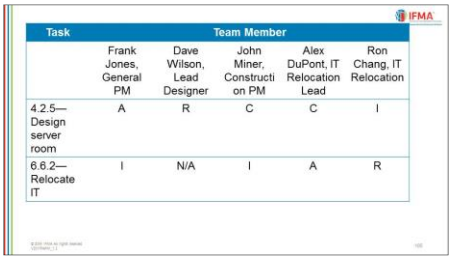
Task	Team Member				
	Frank Jones, General PM	Dave Wilson, Lead Designer	John Miner, Construction PM	Alex DuPont, IT Relocation Lead	Ron Chang, IT Relocation
4.2.5 — Design server room	A	R	C	C	I
6.6.2 — Relocate IT	I	N/A	I	A	R

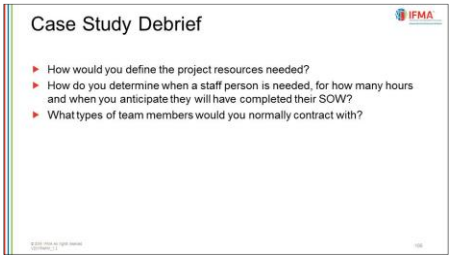
It should be noted that Frank Jones is the main project manager and is completely responsible for the entire project. The other project managers and leads report to Frank Jones.

Consider the following questions:

- How would you define the project resources needed?
- How do you determine when a staff person is needed, for how many hours and when you anticipate they will have completed their SOW?
- What types of team members would you normally contract with?







Documentation

Documentation for the project team and contractor specifications may include the items outlined in *Exhibit 3-25*.

Exhibit 3-25: Documentation for project team and contract specifications

Documentation	Description
Roles and responsibilities	• Specify positions, authority, responsibility and competencies • Responsibilities could be prescriptive or results-oriented
Staff and contractor acquisition plans	For each role, the number of staff/contractors to acquire, work location and cost per period are listed.
Staffing timetable with release criteria	• A staffing timetable schedules when staff/contractors start and finish work. • Release criteria are metrics in work packages that must be met for work to be considered complete prior to staff/contractor release.
Human resource availability	Individual availability is determined
Regulation, policy and safety enforcement	Relevant regulations, union contracts, policies and safety goals and metrics are listed.

Exhibit 3-26 continues the relocation case study.

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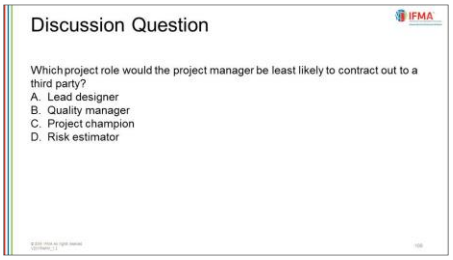
Exhibit 3-26: Relocation Case Study — Acquiring Contracted Resources

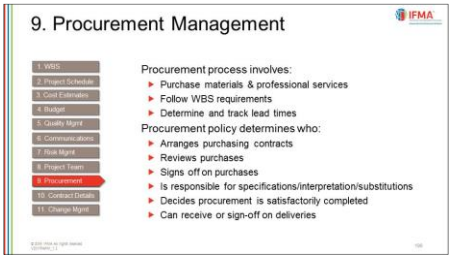
The project contracts out the task to purchase the furniture as a fixed price contract. For the relocation coordinator team position, the project team decides that a time and materials contract provides flexibility for this expert to take on additional tasks as needed.

The scope/statement of work specifies the following duties:

- Provide expert consulting to the project manager and project scheduler
- Plan, execute and integrate/coordinate the relocation
- Be the primary contact with moving companies and furniture constructors
- Make certain that client contacts are informed of relocation timing
- Lead the relocation newsletter team and provide editorial services
- Chair the weekly relocation coordination meetings
- Coordinate furniture construction, move-day adjustments, corrective moves and other deficiency follow-up tasks with contracted resources and facility management staff
- Take on additional tasks at the request of the project manager



9. Procurement Management



Procurement management is the element of the project management plan related to SOWs for purchasing materials or professional services. The project manager uses the WBS to itemize the required SOWs for the project and subject matter experts to help develop the SOWs.

The SOWs list requirements for the:

- Type and quality of materials
- Prescriptive processes
- Results needed from services

Another key task in procurement management is to determine and track lead times, which is addressed later in this book.

Procurement policy specifies who:

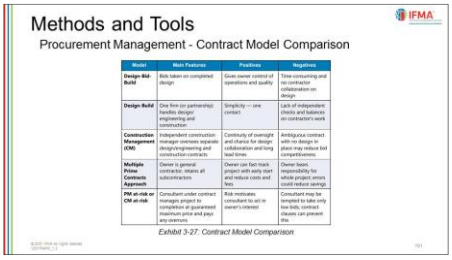
- Can arrange purchasing contracts.
- Reviews purchases
- Signs off on purchases
- Is responsible for specifications, interpretations and substitutions
- Is involved in the decision that procurement is satisfactorily completed after delivery and/or installation
- Can receive or sign-off on deliveries

If procurement policy requires use of the organization's procurement department, project managers carefully manage this relationship to ensure the procurement department properly prioritizes the project's procurement needs.

If a project manager delegates responsibility for some or all of a project to an outsourced provider, the project manager is still accountable for the results. For example, project

managers may contract out work that is beyond the organization's expertise. However, they still must exercise control. The choice is to learn enough about the process to exercise control or add someone to the team who has the expertise. Also, project managers are responsible for conducting due diligence to ensure there is no conflict of interest between contractors and consultants.

Methods and Tools



Most organizations use standard contract documents, for example, AIA standard forms and contracts. Procurement policies specify types of contracts and guidelines for use. The guidelines may be based on a monetary limit, product or service complexity and/or the level of trust in the buyer-seller relationship.

Construction contracts frequently use a contract model, such as the following, to organize project control:

- **Design-Bid-Build** — Construction bids are solicited after designs are complete, allowing for a fixed price contract at the start of construction. The owner can retain control of quality and operations and maintenance in designs. The process is time-consuming, and the contractor is not available for consultation during design. Risks include change orders or conflicts with the general contractor, for example, using only lowest-cost subcontractors.

Construction bids are solicited after designs are complete, allowing for a fixed price contract at the start of construction. The owner can retain control of quality and operations and maintenance in designs. The process is time-consuming, and the contractor is not available for consultation during design. Risks include change orders or conflicts with the general contractor, for example, using only lowest-cost subcontractors.

- **Design-Build** — the owner wants a single contract for both design/engineering and construction services. The owner can engage a firm or a partnership of specialty firms with a proven ability to work together.

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- **Construction Management (CM)** —the owner contracts with an independent construction manager to oversee and coordinate separate contracts with the design/engineering firm and a construction firm. The construction manager's role is to provide continuity and reduce wait time. For example, the construction manager may choose to engage a construction firm before designs are complete. This can reduce overall project time especially when acquiring some materials which require long lead times. However, the ambiguity in the construction contract due to lack of a design may reduce bid competitiveness. In this case, the owner can open subcontracting to more bidders.
- **Multiple Prime Contracts Approach** — the owner acts as the general contractor and directly hires all needed subcontractors. This allows the owner to fast-track the project by starting some work before designs are complete. This method may reduce costs and fees, but conflicts or errors in scheduling could eliminate any savings. An option is to hire an independent construction manager to reduce project risks.
- **PM at-risk or CM at-risk** — the owner hires a consultant to manage and complete a project within a guaranteed maximum price or absorb any cost difference. The intent is to motivate the consultant to act in the owner's best interest. Note: there should be clauses to prevent exclusive use of low bid contracts to meet the goal. Also, project managers should be wary of possible value engineering of materials and equipment in this contracting method.

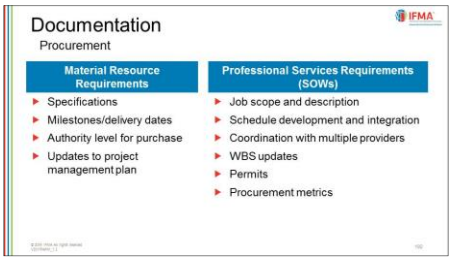
Exhibit 3-27 compares each of the contract models.

Exhibit 3-27: Contract Model Comparison

Model	Main Features	Positives	Negatives
Design-Bid-Build	Bids taken on completed design	Gives owner control of operations and quality	Time-consuming and no contractor collaboration on design
Design-Build	One firm (or partnership) handles design/ engineering and construction	Simplicity — one contact	Lack of independent checks and balances on contractor's work
Construction Management (CM)	Independent construction manager oversees separate design/engineering and construction contracts	Continuity of oversight and chance for design collaboration and long lead times	Ambiguous contract with no design in place may reduce bid competitiveness
Multiple Prime	Owner is general contractor, retains all	Owner can fast-track project with early start	Owner bears responsibility for

Model	Main Features	Positives	Negatives
Contracts Approach	subcontractors	and reduce costs and fees	whole project; errors could reduce savings
PM at-risk or CM at-risk	Consultant under contract manages project to completion at guaranteed maximum price and pays any overruns	Risk motivates consultant to act in owner's interest	Consultant may be tempted to take only low bids; contract clauses can prevent this

Documentation



Documentation for procurement management may include material resources requirements and professional services requirements.

Material Resources Requirements

The following are included in documentation for material resource requirements:

- **Specifications** — specifications for the material being acquired are listed in sufficient detail and note any customization or installation requirements. Each specification lists the method to measure compliance/quality
- **Milestones/delivery dates** — ordering and delivery times are specified
- **Authority level for purchase** — the purchase is signed off on by the appropriate authority, with reference to applicable purchasing criteria
- **Updates to the project management plan** — specific resources to be purchased are updated on the WBS, project schedule, cost estimates and budget

Professional Services Requirements

Professional services requirements include conditions, constraints, and specifications for a project or subproject that is outsourced. These requirements are usually developed as an SOW that gets increasingly more specific once the contractor is selected and begins to help

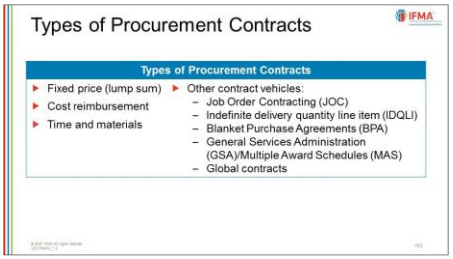
coordinate a contract. Project managers use expert judgment to assess the suggested alternatives or options and stated constraints.

Documentation for professional services requirements may include scope/statements of work and WBS that list deliverables and describe the expected product support.

Additional elements of SOWs for professional services include the following:

- **Job scope and description** — scope of the work to be done and deliverables are defined in sufficient detail for the work to proceed
- **Schedule development and integration** — documentation designates either internal schedulers or the professional service to develop the schedule for items listed in the SOW. Externally developed schedules list the approval and project schedule integration process to be used
- **Coordination with multiple providers** — SOWs specify work that may be subcontracted and the general contractor's responsibility for subcontractor tasks, including coordination. SOWs also note points of coordination with other contractors or the project team
- **WBS updates** — SOWs may require that the professional service update the relevant portions of the WBS
- **Permits** — necessary permits and their required lead times are listed
- **Procurement metrics** — SOWs specify how the products or results of services are assessed, such as the frequency and level of detail of performance, quality or cost data to submit

Types of Procurement Contracts



Types of procurement contracts include the following:

- **Fixed price**, **or lump sum, contracts** — if there is no uncertainty in the cost, both parties agree to a price.

  Purchase orders, which specifies the raw material or product being purchased by quantity, price and delivery date, are the simplest type of fixed price contract.

Third-party staffing contracts can also be fixed price. In this case, the contractor is given a SOW and asked to submit a bid. The contractor is paid the agreed-upon amount, regardless of how long it takes to complete the work.

- **Cost reimbursement contracts** — when costs are difficult to estimate in advance, the buyer can agree to reimburse the seller for actual costs plus a fee that is the seller's profit.

  The contract defines allowable costs and includes an audit mechanism. Indirect costs, such as administration and overhead, are often charged as a percentage of the direct material/labor costs.

  Cost reimbursement contracts include:

  - Cost plus fee — a percentage of the cost is agreed to as the fee
  - Cost plus fixed fee — a fixed fee based on a cost estimate is agreed to in advance and altered only if the scope changes
  - Cost plus incentive fee — can be designed to reward contractors for meeting cost, schedule or quality goals. Such contracts may promote continual improvement such as by sharing cost savings if the project is completed under budget

- **Time and materials** — open-ended contracts are similar to cost reimbursement contacts. However open-ended contracts have fixed prices. For example, they may specify predetermined rates for material and labor.

  For third-party staffing contacts that are time and materials, contractors are paid an hourly rate and are reimbursed for materials documented by receipts.

- **Other contract vehicles** — a number of other contract vehicles exist and may have different names in different countries, for example:

  - Job order contracting (JOC) — project delivery method utilized by organizations to get numerous, commonly encountered construction projects done quickly and easily through multi-year contracts
  - Indefinite delivery quantity line item (IDQLI) contracts — type of contract that provides for an indefinite quantity of supplies or services during a fixed period of time
  - Blanket purchase agreements (BPA) — simplified method of filling anticipated repetitive needs for supplies or services by establishing charge accounts with qualified sources of supply

- General Services Administration (GSA) or multiple award schedules (MAS) — long-term, government-wide contracts with commercial firms providing government buyers access to more than 11 million commercial supplies and services at volume discount pricing
- Global contracts — usually related to pricing and generally stipulates that a supplier must charge an identical price to customers around the globe for the delivery of services and parts

The type of contract offered or negotiated depends on the amount of risk involved for both parties and on the relative availability of materials and qualified contractors. If the work duration or scope is not clearly defined and/or contractors are scarce, contractors may not agree to a fixed price contract or may pad their estimates to reduce their risk.

Fixed price contractors perform work only as stipulated in the contract. Additional work requires a change order and fee negotiation that is potentially more costly than a time and materials contract would have been. However, time and materials contracts generally offer less price stability for project budgets.

Stipulations of contracts may include the following:

- **Compensation** — terms for the contractor/contracting organization include the amount, timing and criteria for payments.

  The following may also be addressed:

  - Taxes — contracts specify who is responsible for tax payments, usually the contractor
  - Incentives — recognition and rewards are clearly linked to objectives under the contractor's direct control
  - Penalties — contracts may include provisions for a penalty for schedule or cost overruns

- **Policy, procedure and practice** — contracts may reference a set of regulations and policies that the contractor agrees to abide by upon signing the contract. The methods used to assess compliance are explicit.

  Key policy, procedure and practice elements include the following:

  - Change orders and negotiation — process for negotiating and pricing work change orders is agreed to in advance
  - Safety — contractor safety measures are included in contracts not only to ensure the health and safety of contractors, but to provide a legal defense if accidents occur and the contractor was not following safety measures. Contractors may be required to hold their own insurance
  - Employee/contractor parity — Many countries have laws that require organizations to establish and monitor policies to ensure that employees and

contractors are treated equally and contracting is not used as a means of bypassing employment laws, such as:

- → Fair hiring practices
- → Disability access
- → Age discrimination
- → Parental rights
- → Sickness and absence policy
- → Leave entitlement
- → Working time regulations
- → Disciplinary and grievance procedures
- → Provisions relating to employment termination or redundancy/layoffs

Exhibit 3-28 continues the relocation case study.

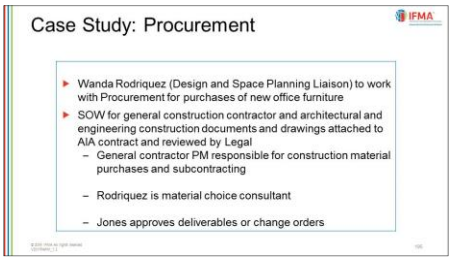
Exhibit 3-28: Relocation Case Study — Materials and Professional Services on Relocation Project

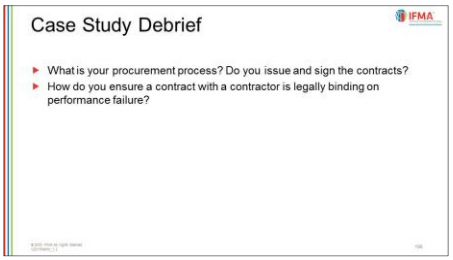
Frank Jones needs to work with the Procurement Department to purchase new office furniture. He delegates the task of consulting with Procurement to Wanda Rodriquez, the Design and Space Planning Liaison. Jones trusts Rodriquez to manage this relationship because she has organizational influence as a marketing vice president, proven soft skills, and interior design expertise.

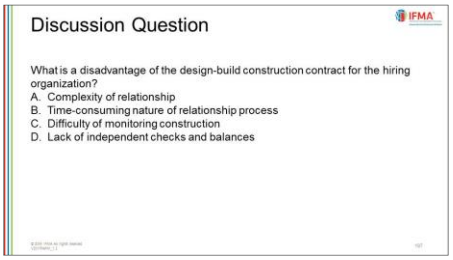
The SOW for the general construction contractor contains architectural and engineering construction documents and drawings that are attached to a standard AIA contract document. This SOW and its attached documents are reviewed by the Legal Department. The contract delegates all responsibility for construction material purchases and subcontracting to the general contractor's project manager. Rodriquez is listed as the material choice consultant and Jones has the authority to approve deliverables and change orders.

Consider the following questions:

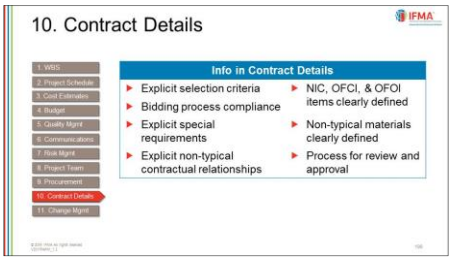
- What is your procurement process? Do you issue and sign the contracts?
- How do you ensure a contract with a contractor is legally binding on performance failure?







10. Contract Details



A contract is a written or oral agreement that creates an obligation between two or more parties and defines the details of that obligation.

Contract details:

- Are usually Preapproved standard boilerplate materials the project manager simply attaches to the completed specification/SOW to form the contract. Other contract details are added a la carte or are customized.
    - For example, there are templates offered by the American Institute of Architects (AIA) or International Federation of Consulting Engineers (FIDIC). AIA standard forms and contract documents are generally accepted by both parties in a transaction and are designed to allow organizations to customize them.
- Could apply to any of several types of contracted resources, including team members, material contracts or professional services.
- May include legal or financial details, such as those addressed in IFMA's *Finance and Business* course.

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Facility managers acting as project managers or their delegates to this role can benefit from a high-level understanding of contract details to select among options or to ensure necessary components are in place.

The following is a list of some of the information included in contract details:

- Criteria for selection are explicit and satisfy the project requirements
- Bidding processes comply with:
  - Health and safety requirements
  - Equal opportunities or fair hiring
  - Labor laws
  - Environmental practices
  - Other regulatory and management requirements
- Special requirements are explicit:
  - Bonds
  - Licensing
  - Insurance coverage
  - Credentials for handling special equipment, materials or substances
- Non-typical contractual relationships among members of the project team are explicit
- The following items are clearly identified:
  - Not-in-contract (NIC)
  - Owner-furnished, contractor-installed (OFCI)
  - Owner-furnished, owner-installed (OFOI)
- Non-typical materials or installation methods are clearly defined
- All bid documents are subjected to the appropriate review and approval process, such as legal review

Standardized Contracts

Most organizations specify the use of standardized contracts or contract details whenever possible. Organizations can produce their own standard forms or use internationally accepted standard contracts and forms, such as those offered by AIA or FIDIC.

Having standardized contract details provides advantages, such as:

- Reducing the risk of:
  - Contract loopholes
  - Contract fraud
  - Lawsuits
- Reducing legal department review costs
- Minimizing time by:
  - Reducing or eliminating the time for contract language negotiations
  - Leveraging standard contracts predesigned for a particular use or type of contracted resource
- Following policies of the demand organization, for example, fair hiring practices
- Offering continual improvement, such as being simple and concise
- Making cost and schedule prominent and controllable
- Acting as a checklist, for example, ensuring each contract has an end date
- Making contracts comparable for bid reviews and benchmarking of past versus present contracts

Legal and Expert Review

Contracts are legally binding documents for both parties, meaning either party can take recourse in court. Therefore, the project manager is accountable for the contents of contracts, including contract details.

Project managers read all contracts and can require independent contract reviews to gain assurance that contract details are appropriate:

- Legal review of contract details is performed once for standard boilerplate materials and at each occurrence of a la carte or customized contracts.
- Risk management representatives determine the need for contract details that transfer risk and assess whether contracts provide the right amount of risk transfer at an acceptable cost.

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Contract Terminology

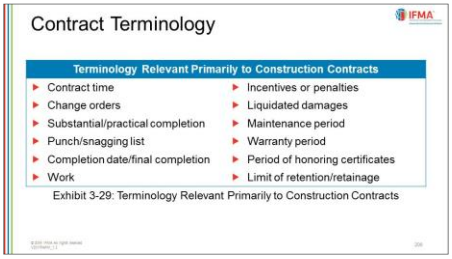


Exhibit 3-29: Terminology Relevant Primarily to Construction Contracts

While some important contract terminology is presented here, the only relevant definition is the one contained within the contract itself. Definitions from any other source could differ.

Exhibit 3-29 outlines some terminology relevant primarily to construction contracts.

Exhibit 3-29: Terminology Relevant Primarily to Construction Contracts

Term	Definition
Contract time or period of performance	Period of time set forth for completion of construction
Change orders	Process by which modifications to the project scope, schedule and cost are made; the written document signed by the contractor, designer and owner that allows for changes involving cost and time
Substantial completion or practical completion	Clearly defined checkpoint in construction where the building or renovated space is ready for occupancy with only minor punch-list items to be completed
Punch list or snagging list	List of deficiencies or incomplete or unacceptable work items compiled by the project manager, architect, engineers and/or designers during final inspection of the project
Completion date or final completion	Clearly defined date when the project is 100% complete, including all of the punch-list items
Work	Construction, equipment and services described in the construction documents to be provided by the contractor
Incentives or penalties	Contractually specified monetary inducements or fines linked to specific performance measurements; may include some form of profit/loss sharing
Liquidated damages	Amount of damages on a daily basis specified in the contract; will be assessed against the contractor for each day beyond the contract

Term	Definition
	completion date that the project remains uncompleted
Maintenance period	Time period in which the contractor provides routine maintenance services for a deliverable as part of the contract
Warranty period	Time period in which a promise or guarantee of quality workmanship or deliverable quality is enforceable
Period of honoring certificates	Time period in which invoices for contractor payment will be honored
Limit of retention/retainage	Longest time period in which money can be held back for paying a contractor for rendered services to ensure all subcontractors have been paid

Bonds

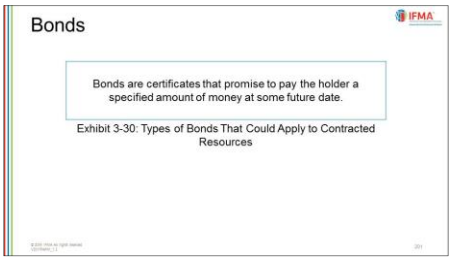
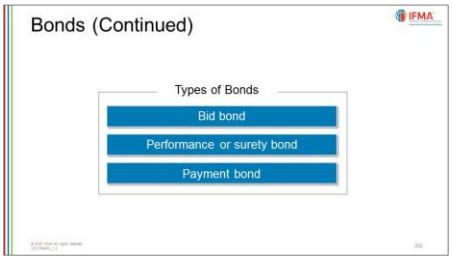


Exhibit 3-30: Types of Bonds That Could Apply to Contracted Resources



Bonds:

- Are certificates that promise to pay the holder a specified amount of money at some future date under stipulations or conditions that are met or un-met
- Are a risk transfer tool employed when the benefit of transferring the risk to another party outweighs the cost of the bond
    - The benefit is a reduction in risk as determined by risk management
- Can also be used as incentives to ensure proper behavior on the part of contractors

Exhibit 3-30 outlines the types of bonds that could apply to contracted resources.

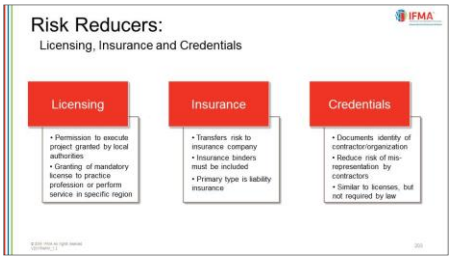
Exhibit 3-30: Types of Bonds That Could Apply to Contracted Resources

Type of Bond	Definition

Bid bond	• Bond or cashier's check that bidders provide to customers along with a bid for a capital project to prove the:
	  - Bid is in earnest
	  - Firm has sufficient capital resources and will provide a performance bond if the bid is chosen
	• Callable or exercised, only when a contract is awarded, but the bidder fails to perform under the terms in the bid
	• Often for 1 percent of the bid value

Performance bond or surety bond	• Issued by an insurance company or bank on behalf of a contractor • Guarantees the contractor will perform the contract or that, in the event of default, the surety, or party assuming the debt obligation, will either complete the contract or pay monetary damages up to the bond limit • Cost usually ranges from 0.25 to 1 percent of a project's conceptual cost - These bonds could be omitted when using trusted contractors or on minor projects
Payment bond	• Issued by an insurance company or bank on behalf of a general contractor • Guarantees payment to all subcontractors and material suppliers if work is completed within the referenced contract's set terms and conditions or that, in the event of default, the surety will make the required payments so the project will be free of any liens at completion

Licensing



Licensing is the:

- Permission to execute a project as granted by local authorities
- Act of granting a license that is mandatory for practicing a profession or service in a specific region

Licenses are granted by an authorized government agency or an accredited board representing the consensus of that profession's community.

If a project requires services that can be performed only by a licensed individual or company, for example, engineering or construction, contract details include this requirement. Sometimes work must exceed a certain cost threshold before a licensed professional is required.

Insurance Coverage

Insurance transfers the risk of the insured events to the insurance company. Organizations that contract out work are still liable for the results of the work and for injuries to workers unless the contractors possess suitable insurance.

Therefore, contracts require all bid winners to provide an insurance binder or certificate of insurance for each type of insurance required:

- A cover letter or insurance binder is temporary evidence of insurance
- A certificate of insurance is a document from the insurance company that verifies insurance coverage for contractors on larger jobs. It includes dates that coverage is in effect and the dollar limits and types of coverage

The primary type of required insurance is liability insurance. Liability insurance protects the insured against lawsuits brought in response to supposed acts of negligence that result in injury or loss of property to the public.

Types of liability insurance include:

- Workers' compensation for work-related injuries
- Employer's liability for protection from employee lawsuits
- Commercial general liability (CGL) for construction defects protection
- Professional liability for facility managers, architects/designers or engineering professionals
- Environmental liability insurance for environmental lawsuit protection
- Umbrella liability for liability payments in excess of standard coverage
- Auto insurance for additional individuals insured on company policy

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Necessary Credentials

Credentials:

- Are documents that prove the identity of a contractor or organization.
  - Proof of identity is a vital control because it reduces the risk of misrepresentation by contractors.
- May also refer to certifications to practice a particular profession or specialty.
- Related to professional practices are similar to licenses except credentials/certificates are not generally legally required unless part of a relevant permit or code.

A contract can still require that contracted resources possess one of several allowed credentials/certificates, especially if the task involves specialized or potentially dangerous equipment or materials. For example, to comply with health and safety requirements and labor laws, a contract for renovation could specify use of credentialed asbestos contractors.

A contract may also require an agency or representative agreement to ensure the contractor or vendor is acquiring proprietary items through legitimate channels. This can protect the owner from claims and knock-off or fake items.

Special Contractual Relationships

Contracts clearly identify what the contractor is responsible for and what is addressed under special contractual relationships.

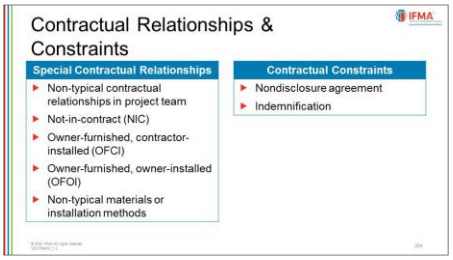
Exhibit 3-31 outlines the types of special contractual relationships.

Exhibit 3-31: Special Contractual Relationships

Type	Description
Non-typical contractual relationships among project team members	Can specify nontraditional accountability and control relationships, such as having a singular agreement with a design/build firm in which the design firm is a subconsultant to the general contractor rather than an independent contractor
Not-in-contract (NIC)	Items included in diagrams or documents for reference but are not part of the final deliverable. Items marked NIC indicate they are not the contractor's responsibility
Owner-furnished, contractor-installed (OFCI)	Items the owner purchases or already owns, but the contractor is asked to install. Contractors can include just the installation costs in bids but may require that the owner assume liability for the

Type	Description
	item. Both the suppliers and installers of owner-furnished items need to be included in preconstruction and appropriate progress meetings. The project manager should also ensure the warranties for equipment are not nullified if the general contractor installs equipment provided by the FM's organization or the "owner"
Owner-furnished, owner-installed (OFOI)	Similar to NIC items except that the contractor may need to account for them in designs and the project schedule. For example, locks and the security system may be part of a separate contract. General contractors need to know any preparation work they are responsible for, such as utility boxes and when the security contractor needs access to the site
Non-typical materials or installation methods	Contracts may specify use of particular materials or installation methods preferred by the owner. If bidders are encouraged to suggest options, such as alternate materials or methods, there should be a section for alternates following the base bid so the bids remain comparable, but contractors can be differentiated

Contractual Constraints



Contractual constraints are other stipulations for contracted resources or the seller that govern their behavior during and after a project. For example:

- A **nondisclosure agreement** is a legally enforceable contract or clause that requires the contracted resource to treat specified intellectual property as proprietary and not share it with others.
- **Indemnification** is a clause stating that the owner, for example, officers, directors or employees, is "held harmless" from any damages or claims resulting from the construction project.

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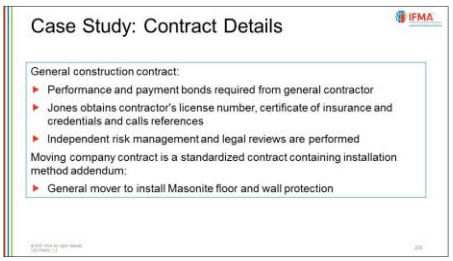
Indemnification may require use of bonds or professional liability insurance to be enforceable.

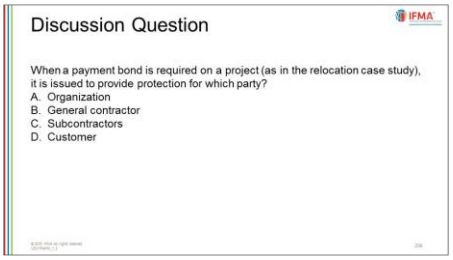
Exhibit 3-32 continues the relocation case study.

Exhibit 3-32: Relocation Case Study — Specifying Relocation Project Contract Details

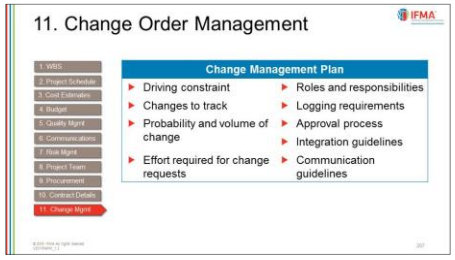
For the general construction contract, the organization requires performance and payment bonds from the general contractor because it is an unknown factor regardless of being preselected by the owner. Frank Jones obtains the contractor's license number, a certificate of insurance and credentials, and he calls references. Independent risk management and legal review of the contract are performed.

For the moving company contracts, the organization uses a standardized contract that contains an installation method addendum requiring the general mover to install Masonite floor protection on all major corridor routes and wall protection on all outside corners.





11. Change Order Management



Change can occur throughout the project life cycle. A change management plan helps control the effect of changes during the Execute and Control phases.

The change management plan describes the:

- Process for submitting, evaluating and implementing changes to the project
- Roles to manage and control change

Exhibit 3-33 outlines the items typically documented in a change management plan.

Exhibit 3-33: Change management plan items

Item	Description
Driving constraint	Identify the most important project constraint; receives overriding consideration
Changes to track	Determine the changes to be tracked and approved
Probability and volume of change	Estimate the probability and volume of change to project deliverables in terms of the project constraints
Effort required for change requests	Estimate total project effort required to manage, evaluate and approve change requests
Roles and responsibilities	Define the change manager, change evaluator and change decision maker
Logging requirements	Define the components of the change log record, change log mechanism and change log monitoring and reporting frequency
Approval process	Define the approval workflow and documents to be produced by the evaluators
Integration guidelines	Establish guidelines for recording changes clearly so they can be integrated appropriately
Communication guidelines	Establish guidelines for communicating change to the project team

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The change management plan is critical to the success of the project. There should be no change without evaluation and approval.

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Progress Check Questions

1. What is the correct order of the steps for acquiring and designing a space?

    a. Contract with design/engineering firms, lease or purchase space, review and approve design, generate final design
    b. Lease or purchase space, Review and approve design, Generate final design, Contract with design/engineering firms
    c. Lease or purchase space, contract with design/engineering firms, review and approve design, generate final design of the project
    d. Review and approve design, Generate final design, Lease or purchase space, Contract with design/engineering firms

2. When acquiring space, what do you do to combine occupant requirements, desired location, desired cost per square meter or square foot, desired floor plan/stacking plan and desired amenities to find an optimum location?

    a. Conduct site search
    b. Create site selection criteria
    c. Conduct building evaluation
    d. Generate a test fit

3. Which of the following types of drawings would probably be used in the design phase for line managers who want to see the layout of their department?

    a. Engineering construction drawings
    b. Architectural construction drawings
    c. As-built drawings
    d. Schematic drawings

4. Which of the following is a cost estimation method that takes cost per person-hour, square meter or foot from provider quotes and historical costs and then multiplies this rate by the quantity of the resource?

    a. Parametric modeling
    b. Bottom-up estimating
    c. Top-down estimating
    d. Historical cost estimating

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5. Which element of a project management plan requires inputs from almost all other project plan elements before it can be considered complete?

   a. Cost estimates
   b. Budget
   c. Quality management
   d. Risk management

6. What scheduling tool uses both forward and backward pass scheduling and combines optimistic, most likely, and pessimistic duration estimates for each task?

   a. Bar charts
   b. Network diagrams
   c. Critical path method
   d. Program evaluation and review technique

7. Refer to the following RACI chart. If Item 4a was unacceptable to the Finance Department, who would senior management need to discuss this issue with and, if warranted, possibly issue a reprimand to?

Task	Team Member				
	Ho Kim, Project Manager	Rick Dunn, Programmer	Ralph Krum, Finance Lead	Jo Legler, IT Lead	Don Smith, Finance Staff
4a — Plan finance space	A	R	C	C	I

   a. Ho Kim
   b. Rick Dunn
   c. Ralph Krum
   d. Don Smith

8. What resources would project managers use to develop project team and contractor specifications that include a scope/statement of work down to the level of detail found in a work package?

   a. Project schedule
   b. Procurement management
   c. Work breakdown structure
   d. Communications management

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9. In which construction contract models are construction bids solicited after designs are complete so a fixed price contract can be arranged from the start?

    a. Design-bid-build
    b. Design-build
    c. Construction management
    d. Multiple prime contracts approach

10. What is returned to contractors who submit proposals that are not accepted?

    a. Bid bond
    b. Performance bond
    c. Surety bond
    d. Payment bond

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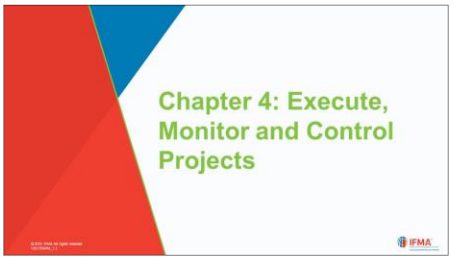
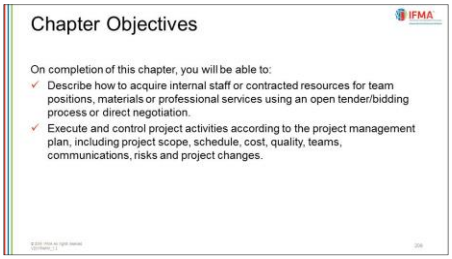
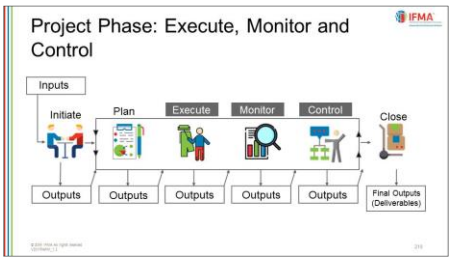
Chapter 4: Execute, Monitor and Control Projects

Chapter Introduction







On completion of this chapter, you will be able to:

- Describe how to acquire internal staff or contracted resources for team positions, materials or professional services using an open tender/bidding process or direct negotiation.
- Execute and control project activities according to the project management plan, including project scope, schedule, cost, quality, teams, communications, risks and project changes.

Lessons

- Acquire Team and Resources

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- Execute, Monitor and Control Projects

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Acquire Team and Resources

On completion of this lesson, you will be able to:

- Describe how to acquire internal staff or contracted resources for team positions, materials or professional services using an open tender/bidding process or direct negotiation.

This lesson contains the following topics:

- Acquiring Team and Resources Overview
- Inputs to Acquiring a Team and Resources
- Team and Resource Acquisition Processes
- Outputs of Acquiring a Team and Resources

Acquiring Team and Resources Overview

The quality and reliability of internal staff and contracted resources are important to any project. Qualified staff, materials and professional services strongly influence whether project objectives will be satisfied and whether the project will be considered successful as measured by:

- Scope and quality of deliverables
- Timeliness of results
- Ability to stay on budget

In other words, projects can be successful only if the project manager and the project team are selected and utilized successfully.

Project managers acquire the team and resources by:

- Selecting members from within their own FM organization.
- Negotiating with line managers for other staff.
- Soliciting and accepting open tenders/bids for contracts.
- Directly negotiating contracts as appropriate.

This process occurs on an as-needed basis throughout the project so staff and contractors, professional services and material resources are available at the right time.

Exhibit 4-1 shows the inputs, processes and outputs for acquiring the team and resources.

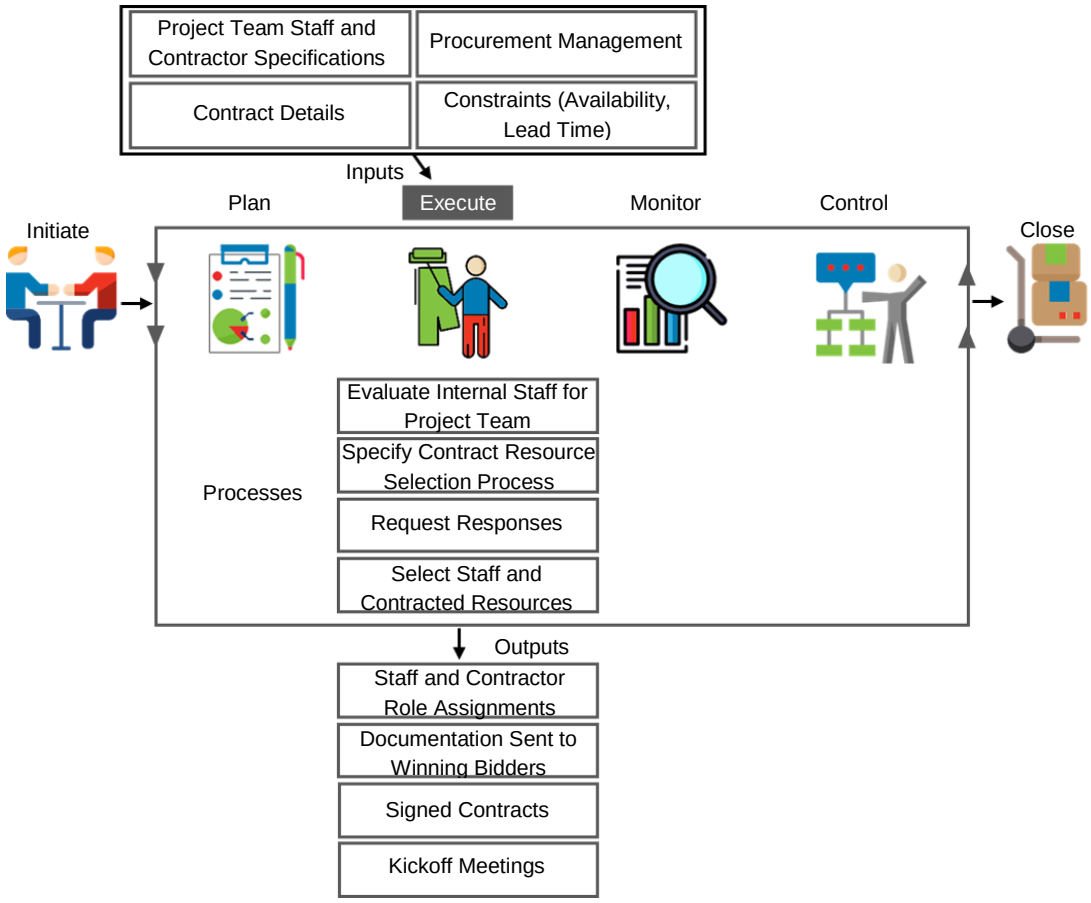
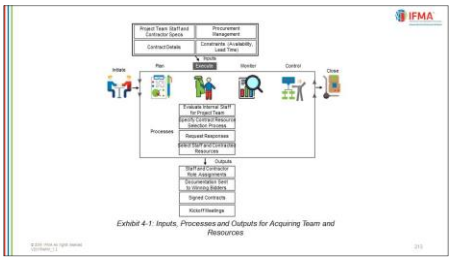


Exhibit 4-1: Inputs, Processes and Outputs for Acquiring Team and Resources



Inputs to Acquiring a Team and Resources

Inputs to acquiring the team and resources may include:

- Specifications for project team staff and contractor
- Procurement management
- Contract details
- Constraints, including availability and lead time

The process of acquiring the team and resources may occur for some staff/contracted resources before the process of planning the team and resources. In that event, the staff member/contracted resource may consult on the specifications or scope/SOWs for their position.

Other inputs may include:

- Policy, procedure and practice tools, such as fair hiring/contracting practices and position descriptions
- Project resources, such as performance reports for staff/previously used contractors

As noted above, constraints related to internal team members and contracted resources include availability and lead time issues.

- **Availability** — the ability of a candidate for a position or contract to be ready to start when needed and have sufficient time to devote to project tasks for his or her portion of the project
- **Lead time** — the delay between when materials or services are requested and when they are available at the right time and place, including time for:
  - Tender/bid processes
  - Selection

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- Contractor execution or production
- Transportation

The project manager verifies that availability and lead time are reflected in the WBS/task list and schedule and considers their impact when setting start and end dates for team members and professional services or order lead times for material resources.

Other constraints related to acquiring staff or contracted resources may include:

- Interdepartmental relationships if departments are involved
- Informal power, influence and goals of prospective team members
- Authority level of project manager to acquire staff from other departments, as department heads may have final say in assignments
- Union agreements on changing job assignments for union employees
- Allowed/expected amount of overtime

The authority level of the project manager to acquire staff may vary, but is generally one of the following:

- The project manager, if also the facility manager, has the authority to hire someone from within their own organization.
- The project manager has the authority to hire someone from another part of the organization but must work with the line manager for agreement.
- The project manager has the authority to hire a contractor.

Team and Resource Acquisition Processes

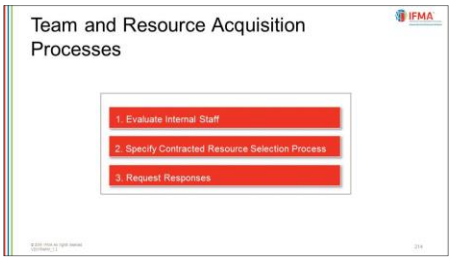

Exhibit 4-2 provides an overview of the Execute phase processes discussed in this topic.

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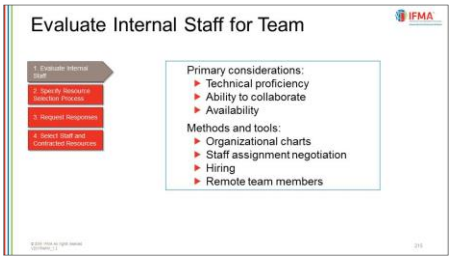
Exhibit 4-2: Acquire Team and Resources Processes in the Execute Phase

Evaluate Internal Staff for Project Team	Specify Contracted Resource Selection Process	Request Responses	Select Staff and Contracted Resources
• Determine availability • Methods and tools	• Open tender/ bidding versus direct negotiation • Typical steps in the tender/ bidding process • Prequalify or preselect contracted resources	• Request responses from contractors for team positions • Request responses for procurement contracts • Standard tender/ bidding documents • Standard proposal format	• Select staff from available options • Apply proposal evaluation criteria • Select staff and contracted resources • Prepare and send documentation/ sign contracts

In this topic, the processes involved in acquiring the team and resources are discussed only as they specifically relate to project management. IFMA's *Finance and Business* course more fully addresses the tender/bidding process.

Evaluate Internal Staff for Project Team



When evaluating potential internal staff members for a project team, project managers look for:

- Technical proficiency for the required tasks.
- The ability to collaborate and get along with other team members.

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If these goals can be satisfied, project managers also consider individual career goals or desired areas of focus. Assigning qualified team members to tasks fitting their interests helps foster team member commitment and sets a tone that the project manager is willing to accept input.

Determine Availability

Project managers determine which qualified staff members could potentially be made available for a relevant portion of the project and which persons are unavailable, for example, non-negotiable scheduling conflicts.

Project managers traditionally occupy staff roles; they may be able to request other staff members, but line managers/department leads generally have authority over assignments for their staff and decide which resources to release. Line managers may be inclined to assign individuals based more on availability than on fit. Project managers use soft skills, such as negotiation and influence, to acquire individuals with appropriate skills.

When working with staff that is assigned to a project part time, project managers work with the person's line manager to ensure conflict between regular duties and project duties is minimized and the team member will be able to meet project time commitments.

Methods and Tools

Exhibit 4-3 outlines the methods and tools that may be used for obtaining a project team.

Exhibit 4-3: Methods and tools for obtaining project team

Methods and Tools	Description
Organizational charts	Project managers can use an organization's existing organizational charts to determine who can have a team member released for the project and note any dual reporting relationships, such as those created when a project team member reports to the project manager and a line manager.
Staff assignment negotiation	Project managers may need to negotiate for staff from line managers or other project managers.
Hiring	Project managers may be able to hire temporary staff or permanent staff if the role will be ongoing after project completion.
Remote team members	The project may be able to accommodate team members who work in remote branches, on different shifts or from home.

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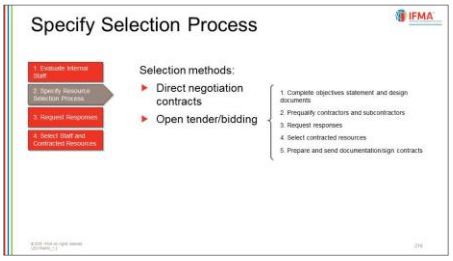
Methods and Tools	Description
Staff development	The project may provide opportunities for shadowing or other participatory performance/support.

Organizational charts/matrix structures are addressed in more detail in IFMA's *Leadership and Strategy* course.

Specify Contracted Resource Selection Process



Organizational policy specifies the selection process to use for each contract team position, material resource contract and professional service contract. Selection processes usually:

- Name who can approve contracts within a price range.
  - Several levels of ranges may be specified.
  - At the lower levels the project manager or a middle manager may approve minor contracts, while at the highest levels a senior executive is named as the approver.
- Specify the type of selection process to use.

In addition to naming who will sign off on contracts, standard selection processes may specify:

- Open tender/bidding versus direct negotiation.
- Tender/bidding process steps.
- Prequalifying or preselecting contracted resources.

Open Tender/Bidding Versus Direct Negotiation

Basic ways that contracted resources can be selected include:

- Open tender/bidding or competitive bidding

- Direct negotiation contracts

Open Tender/Bidding or Competitive Bidding	Direct Negotiation Contracts
• Multiple contractors are invited to tender/bid on a project so the owner can maximize market pricing and achieve the desired project at the lowest cost • The most frequent method by which contracted resources are selected • In many cases, is required by organizational policy either: - In general - For contracts above a certain value - To comply with legal requirements for certain government contracts	• Method for awarding a contract where a single contractor is subject to negotiation and receives a direct award of contract or a small group of selected bidders is subject to negotiation to award the contract. • Can be used to compress the overall project duration by omitting the bidding process. Without other bids, it is difficult to determine whether the project was competitively priced. • Contractors are chosen: - Due to a positive past working relationship. - By recommendation, for example, from an architect or owner. - As part of a prior preselection process. - Because of specialty or proprietary skills and abilities. - Because they are a single source vendor who is the only company that can repair/replace the equipment, such as for proprietary equipment.

Tender/Bidding Process Steps

The steps in the tender/bidding process vary by organizational standards and the type and complexity of the contract being awarded.

For example, the tender/bidding process for capital construction projects typically consists of the following steps:

1. Complete the project objectives statement and design documents, including architectural and engineering construction documents
2. Prequalify a list of general contractors and subcontractors
3. Request responses from potential contracted resources:
    a. Set a deadline for response and a bid bond amount, if required

b. Conduct a pre-bid meeting at the construction site to orient bidders
c. Communicate how contractors will submit questions for clarification, how those questions will be shared with all potential respondents and who is authorized to respond to questions.

4. Select contracted resources:
   a. Collect and evaluate bids
   b. Request bidder presentations from a short list of finalists
   c. Make contractor selections
   d. Conduct final negotiations
5. Prepare and send documentation/sign contracts:
   a. Issue a letter of intent
   b. Prepare and award the contract

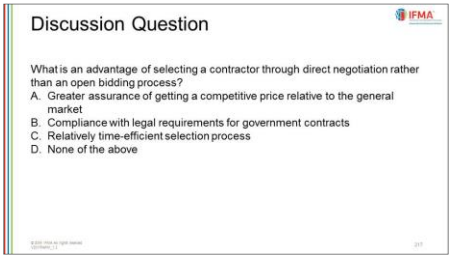
Prequalifying or Preselecting Contracted Resources

Prequalifying or preselecting contracted resources can save time and money if one or the other is allowed. It can also be used as a project control, for example, requiring a general contractor to use preselected subcontractors.

Prequalifying contracted resources narrows the candidates who can respond to a tender/bid offer by setting prerequisites, such as:

- Years of experience
- Litigation history
- Financial status
- Use of bid, performance and payment bonds

When preselecting contracted resources, the project manager sends out requests only to specific contractors who have been predetermined as acceptable. The list could be compiled as its own project or be a list of successfully utilized contractors.



Request Responses

Requesting responses from a, possibly prequalified, list of contracted resources determines the availability and interest of contractors to supply goods or services. Responses from contractors are solicited by submitting a tender or bid request, which is discussed later in this chapter.

Request Responses from Contractors for Team Positions

The process of acquiring contractors for the project team should be as similar to normal hiring practices as is feasible given the project's timeline. Proper due diligence and adherence to standard hiring policies and procedures can increase the chances of project success and minimize risk.

To ensure a sufficient response to an open tender/bidding process, the project manager can:

- Advertise open contracts through various media or staffing organizations or communicate with previously used contractors.
- Widen the pool of applicants by allowing the work to be done remotely to allow national or international candidates to apply. This could increase selection time but may improve the quality of the selection.
- Specify a response deadline to ensure staffing is completed on schedule.

Contractors apply for the position by submitting an application along with a curriculum vitae/resume and references.

Request Responses for Procurement Contracts

Requesting tenders/bids for procurement contracts is more involved than for individual team member contracts because procurement management contracts often involve large sums of money and entail significant project risk.

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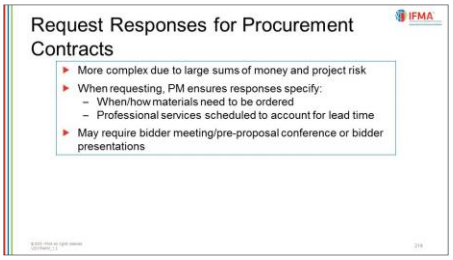
When requesting responses for procurement contracts, project managers ensure responses specify when and how materials need to be ordered and professional services scheduled to account for lead time. Lead times can vary significantly, so procurement requires both diligence to determine lead times and experience to plan for situations that could lead to delays.

Other considerations related to acquiring contracted resources include:

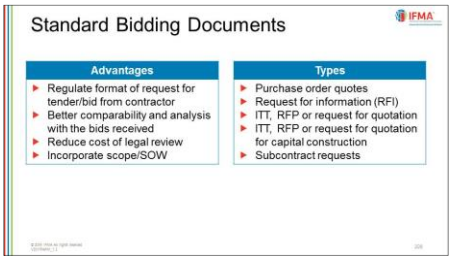
- Conditions of the marketplace, availability or high price volatility
- Availability of credit sources or the timing of release of funds
- Lists of preapproved suppliers, sole-source agreements or contractor selection criteria

To properly prepare contracted resources to provide the best possible responses and to clarify responses, project managers may require:

- **Bidder meeting/pre-proposal conference** — project managers can host on-site or telephone meetings with bidders to perform a walk-through of the project and answer their questions. Clarifications made in meetings can be added to bid documentation as amendments.
- **Bidder presentations** — once proposals are received, some bidders may be asked to make a sales presentation to detail their technical and management capabilities and introduce key staff members.



Standard Bidding Documents



Organizations specify standard processes and documents for contractor selection. There may be several varieties of processes and documents to suit the type of contractor being selected, the complexity of the work or the deliverables.

Standard bidding documents:

- Regulate the format of the request for a tender/bid from a contractor.
- Allow for better comparability and analysis with the bids received.
- Reduce the cost of legal review.
- Incorporate the scope/SOW if it exists at the time the tender/bid is sent.

Tender/bid requests must be clear enough that bidders know what the project requires. For example, construction drawings or SOWs can be interpreted only one way and require no clarification. A lagging indicator of a standard bid request is that the price range of proposals received is within ten percent of one another. Receiving bids in a wider range indicates that bidders made differing assumptions. In such situations, the project manager has difficulty in selecting the best contractor and the project itself could require numerous change orders.

The following are types of standardized bidding documents:

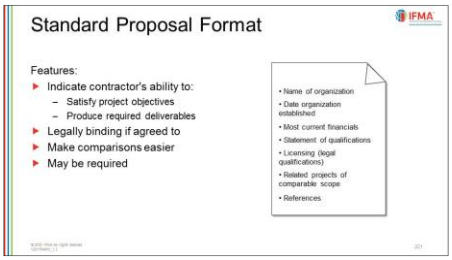
- **Purchase order quotes** — for some materials or products, a process of gathering quotes and availability from suppliers may be sufficient.
- **Request for information (RFI)** — a less formal request for contractors to send marketing or other information on products and services; can be used as the first step in preselecting contractors or to help when determining project requirements before detailed designs exist.
- **Invitation to tender (ITT)** — a special procedure for generating competing offers from different bidders looking to obtain an award of business activity in works, supply or service contracts. This method for managing the supplier selection process typically involves creating a suite of formal tender documents and specific instructions to suppliers for compiling and submitting information. The intent is to help interested third parties produce a competitive tender with information requested in the specified format. Using a formal ITT process helps to ensure that all parties are given equal consideration and that the preferred supplier was selected fairly.
- **Request for proposal (RFP)** — an official statement to vendors about the business activity in works, supply or service required. Prospective suppliers are invited, often through a bidding process, to submit a proposal. Vendors typically try to respond, point by point, to the RFP when they make their proposals. The RFP may dictate to varying degrees the exact structure and format of the vendors' response. The creativity and innovation that suppliers choose to build into their proposals may be used to judge proposals against each other. At the risk of failing to capture consistent information between bidders, suppliers are allowed to make their best efforts in their response. Effective RFPs typically provide sufficient details upon which suppliers will be able to offer a matching perspective.

- **Request for quotation (RFQ)** — used when discussions with bidders are not required, mainly when the specifications of the business activity in works, supply or service are already known and when price is the main or only factor in selecting the successful bidder. An RFQ may also be used as a step prior to requesting an RFP to determine general price ranges. The type and complexity of the acquisition and the level of the expenditure also influence the practices and process. Along a continuum, simple procurements with a low monetary value generally take a lot less time and rigor than procurements of high monetary value or those that require a public bidding process.

ITTs, RFPs or requests for quotations for capital construction requests are usually more complex. For construction projects, bidders submit a table of bids for each different line item in the detailed bid form. For example, finish hardware, interior woodwork, demolition or construction. A standardized form permits later review of bids in a table comparing each bidder against each line item. The forms also provide instructions, for example, requiring that bidders review the contract documents, visit the site and appraise local conditions, such as concurrent work or weather forecasts prior to submitting a bid.

- **Subcontract requests** — project subcontractors can be selected by the owner or the general contractor through direct negotiation or competitive bidding. If general contractors are delegated to select subcontractors, owners request complete information and references for subcontractors.

Standard Proposal Format



Proposals are:

- Documents prepared by the contractor indicating their ability to satisfy relevant project objectives and produce the required deliverables within a given time frame at a quoted cost.
- Legally binding if agreed to in the form of a contract, but they do contain an expiration date to account for inflation and other market conditions.

Organizations should indicate in requests that only proposals conforming to a standardized format and received by a particular date will be considered. Standardized proposals increase comparability between multiple responses. If the organization wants to give contractors the opportunity to propose creative solutions outside of the standard format, the form can include space at the end for responders to list alternates to the base bid.

The primary part of the proposal format is the qualifications statement because it has information related to the scope/statement of work and answers other questions asked in the tender/bidding document.

- Name of organization
- Date organization was established
- Most current set of financial statements, if required
- Statement of qualifications
- Licensing — legal qualifications
- Related projects of comparable scope
- References

The statement of qualifications addresses the items in the bid request pertaining to the scope/statement of work and answers other questions asked in the tender/bidding document.

Responders are given a reasonable deadline to submit proposals. The deadline accounts for all preparatory actions that have been requested, such as site visits, documentation review, bid meetings and cost estimation.

Select Staff and Contracted Resources

A standardized process for reviewing and selecting staff and winning bidders is set by organizational policy. Standard durations for reviews, bid meetings, selection and contract award can be determined and reliably scheduled.

Project managers may select certain staff members for a project, especially team members within the FM unit or other units in the organization. For staff that reports to line managers,

project managers make their requests and negotiate with line managers to acquire individuals with appropriate skills.

The process of selecting contractors may be performed by the project manager or an executive, or it, could be accomplished in a meeting format.

Contractor selection meetings may include, but is not limited to, the following stakeholders:

- Facility Manager
- Project manager
- Top management representative
- Owner's representative
- Relevant project team experts, estimators and analysts
- Architectural and/or engineering representative
- Risk and insurance representative
- Procurement department representative
- Legal department representative
- Financial and tax department representatives

Exhibit 4-4 outlines the methods and tools that may be included when choosing contracted resources.

Exhibit 4-4: Methods and tools for choosing contracted resources

Methods and Tools	Description
Line item cost and time comparisons	If contractor proposals break costs and schedule durations down by line item, the data can be added to a spreadsheet that lists line items in rows and each contractor's estimates in columns for easier comparison.
Weighting	Each subjective criterion is assigned a weight, for example, 0.0 to 1.0, lowest to highest priority, and reviewers assign a numeric score to each criterion, for example, 1 to 5, worst to best. The weight and score are multiplied to arrive at the weighted score.
Independent estimates	Organizations can perform an independent cost estimate as part of project planning and use it as a benchmark.
Multiple screening rounds	Eliminate proposals by setting minimum requirements or prerequisites. The first round eliminates proposals that cannot satisfy the highest priority criteria; can use the results of cost comparisons, weighted scores, independent estimates or other methods to

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Methods and Tools	Description
	eliminate proposals.
Expert judgment	Legal and finance expertise is necessary when evaluating proposals. A team member with subject matter expertise is also important, for example, a space planning professional for a space planning project.
Exception review	Notes variances in bidding line items that are too high or too low in comparison to other bids. The project manager asks the bidder about the exceptions to determine if there were errors. High bids can be negotiated down. Low line item bids are discussed because, although the bid could be enforced, it may result in poor workmanship or change requests.
Contractor rating systems	Contractors who have been used in the past can be assessed based on their ability to meet original deadlines and budgets and on the quality of their work.

Proposal Evaluation Criteria

Proposal evaluation criteria:

- Are prioritized contractor selection factors designed to maximize the probability of project success and minimize risk.
- May be standardized by the organization.
- Can be objective or subjective.

Responses to objective criteria contain measurable values, such as prices or experience levels. An acceptable range of values can be specified. Responses to subjective criteria require expert judgment.

To reflect evaluation criteria priorities, criteria can be weighted or ranked by importance. Price is always an important criterion and can be the primary criterion for commodities, but for more complex materials and services, best value and satisfaction of project requirements may be ranked higher.

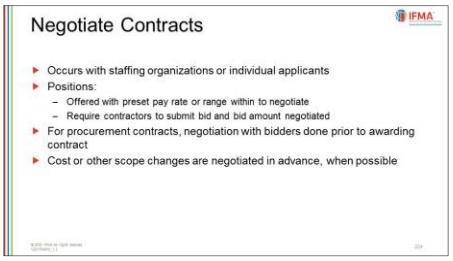
Proposal evaluation criteria include:

- Price
- Best value
- Firm qualifications
- Qualifications of project team
- Similar project experience
- Approach/methodology
- Financial strength
- Differentiation factor

Legal language in tender/bid forms notes that bid selection is entirely at the discretion of the owner even if selection criteria are provided. For example, if price is the primary criteria, tender/bid forms state that the contract will likely be awarded to the lowest responsible bidder who complies with all requirements.

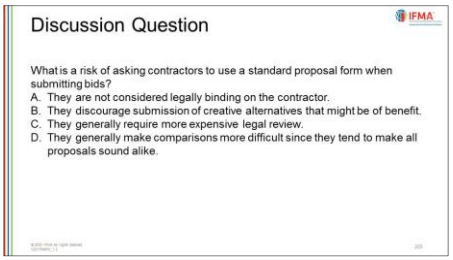
Organizations apply the proposal evaluation criteria to all contractor proposals received and choose the contractor that can provide the greatest value at the lowest risk.

Negotiate Contracts



Contract negotiations for contracted team positions occur with staffing organizations or individual applicants. Some positions are offered with a preset payment rate or range within which to negotiate, while others may require contractors to submit bids and the bid amount could be negotiated.

For procurement contracts, organizations negotiate with bidders prior to awarding the contract on cost reductions for specific line items if the bids exceed the customer's budget or a benchmark. Cost or other scope changes are negotiated in advance whenever possible because changes may affect the schedule or deliverable quality.

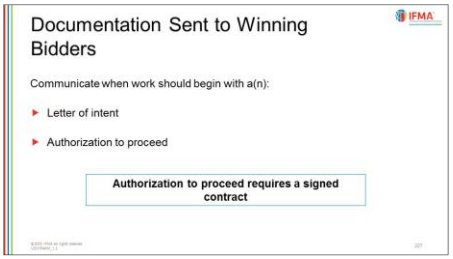


Outputs of Acquiring a Team and Resources

The processes for acquiring a team and resources result in the following outputs:

- Documentation sent to winning bidders
- Staff and contractor role assignments
- Signed contracts
- Kickoff meetings

Documentation Sent to Winning Bidders

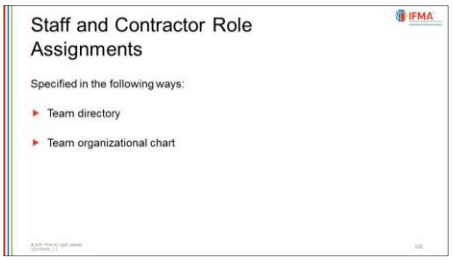


Documentation sent to winning bidders includes communicating when the work should begin with a(n):

- **Letter of intent** — issued by the owner to the contractor to allow work to begin prior to execution of the formal contract
- **Authorization to proceed** — document issued to initiate a project and commence construction

An authorization to proceed differs from a letter of intent in that the authorization usually requires a signed contract. Other documentation sent to winning bidders includes a congratulatory letter and a prepared contract ready to be reviewed and signed.

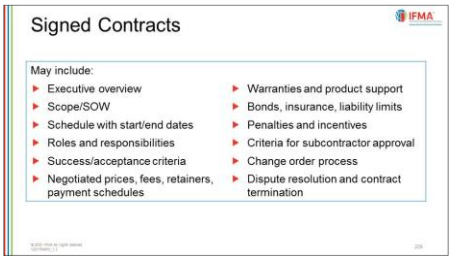
Staff and Contractor Role Assignments



Staff and contractor role assignments can be specified in the following ways:

- **Team directory** — includes contact information and position descriptions for each assigned team member
- **Team organizational chart** — gives an overview of the team size and reporting relationships

Signed Contracts



Once contracts are signed by both the owner's and contractor's representatives, they are legally binding.

Elements of a contract may include:

- Executive overview and table of contents
- Scope/statement of work
- Schedule with start and end dates for the contracted resource
- Roles and responsibilities
- Success or acceptance criteria
- Negotiated prices, fees, retainers and payment schedules
- Warranties and product support

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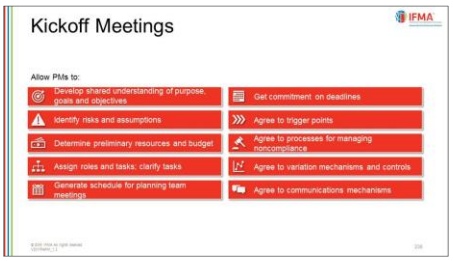
- Bonds, insurance and limitations of liability
- Penalties and incentives
- Criteria for subcontractor approval
- Change order process
- Dispute resolution and contract termination

Kickoff Meetings

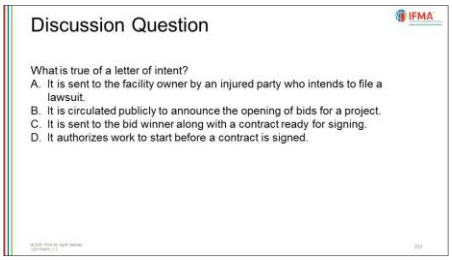


Kickoff meetings are held when a project team is assembled and when professional services are acquired. This is the point where the project transitions from planning to executing.

A kickoff meeting allows the project manager to:

- Develop a shared understanding of the project's purpose, goals, objectives and constraints.
- Identify risks and assumptions.
- Put together a team directory and organizational chart.
- Determine preliminary resources and develop a preliminary budget for kickoffs that occur early in the design phase.
- Assign roles and tasks to team members, allow them to get clarification on tasks and get their feedback on/commitment to deadlines.
    - Establish accountability and responsibility for specific tasks.
- Agree to trigger points and processes for managing noncompliance in the project related to schedule, budget or quality issues.
- Agree to variation mechanisms and controls.
- Agree to communication mechanisms and generate a schedule for additional planning team meetings.
- Start team building to help the group get to know each other.

The kickoff meeting is important as it sets the tone and framework for the entire project and establishes the leadership of the project manager.



Lesson Activity

The purpose of this activity is to review the acquiring contracted resources portion of the relocation case study.

Relocation Case Study

Exhibit 4-5: Relocation Case Study — Acquiring Contracted Resources

The design firm, general contractor and subcontractors are selected using direct negotiation. Nevertheless, the organization carefully reviews the project objectives with these contractors and asks them to develop proposals. For example, for the general contractor's proposal, they ask their relocation coordinator to review proposed costs and their scheduler to review the proposed schedule. After clarifying or negotiating a few items, the parties sign the contract.

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The organization uses open tender/bidding for the mover's contracts. While the organization normally would have selected the lowest bidder, in this case it favors reliability over price. This is because the team interviews references and hears complaints about this bidder's reliability and budget performance, including some last-minute change orders and cost overruns. To reduce relocation risk, the organization chooses a higher-cost service even though this requires the use of contingency funds, which have been nearly exhausted by this point in the project.

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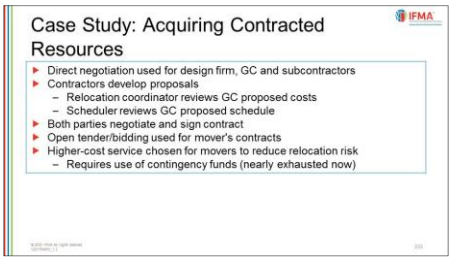

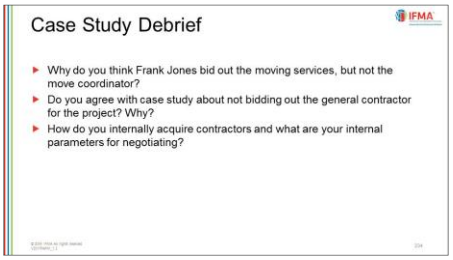

Answer the following questions regarding the acquiring contracted resources portion of the case study:

1. Why do you think Frank Jones bid out the moving services, but not the move coordinator?

2. Do you agree with case study about not bidding out the general contractor for the project? Why?

3. How do you internally acquire contractors and what are your internal parameters for negotiating?

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Execute, Monitor and Control Projects

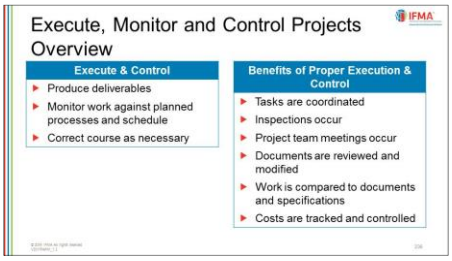
On completion of this lesson, you will be able to:

- Execute and control project activities according to the project management plan, including project scope, schedule, cost, quality, teams, communications, risks and project changes.

This lesson contains the following topics:

- Execute, Monitor and Control Projects Overview
- Processes and Outputs for Executing and Controlling a Project

Execute, Monitor and Control Projects Overview



During project execution, the project team follows the project management plan to produce deliverables. The project manager controls the project by checking that work is done according to plan and deliverables are produced as scheduled to meet the project's scope and objectives. The project manager corrects the course of the project or the work of individual team members as needed.

Some of the benefits of properly executing and controlling a project include:

- Project tasks are coordinated:
  - Schedules are communicated and maintained
  - Tasks are performed when scheduled by the people assigned

  - Project communications are channeled appropriately and logged
  - Work interruptions are avoided or minimized
  - Work is performed by people with appropriate qualifications
  - Rework and downtime are avoided
- On-site inspections occur as planned and as needed
- Project team meetings occur as planned and as needed
- Project documents, such as shop drawings, are reviewed for accuracy and completeness and modified as needed
- Work in progress and work completed is compared to project documents and specifications
- Testing and commissioning are properly conducted
- Steps needed to assure rights under warranty are maintained and taken
- Performance is tracked and corrective action taken as required
- Modifications to the plan are identified, communicated, documented and approved
- The risk management plan is reviewed and updated
- Project costs are tracked and controlled
- Payments are reviewed and approved
- A final inspection is conducted

Exhibit 4-6 shows the inputs, processes and outputs for project execution and control, which involve the Execute, Monitor and Control phases.

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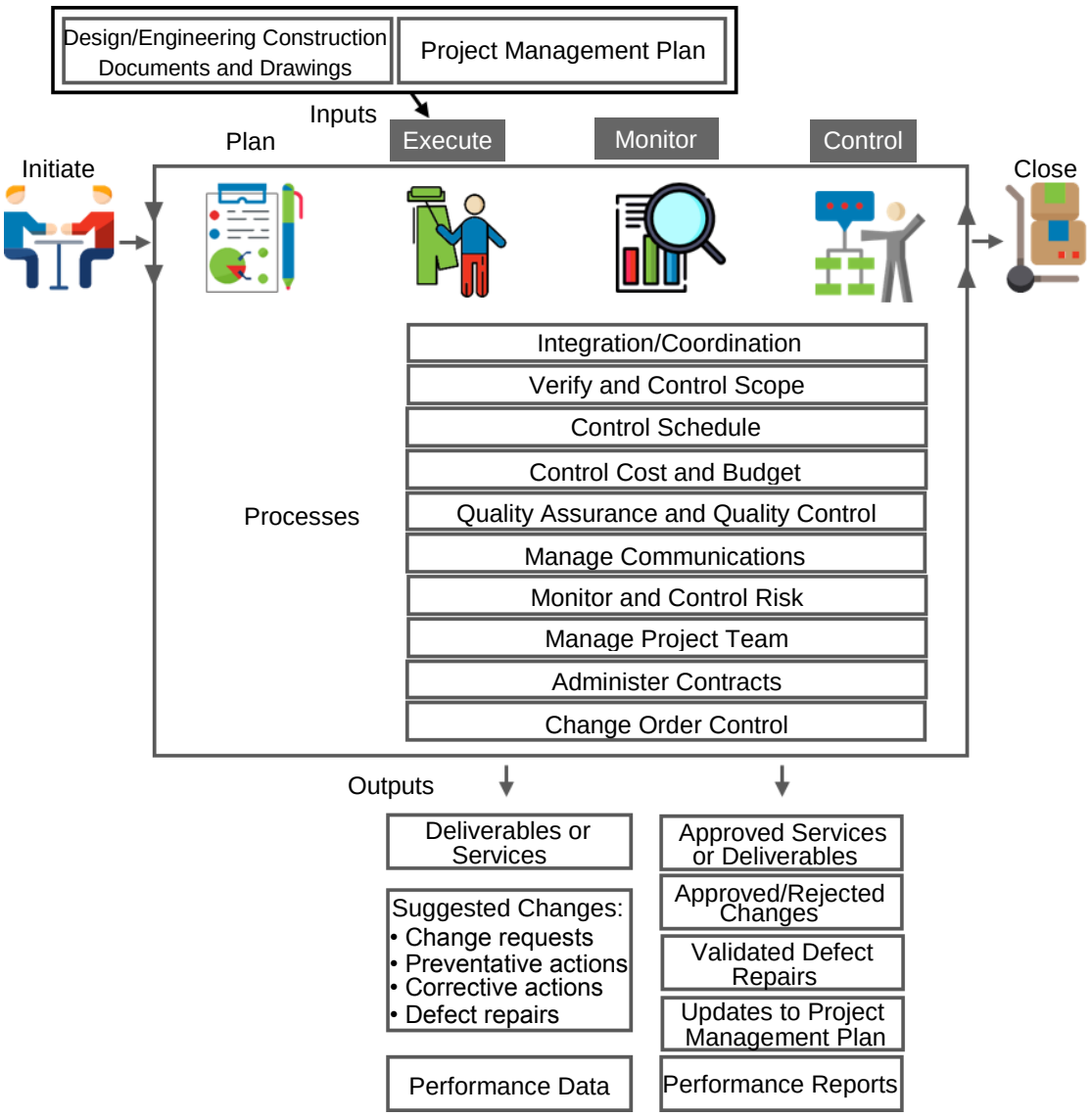
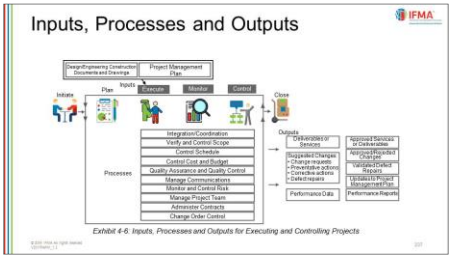


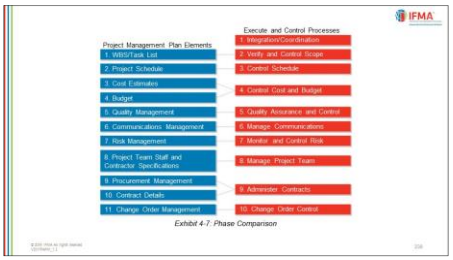
Exhibit 4-6: Inputs, Processes and Outputs for Executing and Controlling Projects

These phases are discussed together because they may occur concurrently, meaning that, while tasks are being done, the project manager monitors the tasks and acts on the information. Monitoring that occurs after task completion may also trigger revisiting the task.

It should be noted that the processes for executing and controlling a project are closely aligned to the elements of the project management plan as shown in *Exhibit 4-7*.

Exhibit 4-7: Phase Comparison





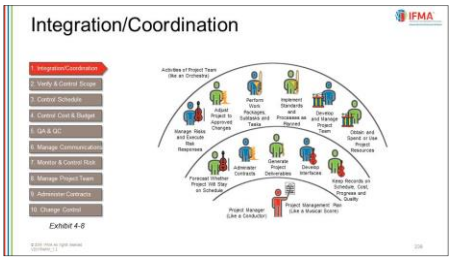
Compare the processes in the Execute and Control phase of a project to the elements of the project management plan, nothing their alignment.

Processes and Outputs for Executing and Controlling a Project

Outputs from the Plan phase become inputs for the Execute, Monitor and Control phases. As such, these inputs may include the design/engineering construction documents and drawings and the project management plan.

This topic is discussed according to the key Execute and Control Project processes listed in Exhibit 4-6. The outputs listed in the exhibit are integrated into the discussion where appropriate.

Integration/Coordination



Integration or coordination during the Execute, Monitor and Control phases is a multitasking effort for the project manager. *Exhibit 4-8* expands upon the orchestra example from Chapter 1. It compares the project manager's task of integrating/coordinating the project team to follow the project management plan to that of a conductor keeping an orchestra in time with a musical score. The project manager's goal is to orchestrate the work of multiple groups into a single harmonious unit.

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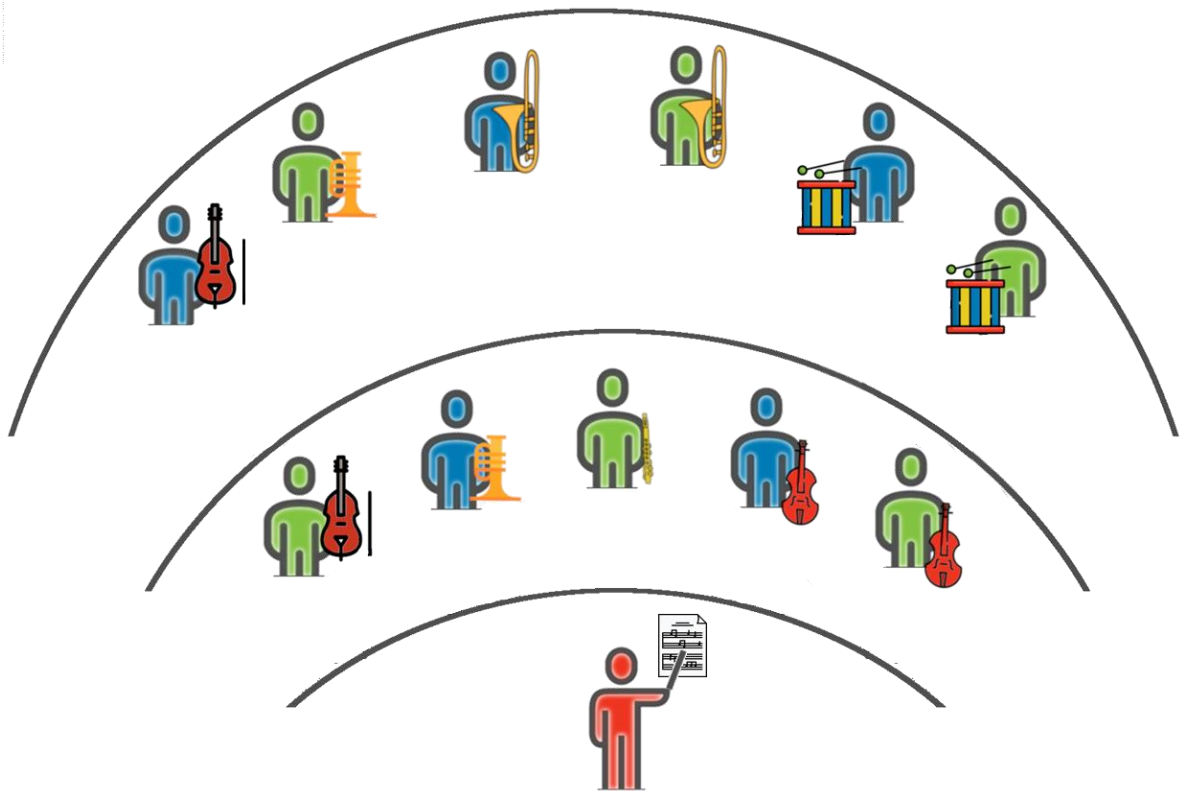


Exhibit 4-8: Integration or Coordination Is Like Conducting an Orchestra

During project execution, integration/coordination requires that project managers balance the project's technical needs against its organizational needs. That is, experts get the support, time and resources needed to accomplish technical goals and engineer deliverables correctly and team members and stakeholders get the management and leadership they need to be motivated and effective. Both tasks need to be executed correctly for the project to be successful.

Integration/coordination control, or the Monitor and Control phases, involves ensuring:

- Work is authorized and done according to the project management plan.
- Actual work is tracked and compared to planned work and variances are investigated without delay.
- The root causes of variances are investigated.
- Solutions to correcting the root causes and/or variances are considered.
- Corrective actions are approved according to the change control process.
- Project management plan elements are updated, and changes are communicated to team members performing affected tasks.

The level of precision in original estimates and the overall amount of planning that was performed directly affects the level of control that can be exercised. Good planning results in good control.

Project managers check work by collecting and integrating qualitative and quantitative data on processes and results.

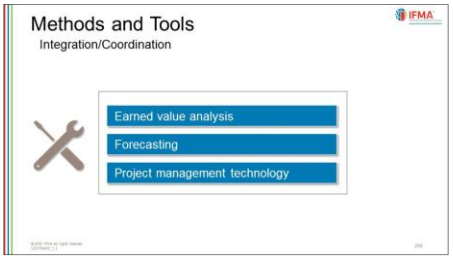
Project managers verify data is:

- **Valid** — data accurately reflects actual costs and completion levels
- **Timely** — data is received soon enough to enable decision making
- **Cost-effective** — data collection does not hinder project work and the value of the information is greater than the cost spent to collect it

Compiling data helps project managers see the big picture and develop a forecast of where the project is heading. If the projected course is likely to be unacceptable, the project manager acts to correct course using the change control process.

The project manager also integrates/coordinates documentation for use in project closure and evaluating project outcomes.

Methods and Tools



Methods and tools for integration/coordination may include the items outlined in *Exhibit 4-9*.

Exhibit 4-9: Methods and Tools for Integration/Coordination

Method or Tool	Description
Earned value analysis	A cost- and schedule-based performance measurement tool that creates a baseline cost/time for each task and measures the cost of work currently completed or earned, to estimate the likely final cost and finish date.

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Method or Tool	Description
Forecasting	Predicts future cost, time and quality of project tasks based on current trends in data.
Project management technology	Organizations can leverage tools in a project management information system (PMIS) or other technology to integrate/coordinate tasks. Such systems typically include the following functionality: • Project planning and tracking • Estimating • Scheduling • Contracts and contractor management • Team collaboration • Document check-in/check-out management • Change orders • Internal team requests for information • Project cost accounting • Calendars

Deliverables and Documentation

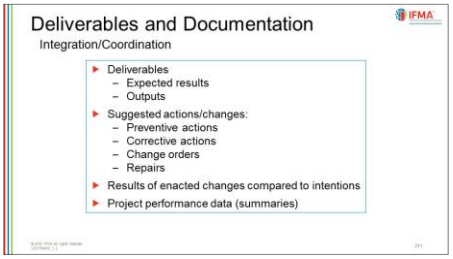

Exhibit 4-10 outlines the items included in the deliverables and documentation of integration/coordination.

Exhibit 4-10: Deliverables and Documentation of Integration/Coordination

Item	Description
Deliverables	Expected result or outputs
Suggested actions/ changes	Suggested project actions/changes include: • Preventive actions to minimize risks found during project execution

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Item	Description
	• Corrective actions to bring actual work back to the plan • Change orders to alter the project management plan and make it feasible given the current situation • Repairs to fix identified defects in deliverables or processes
Results of enacted changes	Results of actions/changes are assessed, compared to intended results and validated if acceptable
Performance data	Overall project performance data is summarized

Exhibit 4-11 continues the relocation case study.

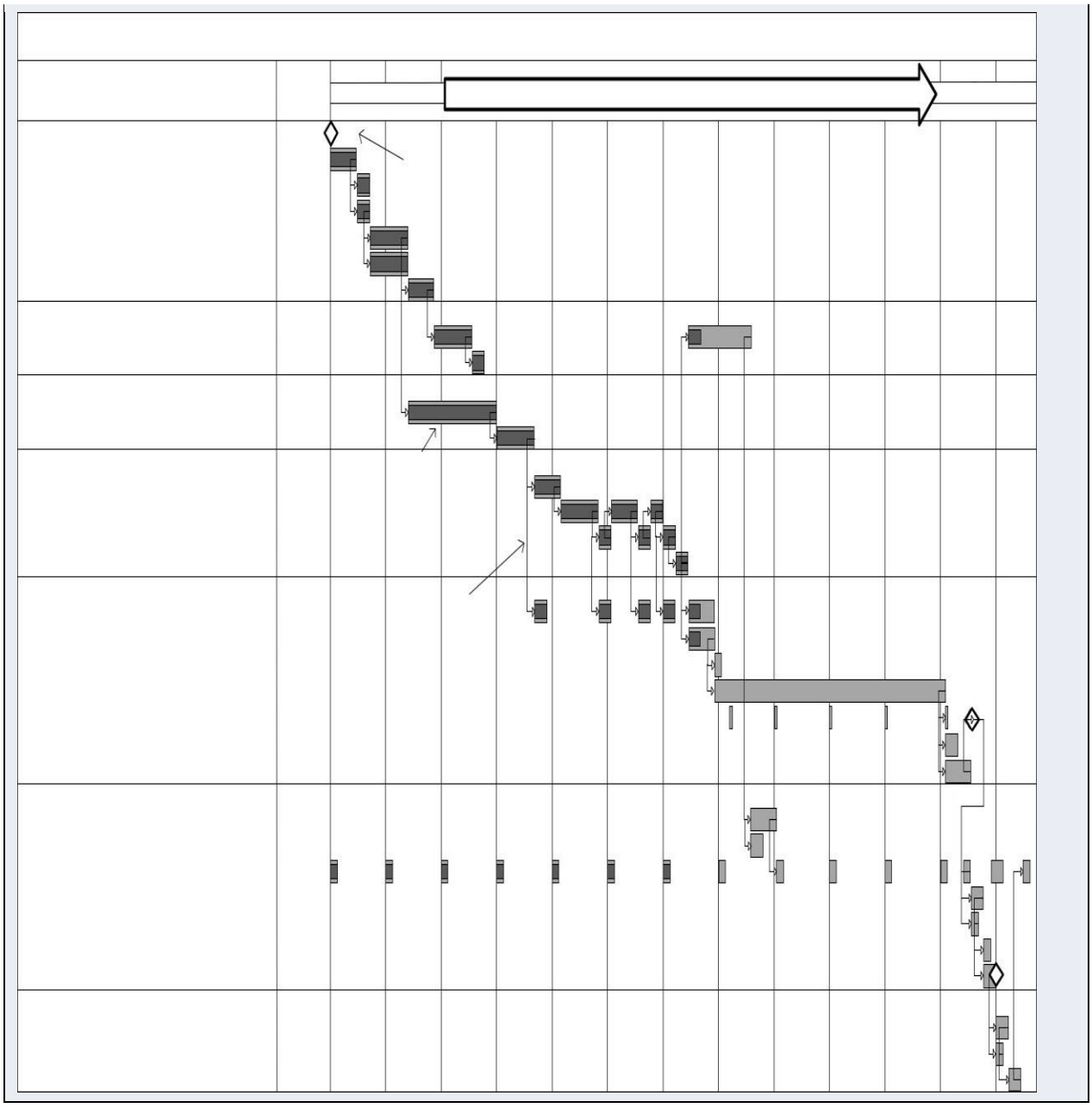
Exhibit 4-11: Relocation Case Study — Integration/Coordination of Relocation Project

Following a kickoff meeting, Construction Project Manager John Miner and his foreman supervise, coordinate and direct the activities of multiple subcontractors working on the construction site. Miner meets with Frank Jones, Design and Space Planning Liaison Rodriquez and Relocation Coordinator Wu every Monday at the construction site. At the meetings, Miner reports on progress, addresses resolution of previous issues and reports new issues and allows Jones and his team to have input when there is a choice of alternate materials or direction.

Midway through construction, there is an earthquake in the region. Even though the earthquake did not directly affect the project site, Miner shows Jones an earned value analysis report indicating that unless some changes are made immediately, construction is forecasted to be over budget and the schedule is forecasted to slip. The analysis determines the root causes to be higher-than-expected inflation in material costs and unexpected delays in several critical path material deliveries. Both are caused by the earthquake, which is affecting some suppliers as well as overall regional prices.

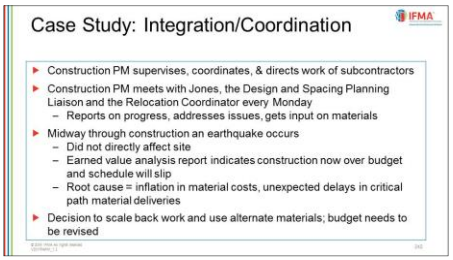
A construction schedule slip would impact the hard relocation deadline. The organization decides to scale back some work and use alternate materials to complete construction on schedule. The organization sees no way to meet the budget and decides to revise the budget to meet currently estimated final costs after the changes are factored in.

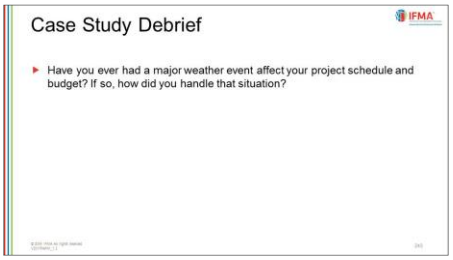
The following Gantt chart shows where the earthquake occurred in the schedule of this project.

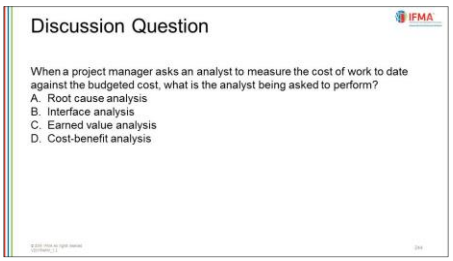


Consider the following question:

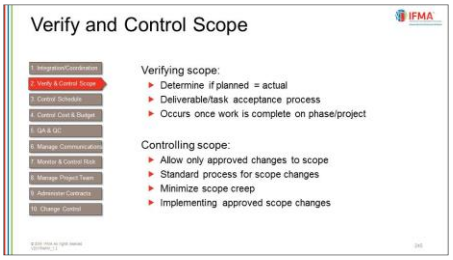
- Have you ever had a major weather event affect your project schedule and budget? If so, how did you handle that situation?







Verify and Control Scope



Verifying the scope involves determining if the planned scope matches the actual scope during execution. Controlling the scope involves allowing only approved changes to the scope. The overall goal is to ensure that the project purpose and success criteria are achieved.

Verifying the scope is a deliverable and task acceptance process that occurs once work is completed on a project or a phase of the project. The project manager refers to the project management plan, including the WBS/task list, to determine whether each deliverable or service matches what was in the scope.

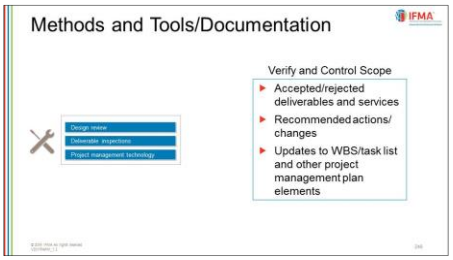
To conduct the deliverable and task acceptance process, project managers seek formal approval of completed deliverables and services from the acceptance authority, for example, executive, facility manager or board committee.

When controlling the scope, project managers apply a standardized process for all scope changes to control the impact on project duration, cost, quality and overall success. The goal of limiting scope changes is to minimize scope creep. When scope changes are recommended, the change control process is used to review and approve the changes.

Controlling the scope also includes implementing approved scope changes, such as:

- Making the necessary scope changes routine rather than emergency work.
- Updating affected project management plan elements.
- Communicating changes to affected stakeholders.

Methods and Tools



Methods and tools for verifying and controlling scope may include the items outlined in *Exhibit 4-12*.

Exhibit 4-12: Methods and Tools for Verifying and Controlling Scope

Method/Tool	Description
Design review	Design/engineering submittals, shop drawings and mock-ups are reviewed for accuracy and completeness, modified as needed and approved.
Deliverable inspections	Technical features of deliverables are tested or measured to show compliance with each relevant requirement.
Project management technology	Software may include methods for updating plan and deliverable documentation after scope changes.

Documentation

The items outlined in *Exhibit 4-13* are included in the documentation for verifying and controlling the project scope.

Exhibit 4-13: Documentation for Verifying and Controlling Scope

Documentation	Description
Accepted/rejected deliverables and services	A list of deliverables that pass inspection and their sign-off documentation is retained. Deliverables that have not been accepted are listed along with the reasons for rejection.
Recommended actions/changes	Required actions needed to accept rejected deliverables are listed and status is tracked.
Updates to the WBS/task list and other project management plan elements	The WBS and its components are updated. Revised copies are distributed with changes highlighted. Approved changes to plan elements resulting from scope changes are made and communicated.

Exhibit 4-14 continues the relocation case study.

Exhibit 4-14: Relocation Case Study — Controlling and Verifying Relocation Project Scope

Frank Jones proposes and gains approval for construction project scope changes due to the projected cost and schedule overruns caused by the earthquake. As a result, Jones directs that the WBS be modified to remove items not to be constructed:

- Outdoor patio
- Shower room
- Expansion space

In addition, the mandate to use only in-floor or in-wall cabling is replaced by some use of cabling through the drop ceiling with cabling poles descending to workstations.

Other WBS items are altered to reflect different materials chosen based on availability. Jones does not want to sacrifice quality. The plan states that alternates be of equal or greater quality as measured by price and selection/approval. Approvals are made by the Design and Space Planning Liaison Rodriquez. She has agreed to devote daily time on the project site to ensure that decisions are made without delay.

The changes do not affect the original project schedule, but the budget needs to be updated. Jones communicates these changes to the general contractor and staff.

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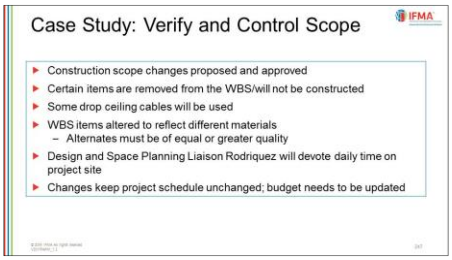
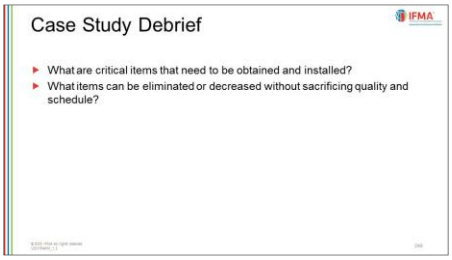
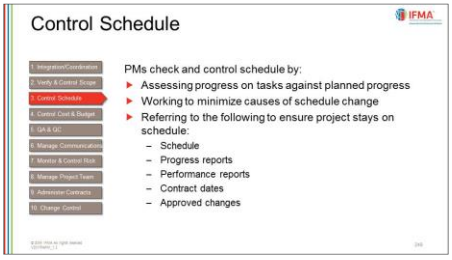
Consider the following questions:

- What are critical items that need to be obtained and installed?
- What items can be eliminated or decreased without sacrificing quality and schedule?





Control Schedule



Project managers check and control the schedule by:

- Ensuring tasks are performed when scheduled by the people assigned.
- Assessing progress on tasks against planned progress to date.
- Working to minimize the causes of schedule change, interruptions, rework and downtime.

If variances from the schedule are detected, either the project manager adjusts tasks to get them back on schedule or a scheduler makes approved schedule changes. Even small

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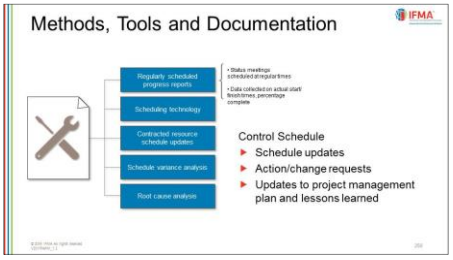
schedule slips are important, because schedule creep frequently occurs in small increments that add up to a major delay.

Project managers refer to the following to verify the schedule and forecast whether the project will stay on schedule:

- Schedule
- Progress reports
- Performance reports
- Contract dates
- Approved changes

When recommending schedule changes, project managers ensure that revised schedules reflect project priorities.

Methods and Tools



The methods and tools outlined in *Exhibit 4-15* can be used in controlling schedule.

Exhibit 4-15: Methods and Tools for Controlling Schedule

Method/Tool	Description
Regularly scheduled progress reports	Project managers organize status meetings at a regular day and time to: • Communicate the current project schedule status to the project team. • Collect data on actual start and finish dates and percentage complete for work in progress.
Scheduling technology	Can show plan versus actual data, a forecasted schedule, responsibility assignments and results of prior actions.

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Method/Tool	Description
Contracted resource schedule updates	If contractors are responsible for their portion of a schedule, they are required to submit a revised schedule after change approval, but before receiving their next payment.
Schedule variance analysis	The amount a task is over or under scheduled time. Along with earned value analysis, it can help determine the magnitude of deviations from the schedule.
Root cause analysis	The root causes of schedule variances are investigated because they may be positive or negative. For example, being ahead of schedule could be caused by efficient workers or by workers taking shortcuts.

Documentation

Documentation for controlling the schedule may include the items outlined in *Exhibit 4-16*.

Exhibit 4-16: Documentation for Controlling Schedule

Documentation	Description
Schedule updates	Approved schedule changes are made and communicated, with special emphasis given to critical path changes.
Action/change requests	Preventive and corrective actions and changes to the schedule are inputs to change control.
Updates to the project management plan and lessons learned	Approved schedule changes may require changes to the WBS. Documenting root causes of schedule changes can improve future plans.

Exhibit 4-17 continues the relocation case study.

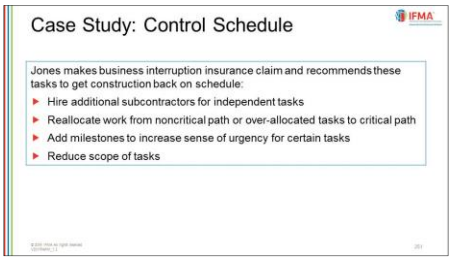
Exhibit 4-17: Relocation Case Study — Controlling Relocation Project Schedule

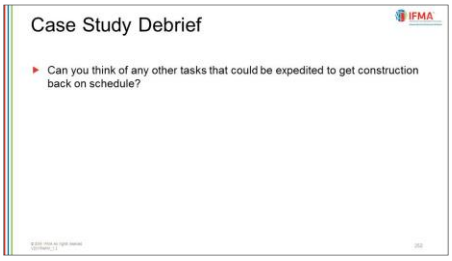
Since the root cause for the construction schedule delays was the earthquake, which is outside of the organization's control, Frank Jones makes a business interruption insurance claim and recommends the following expediting tasks to get the construction back on schedule:

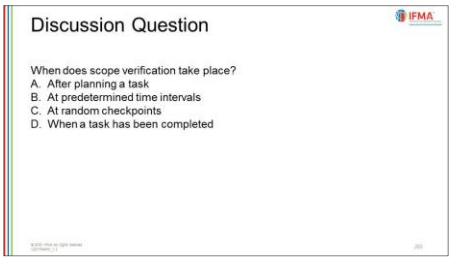
- Hire additional subcontractors for tasks that can be performed independently
    - The incremental output from each additional worker must be enough to warrant the guaranteed additional cost after factoring in effort for additional communication and training
- Reallocate work from the noncritical path or over-allocated tasks to critical path tasks
- Add milestones to increase the sense of urgency for certain tasks
- Reduce the scope of tasks, as discussed previously, including use of prefabricated materials rather than on-site production as available and applicable

Consider the following question:

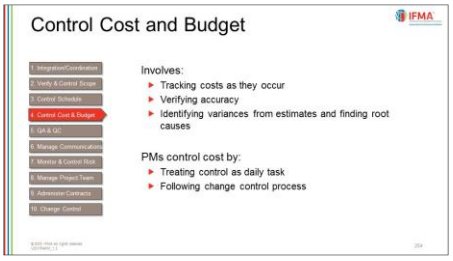
- Can you think of any other tasks that could be expedited to get construction back on schedule?







Control Cost and Budget



Controlling cost and budget involves the following:

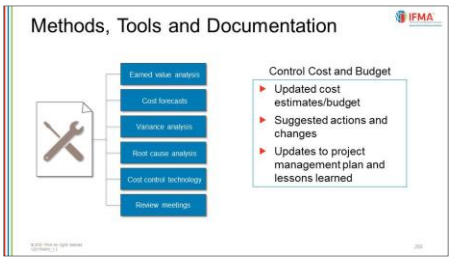
- Tracking costs as they occur
- Verifying the accuracy of cost data
- Identifying variances between estimated and actual costs
- Analyzing the root causes of variance in a budget

Many major budget overruns are the result of a series of small cost overruns that accumulate over time, project managers control cost by:

- Treating cost control as a daily task.
- Studying costs at the level of greatest detail, for example, line item or work package.

In response to current or projected variances over budget, project managers are faced with difficult decisions. For example, either reducing features or increasing the budget. Project managers follow the change control process, discussed later in this chapter, for all recommended actions and changes. Furthermore, they ensure that this process includes all necessary financial controls to prevent unauthorized or incorrect expenditures. For example, audits, separation of duties and dual payment approvals.

Methods and Tools

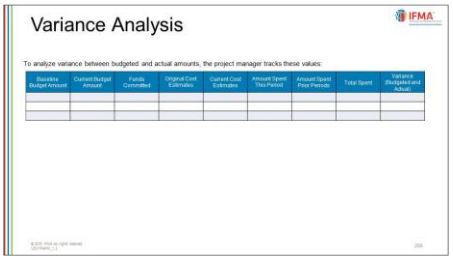


The methods and tools outlined in *Exhibit 4-18* can be used in controlling cost and the budget.

Exhibit 4-18: Methods and Tools for Controlling Cost and Budget

Method/Tool	Description
Earned value analysis	Can be used to calculate cost variance and budget variance • **Cost variance** — amount a task is over or under budget • **Budget variance** — difference between budget at completion and estimate at completion • **Budget at completion** — planned final cost of a task/project • **Estimate at completion** — forecast of final cost of a task/project using the most current data
Cost forecasts	• Include the estimate at completion • Data collected at each milestone can also be used for trend analysis
Variance analysis	Project managers generate a spreadsheet with rows listing budget line items and columns listing: • Baseline budget amount • Current budget amount • Funds committed • Original cost estimates • Current cost estimates • Amount spent this period • Amount spent in prior periods • Total spent • Variance between budgeted and actual amounts spent
Root cause analysis	Root cause analysis of positive and negative cost variances can highlight how much each of the following is a factor: • The item price or rate for work differs from the estimate

Method/Tool	Description
	• The quantity of items or amount of work differs from the estimate
Cost control technology	Cost tracking software can ensure no item is neglected and change control is used
Review meetings	Analysis and forecasts can be reviewed in regular meetings to communicate issues and the status of remedies



Documentation

Documentation for controlling cost and budget may include the items outlined in *Exhibit 4-19*.

Exhibit 4-19: Documentation for Controlling Cost and Budget

Documentation	Description
Updated cost estimates/ budget	• Original and revised estimates are tracked • Budget is updated only when required by scope changes or when budget variances are determined to be too large to be corrected
Suggested actions and changes	Recommendations are tracked
Updates to project management plan and lessons learned	• Changes to cost estimates or budgets may affect the WBS or quality management • Variances and root causes are recorded for use in evaluating outcomes

Exhibit 4-20 continues the relocation case study.

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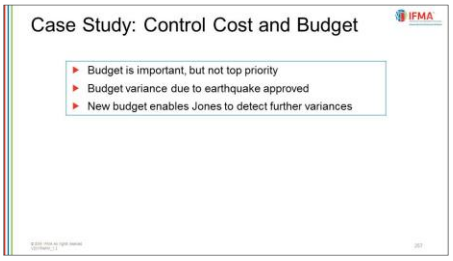
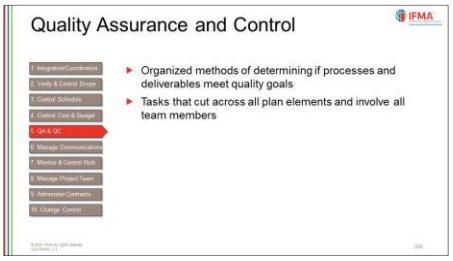
Exhibit 4-20: Relocation Case Study — Controlling Relocation Project Costs

Frank Jones knows that the budget for the project is important even though it is not a top priority. The budget variance after additional staff and material changes due to the earthquake is approved as the new project budget. The new budget enables Jones to detect further variances.



Quality Assurance and Quality Control



Quality assurance and quality control are organized methods of determining whether processes and deliverables meet specified quality goals within the specified time, scope and budget. They are tasks that cut across all other plan elements and involve all team members. The definitions of quality assurance and quality control and the related activities are outlined in *Exhibit 4-21*.

Exhibit 4-21: Quality Assurance vs. Quality Control

	Definition	Activities
Quality assurance (QA)	• Process-oriented set of tools and techniques to monitor and control a project's processes with the goal of ensuring the project will meet its objectives • Verifies the right tasks are being done • Implements process	• Verifying an effective plan and process is in place from the start to minimize later issues • Monitoring processes to identify and prevent potential problems • Performing quality audits

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	Definition	Activities
	improvements based on the results of quality control measurement and analysis	• Creating and using process checklists • Requiring process changes as necessary
Quality control (QC)	• Product-oriented set of measurement and analysis tools used to monitor project results and deliverables • Determines if results and deliverables comply with quality standards and seeks to discover the root causes of quality issues • Ongoing task throughout a project	• Testing and inspecting intermediate and final deliverables • Comparing shop drawings to original specifications to ensure compliance with intended quality and design intent • Analyzing project results, such as schedule and budget performance • Requiring defect repairs as necessary

To help understand the difference between QA and QC, remember that QA emphasizes prevention while QC emphasizes inspection.

- **Prevention** — detection and removal of process flaws during execution
- **Inspection** — detection and removal of flaws in deliverables at key milestones or completion

Resolving defects through prevention is more cost-effective than through inspection. Inspection is usually necessary on a project while prevention is used in part to reduce the costs of inspection.

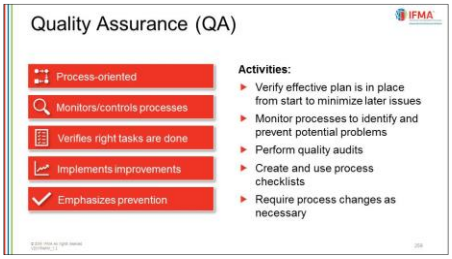
Sources of QC testing and inspection measurements include:

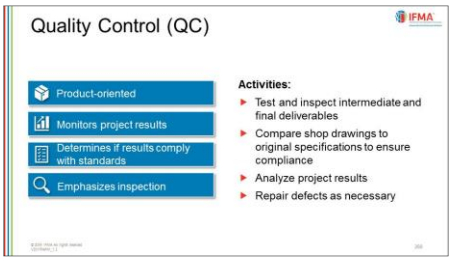
- Acceptance tests from specifications/SOWs in work packages and contracts
- Measurements specified in quality standards, metrics and checklists listed in the project management plan

When preparing to perform QA or QC, the project manager, QA or QC person or team member may review:

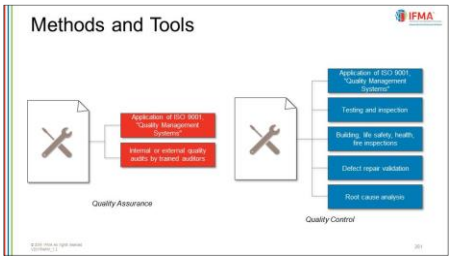
- Approved quality metrics and checklists
- The quality management plan

- Feedback from prior quality processes
- Approved actions and changes
- Defect repairs





Methods and Tools



Methods and tools for QA and QC include use of international quality standards. For example, ISO 9000, is a broad family of quality standards that can be applied to QA and QC.

It includes procedures for:

- Monitoring processes for effectiveness
- Record keeping
- Continual improvement
- Testing and inspection of deliverables for defects
- Taking corrective action
- Analysis of the quality system itself

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Quality audits are used for QA and:

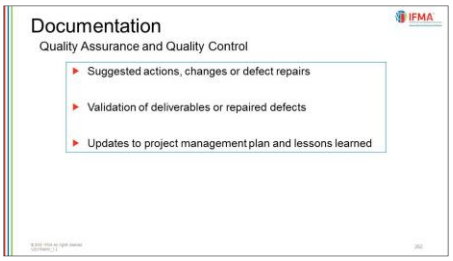
- Are independent reviews conducted at scheduled or random intervals by a trained internal or external auditor.
- Determine policy, procedure or process compliance, such as determining whether the change control process is being followed.

Methods and tools for QC may include the items outlined in *Exhibit 4-22*.

Exhibit 4-22: Methods and Tools for QC

Method/Tool	Description
Testing and inspection	Measurements performed on deliverables to detect and remove errors before: • Deliverables are forwarded to the next project process. • Final deliverables are approved and handed over to project sponsors/owners.
Building, life safety, health, fire inspections	• Inspections for compliance with relevant codes are a key quality control task for projects involving design and construction activities. • Site visits ensure that material and equipment are provided and installed per the specifications in the construction documents.
Defect repair validation	• After reported deliverable defects have been repaired, the deliverable is tested by a QC inspector. • Original tests are repeated, and a certain number of experiments may be required, such as attempts to get the defect to reappear.
Root cause analysis	Applies a number of quality tools to seek the basic underlying cause of defects or variances.

Documentation



Documentation for QA and QC may include the items outlined in *Exhibit 4-23*.

Exhibit 4-23: Documentation for QA and QC

Documentation	Description
Suggested actions, changes or defect repairs	Detected quality issues are documented and corrective actions undertaken via the change control process.
Validation of deliverables or repaired defects	Validation reports are retained for project/contract closure and as a potential legal defense.
Updates to the project management plan and lessons learned	• Testing may reveal weaknesses or actions that can be corrected in the quality plans • Changes to other areas could include schedule changes for additional testing • Completed checklists and test results are retained for lessons learned and emphasis is placed on root causes and the effectiveness of actions

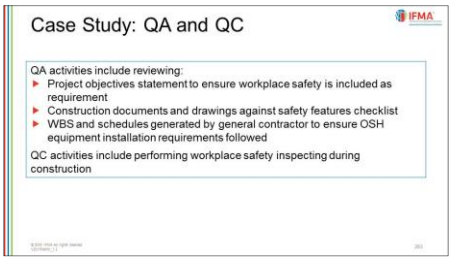
Exhibit 4-24 continues the relocation case study.

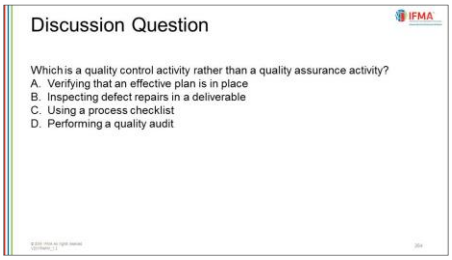
Exhibit 4-24: Relocation Case Study — Relocation Project Quality Assurance and Quality Control

The relocation project team performs QA and QC in many areas. QA activities include reviewing the:

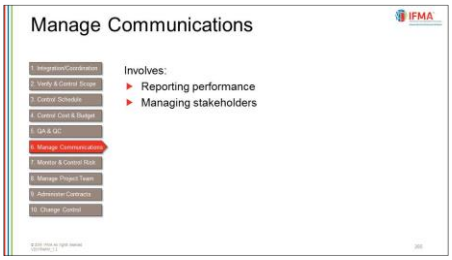
- Project objectives statement to ensure that contractors include workplace safety as a requirement for the area of occupational safety and health (OSH).
- Construction documents and drawings against a checklist of safety features.
- WBS and schedules generated by the general contractor to ensure that all OSH equipment installation requirements are followed.

Quality control activities include performing workplace safety inspecting during construction.





Manage Communications



Managing communications consumes a great deal of the project manager's time, but it is what:

- Holds the team together
- Ensures clarity/understanding
- Delivers control in the process
- Gives other stakeholders critical information throughout the life of the project
- Gives stakeholders a chance to give the project manager valuable feedback

Successful projects and project managers have clear communication plans with various stakeholders throughout the project. Most stakeholders just want to know what is going on and be kept informed. When that is done on regular basis, it builds trust and provides a regular forum for sharing good and bad information. If there is a problem, regular communications can manage the problem and expectations too.

During the Execute, Monitor and Control phases, managing communications involves reporting performance and managing stakeholders.

Reporting Performance

Reporting performance involves:

- Collecting performance data from team members responsible for each of the plan elements
- Analyzing the data
- Arranging the information to suit the purpose and audience
- Presenting the relevant reports to stakeholders

Performance reports measure progress relative to the project management plan and primarily focus on scope, schedule, budget and quality.

Performance reports include the following:

- Status reports differentiated by their purpose:
  - Current period reports that track detailed progress on tasks since the last meeting
  - Cumulative reports that present trends and forecasts
  - Exception or variance reports that provide timely and succinct information for corrective action
- Aggregated or detailed team and contractor performance reports
- Senior management reports that summarize status at a high-level along with proposed plans for problem resolutions
- Financial reports that summarize financing, budgets or cost controls

Reports are control tools. Increasing the frequency of reports increases the number of control points and reduces project risk. Report frequency is balanced against the cost of reports in terms of time needed by team members to prepare and explain/present the reports. Therefore, some reports are regularly scheduled while others are prepared only as requested.

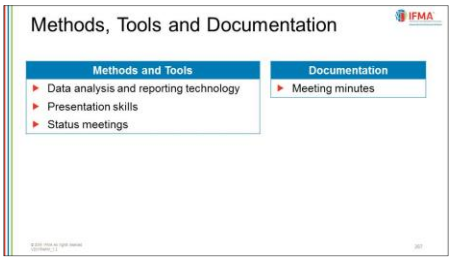
Methods and Tools

Methods and tools for reporting performance may include the items outlined in *Exhibit 4-25*.

Exhibit 4-25: Methods and Tools for Reporting Performance

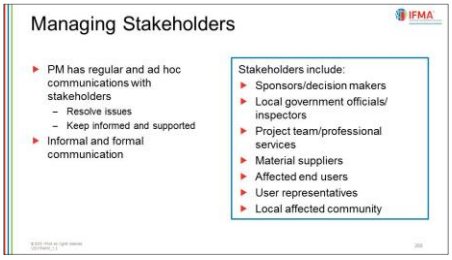
Method/Tool	Description
Data analysis and reporting technology	• Technology can reduce the time required for workers to gather and report data on their activities • Online project management tools can allow remote team members to share information and hold virtual meetings
Presentation skills	• Include setting priorities, such as beginning and ending meetings with the key information that needs to be absorbed • If reports are specialized, such as financial reports, the expert representative for that specialized area presents that report
Status meetings	• Include information on project changes, the status of issues from the prior meeting and new issues • If weekly status meetings are held for project teams, they are ideally on the same day each week • Usually held less frequently for other stakeholders, for example, by milestone

Documentation



Documentation for reporting performance may include meeting minutes, which are reports summarizing meetings that are distributed to attendees and team members who have a representative at the meeting.

Managing Stakeholders



Managing stakeholders is a task for the project manager that involves regular and ad hoc communications with project stakeholders to resolve issues and ensure they feel informed and supported.

Stakeholders include:

- Project sponsors and decision makers, such as senior executives or clients
- Local government officials/inspectors
- Project team and professional services
- Material suppliers
- Affected end users
- User representatives, such as unions and employee welfare representatives
- Local community affected by the project.

Project managers need to communicate with stakeholders both formally and informally to ensure that their concerns are being addressed. They may need to use a variety of leadership and management skills, such as conflict resolution between two or more stakeholders or stakeholder groups.

Stakeholder management is a form of team building. Stakeholders who feel involved are more likely to have project buy-in.

Involved stakeholders are:

- Less likely to disrupt the project
- More likely to accept the final product or service
- In a better position to understand changes or problems as they arise

When preparing to manage stakeholders, project managers review the communications management plan to ensure that no stakeholders are omitted and that the appropriate content and communication styles/media are used.

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Methods and Tools

Methods and tools for managing stakeholders may include the items outlined in *Exhibit 4-26*.

Exhibit 4-26: Methods and Tools for Managing Stakeholders

Method/Tool	Description
Leadership and influence	Guide stakeholders to support the project's purpose and avoid being counterproductive
Stakeholder team building	To develop a sense of teamwork for stakeholders outside of the project team, the project manager conducts in-person meetings such as kickoff meetings, milestone reviews and deliverable acceptance meetings
Communications	• Project managers review their intended communications and media to ensure that the message is at the appropriate level of formality and is clear and concise • Stakeholder replies are summarized to confirm that both parties understand each other
Issue logs	• Can be generated for stakeholders in the same manner as for teams • Assign an owner and a target date for resolution • Help stakeholders see that their issues are being taken seriously • Allow stakeholders to track progress on resolutions

Documentation

Documentation for managing stakeholders may include the items outlined in *Exhibit 4-27*.

Exhibit 4-27: Documentation for Managing Stakeholders

Documentation	Description
Stakeholder reports	Project managers send stakeholders reports on project status and resolution of issues they raised or changes they suggested
Updates to issue logs	Issues may be resolved, or new issues added

Documentation	Description
Updates to project management plan and lessons learned	• Approved changes to communications management require plan updates • Successful or failed methods are tracked as lessons learned

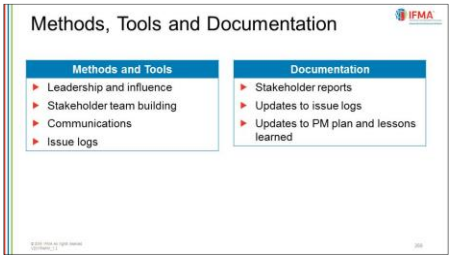

Exhibit 4-28 continues the relocation case study.

Exhibit 4-28: Relocation Case Study — Managing Communications for Relocation Project

The relocation newsletter includes a message from the president praising the team's additional planning efforts that allowed contractors to successfully complete construction on schedule despite the earthquake. The newsletter informs them that the outdoor patio and shower room will be completed after the move.

During the move, department coordinators provide critical word-of-mouth communications to their departments on how to move. In addition, they hand out maps and answer questions about transportation, parking, food service, business cards and building policies and procedures.

After the move, the president holds a company meeting to announce the success of the move and Frank Jones makes an announcement regarding when movers, furniture installers or furniture repair will be available for repairs or changes.

Consider the following question:

- Can you think of any other types of communications that should be considered here?

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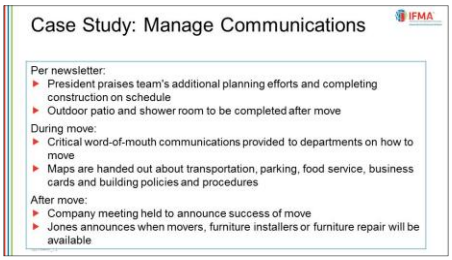
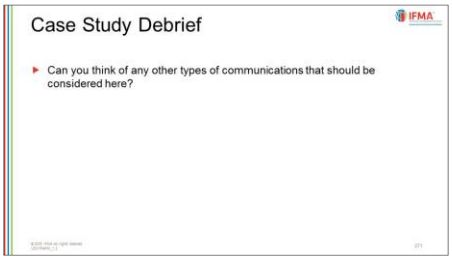
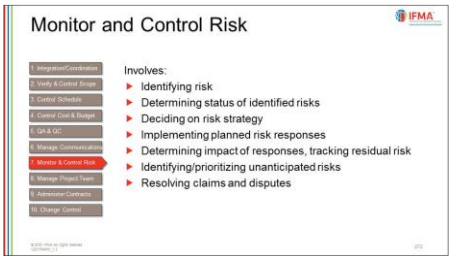




Monitor and Control Risk



Monitoring and controlling risk involves:

- Identifying risk
- Determining the status of identified risks
- Deciding on a risk strategy, such as, avoid, accept, transfer or mitigate
- Implementing planned risk responses
- Determining the impact of responses and tracking residual risk
- Identifying and prioritizing unanticipated risks
- Resolving claims and disputes

Risk management activities during the Execute, Monitor and Control phases involve monitoring risk and controlling risk.

Monitor Risk

Monitoring risk involves:

- Watching for leading indicators and red flags of known risks
- Identifying new risks or risks that are increasing or decreasing in likelihood

It is a process that occurs continuously throughout the project after the risk management plans are in place.

The risk owner or team member assigned responsibility for a given set of risks reviews the risk management plan, risk register, approved changes and performance reports to determine whether:

- Risks have changed in their likelihood or severity.
- Risk policies and procedures are being practiced.
- Project assumptions or constraints have changed.
- Contingency reserves of funds or schedule time will be adequate to respond to new or escalating risks.

Methods and Tools

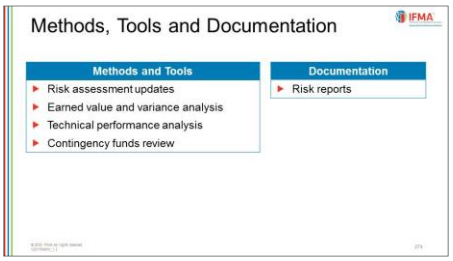
Methods and tools for monitoring risk may include the items outlined in *Exhibit 4-29*.

Exhibit 4-29: Methods and Tools for Monitoring Risk

Method/Tool	Description
Risk assessment updates	A midproject risk identification meeting or other risk identification process may be held to brainstorm new risks and provide status updates for previously-identified risks
Earned value and variance analysis	• Variances from the project management plan indicate whether risks are increasing or decreasing in likelihood or severity • Risk owners treat the earliest point at which a variance begins to appear as a critical period

Method/Tool	Description
	• A response may be ineffective once a variance has grown
Technical performance analysis	Risk owners evaluate technical project achievements at a high-level, combining analyses of time, cost and quality to determine if the scope and purpose are likely to be achieved
Contingency funds review	Risk owners monitor the risk budget and forecast adequacy of remaining funds

Documentation



Documentation for monitoring risk may include risk reports. Risk reports are provided to customers or executives to summarize the risks for the current period and propose responses.

Control Risk

Controlling risk involves:

- Understanding the nature of the risk
- Implementing planned risk responses
- Devising and implementing responses to unanticipated risks
- Assessing the effectiveness of risk responses both during their execution to make corrections as feasible and after their completion to update “lessons learned” documents

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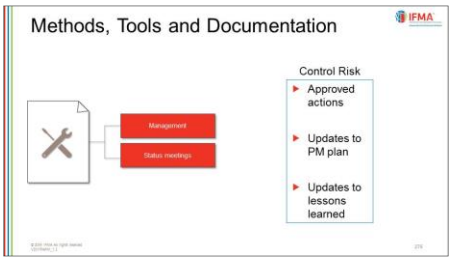
Methods and Tools



Methods and tools for controlling risk may include the items outlined in *Exhibit 4-30*.

Exhibit 4-30: Methods and Tools for Controlling Risk

Method/Tool	Description
Management	Project managers monitor the decisions of risk owners and ensure they conform to the project's risk tolerance levels
Status meetings	Risk events and risk responses can be items for discussion and deadline/responsibility assignment in status meetings

Documentation

Documentation for controlling risk may include the items outlined in *Exhibit 4-31*.

Exhibit 4-31: Documentation for Controlling Risk

Documentation	Description
Approved actions	The recommendations from new risk identification tasks, if approved, may require urgent preventive or corrective action
Updates to project management plan	• Approved changes may require plan element changes • Risk register is a key element to update - In addition to updating or adding items, risks that no longer apply are closed and risk events and responses are recorded
Updates to lessons learned	Risk owners evaluate the impact of risk events that occurred along with the effectiveness of responses

Exhibit 4-32 continues the relocation case study.

Exhibit 4-32: Relocation Case Study — Monitoring and Controlling Risks on Relocation Project

At a project meeting, the FM staff reports a conflict with Design and Space Planning Liaison, Wanda Rodriquez, regarding their task to install voice and data lines. The cabling was originally supposed to be cut in to run under the concrete floors, but to meet the construction schedule this was replaced by running cabling through the drop ceiling with poles to run the cabling to the cubicles. Rodriquez feels that this creates a risk of ruining the aesthetics of the space. Frank Jones's risk response is to develop a compromise after consulting with the construction project manager, who can install floor cabling ducts in a few key areas and still make the schedule.

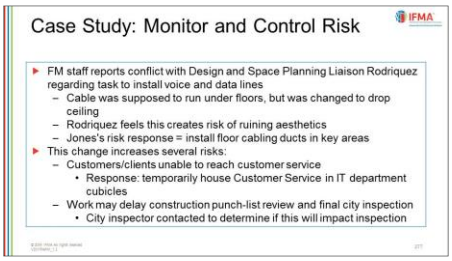
Relocation Coordinator, Sarah Wu, is the primary risk owner for the relocation. She holds a risk identification meeting in which the team follows a process of risk identification followed by asking the team to assess likelihood, impact and consequences.

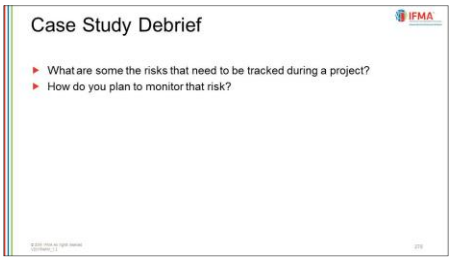
The team concludes that the last-minute work on installing floor cabling ducts increases several risks:

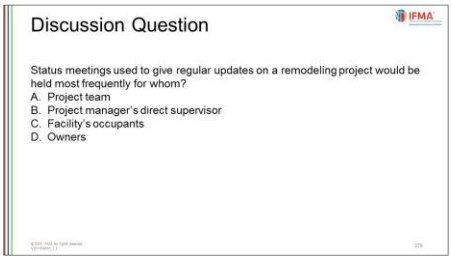
- External customers and clients may not be able to contact customer service immediately after the move because this is where the ducts are being installed. The planned risk response is to temporarily house the Customer Service Department in the IT department cubicles if needed.
- The work may delay the construction punch-list review and final city inspection, which could in turn delay obtaining the certificate of occupancy. The risk is considered low because the contractor assures the team that the work will be completed on schedule, so the only action taken is that Wu contacts the city inspector to determine whether the ongoing work would impact the inspection or issuance of the certificate of occupancy.

Consider the following questions:

- What are some the risks that need to be tracked during a project?
- How do you plan to monitor that risk?







Manage Project Team

Many FM projects will have small project teams consisting of professional staff or contractors with extensive project experience. The project manager's role in these situations is more as a problem solver than as a controller. Project managers assign work packages and clearly explain expected results, and thereafter, allow the team to function effectively without interference other than results monitoring.

When teams consist of many new hires or previously unused contractors, the project manager may need to engage in management and team-building activities to get the team working in the same direction.

Project team management may involve:

- Observing team and individual behavior
- Verifying completion of tasks or deliverables
- Providing appropriate encouragement and feedback
- Resolving conflicts or performance problems promptly
- Making project team changes to maintain or optimize performance

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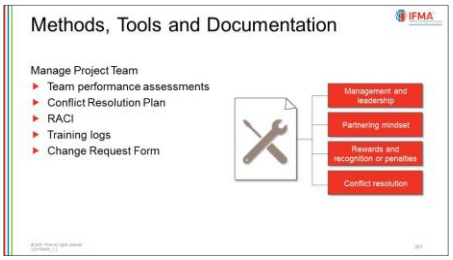
- Conducting periodic performance assessments/reviews
- Redirecting work in response to current performance output
- Integrating/coordinating the work of contractors
- Providing training as necessary and feasible

Methods and Tools



Methods and tools for managing a project team may include the items outlined in *Exhibit 4-33*.

Exhibit 4-33: Methods and Tools for Managing a Project Team

Method/Tool	Description
Management and leadership	Project managers: • Monitor progress and influence staff and contractors to correct their own course as needed • Enforce strict adherence to contract SOWs
Partnering mindset	Project managers: • Treat staff and contractors as partners who share a common commitment to success • Apply a win-win philosophy and continually evaluate and reaffirm mutual objectives
Rewards and recognition or penalties	To reinforce desired behavior, project managers use rewards, such as a bonus and recognition, such as praise, constructively: • Individual recognition can be announced to the team, but individual rewards are kept private to avoid a negative effect • Team rewards are preferred to individual rewards because they foster cohesiveness • Rewards and recognition are always linked to elements under the control of the person or team receiving the reward/recognition

Method/Tool	Description
	Penalties include: • Formal documentation of issues or removal from the project • Financial penalties Note that application of contractual rewards/penalties is an administration task
Conflict resolution	Project managers: • Prevent conflicts by proactively defining roles, communicating frequently and setting the tone for expected behavior • Develop an informal conflict resolution process that stresses timely response • Follow a formal conflict resolution process for issues that cannot be informally resolved

Documentation

Documentation	Description
Team performance assessments	• Peer-to-Peer appraisals • Evaluations
Conflict Resolution Plan	Strategies to be used to resolve conflict: • Avoid • Compromise • Collaborate
RACI	Matrix that delineates • Responsibility • Accountability • Consulted • Informed Usually decided on collaboratively and then used as a follow up tool throughout the project
Training logs	Used to identify training needs which may come out of the assessments

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Documentation	Description
Change Request Form	May be generated if a team member needs to be switched out or can no longer perform their duties

Exhibit 4-34 continues the relocation case study.

Exhibit 4-34: Relocation Case Study — Relocation Project Team Management

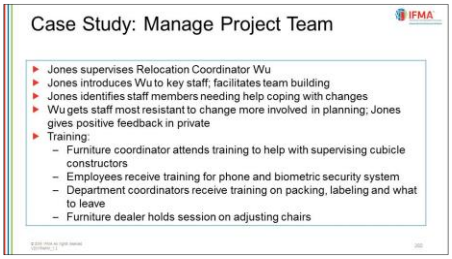
Frank Jones supervises the Relocation Coordinator, Sarah Wu, and personally introduces her to key staff, advertising both her and their accomplishments to facilitate team building. He points out staff members who need additional help coping with relocation changes. Jones notes Wu is making an effort to get staff most resistant to change more involved in relocation planning. Realizing that publicly acknowledging these efforts could undermine the trust she is building with these sensitive individuals; Jones gives Wu positive feedback in private.

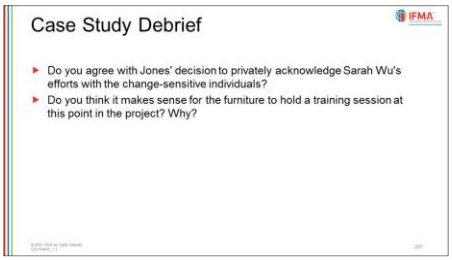
While the construction work is under way, Jones sends the project's furniture coordinator to a training session at the cubicle contractor's site to help this employee supervise the work of cubicle constructors.

Just prior to the move, all employees receive training for the telephone system and the new biometric security system. Department coordinators receive training on packing, labeling and what to leave behind. Also, a furniture dealer holds a session on how to adjust office chairs.

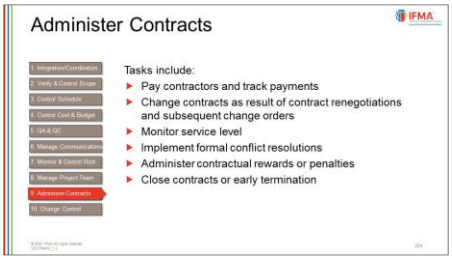
Consider the following questions:

- Do you agree with Frank Jones' decision to privately acknowledge Sarah Wu's efforts with the change-sensitive individuals? Why?
- Do you think it makes sense for the furniture dealer to hold a training session at this point in the project? Why?





Administer Contracts



Project managers administer contracts for all manner of contracted resources, including:

- Contracted team members
- Supplied materials
- Contracted professional services

For the project manager, this is a partnering process. The project manager communicates to contracted resources that beyond the contract itself is an implied covenant of good faith. This means both parties need to commit to open communications and build trust if the relationship is to succeed. Succeeding at these elements allows potential problems to be resolved informally before needing to resort to agreed-upon conflict resolution procedures.

Contract administration for a designated contract administrator consists of the following tasks:

- Paying contractors and providing sufficient detail to account for the value of payments made

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- Changing contracts as the result of contract renegotiations and subsequent change orders
- Monitoring service level
- Implementing formal conflict resolutions
- Administering contractual rewards or penalties
- Closing contracts or early termination

Some of the benefits of properly administering contracts include:

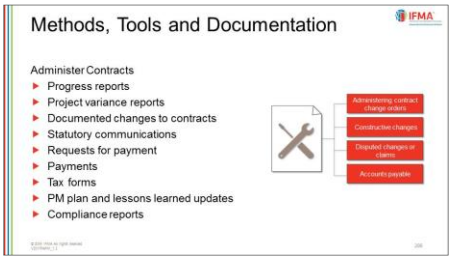
- Any special requirements are verified
- Contractors are oriented to the purpose of the project, criteria used to judge their performance and project plan
- Contractors are given periodic feedback
- The appropriate level of oversight is maintained
- On-site inspections occur as needed
- Project team meetings occur as needed
- Timely corrective action is taken when work does not meet specifications, tasks are not done according to plan or timelines are not met
- Project status is reported according to plan

As there are two sides to any contract, contract administration is a task shared by both the designated contract administrator and contracted resource. When administering contracts, the contract administrator consults with the legal department to understand the legal implications of administrative actions performed on a contract.

The contract administrator prepares to administer a contract by reviewing:

- The SOW and contract details
- The project management plan
- Any data from prior projects using the contractor
- Approved contract changes

Methods and Tools



Methods and tools for contract administration may include the items outlined in *Exhibit 4-35*.

Exhibit 4-35: Methods and Tools for Contract Administration

Method/Tool	Description
Administering contract change orders or renegotiations	• Contract administrators make required changes to contracts after the changes have been cleared by the legal department and both parties sign off on the changes • Changes can be constructive or disputed
Constructive changes	• Changes at least one party feels are needed • If both parties agree the change is constructive, the contract administrator changes the contract
Disputed changes or claims	• Arise when at least one party feels that a change is not constructive or necessary • Problems can arise in the pricing of changes or if the contractor feels that additional work requested is outside the contract but the buyer disagrees • Parties meet to informally resolve the problem or resort to arbitration or litigation as stipulated in the contract
Accounts payable	• Payments to contractors are approved and documented in compliance with contractual payment terms • Payments linked to progress are released after documentation verifies the work

Documentation

Documentation for contract administration may include the items outlined in *Exhibit 4-36*.

Exhibit 4-36: Documentation for Contract Administration

Documentation	Description
Progress reports	Contractors make regular reports on their progress.
Project variance reports	Variances between promised and actual deliverables, costs and deadlines are recorded.
Documented changes to contracts	Approvals for changes are documented and contract changes are communicated to affected parties.

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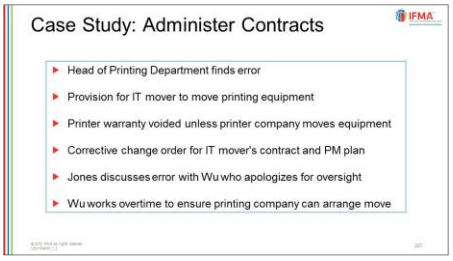
Documentation	Description
Statutory communications	Contract administrators issue contractually required communications, for example, a notice of failure to perform.
Requests for payment	Contractor requests for payment are reviewed, approved and processed.
Payments	Payment records include dates and amounts of payments made and a schedule of pending payments.
Tax forms	Year-end tax forms, if applicable, are sent to contractors and the government as required.
Project management plan and lessons learned updates	Contract changes may require updates to the project management plan or archives.
Compliance reports	Compliance with standards, laws and regulations are documented. For example, environmental reports.

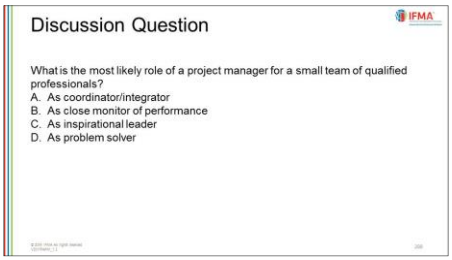
Exhibit 4-37 continues the relocation case study.

Exhibit 4-37: Relocation Case Study — Relocation Project Contract Administration

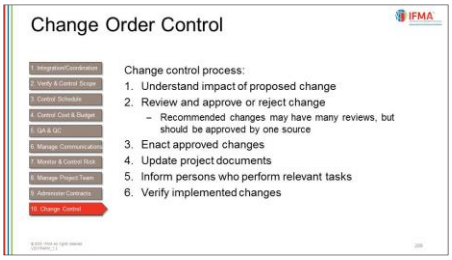
When department heads are attending a project meeting, the head of the Printing Department finds an error. Plans include a provision for the IT mover to move the company's professional printing equipment. The department head points out that the printer warranty will be void unless the printer company moves the special equipment themselves.

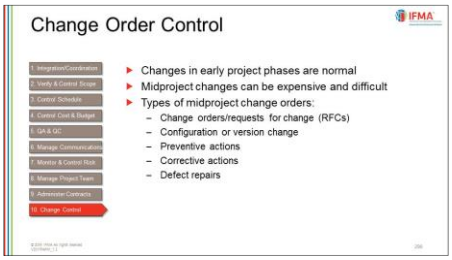
Frank Jones initiates a corrective change order for the IT mover's contract and the project management plan. Jones has a discussion with Wu regarding the error and she apologizes for the oversight. She works overtime, at no charge, to ensure that the printing press company can arrange the move at the proper point in the schedule.





Change Order Control





Change order control, also called the change order process or variations control, is a standardized method for regulating project changes to ensure:

- The impact of proposed changes is understood.
- Changes are reviewed and approved/rejected.
- Only approved changes are enacted.
- The project objectives statement, project management plan and final deliverable documentation are updated.
- Persons responsible for performing relevant tasks are informed of changes.
- Implemented changes are verified.

Recommended changes are channeled through reviewers and approved by one source alone and the approval process is clearly communicated to all parties. The review/approval source could be the project manager, the facility manager, an executive or a change control board. Other stakeholders, such as the customer, design firm or general contractor, are usually designated to consult with the approver. The danger of having customers as the

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change decision makers is that, unlike facility managers or project managers, they may not have the expertise or perspective to foresee how a change affects the scope.

The change control process includes a standardized way to communicate changes to affected parties so they can be understood and incorporated into routine work as opposed to continually making changes in an emergency atmosphere.

Change control is an element of the project management plan that is implemented throughout the project. Changes during the Initiate and Plan phases are normal parts of progressive plan elaboration, but project managers minimize changes in later phases. Midproject change is minimized by approving only changes that increase alignment with the project's purpose and success criteria.

Types of midproject change include the following:

- **Change orders/requests for change (RFCs)** — used for changes that affect the project scope and revise the project management plan. Typical reasons for scope changes include:
  - Owner revisions
  - Alternative materials
  - Unforeseen field conditions
  - Document errors or omissions
  - Regulatory changes
  - System clashes/conflicts
- **Configuration or version change** — a proposal may be made to alter configurable options or upgrade to a new version of a software package
- **Preventive actions** — risk responses that are recommended to mitigate perceived project risks that were not initially discovered in risk management
- **Corrective actions** — suggested course corrections to return the project to the path defined in the project management plan
- **Defect repairs** — quality management may discover defects in materials, processes or deliverables. Completed defect repairs are validated

The rationale for limiting midproject changes is that, over time, the ability to make a change efficiently and effectively decreases, while the cost of the change increases, as shown in *Exhibit 4-38*.

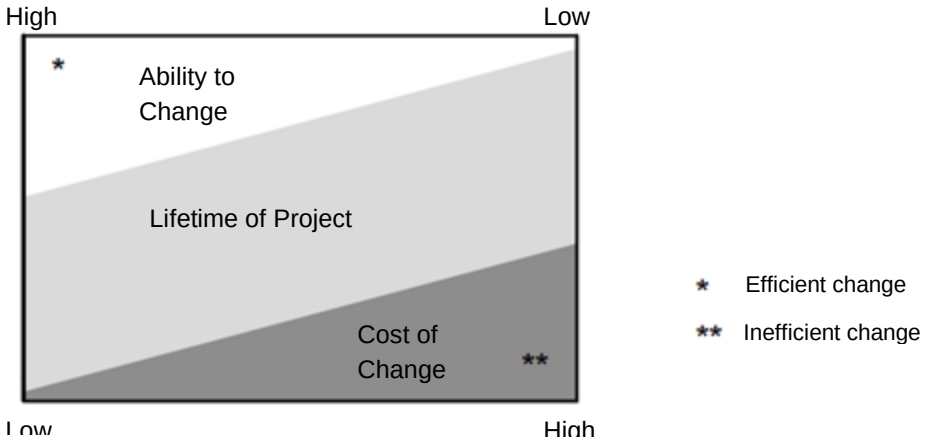
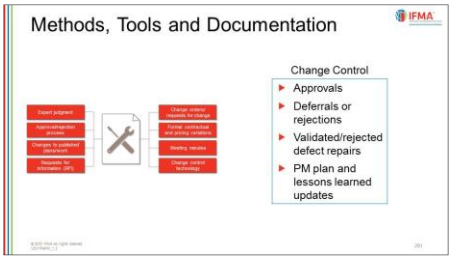


Exhibit 4-38: Lifetime Cost versus Cost of Change/Ability to Influence

Project managers decide the best point in a project to implement approved actions/changes and use integration/coordination skills to ensure all affected plan elements are updated. For actions/changes that are truly emergencies, project managers may create an emergency path to bypass the standard change proposal and approval process. The project manager may need to audit the emergency process to ensure that the system is being used properly.

Methods and Tools



Methods and tools for the change order control may include the items outlined in *Exhibit 4-39*.

Exhibit 4-39: Methods and Tools for Change Order Control

Method/Tool	Description
Expert judgment	Applied by project managers based on: • Project priorities • Experience from prior projects and formal training when designing a change process • Evaluating the impact of changes

Method/Tool	Description
Approval/rejection process	Project managers ensure suggestions are neither forgotten nor implemented without consideration and approval
Changes to published plans/work	Project managers ensure: • Approved actions/changes are translated into plan changes through plan republication or addenda • Changes are implemented in schedules or work in process
Requests for information (RFI)	In a change control context, are requests from staff/contractors for clarification/interpretation of SOWs
Change orders/requests for change (RFCs)	Staff/contractors can issue change orders/RFCs to recommend a change to plans or SOWs
Formal contractual and pricing variations	Clauses may exist in approved contracts and SOWs that specify conditions that would trigger a formal contractual or pricing variation
Meeting minutes	Change control decisions are often made in meetings and the meeting minutes are retained to show how decisions were made
Change control technology	Project management software may contain automated change control tools

Documentation

Documentation for the change order control may include the items outlined in *Exhibit 4-40*.

Exhibit 4-40: Documentation for Change Order Control

Documentation	Description
Approvals	• The approval process and specific roles are communicated to all parties • Approved actions/changes are documented with the appropriate signatures, including approval and receipt of approved changes by team members responsible for their implementation
Deferrals or rejections	Rejected actions/changes and the reason given for their rejection are tracked to ensure they are not being implemented, for lessons learned or for possible implementation in a follow-up project

Documentation	Description
Validated/rejected defect repairs	The acceptance or rejection of defect repairs is recorded for project acceptance and legal defense purposes
Updates to the project management plan and lessons learned	Changes to plan elements and the relative success of change control are recorded

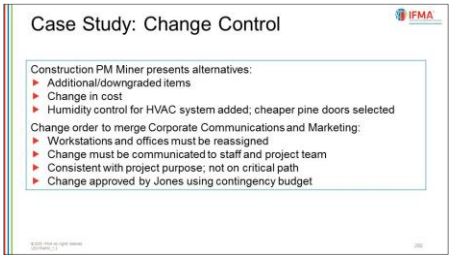
Exhibit 4-41 continues the relocation case study.

Exhibit 4-41: Relocation Case Study — Change Order Management in Relocation Project

Construction Project Manager John Miner presents alternatives to Frank Jones. The alternatives list items that could be added or downgraded and show change in cost. Jones's team adds humidity control for the HVAC system but selects cheaper pine doors to offset the increase.

For the relocation, an example of a change order was the decision to merge the Corporate Communications and Marketing departments. This will require reassigning workstations and offices on a portion of the third floor. Additionally, these changes will need to be communicated to the staff and project team. The change is consistent with the project's purpose and is not on the critical path, so Jones approves the change using some of the contingency budget.

After the earthquake and resulting schedule/budget disruption, Jones consults with Miner, who suggests some changes. Jones initiates a change order to reduce the scope of construction work. The organization's internal cost estimator assesses the impact of the changes in a planning meeting, and senior management reviews the change request. After receiving their approval, Jones and Miner both sign the change order approval.



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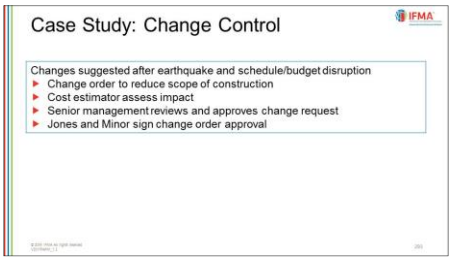

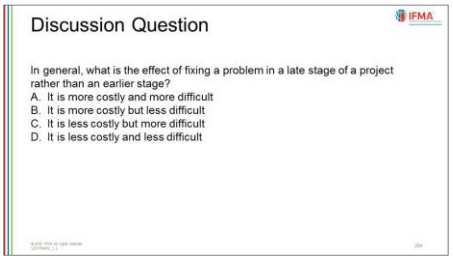

Progress Check Questions

1. Which statement is true of acquiring staff or contractors for a project?

   a. Staff/contractor specifications are always finalized before acquiring the staff/contractors.
   b. Lead time refers to the ability of a candidate for a position or contract to be ready to start when needed.
   c. If a project manager needs a staff member from a different department, the department head has the final say in the assignment.
   d. Availability is the delay between when materials or services are requested and when they are on hand at the right time and place.

2. Which of the following is a method of acquiring contracted resources for a project that tends to find the best available market price so that the project goals can be achieved at the lowest cost?

   a. Direct negotiation
   b. Open tender or open bidding
   c. Hiring
   d. Preselecting contracted resources

3. What is requiring proposals to include high bid, performance, or payment bonds a form of?

   a. Indemnification.
   b. Preselecting.
   c. Direct negotiation.
   d. Prequalifying.

4. What is a way to explain a tender/bid to improve the quality of proposals received?

   a. Bidder meetings
   b. Selection criteria
   c. Bidder presentations
   d. Requests for information

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5. What is a standard component of AIA Document 305 that pertains to the SOW?

   a. RFP addenda
   b. Statement of qualifications
   c. Selection process
   d. Letter of intent

6. What tool can the project manager use to determine if the project is likely to stay on budget and on schedule?

   a. Change order submissions
   b. Root cause analysis
   c. Interface development
   d. Earned value analysis

7. What is considered a process-oriented set of tools and techniques?

   a. Quality assurance
   b. Quality control
   c. Both quality assurance and quality control
   d. Neither quality assurance nor quality control

8. What is the most cost-effective method of resolving defects in deliverables?

   a. Inspection
   b. Transfer
   c. Prevention
   d. Mitigation

9. When a project has a designated contract administrator, which task would the project manager perform?

   a. Managing the partnering process
   b. Changing contracts as a result of a change order
   c. Implementing formal conflict resolutions
   d. Monitoring service level

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10. An owner suggests an alternative material be used in a project. What would this request involve?

    a. Change order.
    b. Corrective action.
    c. Preventive action.
    d. Defect repair.

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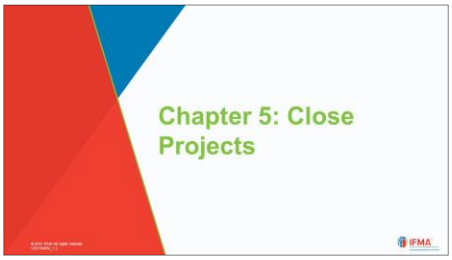
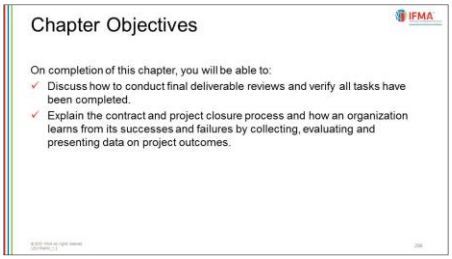
Chapter 5: Close Projects

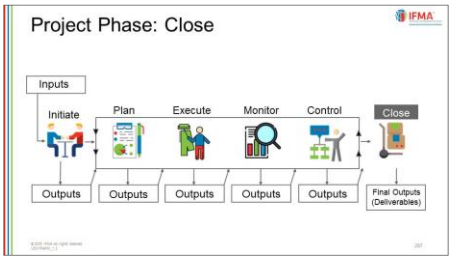
Chapter Introduction



On completion of this chapter, you will be able to:

- Discuss how to conduct final deliverable reviews and verify all tasks have been completed.
- Explain the contract and project closure process and how an organization learns from its successes and failures by collecting, evaluating and presenting data on project outcomes.





Lessons

- Accept Deliverables or Occupy Space
- Close Contracts and Project and Evaluate Outcomes

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Accept Deliverables or Occupy Space

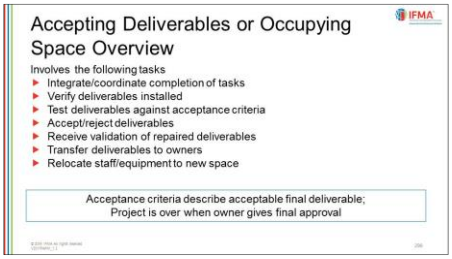
On completion of this lesson, you will be able to:

- Discuss how to conduct final deliverable reviews and verify all tasks have been completed.

This lesson contains the following topics:

- Accepting Deliverables or Occupying Space Overview
- Accepting Deliverables or Occupying Space Inputs
- Process and Outputs for Accepting Deliverables or Occupying Space

Accepting Deliverables or Occupying Space Overview



Accepting deliverables or occupying space is an integration/coordination task for project managers involving:

- Integrating/coordinating completion of all scheduled tasks
- Verifying all deliverables have been installed, if applicable
- Testing project deliverables against acceptance criteria
- Accepting or rejecting deliverables
- Receiving validation of repaired or corrected deliverables from quality control

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- Transferring the deliverables to owners or responsible parties, such as the facility management organization
- Relocating staff and equipment into new or renovated space

Accepting deliverables or occupying space involves formal review and acceptance of deliverables based on acceptance criteria. This is the portion of the project's success criteria and user requirements relating specifically to the features and quality expected in final deliverables.

Once formal acceptance takes place, the deliverables become the owner's responsibility. The owner is the executive/client who takes custody of the deliverable. Typically, the owner and project sponsor are the same person. For FM projects, the owner will usually put the facility manager in charge of operating and maintaining the deliverable. The asset or service program becomes the object of regular FM activities.

The owner determines when the project is done. If the project deliverables or services are not acceptable, then acceptance of deliverables or occupation of space may be delayed until correction and validation processes occur.

Correction and validation processes continue to occur until either the involved parties are satisfied, or the project is cancelled. An exception to this is when the deliverables are events, for example, conferences or conventions. Once the event occurs, the project ends whether or not the owner was satisfied.

Exhibit 5-1 shows the inputs, processes and outputs for accepting deliverables or occupying space.

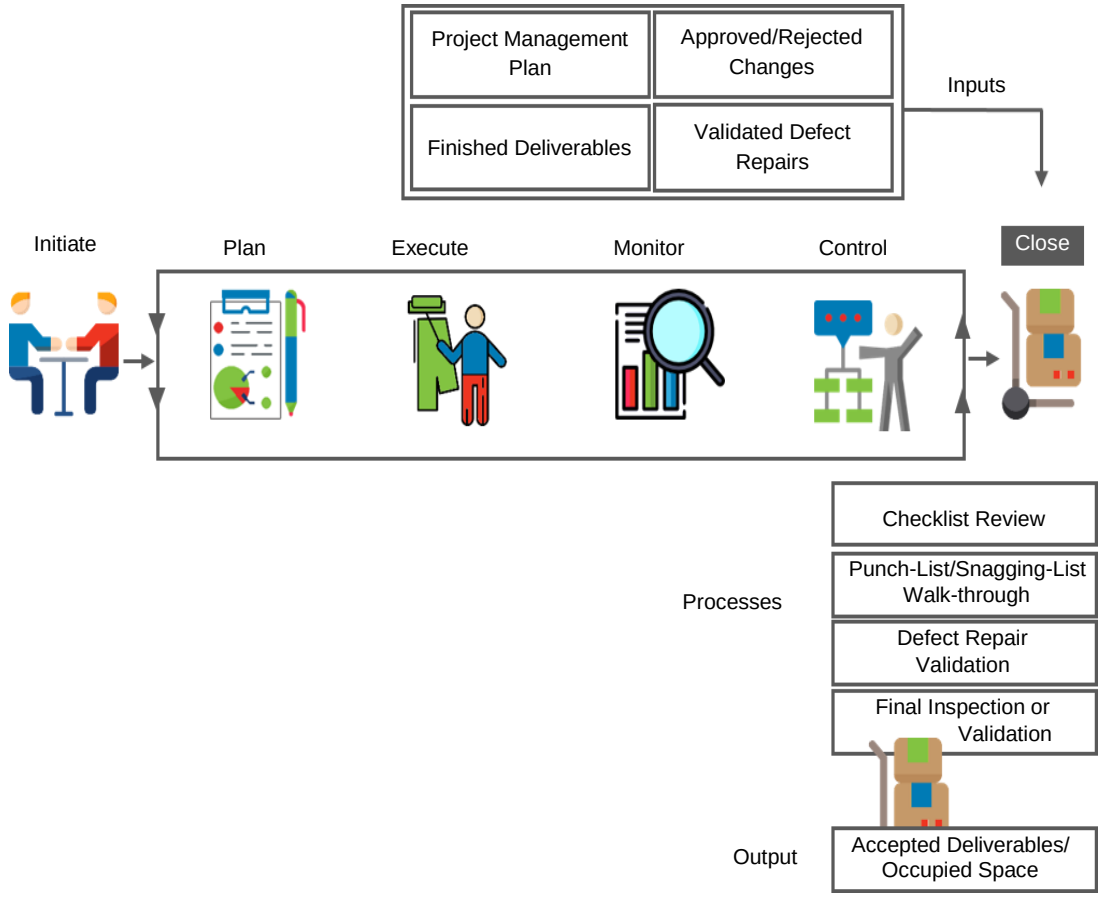
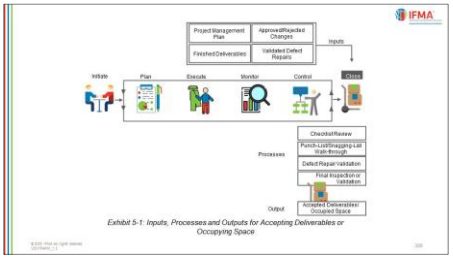


Exhibit 5-1: Inputs, Processes and Outputs for Accepting Deliverables or Occupying Space

Accepting Deliverables or Occupying Space Inputs



Outputs from prior activities become inputs for determining whether or not to accept deliverables or occupy space. As such, these inputs may include:

- The project management plan
- Approved/rejected changes

- Validated defect repairs
- Finished deliverables or substantial/practical completion

Project schedules include a checkpoint or milestone showing a deliverable's anticipated finish date/substantial completion.

Unanticipated successes/challenges could cause this date to vary, so project managers base these decisions on:

- Completion reports from persons responsible for doing the work.
- Completed process checklists from quality assurance.
- Testing and inspection and defect repair validation reports from quality control.

If all tasks/processes are reported complete and all known defects have been validated, the deliverable is ready for final review.

For design and construction projects, the project manager also informally reviews the site to ensure:

- Work appears complete
- The site is clean
- Contractor tools are removed

The project manager should not see incomplete work with the possible exception of areas prepared for owner-furnished items. For example, furniture, data cabling, security system.

Processes and Outputs for Accepting Deliverables or Occupying Space

The following processes and outputs are discussed in this topic:

- Checklist review
- Punch-list/snagging-list walk-through
- Defect repair and validation

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- Final inspection and validation
- Certificate of occupancy
- Commissioning
- Deliverable acceptance
- Occupying space

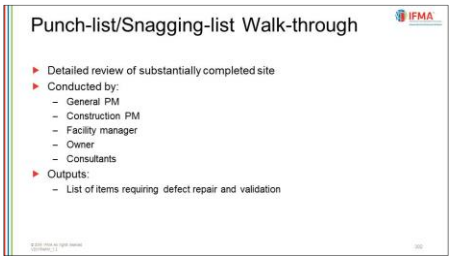
Checklist Review

Checklists are QC tools used for reviewing final deliverables from an entire system perspective. Prior to this point, the focus of testing, inspection, repair, and validation was for project components, such as work packages and tasks.

A system-wide checklist ensures:

- Deliverable(s) function as a complete system
- Nothing is missing
- Deliverable(s) satisfy project objectives and project success criteria/acceptance criteria

Punch-list/Snagging-list Walk-through



A punch-list or snagging-list walk-through is a detailed on-site review of a substantially completed construction site.

Participants in the walk-through include:

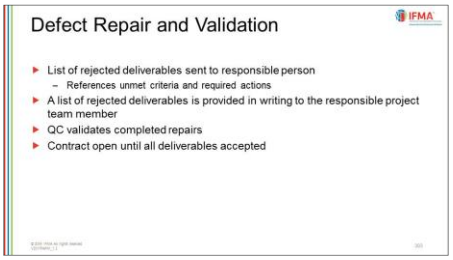
- General project manager

- Construction project manager
- Facility manager
- Owner
- Consultants

Contractors may be responsible only for rework listed on the punch list, so the walk-through review is thorough. Every door, water tap or other element is tested. Project managers avoid creating an adversarial relationship with contractors by showing some flexibility for minor flaws. In return, many contractors will repair some flaws found after the walk-through.

The output of a punch-list/snagging-list walk-through is a list of items requiring defect repair and validation.

Defect Repair and Validation



A list of rejected deliverables is provided in writing to the responsible project team members/professional services.

The list references the following:

- Unmet criteria in the specifications/SOWs
- Required corrective actions or defect repairs

Items listed for repair on punch lists are the responsibility of the construction project manager.

Once the project team member/professional service completes the repairs, the deliverables are validated by QC. Unless contracts are terminated, contracts remain open until all deliverables have been accepted and repairs have been validated.

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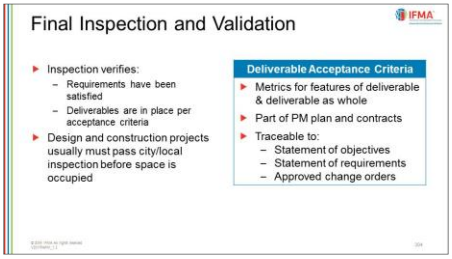
Final Inspection and Validation



A final inspection and validation or deliverable acceptance review verifies:

- All requirements have been satisfied.
- All deliverables are in place as measured by deliverable acceptance criteria.

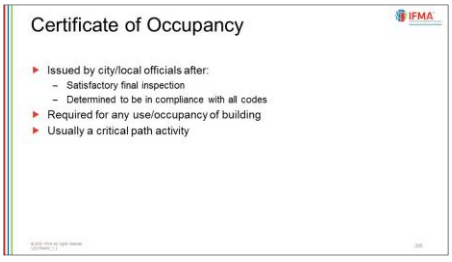
Acceptance criteria are metrics specified in the project management plan and contracts for each feature of the deliverables and deliverable as a whole.

The metrics are traceable back to the project's:

- Statement of objectives, including success criteria
- Statement of requirements
- Approved change orders

Design and construction projects usually require city or local officials to conduct a final inspection for building code compliance. If the review reveals any deficiencies, it is the owner's responsibility to make the required changes because the facility cannot be occupied until it passes this inspection.

Certificate of Occupancy



City or local officials issue a certificate of occupancy or certificate of satisfactory completion once a facility has passed its final inspection. It is determined to be in compliance with all building, life safety, health and fire codes. No occupancy or use is allowed until this certificate is granted. Obtaining this certificate is on a project's critical path.

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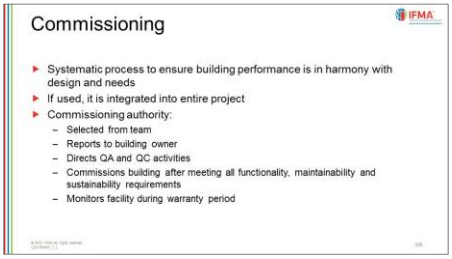
Some government units may provide a temporary occupancy permit to allow relocation or other activities to commence while final corrections are under way.

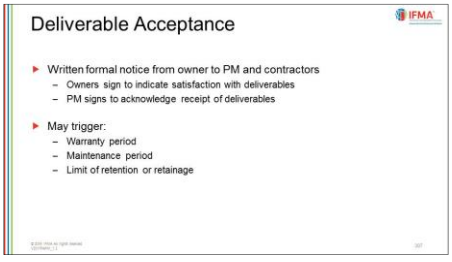
Commissioning



Commissioning, or building commissioning, is a systematic process to ensure building performance is in harmony with the intent of its design and the operational needs of its owner. If commissioning is used, it is integrated into every part of a project, from its definition and planning to its execution and control. The project will have a commissioning authority who is a team member who reports directly to the building owner and directs all QA and QC activities.

The commissioning authority is responsible for commissioning a facility once the facility meets all commissioning requirements for functionality, maintainability and sustainability. They continue to monitor the facility during the warranty period and possibly for an extended operations and maintenance period.

Deliverable Acceptance



Deliverable acceptance is a written formal notice to the project manager and contractors signed by the project manager and owners or executives:

- Indicating the owners are satisfied that all project deliverables meet user requirements and acceptance criteria.
- Acknowledging receipt of the deliverables by the responsible party.

When transferring deliverables to operations and maintenance or other parties, deliverable acceptance may include the following if the deliverables are replacing a system that is being retired but end users require continuous access:

- "Go live" date
- Phased implementation
- Period of redundant operation

When a project has multiple phases or deliverables, deliverable acceptance may occur in phases. Additionally, deliverable acceptance may trigger warranty, maintenance or limit of retention/retainage periods.

Warranty Period

When deliverables are completed and officially accepted, contractually obligated warranty periods may begin. Warranties are guarantees of quality workmanship and agreed or standardized quality that can obligate a manufacturer or construction contractor to repair or replace defects at their own expense, if the defect is reported during the warranty period.

Relevant warranty types may include:

- Contractor
- Manufacturer
- Workmanship
- Product

Warranty information is forwarded to facility managers along with the related expiration dates, terms and conditions, or ongoing costs.

Maintenance Period

Maintenance periods typically begin at deliverable acceptance. Maintenance or extended service agreements provide routine maintenance of deliverables over a promised period to ensure they are properly maintained during their critical early life stages.

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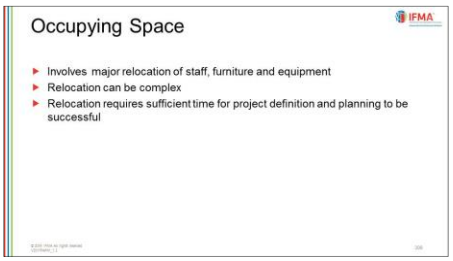
Limit of Retention or Retainage

The purpose of retainage is to ensure no liens remain on project work at project closure. Projects that involve a general contractor and subcontractors will have a retainage period that begins at deliverable acceptance. The retainage period ends when all subcontractors are paid or the limit of retention is reached, at which point the general contractor is issued a final payment.

Occupying Space

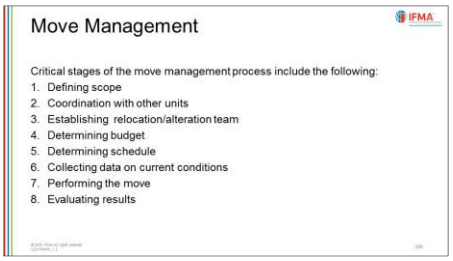


Occupying space typically involves:

- A major relocation of staff, furniture and equipment.
- Training the staff.
- Engaging in change management processes.
- Being customer focused.

Relocation projects can be complex and require devoting sufficient time for project definition and planning to be successful.

Move Management



Moving people is one of the most frequent projects a facility manager leads. Moves can range from simple to complex and may require boxing and transporting items, moving furnishings or moving entirely to accommodate construction or renovation.

Critical stages of the move management process include the following:

- Defining scope
  - Why the relocation/alteration is important to the facility/owner
  - Who is moving
  - Who will fill that space
  - What will be moved
  - Where items will be moved
  - When moved items are needed
  - When occupants will need to move
- Coordination with other units, such as IT, security and HR
- Establishing the relocation/alteration team, including staff, contractors, administration, purchasing and security
- Determining the budget
- Determining the schedule
- Collecting data on current conditions, such as coding and identifying items, descriptions, condition, location, assignment
- Performing the move
- Evaluating results, including commissioning, performance and occupant satisfaction determinations

The ongoing case study in this course addresses this and many other considerations of a relocation project.

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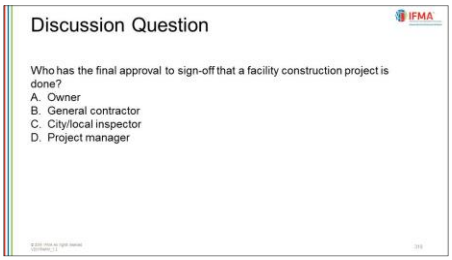

Lesson Activity

The purpose of this activity is to review the occupy space task for the relocation case study.

Relocation Case Study

Exhibit 5-2: Relocation Case Study — Occupy Space Task

Frank Jones, the Relocation Coordinator and the Construction Project Manager hold a punch-list walk-through after the construction is completed on schedule. The relocation coordinator has experience with punch-list reviews and is helpful in finding a door that does not close properly and some poor-quality tile work. Some drop-ceiling tiles are a bit irregular because a room was not perfectly square, but Jones does not think it is noticeable and leaves it off the list.

As repairs are being made, Jones meets with the city inspector for the final inspection. The inspector requires additional fire exit signs be installed. Jones complies, and the city issues a certificate of occupancy.

The move beings the following Friday morning. As the demand organization has the IT infrastructure to move all 500 people over the weekend, there will only be one day of work disruption.

Answer the following questions regarding the case study:

1. Do you agree with Frank Jones' decision to leave the irregular drop ceiling tiles off the punch-list? Why?

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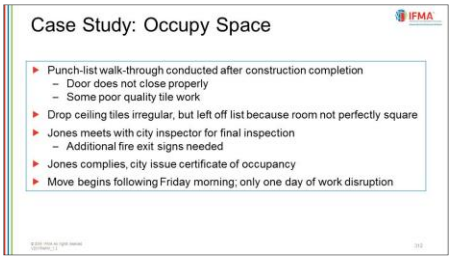
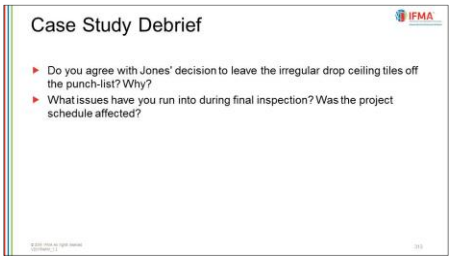
2. What issues have you run into during final inspection? Was the project schedule affected?





Close Contracts and Project and Evaluate Outcomes

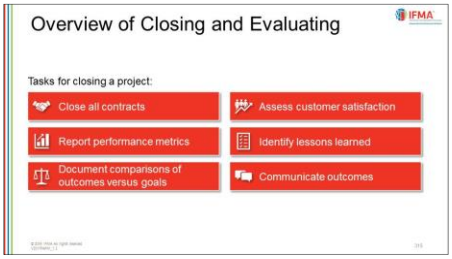
On completion of this lesson, you will be able to:

- Explain the contract and project closure process and how an organization learns from its successes and failures by collecting, evaluating and presenting data on project outcomes.

This lesson contains the following topics:

- Overview of Closing and Evaluating
- Processes and Outputs for Closing and Evaluating

Overview of Closing and Evaluating



When closing contracts and the project and evaluating outcomes, organizations:

- Close remaining contracts
- Record performance metrics
- Compare and document outcomes versus goals
- Assess customer satisfaction

Based on the data they collect, organizations identify and document lessons learned or opportunities for future improvement and communicate outcomes in meetings and printed and online media.

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Some of the benefits of properly performing all closing activities include:

- The process used to manage/oversee the project is reviewed to identify future opportunities for improvement.
- Project outcomes are compared to project goals and objectives.
- Project outcomes, opportunities to improve future projects and lessons learned are documented and communicated.
- Performance metrics associated with the process are captured and documented.
- Customer satisfaction is solicited and documented.

Exhibit 5-3 shows the inputs, processes and outputs for closing contracts and projects and evaluating outcomes. Outputs from the prior activities become inputs for closing contracts and the project and evaluating outcomes.

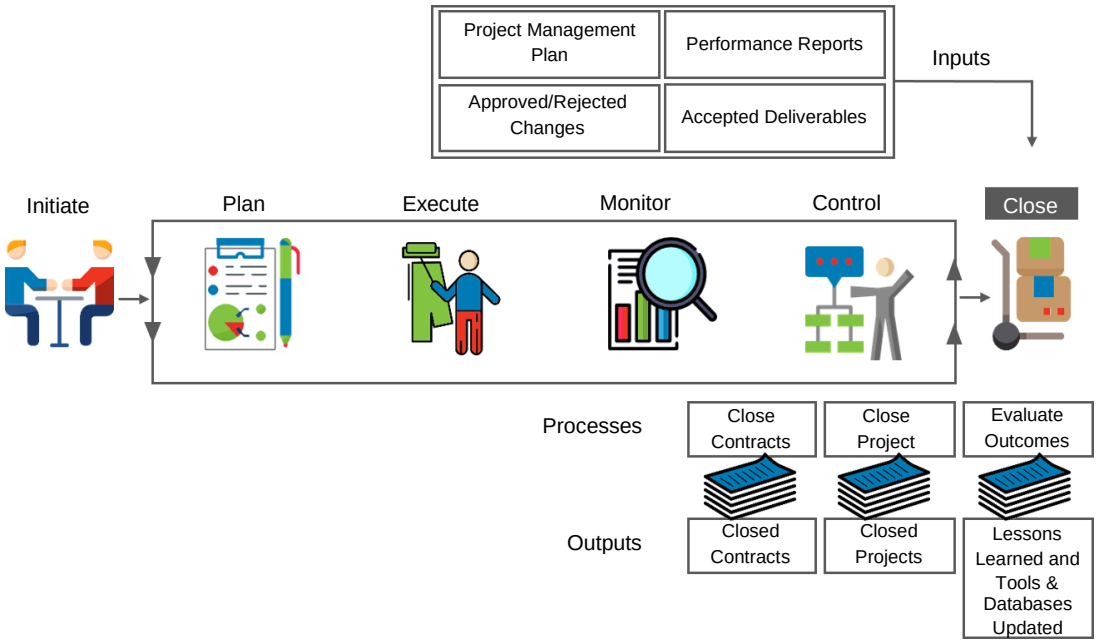


Exhibit 5-3: Inputs, Processes and Outputs for Closing Contracts and Project and Evaluating Outcomes

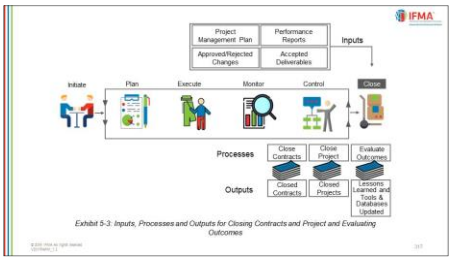


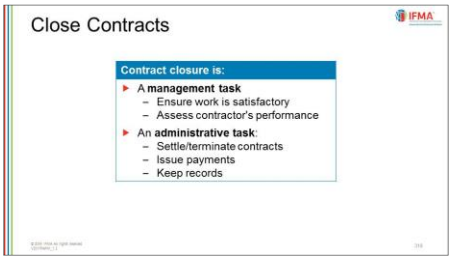
Exhibit 5-3: Inputs, Processes and Outputs for Closing Contracts and Project and Evaluating Outcomes

Processes and Outputs for Closing and Evaluating

The Close Project processes and outputs include the following tasks:

- Close contracts
- Close projects
- Evaluate outcomes

Close Contracts



Closure of contracts for contracted resources involves ensuring all:

- Contract specifications have been met.
- Deliverables meet the acceptance criteria within tolerance levels.

Contract closure is both a management and administrative task, as outlined in *Exhibit 5-4*.

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Exhibit 5-4: Management and Administrative Tasks for Contract Closure

A *management task* because:	An *administrative task* because:
Judgment is required to ensure: • The work is satisfactory. • An assessment of the contractor's overall performance is made.	• Terms and conditions of the contract are reviewed and settled. • Final payments are made and accounted for. • Contract records and contractor performance records are updated. • Contracts may need to be terminated early. However, the approval authority for terminating contracts is typically an executive/client.

For each contract, the close contract process is performed independently. The process occurs when the contract work is complete, so it could happen at any point during a project.

Contract terms and conditions, outlined in chapter 3 of this book, specify the methods by which a contract can be terminated early. Terminating contracts prior to their completion can be:

- By mutual agreement
- At will by one or the other party
- By exercising clauses in the contract that show default or noncompliance by one party

Early termination may require legal review and presentation of legal grounds for contract termination. The organization may be legally required to settle with the contractor for monetary expenses already incurred.

When preparing to close a contract, project managers and contract administrators verify and audit:

- Contracted resource scope/SOWs and the procurement management plan.
- The contract, including change orders or amendments.
- Documentation on technical approach.
- The contract's acceptance criteria for deliverables.
- Status and variance reports by milestone.
- Contractor performance reports.

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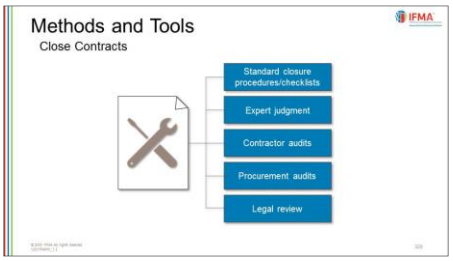
Methods and Tools

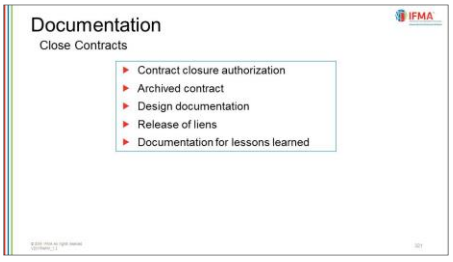


The methods and tools outlined in *Exhibit 5-5* can be used for closing contracts.

Exhibit 5-5: Methods and Tools for Closing Contracts

Method/Tool	Description
Standardized contract closure procedures and checklists	Established closure procedures and contract closure checklists are used to ensure all contract terms and conditions are accounted for
Expert judgment	Expertise is applied in assessments and legal review
Contractor audits	Includes: • Scope verifications • Technical audits • Financial audits
Procurement audits	• Organizations may internally audit their procurement process to evaluate its efficiency • Contracts may also stipulate an independent audit of contractor processes or deliverables as the work is ongoing • The results may be used in contract closure
Legal review	Contract closure requires legal review, especially if the contract is terminated early and there is no at-will termination clause

Documentation



The items outlined in *Exhibit 5-6* are included in the documentation for contract closure.

Exhibit 5-6: Documentation for Contract Closure

Documentation	Description
Contract closure authorization	The project manager signs off on the contract, and the contractor receives formal notice of completion
Archived contract	The contract and its supporting documents are retained, and the contents may be indexed for reference
Design documentation	• Some contracts for construction projects stipulate that the owner receives project designs at the end of the project • For example, electronic files of the construction drawings or computer-assisted design and drafting files
Release of liens	Liens on property exist when work has been performed, but contractors or subcontractors have not yet been paid
Documentation for lessons learned	• Contractor ratings and performance reports • Addition or removal of contractors from preselected lists • Contracting process or contract detail improvements • Examples of high-quality scope/statements of work

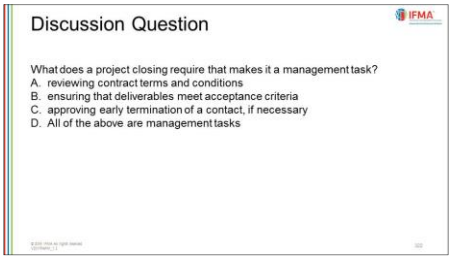


Exhibit 5-7 continues the relocation case study.

Exhibit 5-7: Relocation Case Study — Closing Contracts for Relocation Project

- Once the city issues the certificate of occupancy, Jones sends the general contractor a letter indicating deliverable acceptance and contract closure.
- Frank Jones verifies the punch-list items are corrected.
- As soon as the retainage period is expired, the contract administrator releases the final payment to the general contractor.

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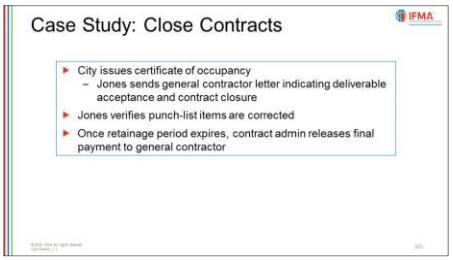
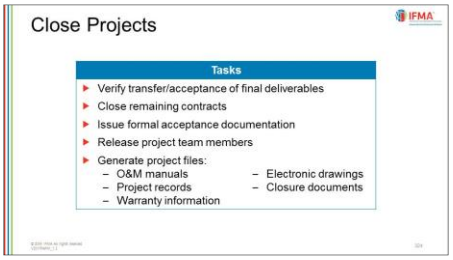


Close Projects



Closing projects is an integration/coordination and administrative task for project managers and/or project administrators.

Closing projects involves:

- Verifying transfer and acceptance of all final deliverables to owners or responsible parties
- Closing remaining contracts
- Issuing formal acceptance documentation
- Releasing project team members
- Generating project files, such as:
    - Operation and maintenance manuals
    - Project records
    - Warranty information
    - Electronic drawings
    - Closure documents

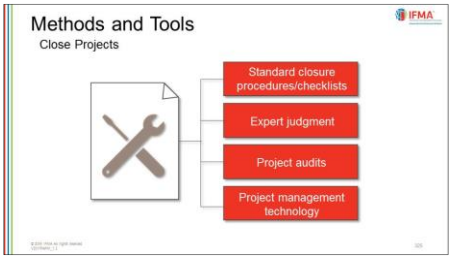
The project manager reviews the following:

- Project management plan
- Contract closure process
- Performance reports
- Quality reports

- Deliverable inspection, transfer and acceptance reports

Documentation from each project management process is forwarded to project closure, as noted previously.

Methods and Tools

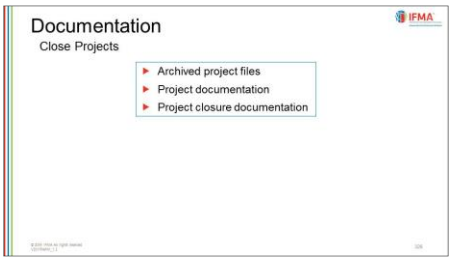


The methods and tools outlined in *Exhibit 5-8* can be used for closing projects.

Exhibit 5-8: Methods and Tools for Closing Projects

Method/Tool	Description
Standardized project closure procedures and checklists	Established closure procedures and checklists ensure all tasks are completed
Expert judgment	Expertise is applied in assessments and legal review
Project audits	Organizations may internally audit their project management process to evaluate its efficiency
Project management technology	Project management software retains project data in electronic records and archive printouts can be made

Documentation



The items outlined in *Exhibit 5-9* are included in the documentation for project closure.

Exhibit 5-9: Documentation for Project Closure

Documentation	Description
Archived project files	• The following is archived: - Project objectives statement - Designs and drawings - Project management plan in its original and modified states - Other data, such as approved/rejected changes • Archives are retained for the following reasons: - Reference for future projects to improve or configure deliverables - Benchmark for future cost or time estimates for work packages - Records for taxes, financial or process audits, or potential litigation - Training and development and outcome evaluation
Product documentation	• Operations and maintenance manuals • Warranties • Maintenance contracts • Electronic drawings
Project closure documentation	• Formally ends the project • Releases team members and equipment • Documents for projects terminated prior to completion indicate: - The reason for termination - How to transfer complete or incomplete deliverables

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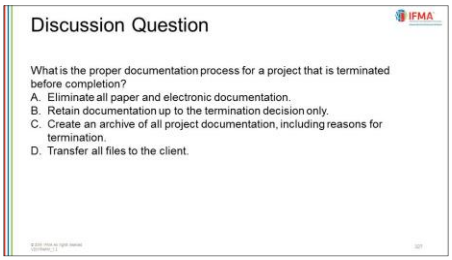


Exhibit 5-10 continues the relocation case study.

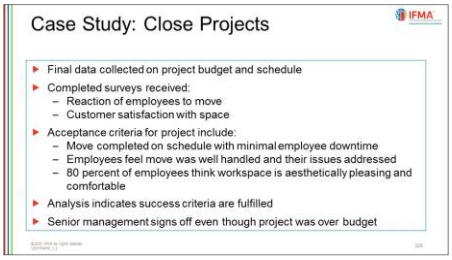
Exhibit 5-10: Relocation Case Study — Closing Relocation Project

After the relocation is complete and the contracts have been closed, Frank Jones collects final data on the actual project budget and schedule. He receives the results of completed surveys regarding the reaction of employees to the move and customer satisfaction with the space from the Evaluate Outcomes process.

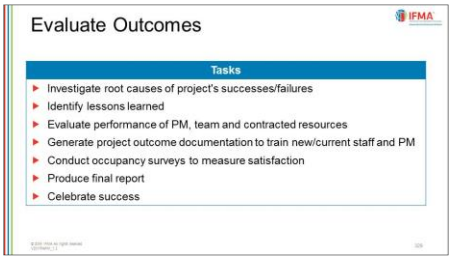
The acceptance criteria for the project include:

- The move is completed on schedule with minimal downtime for employees.
- Employees feel the move was well handled and their issues were addressed.
- 80 percent of employees think the new workspace is aesthetically pleasing and comfortable.

Analysis of project data and survey results indicates that these success criteria are fulfilled, so even though the project was over budget, senior management signs off on the project deliverable acceptance and congratulates the team. Jones documents the project closure.



Evaluate Outcomes



Evaluating outcomes ensures the organization learns from the successes and failures of the project. It may involve the following:

- Conducting an outcome evaluation to determine the:
  - Success or failure of the project
  - Root causes of the success/failure
  - Lessons learned

- Evaluating the performance of the project manager and project team
- Evaluating the performance of contracted resources
- Using project outcome documentation to:
  - Train new project managers or staff
  - Develop the skills of existing project managers and staff
- Conducting occupancy surveys to measure satisfaction with facilities
- Producing a final report
- Celebrating success

The Evaluate Outcomes process is the most likely task to be omitted from a project, even though it produces benefits that are likely to outweigh the additional effort.

Common reasons for this resistance include the following:

- **Evaluation occurs at the end of the project** — project managers and teams may be immediately transferred to regular work or another project
- **Lack of understanding of the value of the evaluation** — senior management may not see the value in the evaluation or wish to fund it
- **Lack of motivation to conduct an evaluation** — psychological elements of relief after a stressful project make it difficult to motivate staff to perform this additional work
- **No desire to revisit failures** — project managers and team members may not want to draw attention to failures and rationalize this desire by implying it is too late to change the past

Project managers use leadership skills to overcome resistance to outcome evaluations.

When preparing to evaluate outcomes, project managers or evaluators review:

- The original and final state of the project objectives statement
- The project management plan
- Contract documentation
- Current project management policies, procedures and practices. For example, organizational hierarchies to determine what changes to suggest

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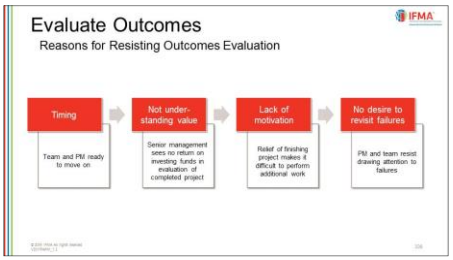
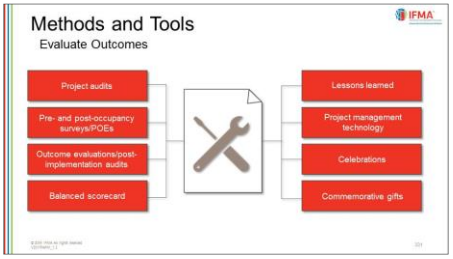


Methods and Tools



The methods and tools outlined in *Exhibit 5-11* can be used for evaluating projects.

Exhibit 5-11: Methods and Tools for Evaluating Projects

Method/Tool	Description
Project audits	• Independent reviews of projects that can provide valuable information for lessons learned • For example, can be used to compare preliminary estimates to final estimates
Pre- and post-occupancy surveys or post-occupancy evaluations (POEs)	Surveys conducted to: • Assess the occupants' level of satisfaction with the various aspects of the new working environment • Check performance against the specifications of the major systems • Measure the increase in customer satisfaction with the new space • Show where facilities are over- or under-delivering on services • Help make occupants aware of services
Outcome evaluations or post-implementation audits	Analyze relative project success in evaluation metrics
Achievement of project's	• The project's purpose and success criteria are tested against

Method/Tool	Description
purpose and success criteria	the actual results to determine if the project solves the original problem • The primary determinant of project success
Scope variance	The significance of variances from the schedule, budget, quality and overall scope is assessed
Client or owner satisfaction	• Even if the purpose and scope are satisfied, the client or owner may not be satisfied • If not, it may be due to a misunderstanding of the purpose or a change in priorities that was not communicated effectively
Action and change order analysis	Midproject changes are assessed to determine: • Changes that can be included in the original plans of future projects rather than requiring midproject change • Changes that were accepted but should have been rejected or vice versa • Whether the project's purpose was adequately communicated to stakeholders. For example, numerous rejected change requests • Recommendations for avoiding change order situations
Root cause analysis	• The root cause of successes and failures can be analyzed using a variety of quality tools • Analysis may reveal mixed results. For example, a project may have failed despite successful teamwork or a success may have occurred despite poor project management
Business value	• Analysis of the financial or project benefits can be measured against what was promised • A tool such as the balanced scorecard can measure business value • It may not be possible to measure business value until sufficient time has passed
Balanced scorecard	• Can provide a comprehensive view of the business value provided by a project • Evaluators use a scorecard to categorize goals and measurements according to four perspectives
Customer perspective	Could include end user satisfaction with deliverables or

Method/Tool	Description
	maintenance support
Business process perspective	Could measure productivity increases or maintainability of deliverables
Innovation and learning perspective	Could measure how well the project contributes to organizational strategy or the skills acquired by participants
Financial perspective	Could measure return on investment, payback period or other bottom-line results
Lessons learned	• Summarize the effect of decisions made on a project • Serve as a guide for what to repeat and what to avoid on future projects • Are applied to update policies, procedures and practices, such as document and contract templates or project organizational charts • Can take the form of helpful hints, for example, how and when to apply a specific technique
Project management technology	Project management software may facilitate indexing outcome evaluation materials for easier reference
Celebrations	The project manager may organize an event or party to congratulate the project team on their performance
Commemorative gifts	Commemorative gifts, such as labeled mugs or T-shirts, can show appreciation and inspire greater company loyalty

Exhibit 5-12 is an example of a partial pre-occupancy survey. Pre-occupancy surveys should be conducted three months prior to the move project. The same survey questions, or most of them, should then be incorporated into the post-occupancy survey conducted three to six months after the move. The two surveys can then be compared to measure change.

Exhibit 5-12: Pre-occupancy Survey Example

Consider your existing assigned work space and support amenities. Please rate how *important* to your work productivity and processes are the characteristics/qualities of space identified below AND then rate how *satisfied* you are with the existing conditions of these spaces that you utilize.

Scale: 1 Not Important 2 Somewhat important 3 Important 4 Very Important 1 Not Satisfied 2 Somewhat satisfied 3 Satisfied 4 Very Satisfied NA – Not Applicable, not relevant or no opinion

Characteristic/Quality of Space	**Importance**	**Satisfaction**

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1. Ability to work independently, free from distraction.	1 2 3 4 N/A	1 2 3 4 N/A
2. Ample desk space for surface work.	1 2 3 4 N/A	1 2 3 4 N/A
3. Ample desk space for technology.	1 2 3 4 N/A	1 2 3 4 N/A
4. Access to collaborative space.	1 2 3 4 N/A	1 2 3 4 N/A
5. Access to desk phone.	1 2 3 4 N/A	1 2 3 4 N/A
6. Adaptability of the environment.	1 2 3 4 N/A	1 2 3 4 N/A
7. Ergonomics.	1 2 3 4 N/A	1 2 3 4 N/A
8. General sound/acoustical quality of the spaces.	1 2 3 4 N/A	1 2 3 4 N/A
9. Quality/access to natural light.	1 2 3 4 N/A	1 2 3 4 N/A
10. Quality/adjustability of the artificial lighting.	1 2 3 4 N/A	1 2 3 4 N/A
11. Ability to be productive.	1 2 3 4 N/A	1 2 3 4 N/A

Documentation

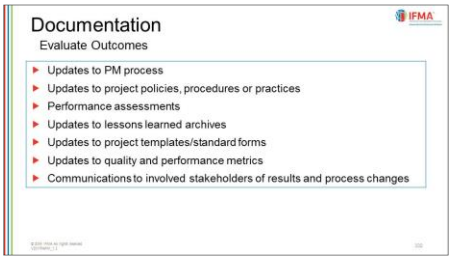

Exhibit 5-13 outlines the documentation resulting from evaluating outcomes.

Exhibit 5-13: Documentation Resulting from Evaluating Outcomes

Documentation	Description
Updates to the project management process	Continual improvement to the processes of initiating, planning, executing, monitoring, controlling and closing a project can increase the chances of success for future projects
Updates to policies, procedures or practices for projects	Policies, procedures and practices are updated as approved and appropriate
Performance assessments	Informal performance assessments for staff and contractors are retained in notes/discussed with line managers
Updates to "lessons learned" archive	Helpful hints and the likely result of particular actions can be edited from project to project and used to help train new project managers
Updates to project templates and standardized forms	Changes made to templates and forms may be applied to future projects
Updates to quality and performance metrics	Measurements considered useful are retained and areas that need more, or less, measurement are determined along with tool recommendations
Communications to all involved stakeholders of project results and process changes	Results of the outcome evaluation, lessons learned and changes to future processes are communicated to stakeholders in a meeting or report to continually improve all project participants rather than producing a report just for the project manager and executives

Lesson Activity

The purpose of this activity is to review the close contracts, close projects and evaluate outcomes tasks for the relocation case study.

Relocation Case Study

Exhibit 5-14: Relocation Case Study — Evaluating Relocation Project

Frank Jones and several analysts perform an outcome evaluation for the relocation. Jones and department leaders talk to and distribute occupancy surveys to all persons affected by the move. They compare the results to an occupancy survey conducted in the previous space to measure the change.

Jones uses original and revised cost estimates and root cause analysis of the budget variances to further analyze whether the negative budget variance could have been foreseen and prevented.

The conclusions are that although the earthquake could not have been predicted, plans could have been better at reducing risks from similar events that could disrupt the supply chain. Specific recommendations include:

- Material availability or on-hand inventory should have greater weight in contractor assessment criteria.
- Risk management should require preselection of alternate suppliers.
- Responses to variances should have been implemented sooner.

Jones keeps a file on this project for reference in future relocations. It includes:

- Notes on what worked and what did not.
- Contact information for preferred contractors and consultants.
- Notes on team member performance.
- Project documents, such as schedules, budgets, proposals, contracts, organizational charts, forms and tools.

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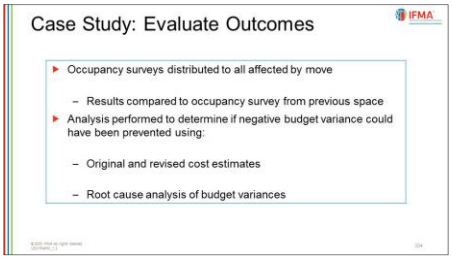
Answer the following questions regarding the case study:

1. What are questions you would want to ask to evaluate the project?

2. What original document would you use the evaluation process?

3. What are possible balance scorecard metrics that could be created for this case study? (Should be associated with the four perspectives: customer, business process, innovation and learning and financial.)



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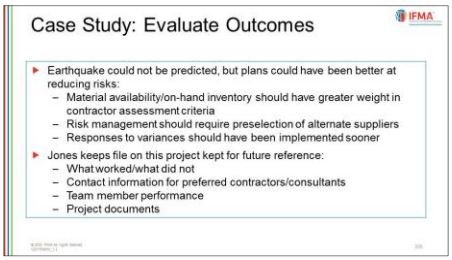

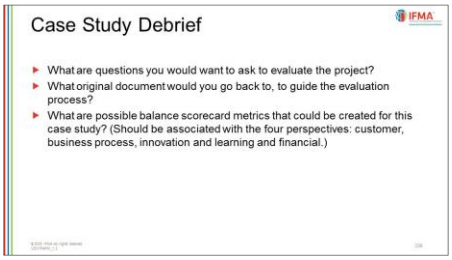

Progress Check Questions

1. Why is an informal walk-through of a construction site performed prior to the formal walk-through?

   a. To see that all work appears complete
   b. To ensure the site is clean
   c. To verify that all contractor tools have been removed
   d. All these statements are correct

2. What validates the deliverables that need correcting?

   a. Project management software
   b. Team member originally responsible for the work
   c. Quality assurance
   d. Quality control

3. Who is responsible for deliverables, once formal acceptance takes place?

   a. The construction project manager
   b. The project manager
   c. The owner
   d. The quality control person

4. Finished deliverables for a construction project are found to be deficient but are repaired and validated. If the owner is still not satisfied, what happens next?

   a. Correction and validation continue to occur until the owner is satisfied or the project is cancelled.
   b. The project is closed regardless of whether the owner is satisfied.
   c. Correction and validation can occur once more, but if validation is successful, the project is closed even if the owner is not satisfied.
   d. None of the above.

5. What is the process for ensuring that a building's performance is in harmony with the intent of its design and the operational needs of its owner?

   a. Commissioning
   b. Warranty
   c. Retainage
   d. Certificate of occupancy

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6. What can be used to ensure liens are cleared at project completion?

    a. Commissioning
    b. Retainage
    c. Warranty
    d. Maintenance agreements

7. How can termination of contracts prior to their completion be accomplished?

    a. By mutual agreement
    b. At will by one or the other party
    c. By exercising clauses in the contract that show default or noncompliance by one party
    d. All these statements are correct

8. What is done both before and after a relocation to measure the increase in satisfaction with the new space?

    a. Action and change order analysis
    b. Balanced scorecard innovation and learning perspective
    c. Root cause analysis
    d. Occupancy surveys

9. In a construction project punch-list review, which is true?

    a. Project managers should point out every flaw, no matter how minor, and get them fixed.
    b. Project managers complete the punch list on their own.
    c. Incomplete work on the site is acceptable if they are areas prepared for owner-furnished items.
    d. The site will still have substantial debris and construction tools that need to be avoided.

10. Which is true of outcome evaluation?

    a. Business value analysis is best conducted immediately upon project completion.
    b. Action and change order analysis tries to minimize change order situations in future projects.
    c. Outcome evaluation reports are developed for the project manager and executives only.
    d. Root cause analysis is performed only for project failures.

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Progress Check Question Answer Key

Chapter 1: Introduction to Project Management

Project Management of Facility Projects

1. d
2. c
3. b
4. d
5. d

The Project Manager

1. b

Project Management Processes and Cycles

1. c
2. a

Chapter 2: Initiate Projects

Initiate Phase and Project Inputs

1. b
2. d

Define Project Purpose

1. a
2. b
3. d

Perform Programming

1. c
2. a
3. a

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4. a

Create Project Charter

1. a

Chapter 3: Plan Projects

Designing Deliverables or Space

1. c
2. b
3. d

Create Project Management Plan

1. a
2. b
3. d
4. a
5. c
6. a
7. a

Chapter 4: Execute, Monitor and Control Projects

Acquire Team and Resources

1. c
2. b
3. d
4. a
5. b

Execute, Monitor and Control Projects

1. d
2. a
3. c

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4. a
5. a

Chapter 5: Close Projects

Accept Deliverables or Occupy Space

1. d
2. d
3. c
4. a
5. a
6. b

Close Contracts and Project and Evaluate Outcomes

1. d
2. d
3. c
4. b

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Appendix

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Glossary

Active listening

A structured form of listening and responding that focuses attention on the speaker.

Addendum, construction document

Corrections or revisions made to construction documents after they are sent to bidders but before bidders have officially responded.

Adjacency diagram

A diagram documenting critical physical proximities of organizational groups, equipment, or support functions.

AIA Contract Documents

A set of standard contract forms produced by the American Institute of Architects (AIA) for design and construction contracts including the contract administration process. They are generally accepted as fair documents for all parties involved.

Architectural drawings/Engineering drawings

A set of technical drawings of a building or engineered item categorized by building trade (e.g., electrical, plumbing) used by architects or engineers to express a design proposal and enable a contractor to proceed with construction.

As-built drawings

Drawings that reflect actual field conditions as a result of construction.

Assignable area

The portion of a floor or building used to house personnel, furniture and equipment. = Usable area – Secondary circulation

Audit

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A planned evidence-gathering process to assess whether agreed-upon requirements are being met to enhance the degree of confidence of intended users or parties involved.

Bubble diagram

An adjacency diagram that illustrates primary and secondary adjacencies between major work groups, departments or functional areas.

Building information modeling (BIM)

A modeling process and technology for producing comprehensive, measurable, three-dimensional virtual models of buildings to aid in construction and all later phases of a facility's life cycle.

Building standard

Owner/landlord determined baseline for type and quality of materials and finishes to be used in their building and provided as part of base rent paid by the tenant (usually stipulated as an allowance per square meter (square foot)).

Certificate of occupancy

A formal document often required by the local building codes as the final step to closeout of construction to allow for occupancy of the facility. Also known as certificate of beneficial occupancy.

Change order

The written document signed by the contractor, designer and owner that allows for changes involving cost and time.

Chargeback

The ability of facility management to charge its services to another group that is requesting those services. Also known as cross charging or recharging.

Churn

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The amount of movement and relocation of occupants within an organization within a specified period. It is the ratio of the number of employees moved annually compared to the total number of employees in an organization.

Circulation factor

A percentage added to work space to allow for circulation patterns of persons or goods in usable space.

Computer-assisted design and drafting (CAD)

Computerized drafting software that can manage space, furniture, and equipment, as well as produce drawings.

Construction agreement

A written contract between an owner and the general contractor detailing the terms to which the parties agree. The agreement details the deliverable (what is to be built), the compensation, the timeframe, and other factors typical of a legally binding contract.

Construction contract documents

A portfolio of detailed documents that generally consist of a construction agreement, general terms and conditions, supplementary conditions, construction documents (including construction drawings and specifications), addenda, a notice to proceed, payment and performance bonds, and change order reviews, approvals and logs.

Construction drawing

Scaled architectural or engineering drawings that include notations on the work required and the materials to be used, showing how to proceed with construction, usually provided as part of a larger set of construction contract documents.

Core and service area

The area with common access or benefit, to all users within a gross space, for example, public corridors, restrooms, mechanical or utility rooms and vestibules. Also called common area, common support area or core area.

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Core and service area factor (rentable/usable ratio)

The factor used to determine a tenant's pro rata share of the core and service area. Also called common area factor, core factor or loss factor. Also known as the rentable/usable ratio.

Delegation

A management decision to give employees/contractors full responsibility for planning and execution of a task.

Design intent drawings

Scaled drawings that form the basis of construction drawings by showing where all construction elements are to be located but omitting engineering calculations. They can be used in variance comparisons with as-built drawings.

Facilities audit

Thorough, periodic reviews that encompass all of the services and assets within a facility. They follow a systematic process of inspecting and reporting on conditions and functional performance levels of existing facilities and FM service programs.

Facility strategic plan

A long-term plan encompassing an entire portfolio of owned and/or leased space that sets strategic facility goals based on the organization's strategic objectives.

Feasibility study

Study of a planned scheme or development, the practicality of its achievement, and its projected financial outcome.

Floor plate

A common term for floor size or outline of overall size, shape, features of a building basic floor plan/building basic shell plan. For example, floor plates might be used to compare the efficiency of one potential site over another. Depending on the layout and design or features of the building bays or building service/core areas, one building may have less common area and therefore cost less in the long run.

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General contractor

The traditional builder who engages in the complete on-site management of the actual construction project. Performs the work by contracting on their own behalf with subcontractors and suppliers.

Gross area

The sum of the floor areas on all levels of a building that are totally enclosed within the building envelope. Measured to the outside face of exterior walls.

Integration

The process of unifying the relatively independent project resources and tasks divided for project planning back into a seamless process.

Lagging indicator

Performance data collected after the event is complete

Master plan

Documents the entire organization’s goals and the type of space required to support those goals.

MEP

Refers to mechanical, electrical and plumbing. Internationally, this term may be referred to as civil drawings.

Mitigate

Adopt or apply preventive measures to reduce probability and/or severity of identified risks.

Organizational culture

An expression of the character of an organization as the sum of its organizational values. It indicates how things get done at the organization. Organizational culture tends to remain in place even as group membership changes because culture is automatically transmitted to new staff.

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Organizational structure

The formal power structure and hierarchy of an organization and the types and number of job positions per department. It is often communicated through charts and descriptions.

Partition

Inside floor-to-ceiling structures or wall assemblies that enclose a space; can be movable or removable.

Plans

The anticipated use of resources and the sequence of tasks necessary to accomplish project goals.

Policies

Broad guidelines designed to focus organizational activities.

Practice

A general term that refers to the customary, habitual or expected procedure or way of doing something. It has no force of law. It may be effective or not, good or bad; it merely describes performance.

Preventive maintenance

A type of planned maintenance having an equipment maintenance strategy based on replacing, overhauling, or remanufacturing an item at a fixed interval, regardless of its condition at the time.

Primary circulation

The portion of the building that is a public corridor or a lobby or is required for access by all occupants on a floor to stairs, elevators, restrooms and/or building entrances.

Procedures

Customary tactics for performing activities.

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Procurement

The systematic process by which an organization reaches formal agreements for the purchase of the supply of goods and/or services.

Programming

The process that defines the detailed project requirements of the end user that are needed to meet the project objectives and general project requirements. A type of analysis that employs user observation, interviews, and surveys to identify and detail a specific function in an organization, sometimes improving functionality (e.g., when translated into a new design for a space). It is documented as a statement of requirements.

Project

A temporary endeavor undertaken to create a unique product, service, or result. Projects are temporary in nature and differ primarily in that operations are ongoing and repetitive.

Project management

The application of knowledge, skills, tools and techniques to project activities to meet the project requirements. Can also be thought of as an organized process for increasing the chances of project success.

Project planning

The process of organizing the resources and tasks required to accomplish a unit of work.

Rentable area

The gross area minus exterior walls, major vertical penetrations and interior parking spaces. In leased space, this area includes shared spaces with other tenants. = Gross area – (Exterior walls + Major vertical penetrations + Interior parking space)

Scale drawings

Drawings that are set to a proportional but smaller size than the actual objects being represented as defined by a supplied key or method of conversion.

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Schematic plans

Scale drawings that include all basic design components of a space or facility such as circulation corridors, partitions, and work space areas, but omit construction details and dimensions.

Secondary Circulation/Vacant Space

The portion of a building required for access to some subdivision of space (whether bounded by walls or not) that is not defined as primary circulation. i.e. corridors between workstations.

Shop drawings

Drawings prepared by the contractor and/or subcontractors that show the specific proposed method for fabricating and erecting in order to achieve the end result outlined in the contract drawings.

Specification

A description of the essential technical requirements for items (hardware and software), materials, and processes that includes verification criteria for determining whether the requirements are met.

Stack plan

A vertical section drawn through a building showing which organizational groups occupy which floors. (also called a stacking diagram)

Stakeholder

Person or organization that can affect, be affected by or perceive itself to be affected by a decision or activity (also Interested party).

Stakeholder relationship management

The process of developing and maintaining communications with relevant stakeholders and developing and maintaining an understanding of their needs, objectives, character, and constraints so that long-term, mutually beneficial solutions can be created for all parties.

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Systems furniture

Furniture that is modularly designed to be assembled in one or more possible configurations. Also called workstations.

Tenant improvement (TI) allowance

Funds set aside by a landlord in accordance with a building standard for use by a tenant to make the space suitable for occupancy. The size of the allowance can vary by the duration of the lease. Also known as tenant finish allowance.

Test fit

A scale drawing showing a proposed layout of space for business units or departments to determine if the space can adequately address space requirements.

Usable area

The portion of a building or floor available for occupants. In leased space, this is the area not shared with other tenants. = Rentable area – (Building core and service area + Primary circulation)

Value engineering

A systematic approach to assessing and analyzing the user's requirements of a new asset, and ensuring that those requirements are met, but not exceeded. Consists primarily of eliminating perceived "non-value-adding" features of new equipment.

Workstation

Any space, including furniture and equipment, designated for accomplishing a work function. The space may be assigned to an individual or intended for group or general use but typically excludes private rooms or conference areas surrounded by full height walls.

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