Management of IS Project

信息系统管理学习笔记

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文艺数学君
换一种姿势学数学

模板来自，*ElegantBook*，感谢模版的制作.

Victory won't come to us unless we go to it. — M. Moore

The only stupid question is the one you were afraid to ask but never did. — Rich Sutton

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- ❑ Project 成功的定义 (triple constraint)
- ❑ Project, Program, Portfolio
- ❑ Project Management 的介绍
- ❑ Project Management Office (PMO)

- A project is a temporary endeavor undertaken to create a unique product, service, or result.
- Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements.
- The project management triangle or "triple constraint" includes scope, time, and cost.
- A program is a group of related projects managed in a coordinated way. A portfolio includes many programs and project managed according to the organisation's strategy.
- A project management office (PMO) standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques. The types of PMOs can vary being supportive, controlling or directive.

1.1 Project 的介绍

1.1.1 什么是 Project

定义 1.1. Project

Project：A project is a temporary(短暂的) endeavor(努力) undertake to create unique product, service or results. ♣

一些关于 **project** 的例子:

- A team of students creates an app.
- The Norwegian Government creates a new web application for patients and introduces it to practice.
- A university decides to re-design and and launch new student registration procedures.

Projects are often utilized as a means of directly or indirectly achieving strategic objectives (项目通常被用作直接或间接**实现战略目标的手段**):

- related to opportunities/business needs
- related to technological advance
- related legal regulatory requirements (相关法律规则要求)

1.1.2 Project 的性质

项目有着两个性质, 分别是不确定性和复杂性. (Projects always involve some **uncertainty** and **complexity**.) 这个会在2.3.2中详细讨论.

- **Uncertainty (关于不确定性)**
  - We might not know exactly how to reach the result. (我们不知道如何达到结果)
  - We might not be sure about the exact properties of the end result. (我们可能不确定最后结果的属性)
  - The scope of the project might change along the way. (项目的范围会一直有改变)
- **Complexity (关于复杂性)**
  - Multiple relationships: among resources involved the project, different parts of work in progress and between the project and its environment. (多种关系: 项目所涉及的资源之间, 正在进行的工作的不同部分以及项目与环境之间的关系.)
  - Complexity increases when number, variety and connectedness increase. (复杂度随着数量, 种类, 相关之间的关联的增加而增加)

1.1.3 Project 成功的定义

对于 Project 成功的定义有很多不同的定义. 通常会用下面三个点来定义项目是否成功, 我们称其为 **project management triangle**.

定义 1.2. Project Success

The project met scope, time, and cost goals (the project management triangle or "triple constraint").

♣

上面提到的 project management triangle 如下图所示:

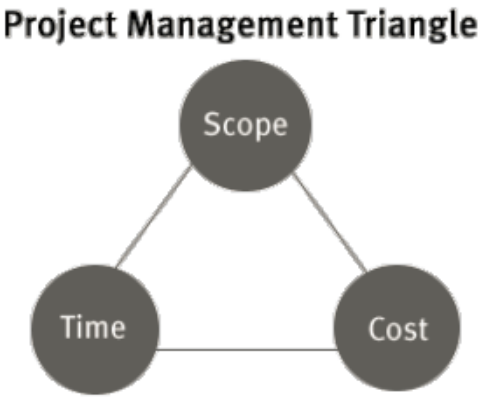


图 1.1: Project Management Triangle

但是, 也会有一些其他定义 project success 的方式.

- The project met scope, time, and cost goals (the project management triangle or "triple constraint").

- Overall balancing an extended view of the competing project constraints, including: Scope, Quality, Time, Budget, Resources, and Risks. (在总体上获得项目的平衡)
- The project satisfied the customer/sponsor. (项目满足了客户或是赞助商)
- The results of the project met its main objective, such as making or saving a certain amount of money, providing a good return on investment. (项目结果达到了主要目标)

1.1.4 Projects, Programs, Portfolios

接下来介绍 Projects, Programs, Portfolios 三者的关系, 从大到小排序为: $Projects \in Programs \in Portfolios$. 也就是如图1.2所示:

图 1.2: Projects, Programs, Portfolios

下面是三者详细的定义:

- **Program**: group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually. (以协调管理的方式管理一组 projects, 从而获得单独管理没法获得的好处) A program can also include subsidiary programs and program activities.
- Programs and projects are grouped within a portfolio. (Programs 和 projects 两者合成一个 portfolio) Portfolio management aligns with organizational strategies. The projects and programs of the portfolio may not necessarily be interdependent or directly related. (三者不需要有直接的关系) They are managed as a group to achieve strategic objectives. (但是他们作为一个整体进行管理以实现战略目标)

1.2 Project Management 的介绍

定义 1.3. Project Management

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. (Project Management 就是应用知识, 技能, 工具等到项目活动中满足项目的需求)

♣

Project management approaches 可以分为下面的两种类型, 更多内容查看2.3.3:

- highly predictive approaches
- highly adaptive approaches

1.2.1 Project Management 的 5 个步骤

Project management is accomplished through the appropriate application and integration of project management processes (Project Management 的完成, 分为 5 个步骤): Initiating, Planning, Executing, Monitoring-Controlling, Closing.

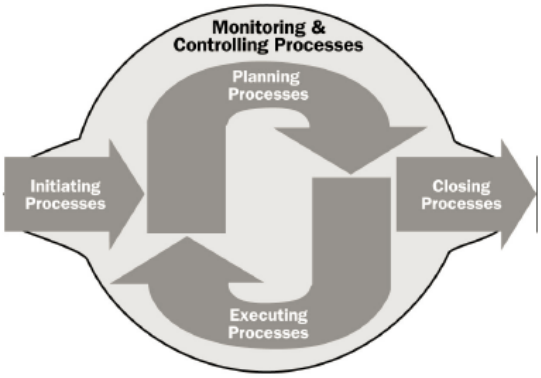


图 1.3: Project Management Process

1.2.2 Project Management Office (PMO)

定义 1.4. Project Management Office (PMO)

A project management office (PMO) is a management structure that standardizes the projectrelated governance processes and facilitates the sharing of resources, methodologies, tools, and techniques. (PMO 是一种管理结构, 这种结构可以标准化项目管理相关的流程, 和促进资源, 方法, 工具等的共享)

♣

对于 PMO 的作用:

- 既可以提供项目管理的支撑功能 (providing project management support functions)
- 也可以实际负责一个或多个项目的管理 (actually being responsible for the direct management of one or more projects)

现在有三类不同的 PMO:

- **Supportive PMOs** provide a consultative (顾问) role to projects by supplying templates, best practices, training, access to information and lessons learned from other projects. This type of PMO serves as a project repository (知识库). The degree of control provided by the PMO is low.
- **Controlling PMOs** provide support and require compliance (服从, 也就是 project 需要遵从一些东西, 例如下面讲的使用特定的模版) through various means. Compliance may involve adopting project management frameworks or methodologies, using specific templates, forms and tools, or conformance (一致性) to governance. The degree of control is moderate.
- **Directive PMOs** take control of the projects by directly managing the projects. Project Managers are assigned by and report to the PMO (项目经理由 PMO 分配并向 PMO 报告). The degree of control is high.

第 2 章 Project Manager's Role and Project Lifecycles (Chapter 1 cont and part of Chapter 2)

内容提要

- ❏ stakeholder
- ❏ Role of Project Manager
- ❏ Project Lifecycles
- ❏ trends that affect Project Management

- Project stakeholders are individuals and organizations who are actively involved in the project or whose interests may be positively or negatively affected by the project's execution or successful completion. Stakeholder management and top management commitment are critical for a project's success.
- Project managers need to possess technical project management skills, strategic and business management skills and leadership skills
- A project life cycle is the series of phases that a project passes through from its initiation to its closure.
- Projects can follow different types of life-cycles ranging from highly predictive to highly adaptive.
- Several trends are influencing IT project management including outsourcing, globalisation and virtual teams. Agile approaches are mainstream today.

2.1 Stakeholder 的介绍

2.1.1 什么是 Stakeholder

定义 2.1. Stakeholder

Stakeholders (利益共享者) are the people involved in or affected by project activities, and include the

- project sponsor
- project team
- support staff
- customers
- users
- suppliers
- opponents of the project (项目竞争对手)

，
These stakeholders often have very different needs and expectations (不同的人有不同的需求和希望). Different stakeholders may have competing expectations that might create conflicts within the project (所以不同的 stakeholder 会产生冲突).

2.1.2 Stakeholder 的重要性

Stakeholders require the **project manager's** attention throughout the project's life cycle.

Identifying stakeholders, understanding their relative degree of influence, and balancing their demands, are critical to the success of the project (识别和理解 stakeholders 对项目的成功至关重要). Failure to do so can lead to delays, cost increases and other negative consequences including project cancellation

2.1.3 Stakeholder 的例子

- **Sponsor**: provides resources/funding and direction to the project (frequently is a senior member of top management within the organisation).
- **Customers, users (用户)**: the actors that will takeover the projectt's outcome.
- **Sellers (供应商和承包商)**: include vendors suppliers, contractors that provide components
- **Organisational Groups**: the groups affected by the activities of the proejct (e.g. human resources, legal, finance). The project team interacts a lot with them, they work together to achieve project goals.
- The **team members** (注意, team member 也算是 stakeholder)!

2.2 Project Manager 的介绍

2.2.1 什么是 Project Manager

Project managers work with the project sponsors, the project team, and other stakeholders to meet project goals.

A project manager in IT should possess project management and IT knowledge, understanding of the project and how it will fit into the organization, and experience in general management and leadership skills.

2.2.2 好的 Project Manager

Good project managers do not assume that their definition of success is the same as the sponsors'. They take the time to understand their sponsors' expectations (花时间理解赞助商的

期望) and then track project performance based on important success criteria (根据主要成功的标准追踪项目进度).

The project manager should be communicating with the sponsor throughout the project to make sure it is meeting expectations. **应该如何去做**

同时, 好的 Project Manager 应该持续发展三个 skills (The **PMI Talent Triangle** was developed to emphasize the types of skills project managers need to continuously develop).

- Technical project management skills
- Strategic and business management skills
- Leadership skills

下面是高效的项目经理应该有的 6 个特性 (Six traits of highly effective project managers).

- Be a strategic business partner (成为战略业务合作伙伴).
- Encourage and recognize valuable contributions (鼓励并认可宝贵的贡献).
- Respect and motivate stakeholders (尊重和激励 stakeholder).
- Be fully vested in success (完全获得成功).
- Stress integrity and accountability (强调完整性和责任感).
- Work in the gray/Be able to deal with ambiguity (能够处理工作中的歧义)

同时, project managers 还需要掌握十个知识领域. (the Knowledge Areas encompass 包含 what the Project Manager needs to know) 这一部分见4.1.3.

2.2.3 Project Managers 有重要作用的地方

下面是一些 Project Managers 有重要作用的地方 (可以用在举例的题目里面).

- 在 Project Integration 的 Executing 阶段5.2.3
- 在 Schedule Management 的 control 阶段, 关于 leadership, 7.1.7

2.3 Project Lifecycle 的介绍

2.3.1 Project Lifecycle 的定义

定义 2.2. Project Lifecycle

A project life cycle is the series of phases that a project passes through from its initiation to its closure.

A project may be divided into any number of phases. A project phase is a collection of logically related project activities that culminates in the completion of one or more outputs (项目阶段是逻辑上相关的项目活动的集合, 这些活动最终完成一个或多个输出).

关于 **project lifecycle** 与 **product lifecycle** 两者的区别.

For example, a software product life cycle includes an initial software project life cycle but also processes for deployment, support, maintenance, evolution, replacement, retirement of the

software (例如, 软件产品生命周期包括初始软件项目生命周期, 但也包括软件的部署, 支持, 维护, 演进, 替换, 报废的过程。).

也就是 product life cycle 多了后面的 deployment, support 等步骤.

2.3.2 Project Lifecycle 的不同阶段

在不同阶段的 Project Lifecycle, 有以下不同的性质.

- In early phases of a project life cycle (在早期)
  - resource needs are usually lowest (资源需要是少的)
  - the level of uncertainty (risk) is highest (不确定性是高的)
  - project stakeholders have the greatest opportunity to influence the project
- In middle phases of a project life cycle (在项目中期)
  - the certainty of completing a project improves
  - more resources are needed
- The final phase of a project life cycle focuses on
  - ensuring that project requirements were met (确保项目的需要是满足的)
  - the sponsor approves completion of the project (赞助商统一结束 project)

把上面的各个阶段的 **cost** 和 **uncertainty** 总结下来, 如下图所示.

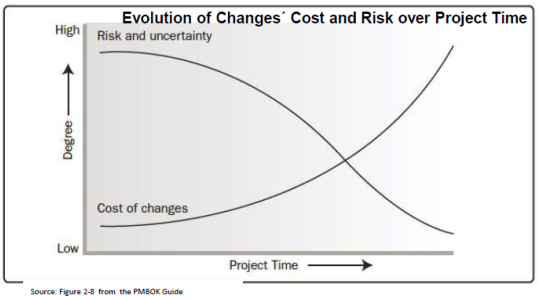


图 2.1: 项目各个阶段的 Cost 和 Uncertainty

从上面的图中, 可以看到, 随着项目的进行 (project time 的增长):

- cost 在逐渐增大
- uncertainty 在逐渐减少

2.3.3 Project Lifecycle 不同分类

Project life cycles can range along a continuum from **highly predictive** approaches at one end to **highly adaptive** approaches at the other.

- **Highly Predictive**
  - Requirements, Are specified during initiation and planning (在开始阶段就得到明确)
  - Risk and Cost, Are controlled by detailed planning based on in-depth analysis of requirments and constraints prior(在... 之前) to development.

    - Stakeholders, Are involved at scheduled milestones.
- **Middle**
    - Requirements, Are elaborated (详细说明) at periodic intervals (每隔一段时间) during software developement.
    - Risk and Cost, are controlled by progressively detailed planning based on timely specification of requirements and constraints during the development.
    - Stakeholders, are involved at specified intervals.
- **Highly Adaptive**
    - Requirements, Are elaborated (详细说明) at frequent intervals (每隔一段时间) during software developement. **也是 Adaptive, requirements 修改就越频繁**.
    - Risk and Cost, Controlled as requirments and constrains emerge. (随着需求和约束的出现得到控制)
    - Stakeholders, Continuously involved (逐渐加入进来, 不是一开始就全部进来).

2.4 Trends Affecting Information Technology Project Management

对于影响 Information Technology Project Management 的四个点, 分别是 **Globalization**, **Outsourcing (外包)**, **Virtual teams**.

- **Globalization**: project teams tend to have members from many different places around the world as organisations become multinational and experts tend to move from country to country.
    - **Issue**: Communications, Trust, Common work practices(共同的工作习惯), Tools
    - **Suggestions**, 1. Employ greater project discipline(运用更多的纪律), 2. Think globally but act locally, 3. Consider collaboration over standardization(考虑协作, 而不是标准化), 4. Keep project momentum going(确保项目的发展势头), 5. Use newer tools and technology.
- **Outsourcing (外包)**: when an organization acquires goods and/or sources from an outside source. Offshoring is sometimes used to describe outsourcing from another country.
    - **Advantage**: using outsourcing to their advantage, such as finding ways to **reduce costs**
    - **Disadvantage**: 1. Practice can be unpopular on some countries and entails risks. 2. Project managers should become more familiar with many global and procurement(采购) issues
- **Virtual teams**: A virtual team is a group of individuals who work across time and space using communication technologies. (查看 PPT 23)
- **Agile**: Agile today means using an approach where requirements and solutions evolve through collaboration. Agile approaches are now mainstream, PMI introduced relevant certifications. (查看 PPT 24)

2.4.1 对于 Agile/Adaptive Approaches 的好处

- Agile / Adaptive approaches promote the strong engagement of team members (提高参与的积极度)
- Expectations of the project manager do not change in an adaptive environment, but control of the detailed product planning and delivery is delegated to the team (项目经理的期望在适应性环境中不会发生变化, 但是详细产品计划和交付的控制权将委托给团队, 有更加多的灵活度).

Irrespectively (不管) of how predictive or adaptive is the approach followed, project managers should focus on creating a collaborative decision-making environment and providing opportunities for team members to develop additional skills (不管使用哪一种方式, 我们都希望可以创造出一个好的环境, 使得小组成员可以学到更多的东西和额外的知识.)

第 3 章 Organizational Aspects and Governance Arrangements (Chapter 2 continued)

内容提要

- stakeholder
- Role of Project Manager
- Project Lifecycles
- trends that affect Project Management

- A systems approach helps us understand how projects relate to their context and how their different components relate to each other.
- Projects operate in an environment broader than the project itself and are influenced by organizational structures, and organizational culture. (项目在比项目本身更广阔的环境中运作, 并受组织结构和组织文化的影响)
- The three basic organizational structures include functional, matrix, and project types.
- Project managers have the most authority in a pure project organization, an intermediate amount of authority in a matrix organization, and the least amount of authority in a pure functional organization.
- IT governance entails distributing decision rights for IT principles, architecture, infrastructures, business applications, investments. It is very important for the complex settings of large-scale organisations. Project management depends on IT governance.

3.1 A Systems Approach to Project Management for Information Systems

Projects do not exist in isolation.(项目不会单独存在) Important to place projects within their context:

- organisational influences (culture and structure),
- stakeholders and governance arrangements (利益相关者和治理安排)
- Systems approach 的历史: The systems approach emerged in the 1950s as a holistic approach to problem solving in different domains including biology, physics and management.
- Systems are sets of interacting components that are purposeful (they aim to fulfill a purpose). (系统是有目的的交互组件集, 它们旨在实现目的)
- They can be open or closed to the environment within which they operate.
- They can be composed of many subsystems and be part of wider systems.

- Systems approach 能做什么: A systems approach helps us understand how projects relate to their context(系统方法可帮助我们了解项目与环境之间的关系) and how their different components relate to each other(它们的不同组成部分如何相互关联).

我们需要注意的是, systems approach 中我们认为一个 project 在一个更大的环境中受影响. A systems approach requires project managers to always view their projects in the context of the larger organization.

3.2 Organisational influences

- Projects operate in an environment broader than the project itself.
- An organization's culture-style and structure influence how its projects are performed. (在这里我们考虑 culture-style 和 structure)
- 一个例子: When a project involves external entities such as those that are part of a joint venture or partnering agreement (当项目涉及外部实体, 例如合资企业或合作伙伴协议中的外部实体时), the project will be influenced by more than one organization (该项目将受到多个组织的影响).

3.2.1 Organizational Cultures and styles

Cultures and styles are group phenomena which develop over time (文化和风格是随着时间而发展的群体现象). This includes(文化和风格包括哪些):

- established approaches to initiating and planning projects (建立启动和计划项目的方法),
- the means considered acceptable for getting the work done (被认为可以完成工作的手段),
- recognized authorities who make or influence decisions (做出或影响决策的公认权威).

Cultures and styles are shaped by common experiences such as(他们会有以下的共同经验来塑造, 也就是他们是如何形成的):

- visions, mission, values, beliefs, and expectations (愿景，使命，价值观，信念和期望);
- regulations, policies, methods, and procedures, motivation and reward systems (法规，政策，方法和程序，激励和奖励制度);
- leadership, hierarchy, and authority relationships (领导，层级和权限关系);
- code of conduct, work ethic, and work hours;
- operating environments.

接下来我们把问题具体到 Organizational culture. Organizational culture is a set of shared assumptions, values, and behaviors that characterize the functioning of an organization (组织文化是一组共同的假设, 价值观和行为, 它们代表了组织的功能). Ten characteristics of organizational culture(下面是 10 个关于 organizational culture 的特点):

- Member identity (会员身份)
- Group emphasis (项目组重点)

- People focus
- Unit integration
- Control
- Risk tolerance (risk 的容忍度)
- Reward criteria (奖励标准)
- Conflict tolerance (冲突容忍度)
- Means-ends orientation
- Open-systems focus (开放系统的焦点)

下面是一些 culture 的例子.

- Highly regulated v.s. loosely regulated organisations (比较松散或是管理严格)
- Motivation and reward systems encouraging competition vs cooperation? Hierarchical or flat?
- Risk averse(不喜欢做)-high reliability (风险规避高可靠性) vs experimental?
- Work hours?

3.2.2 Organisational Structures

Organisational Structures 有三种基本的形式:

- Functional (根据每个人的特长划分): units defined by specialty (特长).
- Projectized (根据项目划分): units defined on the basis of projects.
- Matrix (结合上面两种, 这里还包含三种形式): middle ground between functional and project structures; personnel often report to two or more bosses; can be weak, balanced, or strong matrix.

但是我们也需要注意到, 一些组织会有上面的三种形式的 Organisational Structures(Many organisations include all types). For instance, a traditional functional organisation may create a project-based unit to handle a critical project.

关于 Project managers 在三种结构中的地位. Project managers have the most authority in a pure project organization, an intermediate amount of authority in a matrix organization, and the least amount of authority in a pure functional organization.

3.2.2.1 Functional Organisation

下面是关于 Functional Organisation 的一些特性.

- Hierarchy (等级结构) where each employee has one clear superior.
- Employees grouped by specialty, such as engineering, marketing, and accounting. (按照员工的专长进行分类, 类如工程师, 会计)
- May be further subdivided into focused functional units, such as mechanical and electrical engineering. (也可以进一步进行细分)
- Project members can be distributed in multiple units. (一个项目里的人可能来自不同的 unit)

Functional Organisation 的结构图如3.1所示.

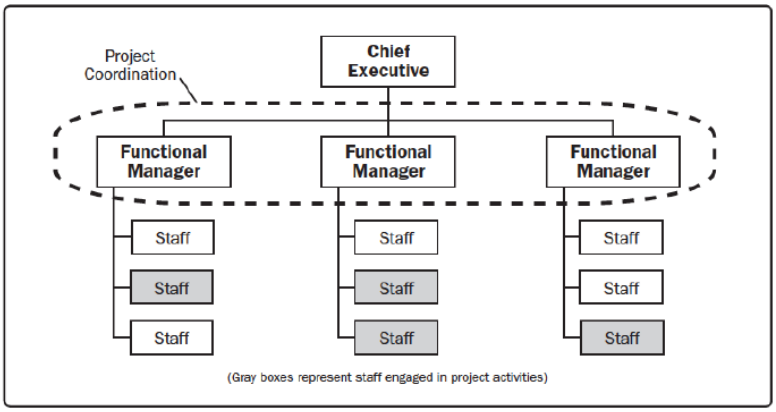


图 3.1: Functional Organisation 的结构图

3.2.2.2 Projectized Organisation

下面是关于 Projectized Organisation 的一些性质.

- Teams operate as separate units under the leadership of a project manager.
- All resources are reporting to their project manager and project managers report to the highest authority in the organization.
- In projectized organisations projects are the dominant form of business (在项目化组织中, 项目是业务的主要形式).

Projectized Organisation 的结构图如3.2所示.

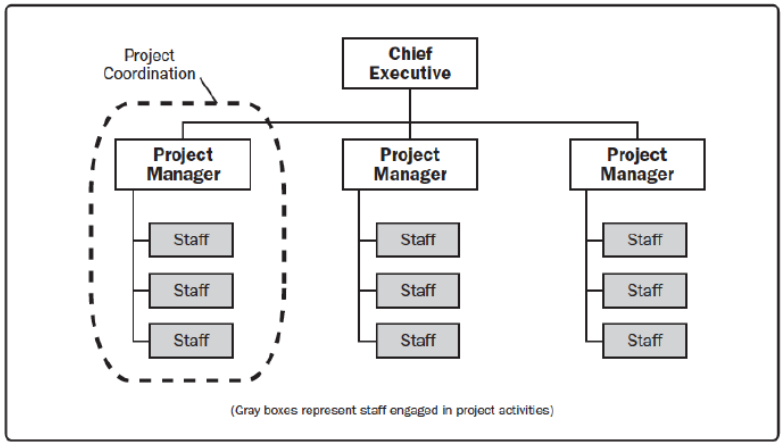


图 3.2: Projectized Organisation 的结构图

3.2.2.3 Matrx organizations

下面是关于 Matrx organizations 的一些性质.

- blend functional and projectized characteristics (结合了上面两种 organizations 的特点)
- Project participants are under two chains of command (functional and project), 组员会同时在两个分组里面, 可以看下面图里横着和竖着.

- Can be classified as weak, balanced, or strong depending on the relative level of power and influence between functional and project managers (根据职能和项目经理之间的相对权力水平和影响, 可以分为弱, 平衡或强)

三种 Matrx Organisation 的结构图如3.3所示.

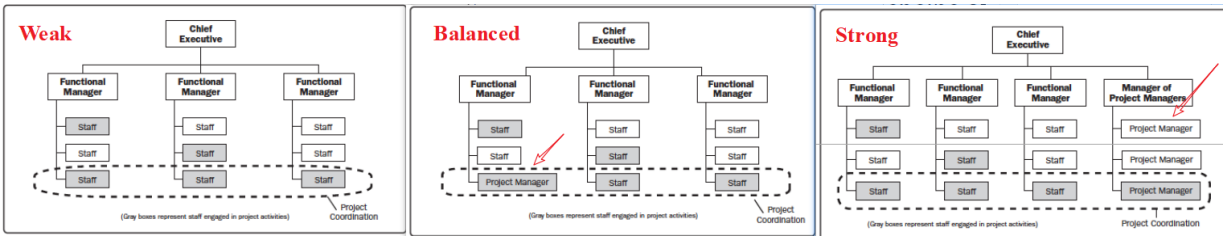


图 3.3: 三种 Matrx Organisation 的结构图

下面的图3.4是关于这三种结构下, project manager's authority 和 who control the project budget.

Project Characteristics	Organizational Structure Type				
	Functional	Matrix			Project
		Weak Matrix	Balanced Matrix	Strong Matrix	
Project manager's authority	Little or none	Limited	Low to moderate	Moderate to high	High to almost total
Who controls the project budget	Functional manager	Functional manager	Mixed	Project manager	Project manager

图 3.4: 三种 Matrx Organisation 的权力分配

3.3 Project governance

- 定义: Project governance enables organizations to align projects with business strategy and stakeholders' needs or objectives, and to manage them in a consistent way (项目治理使组织能够使项目与业务战略和利益相关者的需求或目标保持一致, 并以一致的方式进行管理).
- It is the management framework within which project decisions are made (它是用于制定项目决策的管理框架). It defines roles, responsibilities, and accountabilities for the success of the project.
- For an IT/IS project, project governance is dependent to the overall IT governance of the organisation (项目治理取决于组织的整体 IT 治理).

下面详细解释一下 IT Governance:

- IT Governance through a matrixed approach, 这个矩阵如图3.5所示.
- Developed on the basis of extensive empirical research (在广泛的实证研究的基础上发展起来的).
- A matrix that juxtaposes five IT decision domains against different decision taking modes (该矩阵将五个 IT 决策域与不同的决策模式并置).

- Depending on how these decisions are taken, different projects have different stakeholders and different positioning within the organisation. (根据做出这些决定的方式，不同的项目在组织中具有不同的利益相关者和不同的定位)

Decision by who \ Decision on what	IT Principles	IT Architecture	IT Infrastructure	Business App Needs	IT Investment
	Decision	Decision	Decision	Decision	Decision
Business Monarchy	Profit Growth	Profit	Profit	Profit	Profit Growth
IT Monarchy			Profit		
Feudal					Growth
Federal				Profit	
Duopoly	ROA	ROA	ROA	ROA	ROA
Anarchy					

图 3.5: IT Governance 的 matrixed approach

再详细介绍一下 IT Governance:

- It is about making sure that information technology provides the best possible support for the organisation in delivering what it is there to deliver (就是要确保信息技术在为组织提供交付内容方面为组织提供最佳的支持).
- It is also about handling that technology in a prudent and professional way (这也与以谨慎和专业的方式处理该技术有关).
- It is very important for the complex settings of large-scale organisations.

图3.6表示一个大型的 IT 项目的结构, 这个项目与 organisation 之间的关系.

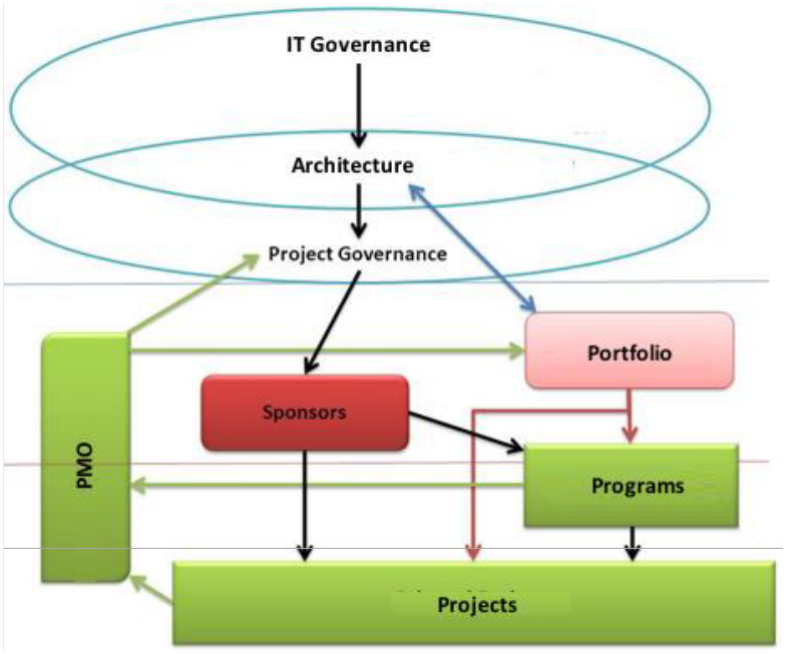


图 3.6: Overview of IT project coordination within large scale organisations

一些关于 IT Governance 的属性.

- IT Governance is essential in complex settings such as NAV and DNB.
- IT governance provides the framework and structure that links IT resources and information to the organisations' goals and strategies.

- Project governance is shaped by the overall IT governance and enables organizations to align projects with business strategy and stakeholders' needs or objectives, and to manage them in a consistent way.

下面介绍一下 Agility(敏捷开发)

- IT governance choices do influence firms' characteristics. (IT 治理的选择确实会影响企业的特征)
- For instance, how IT governance choices shape firms' agility (例如, IT 治理选择如何影响企业的敏捷性)?
- Agility is most penalized when firms decentralize both decisions for app and infrastructure (当公司将应用程序和基础架构的决策权下放时, 敏捷性将受到最大的惩罚). This implies that decentralizing all IT decisions is the worst possible approach to governing IT assets in terms of agility (这意味着将所有 IT 决策分散化是在敏捷性方面管理 IT 资产的最糟糕的方法).
- 这个对应着图3.7右上角的圆, Decentralization (去中心化) of apps and centralisation (中心化) of infrastructure results in the highest agility (应用程序的分散化和基础架构的集中化带来了最高的敏捷性).

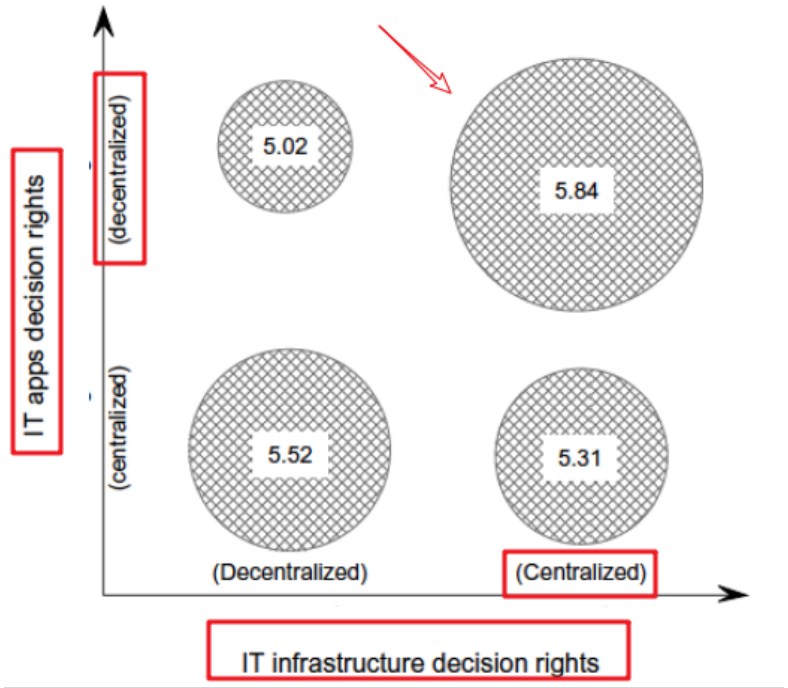


图 3.7: IT Governance 中 App 与 Infrastructre 中 Agility

第 4 章 The Project Management Process Groups (Chapter 3)

内容提要

- ❏ 5 process groups
- ❏ 49 project processes
- ❏ complexity and uncertainty
- ❏ adaptive and predictive

- Project management is accomplished through the appropriate application and integration of project management processes that are categorized into 5 process groups: Initiating, Planning, Executing, Monitoring-Controlling, Closing.
- The five process groups include 49 project management processes.
- Although all 5 process groups are required for any given project, not all 49 processes are always needed. The project management processes of each process group are mapped to the knowledge areas in a 10x5 matrix. This matrix is an overview of the project management body of knowledge. We select and adjust processes from this matrix.
- Project needs are shaped by the organizational structures and culture, stakeholders and governance arrangements and the complexity and uncertainty entailed in the end-product that the project needs to deliver. We can have project management approaches that are more or less predictive or adaptive.

4.1 Management Process Groups 的介绍

4.1.1 五个 Management Process Groups

正如我们在1.2.1中介绍的, Project management 通过适当的应用 project management processes 来完成. 这些 processes 一共分为 5 个 Management Process Groups:

- **Initiating**, Processes to define a new piece of work and to ensure you have authority to proceed.
- **Planning**, Projects that follow a predictive approach tend to have more detailed initial planning than more adaptive ones.
- **Executing**, Processes to prepare "products" according to specifications. This is where the main activity happens and you create the products.
- **Monitoring-Controlling**, Processes to track, review, and regulate the progress of the project.
- **Closing**, Process to finalize all activities.

完整的如下图所示,

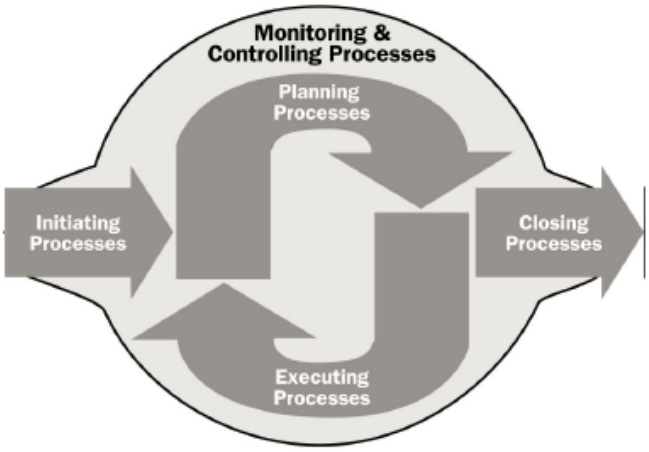


图 4.1: Project Management Process

关于 process group 的一些性质的介绍:

- 对于任何的项目, 这 5 个 groups 都是要执行的 (For any given project, Initiating, Planning, Executing, Monitoring-Controlling and Closing need to be performed).
- Project management processes apply globally and across industries. (项目管理流程适用于全世界和所有的行业)
- 经过上面提到的 5 个 groups 都是要用到的, 但是不是 49 个 process 都是要用到的. (Although all 5 process groups are required for any given project, not all 49 processes are always needed.)
- 不同的项目需求, 需要使用不同的 processes. The application of project management processes depends on project needs.
- **这里给出解释为什么不是 49 个 processes 每次都要使用的** Good practice does not mean that the processes should always be applied uniformly on all projects. For any given project, the processes that are appropriate (恰当的) and the appropriate degree of rigor (严格) for each process need to be decided. (完全按照这 49 个 process 并不一定是好的, 需要检查这些 process 的恰当性)

上面说到不是 49 个 processes 每次都要使用的原因是我们需要检查这个 processes 是否恰当. 下面是关于 process 是否恰当的标准 (Appropriate project management processes are defined on the basis (标准) of:).

- institutional factors (the organizational structures and culture, stakeholders and governance arrangements), 我们需要考虑到公司结构, 文化等的因素
- complexity and uncertainty entailed in the end-product that the project needs to deliver. 项目需要交付的最终产品涉及复杂性和不确定性.

4.1.2 详细介绍 Management Process(49 个)

一共有 5 个 Process Groups, 共有 49 个 processes. 每一个 process 包含三个部分, 分别是:

- Inputs
- Tools and Techniques
- Outputs

Processes are linked by specific inputs and outputs where the output of one process becomes the input to another.

4.1.3 Management Process 需要的知识

Management Process 对应着 10 个知识点的内容, 也就是对应着书上的 10 个章节. 我们会在后面逐个介绍这些内容的.

- Project Integration Management. 详细内容查看: 5.
- Project Scope Management.
- Project Schedule Management.
- Project Cost Management.
- Project Quality Management.
- Project Resource Management.
- Project Communications Management.
- Project Risk Management.
- Project Procurement Management.
- Project Stakeholders Management.

4.1.4 5 个 Process Groups 和对应的 Knowledge

上面介绍了 10 个 knowledge areas, 下面我们将上面 10 个 knowledge areas 与 5 个 Process Groups 对应起来. 也就是每一个部分需要什么 knowledge areas. **这里详细的对应关系可以查看一个表格, 10*5 的一个表格**

4.2 不同的项目需要不同的 processes

我们不同的项目, 是有不同的需求. 我们需要根据不同的项目需求进行不同的管理的方式.

如上图4.2所示:

- 先看 y 轴, 随着项目不确定性的增大, 需要使用更多适应性的方法. (More adaptive approaches)
- 再看 x 轴, 随着项目复杂性的增大, 需要使用更多谨慎的方法. (More rigorous approaches)
- 我们详细看一下上图中的四个象限的内容:
  - **Uncertainty=Low, Complexity=low (1,1 位置)**, 采用 laissez faire(自由放任的措施)

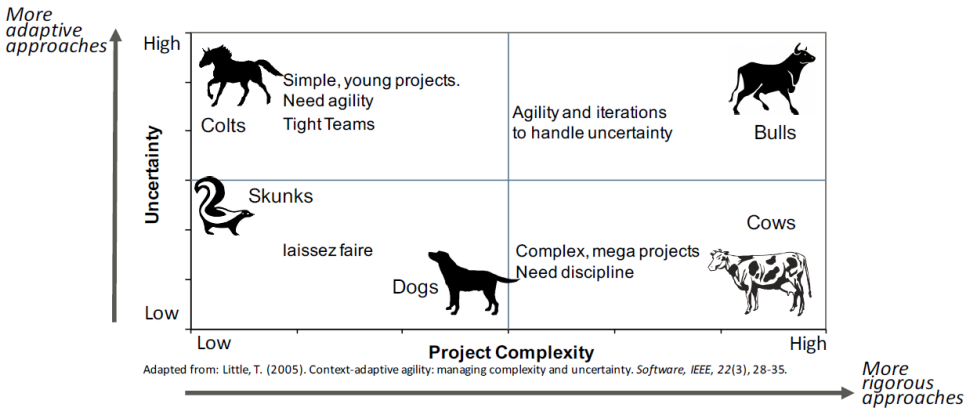


图 4.2: 不同项目需要的不同管理方式

- **Uncertainty=Low, Complexity=high (2,1 位置)**, 这些是 Complex, mega projects. Need discipline(需要纪律)
- **Uncertainty=high, Complexity=low (1,2 位置)**, 这些是 Simple, young projects. Need agility. (需要敏捷) Need tight Teams(需要紧凑的团队)
- **Uncertainty=high, Complexity=high (2,2 位置)**, 需要 Agility and iterations to handle uncertainty, (敏捷性和迭代以处理不确定性)

Project needs are shaped by the organizational structures and culture, stakeholders and governance arrangements and the complexity and uncertainty entailed in the end product that the project needs to deliver. We can have project management approaches that are more or less predictive or adaptive.

项目需求由组织结构和文化, 利益相关者和治理安排以及项目需要交付的最终产品带来的复杂性和不确定性决定. 我们可以采用或多或少具有预测性或适应性的项目管理方法.

第 5 章 Project Integration Management (Chapter 4)

内容提要

- ❑ Project Integration management 介绍
- ❑ Project Integration management 在 5 个 process 的具体表现

在这一部分, 我们首先介绍 Project Integration management 是什么. 接着, 因为 Project Integration management 在 5 个 process groups 都用到, 我们介绍一下每一部分是如何用到的.

- Project management is accomplished through the appropriate application and integration of project management processes. Different Project management approaches can be used depending on project needs.
- Project integration management involves coordinating all of the other knowledge areas throughout a project's life cycle. Project integration management is the only knowledge area that goes across all five process groups. All project integration management processes are needed in all projects, but, their content needs to be adjusted.
- Project Integration Management includes the following key processes
  - Develop the project charter
  - Develop the project management plan
  - Direct and manage project work
  - Manage project knowledge
  - Monitor and control project work
  - Perform integrated change control
  - Close the project or phase

5.1 Project Integration management 的介绍

定义 5.1. Project Integration management

- Project integration management involves coordinating all of the other knowledge areas throughout a project's life cycle (项目集成管理涉及在项目生命周期中协调所有其他知识领域).
- In the project management context, integration includes consolidation, communication, and integrative actions that are crucial to controlled project execution (在项目管理环境中, 集成包括对受控项目执行至关重要的合并, 沟通和集成操作).
- Project integration is a linking mechanism that keeps everything together.

♣

下面是一些 Project integration management 的性质.

- Project integration management goes across all five process groups (她包含了 5 个过程, 从那个 matrix 中可以看到第一行是满的).
- It is the only Knowledge Area that goes across all. (这是唯一一个)
- All project integration management processes are needed in all projects, but, their content needs to be adjusted.

5.2 Project Integration 在 five process groups

首先我们看一个总览. Project Integration Management includes the following key processes:

- Develop the project charter (Initiating 阶段)
- Develop the project management plan (Planning 阶段)
- Direct and manage project work (Executing 阶段)
- Manage project knowledge (Executing 阶段)
- Monitor and control project work (Monitoring and Controlling 阶段)
- Perform integrated change control (Monitoring and Controlling 阶段)
- Close the project or phase (Closing 阶段)

5.2.1 Initiating 阶段

在 Initiating 阶段, 我们需要有一个 **project charter**, 类似于项目申请书. 也就是在这个阶段, 我们需要 **develop project charter**

- 定义: **A project charter** is a document that formally recognizes the existence of a project and provides direction on the project's objectives.
- 用处: A project charter aims to minimize uncertainty. 最小化不确定性.
- The template can be more or less elaborate. It is adjusted to the type of project.
- Key project stakeholders should sign the project charter to acknowledge agreement on the need and intent of the project. 项目利益者要签名, 并确认项目的意图和需要.
- Very important to have this document before planning. A focal (中心) point throughout the project.

5.2.2 Planning 阶段

在 planning 阶段, 我们需要有更加详细的计划表. 也就是, 我们需要进行 **develop project management plan**.

- 定义: A **project management plan** is a document used to coordinate all project planning documents and guide a project's activities.
- Plans created in the other knowledge areas are subsidiary parts of the overall project management plan (在其他知识领域中创建的计划是整体项目管理计划的子部分).

- Common elements of the project management plan include (project management plan 需要包含的内容):
  - Description of how the project is organized.
  - Management processes used on the project.
  - Work to be done, schedule, and budget information.
- For large-scale software development projects ISO/IEC/IEEE 16326:2009 (Software Engineering–Life Cycle Processes– Project Management) can be used.
- Project planning and execution are intertwined (plan 和 execuate 是相互交错的, plan 和 execuate 可能会同时在执行). Those who will do the work should help to plan the work. Project managers must get input from the team to develop realistic plans.

5.2.3 Executing 阶段

在有了上面的 plan 之后, 下面就是项目的具体执行阶段. 这一阶段有两个 process, 分别是:

- 指导和管理项目工作 (Direct and manage project work).
- 管理项目用到的知识. (Managing Project Knowledge)

5.2.3.1 Direct and manage project work

- 定义: **Directing and Managing Work** Involves managing and performing the work described in the project management plan (管理和执行项目管理计划中描述的工作).
- 特点: The majority of time and money is usually spent on execution. 在执行阶段是花时间和钱最多的地方.
- 对 project managers 的一些要求
  - It is often helpful for IT project managers to have prior technical experience. (IT 的项目管理人有科技的经验是最好的)
  - On small projects, the project manager may be required to perform some of the technical work or mentor team members to complete the projects.
  - The project manager must understand the business and application area of the project.

  在这个阶段, project managers 有重要的作用.
- 在这一阶段 project manager 需要做的事情: The project manager needs to focus on leading the project team and managing stakeholder relationships to execute the project management plan successfully.
- Project managers must lead by example (项目经理必须以身作则)
  - Demonstrate the importance of creating and then following good project plans and following them in project execution (演示创建并遵循良好的项目计划并在项目执行中遵循这些计划的重要性)
- Organizational culture can help project execution (组织文化可以帮助项目执行)
  - Providing guidelines and templates

- Tracking performance based on plans

5.2.3.2 Managing Project Knowledge

- 定义: **Managing Project Knowledge** Involves managing both explicit (显性) and tacit (隐性) knowledge.
  - **Explicit knowledge (显性知识)**: easily explained using words, pictures, or numbers and is easy to communicate, store, and distribute. (容易解释的内容)
  - **Tacit knowledge (隐性知识)**: difficult to transfer to another person by means of writing it down or verbalizing it (很难用语言来进行表达, 例如如何骑车等). It can include skills, ideas and experiences that people have but are not codified (how do you ride a bike? how do you perform complex technical operations?). Term introduced by Polanyi in the 50s.
- It can be helpful for teams to share physical or virtual spaces.

5.2.4 Monitoring and Controlling 阶段

在项目执行的过程中, 我们需要对项目进行监督和控制. 在这里有 2 个 processes, 分别是:

- Monitor and control project work

5.2.4.1 Monitor and control project work

- Changes are inevitable, it‘s important to develop and follow a process to monitor and control them. (改变是在所难免的, 所以需要建立并遵循一个步骤来监督他们)
- 下面是分开介绍 Monitor 和 control.
- 对于 Monitor
  - Monitoring project work includes collecting, measuring, and disseminating performance information (监视项目工作包括收集，衡量和传播绩效信息).
  - **Former view**: The project team should strive to do exactly what was planned on time and within budget. (项目团队应努力按时并在预算范围内准确地完成计划的工作)
  - **Modern view**: Project management is a process of constant communication and negotiation. Changes are often beneficial, and the project team should plan for them (项目管理是一个不断沟通和协商的过程. 更改通常是有益的, 项目团队应该为更改做好计划).
- 对于 Control
  - For change control we need a formal, documented process that describes when and how official project documents and work may be changed, who is authorized to make changes and how to make them.

5.2.4.2 Perform integrated change control

关于 integrated change control 的总体结构如图5.1所示:

图 5.1: Change Control

下面是对一些 change control 详细的说明:

- Formal, documented process that describes when and how official project documents and work may be changed
  - Describes who is authorized to make changes, paperwork required for these changes, and any automated or manual tracking systems the project will use
- Change control board (CCB) is a formal group of people responsible for approving or rejecting changes on a project (专门负责管理项目改变的人)
  - Provide guidelines for preparing change requests, evaluate change requests, and manage the implementation of approved changes
- Some CCBs only meet occasionally, so it may take too long for changes to occur
- Some organizations have policies in place for time-sensitive changes

5.2.5 Closing 阶段

完成了上面所有的事情之后, 最后就是项目的 closing 阶段了.

- 定义: **Closing a project** entails finalizing all of its activities and transferring the completed or cancelled work to the appropriate people (需要完成所有活动并将已完成或已取消的

工作移交给适当的人员).

- Main outputs include (这一部分主要的输出)
  - Final product, service, or other type of deliverable. (最终的产品, 和一些要提交的内容)
  - Lessons Learnt Document or something similar. (一些文档)

第 6 章 Project Scope Management (Chapter 5)

内容提要

❑ Scope Management 介绍 ❑ Scope Management 的 processes

- Project scope management includes the processes required to ensure that the project addresses all the work required, and only the work required, to complete the project successfully.
- Scope Management includes 6 processes: Plan Scope Management, Collect Requirements, Define Scope, Create WBS, Validate Scope, Control Scope. These processes differ for predictive and adaptive approaches.
- A WBS is a hierarchical decomposition of the total scope of work. The lowest level WBS components, are called work packages. A WBS specifies what will be done, not how or when.

6.1 Scope Management 的介绍

定义 6.1. Scope Management

Project scope management includes the processes involved in defining and controlling what is or is not included In a project (Scope Management 要做的就是确认什么是在项目里面, 什么不在项目里面). Ensures that the project team and stakeholders have the same understanding of what products the project will produce and what processes the project team will use to produce them (同时, 确保项目团队和利益相关者对项目将生产什么产品以及项目团队用来生产产品的过程具有相同的了解).

6.2 Scope Management 的阶段

Description of the 6 Scope Management processes (Scope Management 有下面的 6 个步骤)

- Plan Scope Management: The process of creating a scope management plan that documents **how the project scope will be defined, validated, and controlled.** This way, we determine how the project's scope and requirements will be managed (这样, 我们确定如何管理项目的范围和需求).
- Collect Requirements: The process of **determining, documenting, and managing stakeholder needs and requirements** to meet project objectives.

- Define Scope: The process of **developing a detailed description of the project** and product. Reviewing the project charter, requirements documents, and organizational process assets to create a scope statement.
- Create WBS (这个部分很重要): The process of **subdividing project work into smaller, more manageable components** (将项目工作细分为更小, 更易于管理的组件).
- Validate Scope: The process of formalizing acceptance of the completed project deliverables. (正式接受已完成项目可交付成果的过程)
- Control Scope: The process of monitoring the status of the project and product scope and **managing changes** to the scope baseline throughout the life of the project.

下面是在 Scope Management 中 6 个 processes 的总体框架图. 前 4 个都是在 planning process 过程中的. 后面两个是在 monltoring and controlling process group 中的.

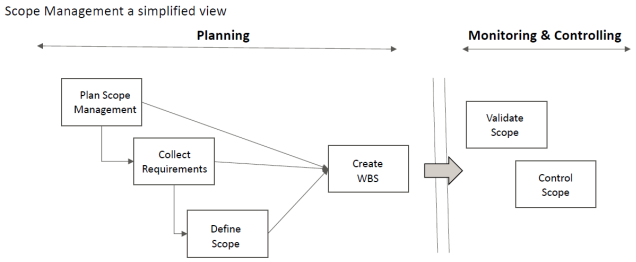


图 6.1: Scope Management 整体图

6.2.1 Scope Management 在 predictive 和 adaptive 的区别

如果项目采取不同的策略, predictive 和 adaptive, 那么 Scope Management 会有很大的不同. Scope Management includes 6 processes: Plan Scope Management, Collect Requirements, Define Scope, Create WBS, Validate Scope, Control Scope. These processes differ for predictive and adaptive approaches.

	Predictive identify all the work, down to task level, from the start and then manage against that	**Adaptive** only identify work, at high level, work throughout the project with stakeholders to elicit needs and tasks accordingly.
Plan Scope Management	Plan for a predictive approach that will stabilize the scope upfront.	Plan for an adaptive approach allowing scope evolution
Collect Requirements	Work with stakeholders to develop upfront requirements that are complete, correct, consistent and detailed.	Stakeholders provide requirements in an emergent manner. Keep backlog of requirements for potential assignment.
Define Scope	Aim to define completely and in detail, a static scope.	High level definition, planned to evolve during the project.
Create WBS	Detailed and comprehensive classification of project scope, owners for each task assigned.	Start with a high level WBS and end up with a detailed one. Additional detail added when appropriate, for example, Scrum or XP teams will do a Sprint plan that features detailed tasks.
Validate Scope	Occurs at specific checkpoints or at the end.	Occurs incrementally, validation may be planned formally or just be built-in in the process and happen in non going basis.
Control Scope	Scope changes are controlled. Key process output: decisions of the change control board .	The scope may evolve. Key process output: customer decisions about the next set of features to be implemented.

图 6.2: Scope Management 在 predictive 和 adaptive 情况下的区别

下面就是对上面提到的 6 个 process 进行详细的介绍.

6.2.2 Plan Scope Management 阶段

- In large scale projects, the team uses expert judgment, data analysis, and meetings to develop (这是在这个 process 中使用的 tools):
  - **a scope management plan (这是这个阶段的 output)** that includes the approach to be followed for preparing a detailed project scope statement, creating, maintaining and approving a WBS, obtaining formal acceptance of the completed project deliverables, controlling requests for changes to the project scope.
  - **a requirements management plan (这是这个阶段的 output)** that describes the approach for project requirements analysis documentation, and management. For instance, this plan can include details on how to plan, track, and report requirements activities, how to prioritize requirements, how to trace attributes of requirements.

6.2.3 Collect Requirements 阶段

In all projects, the team has to collect project requirements (在所有的项目中, 我们都需要进行需求的收集).

This process is performed once or at predefined points in the project. The project's success is directly influenced by active stakeholder involvement in the discovery and decomposition of needs into project requirements and by the care taken in determining, documenting, and managing these requirements (利益相关者积极参与发现需求并将其分解为项目需求, 以及确定, 记录和管理这些需求时所采取的谨慎态度, 直接影响着项目的成功).

Requirements become the foundation of the WBS (requirements 是后面建立 WBS 的基础). Cost, schedule, quality planning, and procurement are all based on these requirements (一些其他的东西都要基于 requirements).

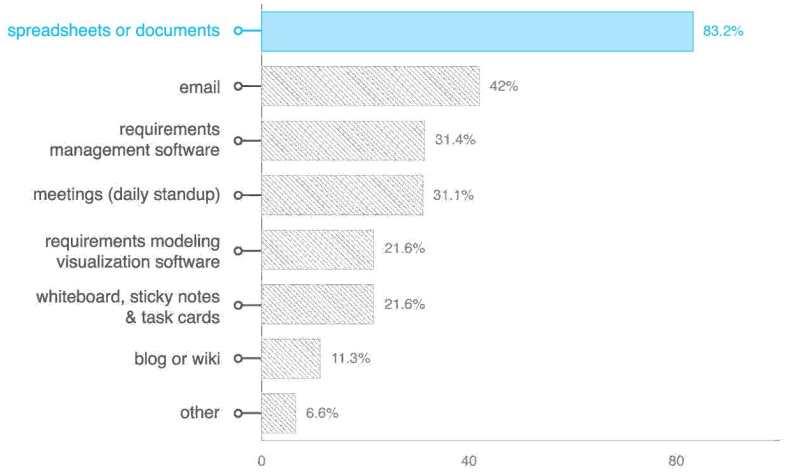


图 6.3: 收集 requirement 的不同方式

6.2.4 Define Scope 阶段

- The **project scope statement** is the description of the project scope, major deliverables, assumptions, and constraints (项目范围声明是对项目范围, 主要可交付成果, 假设和约束的描述).
- It provides a common understanding of the project scope among project stakeholders. It can be updated throughout the duration of the project as the understanding is being developed (随着理解的发展, 它可以在项目的整个过程中进行更新).
- The project charter (这个是在 Integration management 里面的) provides the basis for further defining the project scope.

下面是一个 define scope 的例子. 可以看到在 define scope 的时候是需要非常详细的内容的.

Project Charter: Upgrades may affect servers . . . (listed under Project Objectives)

Project Scope Statement: Servers: This project will require purchasing **10 new servers** to support Web, network, database, application, and printing functions. Virtualization will be used to maximize efficiency. Detailed descriptions of the servers are provided in a product brochure in Attachment 8, along with a plan describing where they will be located.

6.2.5 Create WBS

首先我们明确 WBS 是什么.

- A WBS is a hierarchical (分层的) decomposition (分解) of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables (WBS 是项目团队为实现项目目标并创建所需的可交付成果而要进行的总体工作范围的分层分解).
- A WBS organizes the total scope of the project, and represents the work specified in the current approved project scope statement. **The lowest level WBS components, are called work packages**.
- A WBS specifies **what will be done, not how or when**. It is the basis for time planning not a timeplan.

下面是一个简单的 WBS 的示例图:

下面是关于 WBS 的一些特性:

- A unit of work should appear at only one place in the WBS.
- The work content of a WBS item is the sum of the WBS items below it (WBS 的工作内容是其下方 WBS 项目的总和).
- Project team members should be involved in developing the WBS to ensure consistency and buy-in (团队成员应该参与 WBS 的开发, 确保一致性和认可度).

下面是一个相同的 project, 但是按照不同的思路去划分, 就会有不同的 WBS.

最后, 我们讨论一下如何可以创建出 WBS (Approaches to developing work breakdown

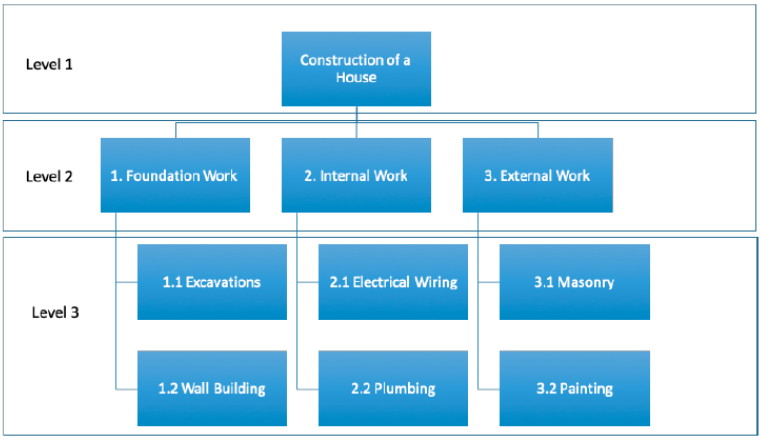


图 6.4: WBS 简单例子

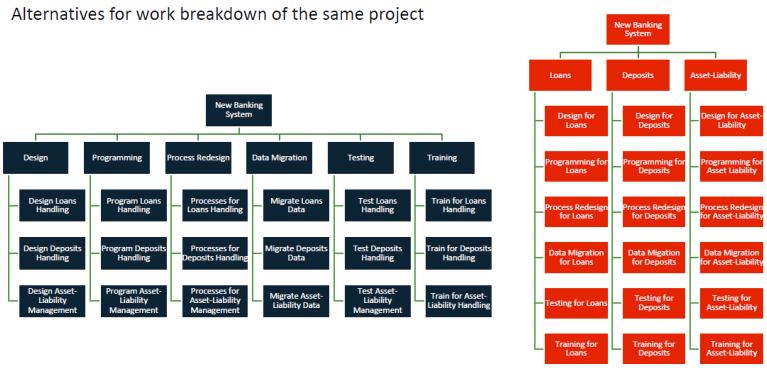


图 6.5: 相同的 project 不同的 WBS

structures).

- **Using guidelines (使用标准)**: some organizations, like the U.S. Department of Defense (DOD), provide guidelines for preparing WBSs
- **Analogy approach (类比方法)**: review WBSs of similar projects and tailor to your project
- **Top-down approach (总整体到局部)**: start with the overall description of the project and break it down
- **Bottom-up approach (从局部到整体)**: start with the specific tasks and consolidate them.
- **Mind mapping (思维导图的方式, 从一点开始发散)**: uses branches radiating out from a core idea to structure thoughts and ideas

还有一点关于 WBS 的小 tips, 就是模块化 (Modularity).

首先为什么可以模块化. Modularity: project components that are almost "stand alone" so, they can be separated and recombined.

Why it is good to componentise (组件化) work as much as possible(模块化带来的好处):

- Handling interruptions and changes of priorities.
- Managing dependencies and risk propagation.
- Enhancing ownership.
- Exploiting opportunities for early wins.

6.2.6 Validate Scope and Control Scope

首先我们说明, 为什么要进行 Validate Scope 和 Control Scope.

It is difficult to create a good project scope statement and WBS for a project (为项目创建良好的项目范围说明和 WBS 是很困难的). Even more difficult, especially on IT projects, to verify the project scope and minimize scope changes(尤其是在 IT 项目上, 更难以验证项目范围并最小化范围更改).

Even when the project scope is fairly well defined, many IT projects suffer from **scope creep**. Tendency for project scope to keep getting bigger and bigger (项目范围趋于不断扩大的趋势).

对于上面 scope creep 的解释: The tendency to add features which inevitably leads to complex products that are confusing and hard to use (增加很多的 features 导致产品变得复杂和很难使用).

一个关于 scope creep 的例子.

McDonald's fast-food chain initiated a project to create an intranet that would connect its headquarters with all of its restaurants to provide detailed operational information in real time.

After spending $170 million on consultants and initial implementation planning, McDonald's realized that the project was too much to handle and terminated it.

于是就有了下面的 Validate Scope 和 Control Scope.

- **Scope validation** involves formal acceptance of the completed project deliverables
  - Acceptance is often achieved by a customer inspection and then sign-off on key deliverables. (验收通常是通过客户检查来实现的, 然后在关键交付物上签字)
- **Scope control** involves controlling changes to the project scope
  - Keeping project goals and business strategy in mind

第 7 章 Project Schedule Management (Chapter 6)

内容提要

❑ Schedule Management 是什么 ❑ Schedule Management 如何执行

- Schedule Management includes 6 processes: Plan Schedule Management, Define Activities, Sequence Activities, Estimate Activity Durations, Develop Schedule, Control Schedule.
- The key outcome of Schedule management is a project schedule which includes all the activities for each work package , their interdependencies and their durations.
- Gantt charts, represent schedule information where activities are listed on the vertical axis, dates are shown on the horizontal axis, and activity durations are shown as horizontal bars placed according to start and finish dates.
- Sequencing activities is an important process for Project Time Management. Logical relationships should be identified during this process. There are four types of logical relationships between activities: Finish-to-start (FS), Finish-to-finish (FF). Start-to-start (SS), Start-to-finish (SF). It may be necessary to use lead or lag time between activities to support a realistic and achievable project schedule. Also, contingency reserves may be included to account for unknown work (contingencies). These are represented as “buffers” .
- Identifying the Critical Path is useful for making schedule trade-offs and controlling time by assessing the implications of variances and deciding whether corrective or preventive action is required.

7.1 Schedule Management 的介绍

7.1.1 Schedule Management 六个步骤介绍

Schedule Management 包含 6 个步骤, 图7.1是一个总览图.

下面是对每一个 process 的一个大致的介绍, 后面会详细展开 (Description of the Schedule Management processes).

- **Plan** Schedule Management: The process of establishing policies, procedures, and documentation for developing, executing, and controlling the project schedule.
- Define Activities: The process of identifying and documenting the activities to be performed within each work group (识别和记录每个工作组中要执行的活动的过程).
- Sequence Activities: The process of identifying and documenting relationships among the project activities (识别和记录项目活动之间的关系的过程).

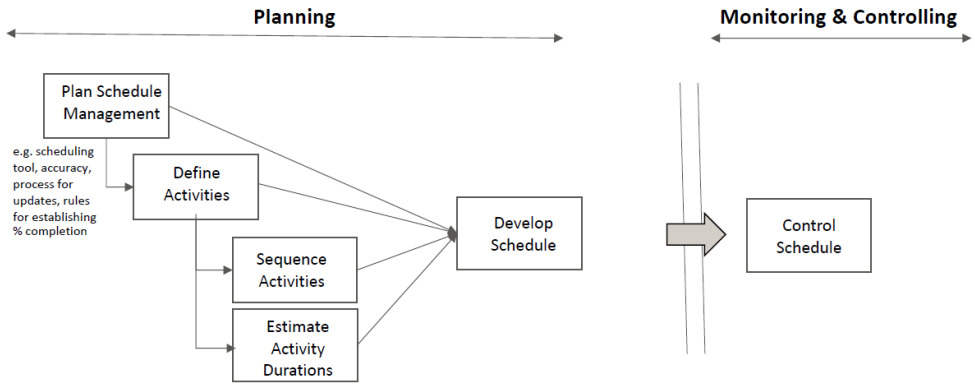


图 7.1: Schedule Management 中 6 个步骤

- Estimate Activity Durations: The process of estimating the number of work periods needed to complete individual activities with estimated resources (估计用估计资源完成单个活动所需的工作时间数量的过程).
- Develop Schedule: The process of analyzing activity sequences, durations, resource requirements, and schedule constraints to create the project schedule model (分析活动序列，持续时间，资源需求和进度约束以创建项目进度模型的过程).
- Control Schedule: The process of monitoring the status of project activities to update project progress and manage changes to the schedule baseline to achieve the plan.

这个是 Schedule Management 最主要的任务, **The key outcome of Schedule management is a project schedule which includes all the activities for each work package , their interdependencies and their durations.**

7.1.2 Plan Schedule Management 阶段

首先是第一个阶段, Plan Schedule Management, 这个阶段最后的 output 是 schedule management plan. 一些在 schedule management plan 中需要包含的点 (Some elements of a schedule management plan).

- Level of accuracy and units of measure (e.g. time measured in hours, days, weeks etc.) (精确程度, 小时, 天还是周)
- Control thresholds (e.g. +/- 10%)
- Reporting formats (e.g. format and frequency of reports)

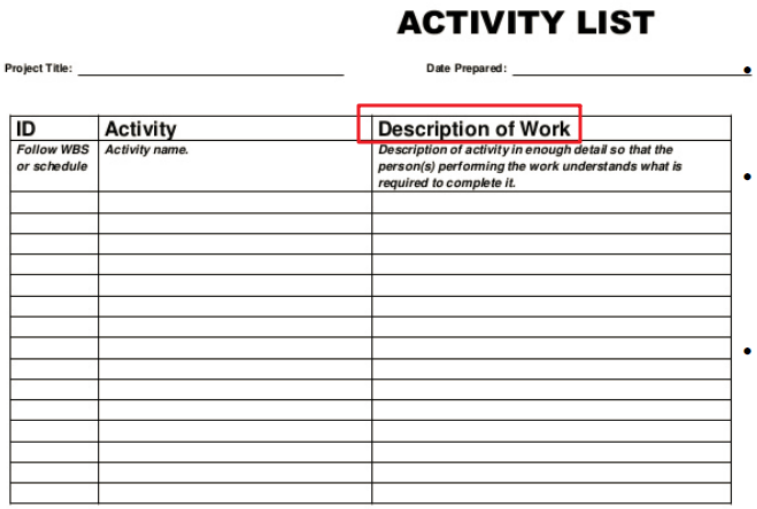
7.1.3 Define Activities 阶段

在 define activities 阶段, 我们会有一个 **activity list** 的表格. 也就是每一个 work package(这是 WBS 结构中的最底层) 中的每个工作包分析为活动列表中的活动 (Each work package analyzed to activities in the activity list).

- A comprehensive list that includes all activities required for the project (首先这个 list 需要包含所有的活动). The list also includes an identifier and a description for each activity

(接着需要有这个活动的介绍). Each activity should have a unique name (每一个活动需要有一个 ID).

- 这一点是对下图7.2中 **description of work 部分的介绍**Defining activities involves identifying the specific actions that will produce the project deliverables in enough detail to determine resource and schedule estimates (定义活动涉及确定, 将足够详细地产生项目可交付成果以确定资源和进度表估计的特定操作).



ACTIVITY LIST

Project Title: _____ Date Prepared: _____

ID	Activity	Description of Work
Follow WBS or schedule	*Activity name.*	*Description of activity in enough detail so that the person(s) performing the work understands what is required to complete it.*

图 7.2: Activity List 范例

那么我们如何开始创建上面的 activity list, 下面是几个步骤:

- Starting with the Work Breakdown Structure (WBS) you can define the activities for each workpackage (从 WBS 开始, 对其中 workpackage 中每一个 activity 进行定义).
- Every activity except the first and last should be connected to at least one predecessor and at least one successor with a logical relationship (除了第一个和最后一个 activity 之外, 其他的 activity 都需要有关联).
- The identification of logical relationships between activities is needed to develop a project schedule in a later step (识别活动之间的关联, 可以在后续步骤中制定项目进度表).

对于上面的第二句话, 也就是活动与活动之间需要有相互联系 (Every activity except the first and last should be connected to at least one predecessor and at least one successor with a logical relationship), 我们在这里给出一个例子.

现在的 workpackage (WP) 是 Paint Bedrooms, 包含下面四个活动:

- Remove Furniture
- Paint Master Bedroom
- Paint Second Bedroom
- Replace Furniture

画出他们的逻辑关系, 如图7.3所示.

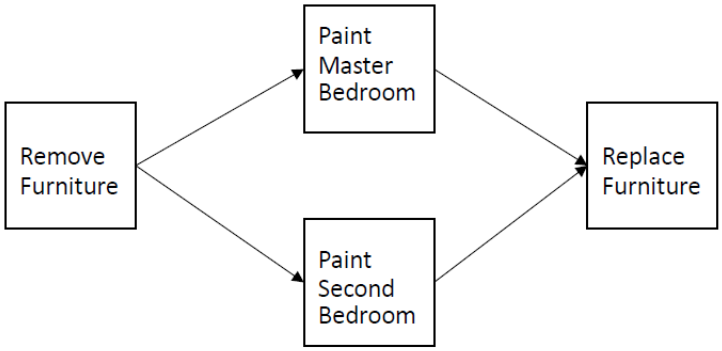


图 7.3: 活动之间的逻辑关系示例

7.1.4 Sequencing Activities 阶段

首先是一个总体的介绍. 下面提到的各个加粗的名词都会在下面有涉及到. Sequencing activities is an important process for Project Time Management.

- Logical relationships should be identified during this process. There are four types of logical relationships between activities: **Finish-to-start (FS), Finish-to-finish (FF). Start-to-start (SS), Start-to-finish (SF)**.
- It may be necessary to use **lead or lag** time between activities to support a realistic and achievable project schedule.
- Also, contingency reserves may be included to account for unknown work (contingencies). These are represented as **"buffers"**.

Sequencing Activities 就是对各种活动进行排序, 分析其顺序的各种原因 (内在或外在). 也就是, Sequencing involves evaluating the reasons for dependencies and the different types of dependencies

对于原因, 可以分成两个维度进行讨论:

- Mandatory(强制的) vs Discretionary(自由决定的)
  - **Mandatory dependencies**: inherent (固有的) in the nature of the work being performed on a project, sometimes referred to as hard logic.
  - **Discretionary dependencies**: defined by the project team, sometimes referred to as soft logic. and should be used with care since they may limit later scheduling options. (这种顺序是由团队自己决定的)
- External vs Internal (外在原因和内在原因)
  - **External dependencies**: involve relationships between project and non-project activities, (外在的原因, 可能是项目和不是项目的事情)
  - **Internal dependencies**: involve relationships between project activities (all within the same project), (内在原因, 可能是同一个 project 中的两个 activities 会有冲突)

为了更好的说明活动与活动之间的关系 (Logical relationships between activities), 会有

下面的四种状态.

- Finish-to-start (FS). A logical relationship in which an activity cannot start until an activity has finished. (直到上一个活动结束, 下一个活动才可以开始)
- Finish-to-finish (FF). A logical relationship in which an activity cannot finish until an activity has finished. (一个活动不能结束, 知道另一个活动已经结束了, 下面中就是活动 B 不能结束除非 A 结束了)
- Start-to-start (SS). A logical relationship in which an activity cannot start until an activity has started. (一个活动不能开始除非另一个活动已经开始, 也就是下图中 B 不能开始除非 A 开始了)
- Start-to-finish (SF). A logical relationship in which an activity cannot finish until an activity has started. (一个活动不能结束, 除非另一个活动已经开始. 也就是下图中 A 不能结束, 除非 B 开始了)

对于上面的四种状态, 我们看图7.4结合上面的定义进行理解.

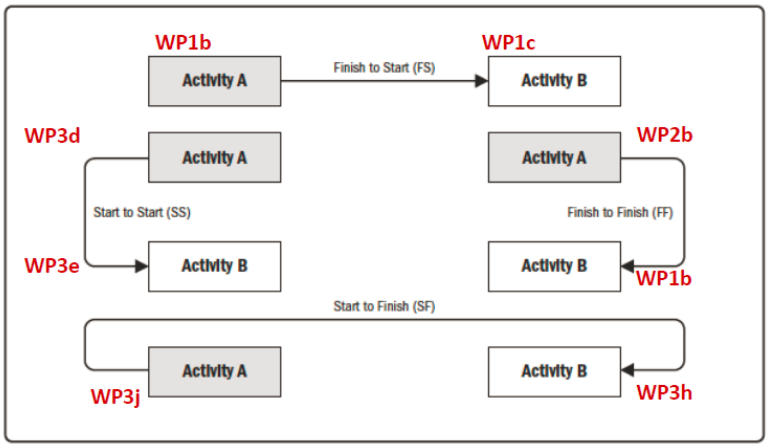


图 7.4: 活动之间的四种逻辑关系

我们对图7.4进行再次详细的解释:

- **FS**: B 不能开始, 除非 A 结束了. 例如 B 是"Train employees in new processes.", A 是"Develop new work processes.". 只有有了新的 work process, 才可以使用这个 process 来训练员工. 也就是 A 要先完成, 才可以开始 B.
- **FF**: B 不能结束, 除非 A 结束了. 例如 A 是"Draft changes in regulations.", B 是"Develop new work processes.". 只有 A 结束了, B 才可以结束, 因为需要 regulations 确定下来, 才能 new process 才可以完全确定下来.
- **SS**: B 不能开始, 除非 A 开始了. 例如 A 是"Test new software", B 是"Rework (make some changes) software". 需要先进行测试 (活动 A), 才可以进行活动 B.
- **SF**: B 不能结束, 除非 A 开始了. 例如 A 是"Handover to IT department.(移交 IT 部门)", B 是"Support technically the new system for a transition period. (在过渡期提供技术支持)". 可以看到必须要移交之后 (A 开始), 在过渡期才算结束 (B 结束).

7.1.5 Estimate Activity Durations 阶段

- 定义: Activity duration estimates are quantitative assessments of the number of time periods that are required to complete an activity.
- 如何估算: Three estimates to define an approximate range for an activityt's duration: optimistic, most likely, pessimistic (我们使用最优情况, 最可能发生情况, 最坏情况给出一个活动时间的估计). People doing the work should help create estimates.
- Activity duration estimates may include some indication of their range. For example: 2 weeks +/- 2 days (最终的活动时间会是一个范围)

下面是一些具体的 skill, 来帮助我们更好的估计活动需要的时间. Some people find estimating to be challenging, especially for their own work. It is very important to develop this skill.

- Define the activity in detail to help make better estimates. (对活动要描述的尽量详细)
- If you realize that an activity estimate might not be a good one, let your team know as soon as possible so that adjustments can be made early in the project.
- Do not confuse duration with effort. For instance, 10 workdays might be needed to complete a task which will has duration of 5 calendar days. (努力程度不同, 完成的时间也不同. 例如只花 5 天的时间完成了 10 天的工作量)

同时, 我们需要注意到, 不是人数越多做得越快的:

- Adding more people to a late project helps less than you might think, and it helps less and less the more people you add. (在项目后期增加人并不会有很大的帮助)
- 20 people for 10 months is not the equivalent to 10 people for 20 months (or 2 people for 100 months). (20 个人 10 个月的工作量不等于 10 个人 20 个月的工作量) The more people work on a project, the more overhead required to coordinate work (and the less spent on value-adding work). 在项目上工作的人越多, 协调工作所需的开销就越多 (在增值工作上花费的钱越少)

7.1.6 Developing the Schedule 阶段

After analyzing activity sequences and durations you can develop the schedule. 在有了上面的 activity sequences 和 activity durations 之后, 就可以正式开始 develop the schedule.

对于 Developing the Schedule, 我们使用特殊的 barchart 来进行表示, 如图7.5所示. Bar charts, also known as **Gantt charts**, represent schedule information where:

- activities are listed on the vertical axis
- dates are shown on the horizontal axis
- activity durations are shown as horizontal bars placed according to start and finish dates.

在绘图的时候, 关键活动属性是持续时间, 活动也可能具有相关的资源和成本. Key activity attributes are their durations, activities may also have resources and costs associated.

对于一些关键节点 (milestone) 的表示, 他的持续时间是 0. 这种关键节点可以是根据

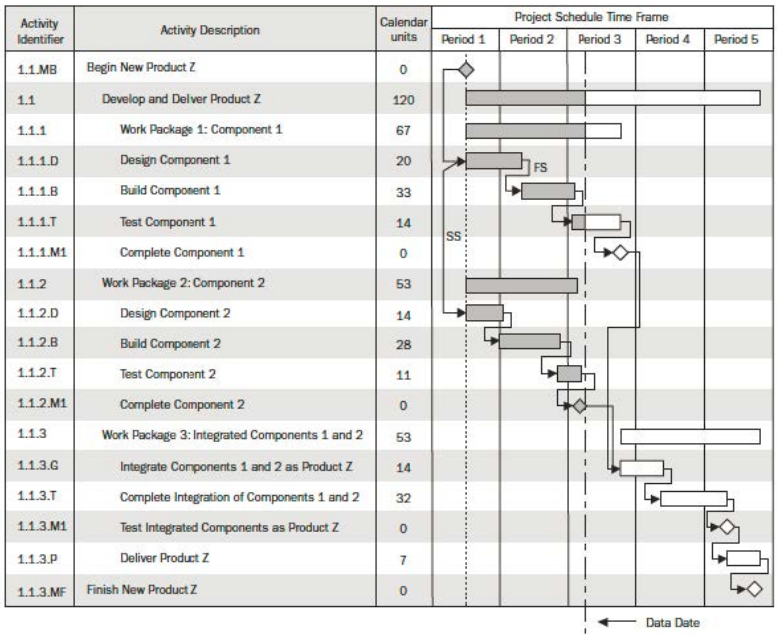


图 7.5: Gantt charts 示例图

合同要求, 一个必须要进行项目提交的日期. Milestones have zero duration and represent a moment in time (such as a mandatory delivery date required by a contract).

目前, 大部分情况 PM 会来做 scheduling charts. Nowadays, usually PM software generates scheduling charts. You must input tasks, durations, resources, and dependencies.

对于定义 Schedule 的时候, 有三种情况需要考虑进去, 分别是:

- Lag (延迟)
- Lead (提前完成)
- Buffers (缓冲时间, 为了突发事件)

7.1.6.1 Lag (延迟)

- Lag 的定义: Lag is the **planned delay** of a successor activity and represents time that must pass before the activity can begin.
- Lag 的属性: Lag may be found in activities with all relationship types: finish-tostart, start-to-start, finish-to-finish, and start-to-finish. **(Lag 会在四种活动连接去年高考都能找到)**
- In a start to start relationship, a lag is the amount of time whereby a successor activity will be delayed with respect to a predecessor activity. For example, we can start reworking the processes 15 days after we start the pilot.

关于 Lag 的介绍, 如图7.6所示.

7.1.6.2 Lead (提前)

- Lead 的定义: Lead is the **planned earlier** start of a successor activity with respect to the completion of a predecessor activity. In other words, the second activity can begin (and

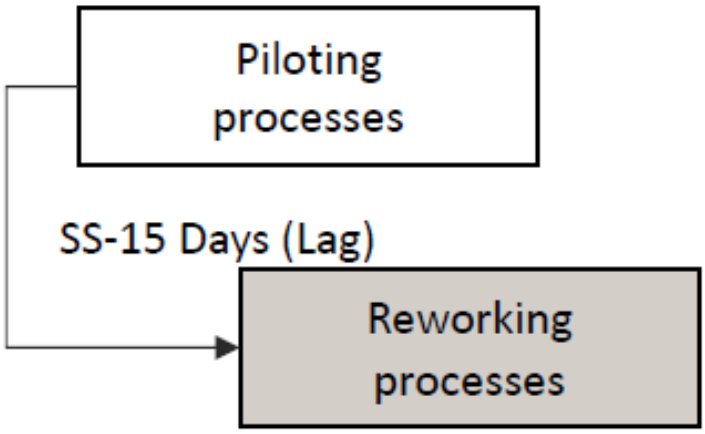


图 7.6: Lag 示意图

be conducted in parallel) before the end of the first activity. (就是下一个活动提前开始了, 和上一个同时在进行)

- Lead 的属性: Lead is only found in activities with finish-to-start relationships.
- For example, we can start developing new work processes 15 days before we finish analysing the existing ones.

关于 Lead 的介绍, 如图7.7所示.

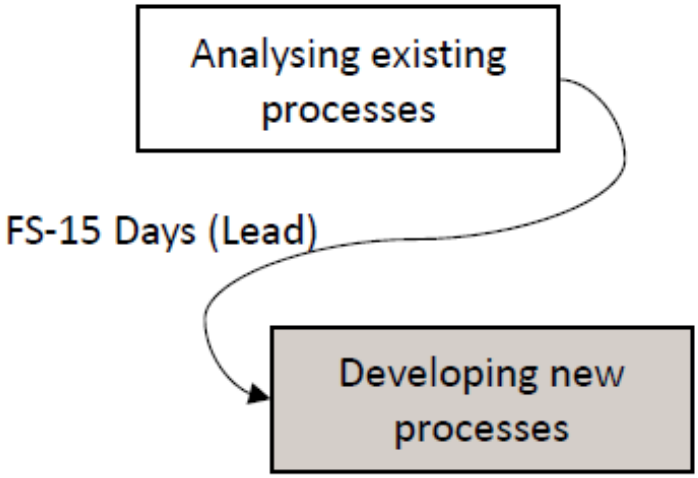


图 7.7: Lead 示意图

7.1.6.3 Buffers (缓冲时间)

- Buffers 的定义: Contingency reserves may be included to account for unknown work (contingencies). (可能包括应急准备金以解决未知工作, 突发事件) Contingency reserves need to be separated from the individual activities and represented as "buffers".
- As more precise information about the project becomes available, the contingency reserve may be used, reduced, or eliminated.
- 要有 Buffers 的理由: There are good reasons for including buffers in a plan and good

reasons for avoiding them:

- Murphy’s Law states that if something can go wrong, it will.
- Parkinson’s Law states that work expands to fill the time allowed.

7.1.6.4 Resource Calendars and Project Calendars

下面是关于两种 Calendars 的介绍.

- Resource Calendars
  - A resource calendar is a calendar that identifies the working days and shifts on which each specific resource is available. (资源日历是一种日历, 用于标识每个特定资源可用的工作日和班次)
  - Resource calendars specify when and for how long identified project resources will be available during the project. (资源日历指定在项目期间何时可用已识别的项目资源以及持续多长时间)
- Project Calendars
  - A project calendar identifies working days that are available for scheduled activities.
- 需要注意: Unless a specific calendar is defined, a default calendar of 5 working days per week is used. (默认的工作时间是一周 5 天)

7.1.6.5 Critical Path

接下来是 Critical Path 的介绍. 这个也被叫做是关键路径. 他是需要完成项目所需要的最短时间 **(我们可以理解为从 start 到 end 整个路径中所花费时间最少的)**. The critical path calculates the minimum project duration.

- Critical Path 定义: The critical path is the series of activities that determines the earliest time by which the project can be completed.
- Slack (松弛) or float is the amount of time an activity may be delayed without delaying the project finish date. (对一些活动时间的延长会对最终的结果有影响)
- Identifying the Critical Path is useful for determining the extend of scheduling flexibility. Also, is important for control: assessing the implications of variances and deciding whether some action is required.
- A delay on any activity not on the critical path may have little effect on the overall project schedule, while a delay on a critical activity may require immediate action. (在关键路径上的 delay 可能会对整个项目产生影响)

下图7.8是 Critical Path 的一个例子. 其中红色的线表示 Critical Path.

通过评估差异的影响并确定是否需要采取纠正或预防措施, 确定关键路径对于进行时间表权衡和控制时间很有用. Identifying the Critical Path is useful for making schedule trade-offs and controlling time by assessing the implications of variances and deciding whether corrective or preventive action is required.

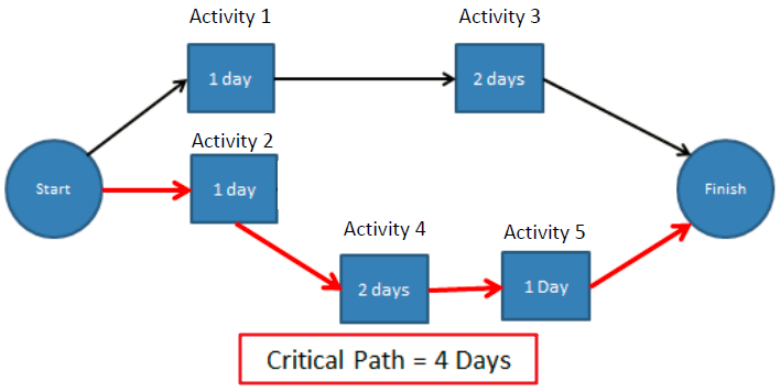


图 7.8: Lead 示意图

7.1.6.6 Shortening Schedules 的技术

下面是关于如何缩短 Schedules 的方法, 有下面的三种方式:

- Shortening durations of critical activities/tasks by adding more resources or changing their scope (通过添加更多资源或更改其范围来缩短关键活动/任务的持续时间)
- Fast tracking activities by doing them in parallel or overlapping them (通过并行或重叠进行快速跟踪活动)
- Crashing activities (赶工)

下面再解释一下 **Crashing**.

- Crashing is a technique used to shorten the schedule duration by reducing the completion time of an activity by increasing resource availability or paying for more efficient production means. (通过增加资源可用性和生产付费方式, 来减少花费的时间)
- Examples of crashing include approving overtime or paying to expedite delivery by alternative means. (常见的方式, 批准加班或通过其他方式支付加快交货的费用)
- Crashing makes sense only for activities on the critical path where the shortening of a single activity will result to shorter overall project duration. Crashing may result in increased risk. (Crashing 在 Critical Path 上的事情时比较好)
- Crashing is a good example of the time/cost tradeoff. (就是用成本来换时间)

7.1.7 Controlling the Schedule 阶段

首先根据实际情况进行 Controlling the Schedule 是很重要的. It is important to update the schedule with actual data

- Note actual activity durations as they are completed (记录实际消耗的时间)
- Revise estimates for activities in progress (修改对整个项目需要时间的估计)
- Monitor changes to make informed decisions (监督改变并作出通知)

下面是为什么要做 control 和如何来做 control

- Goals of schedule control(为什么要做 control)
  - Know the status of the schedule

    - Influence the factors that cause schedule changes
    - Determine that the schedule has changed
    - Manage changes when they occur
- Important activities (如何做 control)
    - Review the draft schedule or estimated completion date in the project charter
    - Prepare a more detailed schedule with the project team
    - Make sure the schedule is realistic and followed
    - Alert top management well in advance if there are schedule problems (提前通知主管)

关于 leadership, good leadership is as important as good schedule charts and techniques. 下面是一些可以做的事情:

- Don't plan for everyone to work at 100% capacity all the time. (首先我们不能确保每个员工都可以百分百使用好时间)
- Hold progress meetings with team members and stakeholders and be clear and honest in communicating schedule issues (与团队成员和利益相关者举行进度会议, 并在沟通进度问题时保持清晰诚实).
- Project managers should use
    - empowerment, 权利
    - incentives, 刺激
    - discipline, 纪律
    - negotiation, 交涉

第 8 章 Project Cost Management (Chapter 7)

内容提要

- ❏ 理解 Project Cost Management processes
- ❏ Project Cost Management 的 4 个

- Cost Management includes 4 processes: Plan Cost Management, Estimate Costs, Determine Budget, Control Costs.
- Cost estimates may include contingency reserves to account for cost uncertainty. The project budget is the aggregation of the activitiesestimated costs.
- Earned value management EVM is a project performance measurement technique that integrates scope, time, and cost data. With EVM you can assess project performance and progress by comparing three curves: planned value (PV), actual cost (AC), earned value (EV).

8.1 Cost Management 的介绍

8.1.1 Project Cost Management 四个步骤介绍

Project Cost Management 包含四个步骤, 下面我们进行详细的介绍 (Description of the 4 Cost Management processes).

- Plan Cost Management (预算计划, planning 阶段): The process that establishes the policies, procedures, and documentation for planning, executing, and controlling project costs (建立用于计划, 执行和控制项目成本的策略, 过程和文档的过程).
- Estimate Costs (预算估计, planning 阶段): The process of estimating the monetary resources needed to complete the project.
- Determine Budget (决定预算, planning 阶段): The process of aggregating the estimated costs of individual activities to **establish the overall project cost baseline** (汇聚每一个活动的成本, 建立一个总项目成本的基准).
- Control Costs (预算控制, monltoring 阶段): The process of monitoring the status of the project to update the project costs and managing changes to the cost baseline.

对于上面提到的四个步骤, 总的流程如下图8.1所示:

在一些情况下, **Estimate Costs** 和 **Determine Budget** 这两个过程可以合并. Especially those of smaller scope, cost estimating and cost budgeting are tightly linked and can be viewed as a single process that can be performed by a single person over a relatively short period of time.

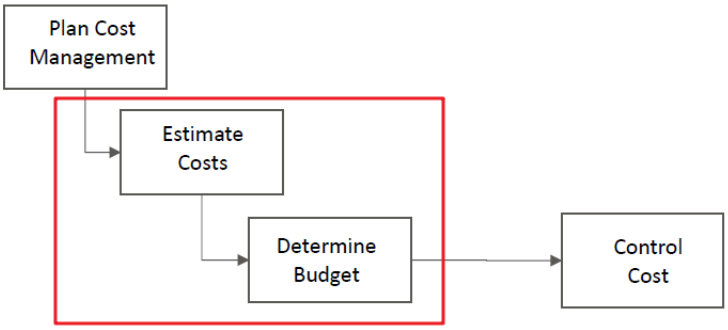


图 8.1: Project Cost Management 中 4 个步骤

8.1.2 Plan Cost Management

Planning how the costs will be managed throughout the life of the project (计划在项目的整个生命周期中如何管理成本).

A cost management plan may include (一个 cost management plan 可能包含以下几点):

- Level of accuracy (小项目, 要更加精确)
- Units of measure (使用的货币)
- Organizational procedure links
- Control thresholds (预算上限)
- Rules of performance measurement
- Reporting formats (汇报形式)
- Process descriptions

8.1.3 Estimate Costs

定义: **Cost estimates** are a prediction of the cost for each activity based on the information known at a given point in time. Estimates are usually done at various stages of a project. Should become more accurate as time progresses (随着项目的进展, 估计的准确率应该更加准确).

Cost estimates are expressed in units of some currency (i.e., NOK, dollars, euros, yen, etc.).

For estimating costs you can assess different alternatives (为了估算成本, 您可以评估不同的选择). Cost tradeoffs and risks should be considered, such as make versus buy, buy versus lease, etc (应考虑成本权衡和风险, 例如制造与购买, 购买与租赁等). It is important to provide supporting details for estimates and updates to project documents. A large percentage of total project costs are often labor costs (项目总成本中很大一部分通常是人工成本).

8.1.3.1 Estimate Costs 的四种方法

那么, 如何来估计 cost 呢, 下面是四种估计 cost 的方法.

- Analogous or top-down estimates (类似项目估计)

- Use the actual cost of a previous, similar project as the basis for estimating the cost of the current project.

- Bottom-up estimates (自底向上估计)
  - Involve estimating individual work items or activities and summing them to get a project total (估计每一个人的工作, 并将它们加起来).
- Three-point estimates
  - Involve estimating the most likely (最可能的), optimistic (最好情况), and pessimistic (最坏情况) costs for items (计算三个值, 算区间).
- Parametric estimating (参数估计)
  - Uses project characteristics (parameters) in a mathematical model to estimate project costs (用数学模型来进行解决).

8.1.3.2 详细介绍 Three-point estimates

下面我们详细来说一下上面的 Three-point estimates 是如何操作的. 我们使用三个值来定义一个大致的花费区间. Similarly to duration estimation, we can use three estimates to define an approximate range for an activity's cost:

- **Most likely (cM) 最有可能的值**. The cost of the activity, based on realistic effort assessment for the required work and any predicted expenses.
- **Optimistic (cO) 最好情况的预算**. The activity cost based on analysis of the best-case scenario for the activity.
- **Pessimistic (cP) 最坏情况的预算**. The activity cost based on analysis of the worst-case scenario for the activity.

于是, 最后我们可以得到类似于下面的表格.

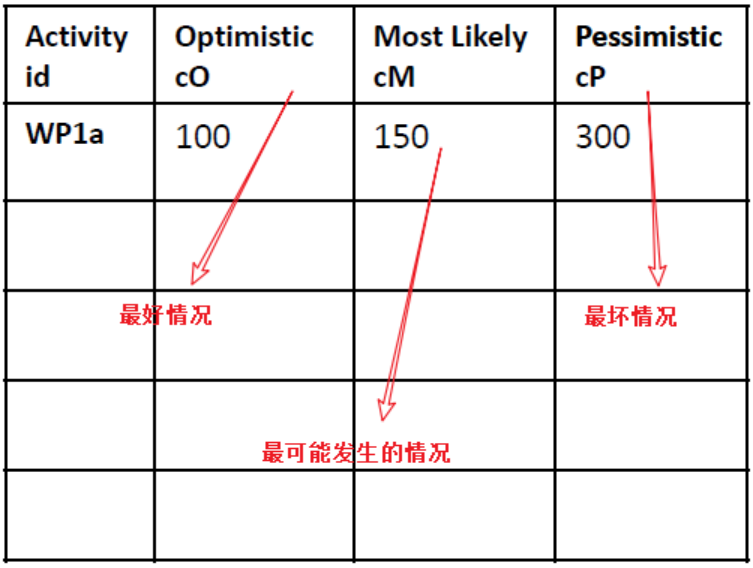


图 8.2: Three-point estimates 估算结果示例

8.1.3.3 关于 Reserve Analysis

在预算的估计部分, 我们需要多加一部分的估计, 就是预留估计, 为一些偶发事件做准备. Cost estimates may include contingency (偶发性) reserves to account for cost uncertainty. This is similar to contingency reserves (buffers) used for time management (这类似于用于时间管理的应急准备金). The project budget is the aggregation of the activities'estimated costs.

Contingency reserves (应急储备) can be provided for a specific activity, for the whole project, or both. The contingency reserve may be a percentage of the estimated cost or a fixed amount.

As more precise information about the project becomes available, the contingency reserve may be used, reduced, or eliminated. (应急储备会随着项目的进展变化)

8.1.4 Determine Budget

- Determine Budget is the process of aggregating the estimated costs of individual activities to establish the **total project's cost baseline**. This involves also allocating the project cost estimates over time (这还涉及随着时间的推移分配项目成本估算). Time-phased budget is used by project managers to measure and monitor cost performance (项目经理使用时间分段预算来衡量和监视成本绩效).

Contingency reserves (应急储备) are part of the cost baseline and the overall funding requirements for the project.

The cost baseline can only be changed through formal change control procedures and is used as a basis for comparison to actual results (成本基准只能通过正式的变更控制程序进行更改, 并用作与实际结果进行比较的基础).

8.1.5 Control Costs

Much of the effort of cost control involves analyzing the relationship between the consumption of project funds to the physical work being accomplished for such expenditures (成本控制的大部分工作涉及分析项目资金消耗与为此支出完成的体力劳动之间的关系).

在 Control Costs 中包含的几个事项 (Activities involved in controlling project costs)

- Monitoring cost performance (监控成本绩效)
- Ensuring that only appropriate project changes are included in a revised cost baseline (确保在修订的成本基准中仅包括适当的项目变更)
- Informing project stakeholders of authorized changes to the project that will affect costs (通知项目利益相关者有关将影响成本的项目授权变更)

8.1.5.1 Earned Value Management (EVM)

Earned Value Management (EVM) is a project performance measurement technique that **integrates scope, time, and cost data**. With EVM you can assess project performance and

progress. (我们使用 EVM 来衡量项目的表现和进展)

我们通过绘制三条曲线来使用 EVM. You can use EVM by charting three curves:

- **The planned value (PV)**, is the budgeted cost of work scheduled from the beginning of the project till a given time.
- **Actual cost (AC)**, is the actual costs incurred from the beginning of the project till a given time.
- **The earned value (EV)**, is the budgeted cost associated with the work that has been completed from the beginning of the project till a given time. So, it is is a measure of work performed expressed in terms of the budget authorized for that work.

三条曲线的关系如下所示:

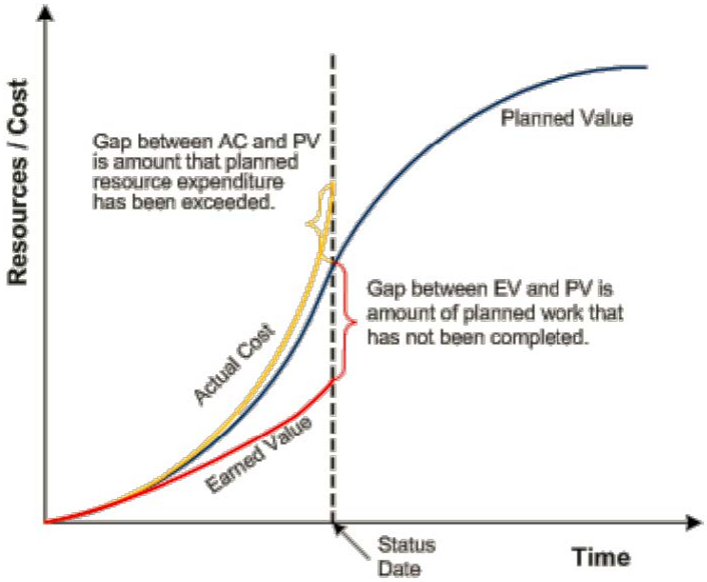


图 8.3: EVM 例子

其中:

- Gap between AC and PV is amount that planned resource expenditure has been exceeded (预算超出部分).
- Gap between EV and PV is amount of planned work that has not been completed.

下面看一个计算的例子.

例 8.1 Your project is to build a four sided square fence like the one shown in the picture. Each side is to take one day to build and the cost budgeted is 1000 per side. The sides are planned to be completed one after the other. Today is the end of day three. Up to today the project completed: side A with a cost of 1000, side B with a cost of 1100, and half of side C with a cost of 800.

What is the planned value (PV), actual cost (AC) and the earned value (EV) at the end of day three?

解答:

- 因为每一边预算是 1000, 一天完成, 今天是第三天, 所以 PV=3000
- 实际的花费为 A=1000, B=1100, 1/2*C=800, 所以 AC=2900

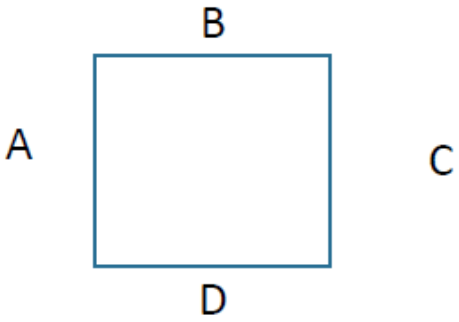


图 8.4: EVM 例题

- 因为 C 只完成了一半, A 和 B 完成了, 所以 EV=1000+1000+500=2500

第 9 章 Project Quality Management (Chapter 8)

内容提要

❑ 理解 Project Quality Management

- Quality is the degree to which a set of inherent characteristics fulfill requirements.
- Cost of quality includes all costs incurred to avoid failures (cost of conformance) and all costs incurred because of failures (cost of non conformance).
- There are three processes for Project Quality Management: Planning Quality Management, Managing Quality, Controlling Quality.
- Quality management is performed during the project's execution to provide confidence that stakeholders' requirements will be met. Quality audits of project activities are performed to check if they comply with organizational and project policies and procedures.
- Quality control is used to formally demonstrate, with reliable data, that the sponsor and/or customer's acceptance criteria have been met. Quality control inspections of project outcomes are performed to check if they conform to agreed requirements.

9.1 Project Quality 的介绍

关于 quality management 和 risk management 是有相似之处:

- 依赖的知识: Both rely on cause-and-effect analysis techniques to determine preventive and corrective actions (两者都依靠因果分析技术来确定预防和纠正措施).
- 作用: Quality and risk management serve as an opportunity to learn, innovate, and improve projects to satisfy the stakeholder.

9.1.1 什么是 Quality

下面两个是对于 quality 的定义:

- **对于 quality 的一个宽泛的定义:** Quality of project outcomes is "the degree to which a set of inherent characteristics fulfill requirements" (项目成果的质量是" 一组固有特征满足要求的程度") (ISO 9000 family of quality management standards).
- **quality 在 software 上的定义:** The definition from software engineering is similar: "the degree to which a software product satisfies stated and implied needs when used under specified conditions. (在指定条件下使用时, 软件产品满足陈述和隐含需求的程度)" (ISO 25010 standard for systems and software Quality Requirements and Evaluation).

9.1.2 Quality level 与 Quality grade

现在有一个趋势, 就是认为 quality 就是最好的. There is a tendency to think that quality means the best material, the best equipment, and absolute perfection. Many project teams deliver quality based on such impressions (许多项目团队基于这样的印象提供质量). This is called **gold plating**.

但是实际上, 有 quality level and quality grade 两者.

- The quality level is always relative to the requirements defined (quality level 是最基本的).
- The quality grade signifies the rank of the requirements (quality grade 是比较高级的).

While a quality level that fails to meet quality requirements is always a problem (达不到 quality level 就是质量问题), a low grade of quality may not be a problem if there is no requirement for a high grade (但是低的 quality grade 不是很大的问题).

对于一些重要的软件, 达到 high grade 变得越来越流行. Attainment (达到) of high grade is more prevalent (流行的) in critical software, which has impact on human health, safety, and welfare, and for the protection of personal or business proprietary information.

所以, 我们需要 project quality management 来进行质量的管理. Project quality management ensures the project will satisfy the requirements for which it was undertaken (i.e. achieve the quality level defined).

9.2 Project Quality Management 的 3 个步骤

接下来我们介绍 Quality Management. 首先是关于 quality management 的目标, Determining quality policies, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken (确定质量政策, 目标和责任, 以便该项目能够满足其开展的需求). Project Quality Management implements within the project's context, the organization's quality management system when such a system is in place.

接下来我们介绍 Project Quality Management 的三个步骤.

- Planning Quality Management: identifying quality requirements and/or standards for the project and its deliverables and documenting how the project will demonstrate compliance with quality requirements.
- Managing Quality: translating the quality management plan into executable quality activities
- Controlling Quality: inspecting (检查) results to assess (确认) if they comply with the relevant quality standards and recommend necessary changes.

Project Quality Management 的三个步骤分散在三个 process groups 中, 1. planning, 2. executing, 3. monitoring and controlling. 其中 2. executing, 3. monitoring and controlling 会在项目过程中同时进行. 下图9.1是整个的框架图.

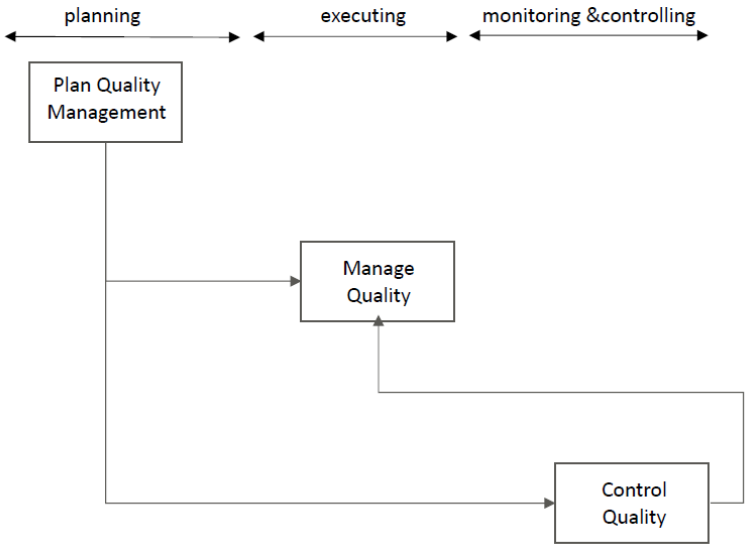


图 9.1: Project Quality Management 三个 process 联系方式

9.2.1 Plan Quality Management 阶段

- Plan Quality Management 的重要性: Every project should have a quality management plan. Project teams should follow the quality management plan and should have data to demonstrate compliance with the plan.
- Quality Management Plan 的具体内容: The quality management plan describes how the project plans to meet the quality requirements set for the project. The quality management plan may be formal or informal, detailed, or broadly framed. 下面是一些基本需要的内容.
  - Requirements documented.
  - Baselines for scope, schedule, cost. (范围, 进度, 成本的基准)
  - Quality related organizational policies and procedures (与质量相关的组织政策和程序).
- During quality planning, the project team needs to prepare estimates for the **cost of quality**. (在做 quality planning 的时候, 我们需要考虑预算)

下面对 cost of quality 进行解释.

- **Cost of quality** includes all costs incurred to avoid failures (**cost of conformance, 图9.2中左侧的花费**) and all costs incurred because of failures (**cost of non conformance, 图9.2中右侧的花费**). (这一部分的花费包括避免失败的花费, 和失败之后的弥补的花费)
- **Failure costs** are often categorized into internal (found by the project) and external (found by the customer). Failure costs are also called cost of poor quality.
- Decisions on quality can be taken together with key project stakeholders during the planning process by taking into account the estimated cost of quality (在计划过程中, 可以通过考虑质量的估计成本与关键项目利益相关者一起做出质量决定).

我们对图9.2进行一下详细的解释.

- Cost of conformance(避免 failure 的发生), Money spend during the project to avoid failures
  - Prevention Costs (避免发生)
    - Training
    - Document Processes
    - Equipment
    - Time to do it right
  - Appraisal Costs (Assess the quailty, 评估费用)
    - Testing
    - Destructive testing loss(破坏性测试损失)
    - Inspections (检查)
- Cost of non conformance (发生之后做的事), Money spent during and after the project because of failures.
  - Internal Failure Costs
    - Rework
    - Scrap (报废)
  - External Failure Costs
    - Warranty work(保修)
    - Lost bussiness(丢掉订单)
    - Liabilities (负债)

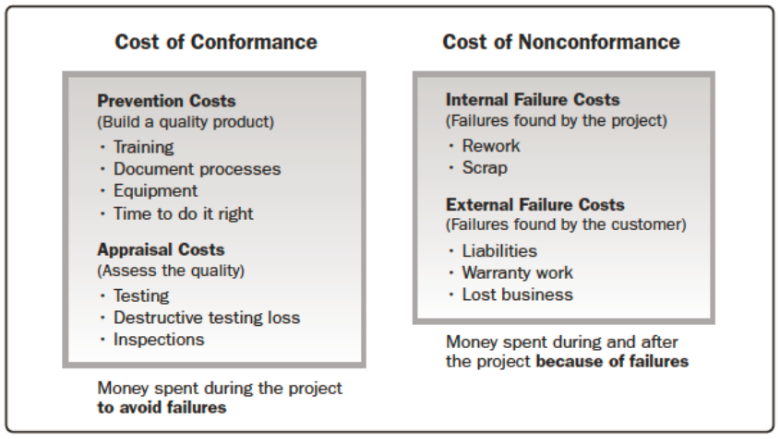


图 9.2: Cost of Quality 的解释

9.2.2 Manage Quality 阶段

关于 Quality management 的知识点的总结. Quality management is used during the project's execution to provide confidence that stakeholders' requirements will be met. **Quality audits (审查)** of project activities are performed to check if they comply with organizational and project policies and procedures.

- Manage Quality 的目标: By managing quality we seek to build confidence that a future output or an unfinished output, also known as work in progress, will be completed in a manner that meets the specified requirements and expectations.
- 如何做: **Quality audits(审计)** are key for this. Quality auditors compare actual processes to documented processes by observation and checking records. Quality auditors may also discover a lack of documentation or erroneous documentation.
- Quality Management also provides an umbrella for continuous process improvement, which is an iterative means for improving the quality of all processes. Opportunities for process improvement can be identified (质量管理还可以使得整体的质量得到不断的提升).

下面详细介绍一下 quality audits. 首先看一下 quality audits 的定义, "A quality audit is determining if project activities comply with (遵从) organizational and project policies and procedures."

Quality audit 主要包括一下的内容 (The objectives of a quality audit may include):

- identify all good and best practices being implemented;
- identify all nonconformity, gaps, and shortcomings (找出所有不合格, 差距和缺点);
- share good practices introduced or implemented in similar projects in the organization and/or industry (分享在组织和/或行业的类似项目中引入或实施的良好实践);

关于 Quality audit 的一些性质

- Quality audits may be scheduled or random.
- A quality assurance department, or similar organization, often oversees (监督) quality assurance activities. Also the customer or sponsor, as well as other stakeholders not actively involved in the work of the project might be involved. (质量保证部门或类似组织经常监督质量保证活动. 客户或赞助者, 以及未积极参与项目工作的其他利益相关者也可能参与其中.)

9.2.3 Control Quality 阶段

关于 Control Quality 的知识点的总结. Quality control is used for monitoring and controling to formally demonstrate, with reliable data, that the sponsor and/or customer's acceptance criteria (验收标准) have been met. Quality control inspections (检查) of project outcomes are performed to check if they conform to agreed requirements.

- Control Quality 的目标: The Control Quality process aims to verify through quality control inspections that the delivered output meets the requirements.
- Control Quality 的主要步骤: The key benefits of this process include:
  - identifying the causes of poor quality and recommending and/or taking action to eliminate them (查明质量欠佳的原因, 并建议和/或采取措施消除它们);
  - validating that project deliverables and work meet the requirements specified by key stakeholders necessary for final acceptance (验证项目可交付成果和工作是否符合

关键利益相关者指定的最终验收所必需的要求).

- Performing the Control Quality process results to verified deliverables (执行" 控制质量" 过程可得出可验证的可交付成果).
- Inspection (检查) may be conducted at any level. For example, the results of a single activity can be inspected, or the whole final product of the project can be inspected.

Large organizations may mandate (强制) a separation of QC personnel from other project personnel to ensure their impartiallity (在一些大的项目中, 要求 QC 与项目团队分开, 为了公平). Nevertheless, when QC is independent and not included in cross-functional teams, collaborative exploration of quality issues may be lost (但是, 如果质量控制是独立的并且不包含在跨职能团队中, 则可能会丢失对质量问题的协作探索).

下面是一些做 quality control 的方法 (The textbook lists 7 basic tools that help in performing quality control).

- Cause-and-effect diagrams
- Control charts
- Check-sheets
- Scatter diagrams
- Histograms
- Pareto charts
- Flowcharts

我们在这里详细介绍 cause and effect diagrams, 也被称作 (fishbone diagrams or Ishikawa diagrams)

- Cause-and-effect diagrams are also known as fishbone diagrams or Ishikawa diagrams.
- This type of diagram **breaks down the causes of the problem statement identified into discrete branches (就是从各个不同的因素进行分析)**, helping to identify the sources of a problem.
- This can help in making adjustments that will prevent problems from occurring in the future.

如图9.3所示, 为鱼骨图的例子, 这里将问题拆分为各个部分进行分析. 例如这里拆分为 People, People 里面有拆分为 training 和 responsibility 两个部分.

下面是一个具体的例子: find the cause,

- poeple not have enough training
- methods are not appropriate

9.2.4 Quality Management 在 IT 领域的不同

The Quality movement originated in manufacturing. We need to keep in mind the distinctiveness (特殊性) of IS projects. (我们需要在心里记住他在 IT 领域的独特性)

Manufacturing is a repetitive (复制) process where thousands of parts are replicated through the same production line. Uniformity is always expected when the process is stable (在生产

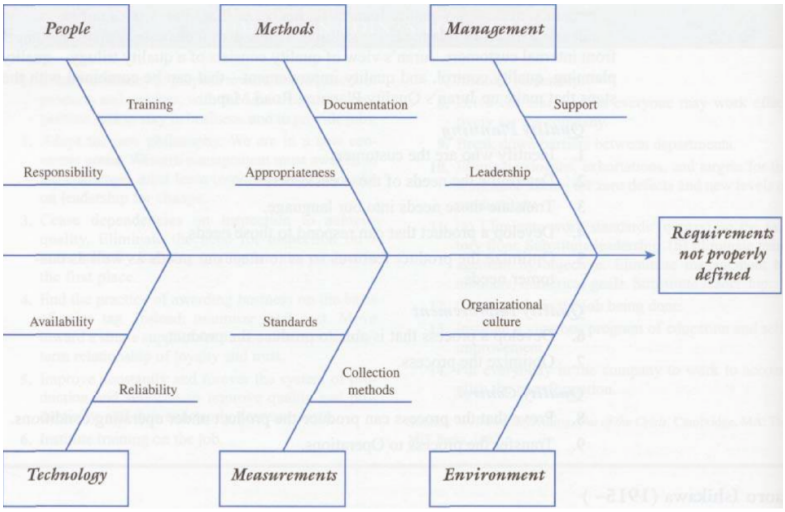


图 9.3: Cause and Effect Diagrams 例子

领域, 会有流水线, 整个过程会稳定下来). On the other hand, no project is exactly the same twice (但是在 IT 领域, 没有一个项目是相同的).

Various external factors affect IS projects such as changes of developers, knowledge level, programming skills, and so on (各种外部因素都会影响 IS 项目, 例如开发人员的变更, 知识水平, 编程技能等).

With such distinctiveness of software processes, some common problems are observed in the application of statistical analysis (由于软件过程的这种独特性, 在统计分析的应用中发现了一些常见的问题).

第 10 章 Project Resource Management (Chapter 9)

内容提要

❑ 理解 Project Resource Management

- Project Resource Management is about engaging project team members effectively in projects.
- This can be accomplished through processes:
  - Planning Resource Management
  - Estimating Activity Resources
  - Acquiring Resources
  - Developing the Project Team
  - Managing the Project Team
  - Controlling Resources
- The Human Resources Management plan describes how roles, responsibilities, reporting relationships and staffing will be handled. Key contents of this plan are responsibility assignment matrices, project organization charts, staffing management plans including resource histograms.
- (成员选择的标准), Acquiring project teams can involve negotiations. Members are selected based on criteria that include: availability, cost, experience, ability, knowledge, skills, attitude, location, time zone and communication capabilities.
- Developing the project team is about improving people skills, technical competencies and overall team environment and team performance. Team building is important.
- Managing the project team entails (需要) fostering (促进) teamwork and integrating the efforts of team members. Conflict Management is important for managing project teams.

10.1 Psychological and Sociological Insights to Leading Teams

10.1.1 Teams 的重要性

首先, 我们说明 teams 的重要性:

- IS projects require the engagement of knowledge workers to solve novel problems and deliver solutions.
- IS project teams spend a large proportion (比例) of their time collaborating, discussing ideas and making joint decisions.
- Team work and team spirit are important.

10.1.2 Teams 与 Group 的区别

接着我们来看一下 team 和 group 两者的区别:

- Working Group
  - Strong, clearly focused leader
  - Individual accountability (个人责任)
  - Individual work-products
  - Run efficient meeting
  - Discusses, decides, and dologates(致辞)
- Team
  - Shared leadership roles
  - Collective work-products
  - Encourages open-ended discussion and active problem-solving meeting
  - Discusses, decides, and **does real work together**

10.1.3 Managerial attitudes(管理态度)

Douglas McGregor researched human relations in management in the 1960s and distinguished two extreme types of managerial attitudes (有人在 1960s 提出了两者截然相反的管理态度): 这两种管理方式是基于下面两种不同的假设.

- Theory X(假设员工不喜欢工作): assumes workers dislike and avoid work.
- Theory Y(假设员工喜欢工作): assumes individuals consider work as natural as play or rest and enjoy the satisfaction of esteem and selfactualization needs.

针对上面两种不同的假设, 就有了下面两种不同的管理措施.

- Theory X stresses the importance of strict supervision, external rewards, and penalties. (要严格监督, 额外的奖励, 和惩罚)
- Theory Y highlights the motivating role of job satisfaction and encourages workers to approach tasks without direct supervision (强调鼓励).

但是在实际中, 还是希望可以按照 Theory Y 的模式. Although combination of both theories can be appropriate in many projects, in IS projects, managers are encouraged to take approaches closer to theory Y.

10.2 Research Related to Managing and Leading People

关于管理团队的一些理论, 这里就 5 个理论进行详细的说明. Psychologists and management theorists have devoted much research and thought to the field of leading people at work.

- Motivation theories
- Influence and power
- Effectiveness improvement

- Emotional intelligence
- Leadership

10.2.1 Motivation Theories

这里分为内部刺激和外部刺激.

- **Intrinsic motivation** causes people to participate in an activity for their own enjoyment
  - Example: some people love to read, write, or play an instrument because it makes them feel good
  - sense of achievement
  - curiosity
  - interest
  - pride
- **Extrinsic motivation** causes people to do something for a reward or to avoid a penalty (外部刺激使得人们希望获得奖励或是避免惩罚)
  - Example: some young children would prefer not to play an instrument, but they do because they receive a reward or avoid a punishment for doing so
  - money
  - grades
  - career
  - praise
  - exam

10.2.2 Influence and power

- **Influence**
  - Assigning work that capitalizes on a worker's enjoyment of doing a particular task and expertise to influence people is very likely to yield good results (利用人们的乐趣来完成工作, 会有好的效果).
- **Power**
  - Power is the ability to get people to do things they would not otherwise do
  - Power is much stronger than influence, it is often used to force people to change their behavior.

10.2.3 Effectiveness improvement

PM 可以使用下面的七个习惯来提高效率 (Project managers can apply Covey's seven habits to improve effectiveness on projects)

- Be proactive (主动)
- Begin with the end in mind

- Put first things first
- Think win/win (考虑双赢)
- Seek first to understand, then to be understood
- Synergize (协调合作)
- Sharpen the saw (敏锐的发现)

10.2.4 Emotional intelligence (情商)

Emotional intelligence 包含下面的 5 个点 (Emotional Intelligence includes)

- self-awareness (自我认识)
- self-regulation that are intrapersonal abilities (自我调节是人际交往能力),
- and empathy (同理心)
- and social skill that are interpersonal (际交往能力).
- motivation.

10.2.5 Leadership

There is no one best way to be a leader. Most experts agree that the best leaders are able to adapt their style to needs of the situation.

10.3 Project Resource Management 的 6 个步骤

在 Project Resource Management 中包含 6 个步骤:

- Planning Resource Management: identifying and documenting project roles, responsibilities, required skills, reporting relationships and creating a staffing management plan.
- Estimate Activity Resources: The process of estimating the type and quantities of material, human resources, equipment, or supplies required to perform each activity.
- Acquiring Resources: confirming people availability and obtaining the team necessary to complete project activities.
- Developing the Project Team: improving competencies, team member interaction and overall team environment to enhance project performance.
- Managing the Project Team: tracking team member performance, providing feedback, resolving issues and managing changes to enhance project performance.
- Controlling Resources: ensuring resources assigned to the project are available as planned.

在整个 project 的执行过程中, team 与项目最后的成功紧密相连. Throughout project execution, team related processes (developing and managing) are critical for the project success.

下图10.1是一个整体的流程图.

10.3.1 Planning Resource Management

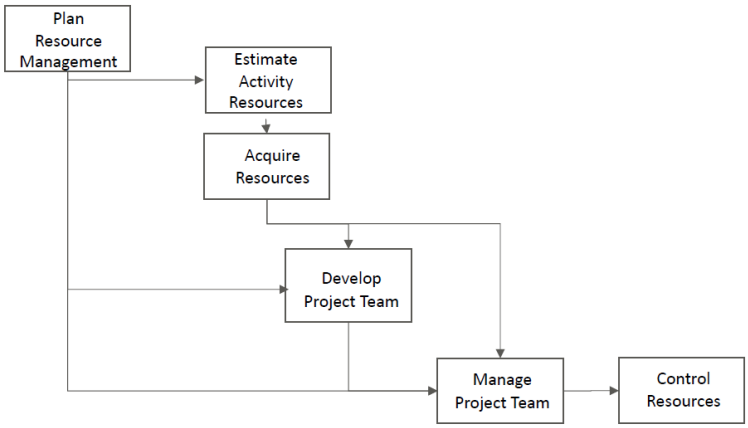


图 10.1: Project Resource Management 流程图

- Resources Management plan 做什么: The Resources Management plan describes how roles, responsibilities, reporting relationships and staffing will be handled (资源管理计划描述了角色, 职责, 报告关系和人员配备的处理方式).
- 这个 plan 中要包含的主要内容 (后面会详细介绍这三个), Key contents of this plan are:
  - responsibility assignment matrices, RAM (责任分配矩阵)
  - project organization charts (项目组织结构图)
  - staffing management plan including a resource histogram (员配备管理计划, 包括资源直方图)

10.3.1.1 Responsibility assignment matrix (RAM)

- RAM 介绍: A responsibility assignment matrix (RAM) is a matrix that maps the work of the project as described in the WBS to the people involved in performing the work (将人和工作联系起来).
- It can be developed at the activity level or (for large projects) at the workpackage level.
- A commonly used format is a RACI matrix. Where different project members can be: Responsible, Accountable, Consult, Inform.
  - Responsible (参与, 做这个项目的人): those who do the work for the activity
  - Accountable 项目签字的人 (每个项目只能有一个): the one ultimately answerable for the correct and thorough completion of the activity. In other words, an accountable must sign off (approve) work. Only one A per activity.
  - Consult: those whose opinions are sought and with whom there is two-way communication.
  - Inform (只需要通知): those who are kept up-to-date on progress, and with whom there is just one-way communication.

图10.2是一个 RAM 矩阵的一个例子, 其中 R, I 等字母就是上面 Inform 等的缩写.

	Person				
Activity	Ann	Ben	Carlos	Dina	Ed
Create charter	A	R	I	I	I
Collect requirements	I	A	R	C	C
Submit change request	I	A	R	R	C
Develop test plan	A	C	I	I	R

R = Responsible A = Accountable C = Consult I = Inform

图 10.2: Responsibility assignment matrix (RAM) 例子

10.3.1.2 Project organization chart

A project organization chart is a graphic display of the project team members and their reporting relationships. It is especially useful to have such a chart when there are large-sized teams.

这个就是和图10.3是一样的.

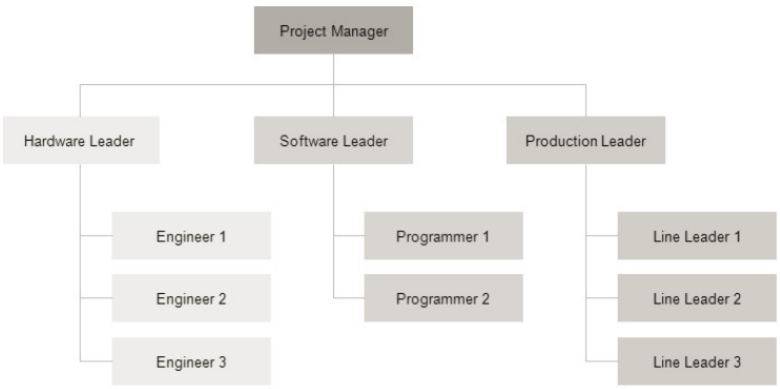


图 10.3: Project organization chart 例子

10.3.1.3 Resource histogram

A resource histogram provides a visual representation of **resource allocations** over time.

Resource histogram 可以参考图10.4是一样的.

10.3.2 Estimate Activity Resources

在做任务分配的时候, 下面是一些值得注意的点:

- Make sure there are no conflicts for key resources (same person can't be two places at once).
- A very common problem: some resources are over-allocated while others are under-allocated. People working on some activities are overwhelmed, while others have nothing much to do.

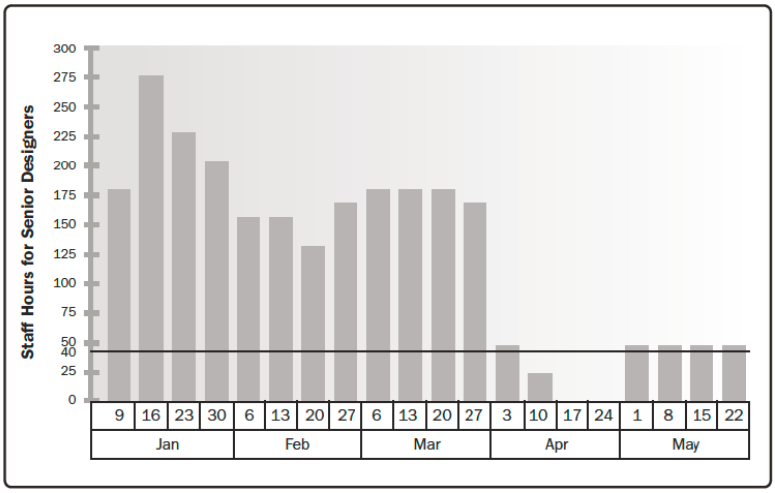


图 10.4: Resource histogram 例子

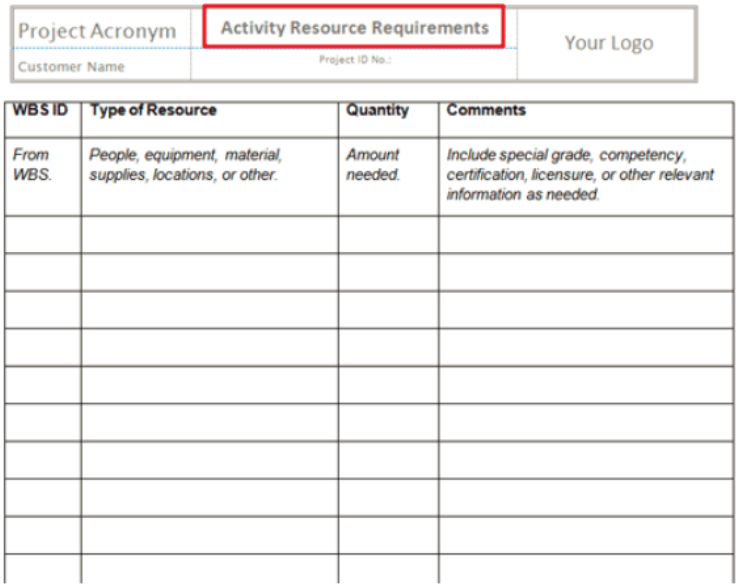
- An issue related to assigning people in multiple activities at the same time: switching tasks takes effort (如果同时让一个人做多个任务, 任务之间的切换也是需要他的精力的). People work more hours. Burn out, morale issues (精疲力尽, 士气问题).

于是, 我们会有一个 Activity Resources Requirement, 如图10.5所示, 记录关于需求, 数量, 描述等内容.

- 对 Activity Resources Requirement 的描述: Activity resource requirements identify the types and quantities of resources required for each activity in a work package.
- These resources then can be aggregated to determine the estimated resources for each work package and each work period.
- The amount of detail and the level of specificity can vary.
- Examples of resource categories include:
  - labor
  - material
  - equipment
  - supplies
  - Resource types may include the skill level, grade level, or other information as appropriate to the project.

10.3.3 Acquiring Resources

- Project Management may or may not have direct control over team member selection (Project Management 可能无法直接控制团队人员的选择).
- When acquiring new team members the involvement of existing team members increases the likelihood of building a cohesive (有凝聚力) team.
- **Negotiations with**: functional managers to allow their staff to participate in projects, other projects that compete for the same resources, external suppliers and subcontractors.
- **Selection criteria (选择标准)** for team members include: availability, cost, experience,



Project Acronym	Activity Resource Requirements	Your Logo
Customer Name	Project ID No.:	

WBS ID	Type of Resource	Quantity	Comments
From WBS.	*People, equipment, material, supplies, locations, or other.*	*Amount needed.*	*Include special grade, competency, certification, licensure, or other relevant information as needed.*

图 10.5: Activity Resources Requirement 例子

ability, knowledge, skills, attitude, location, time zone and communication capabilities.

10.3.4 Developing the Project Team

- 团队发展带来的好处: Developing the project team improves people skills, competencies and overall team environment and performance.
- Training can enhance the team members competences. Training can be formal or informal on the job training.
- Team building activities can help individual members work together. They can vary from short activities during meetings to professionally facilitated experiences. Team building activities are especially valuable when team members operate from remote locations (来自不同的地方的时候, 这个 activities 尤其有用).
- Team-based reward and recognition systems can promote teamwork. Focus on rewarding teams for achieving specific goals throughout the project not only when it is completed (专注于奖励团队, 以便在整个项目中实现特定目标, 而不仅仅是在完成时).

10.3.5 Managing the Project Team

- Managing the project team is important for integrating the efforts of team members.
- Performance appraisals during the project are useful for clarifying roles and responsibilities (项目期间的绩效评估对于阐明角色和职责很有用), providing constructive feedback to team members, discovering unresolved issues and establishing goals for future time periods.
- **Conflict Management** is important for managing the project team.

下面详细说明一下 Conflict Management(了解下面几种的区别):

- Withdraw/Avoid (回避或是拖延). Retreating (撤退) from an actual or potential conflict situation; postponing the issue to be better prepared or to be resolved by others.
- Smooth/Accommodate (强调相同点). Emphasizing areas of agreement rather than areas of difference.
- Compromise/Reconcile (妥协, 和解, 让步). Searching for solutions that bring some degree of satisfaction to all parties. Use a give-and-take approach (寻找可以使各方满意的解决方案, 使用让步方法).
- Force/Direct (强迫). Pushing one‘s viewpoint at the expense of others; offering only win-lose solutions, usually enforced through a power position (以别人的利益来推销自己的观点; 只提供输赢的解决方案, 通常是通过权力职位来实施).
- Collaborate/Problem Solve (协作解决问题). Incorporating multiple viewpoints and insights from differing perspectives; requires a cooperative attitude and open dialogue (融合来自不同角度的多种观点和见解, 需要合作态度和公开对话).
- Confrontation (直面问题). Directly facing a conflict using a problem-solving approach.

10.3.6 Controlling Resources

Ensuring physical resources assigned to the project are available as planned (确保分配给项目的物理资源按计划可用). Also involves monitoring the planned versus actual resources utilization and taking corrective actions as needed (还涉及监视计划的资源利用率与实际的资源利用率, 并根据需要采取纠正措施).

第 11 章 Project Risk Management (Chapter 11)

内容提要

- ❑ 理解 Project Quality Management cesses
- ❑ Quality Management 的 3 个 pro-

- Project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect (opportunity or threat) on one or more project objectives such as scope, schedule, cost, and quality.
- Project risk management aims to decrease the likelihood and impact of negative events in the project and increase the likelihood and impact of positive events.
- **The processes for Project Risk Management are**: Planning Risk Management, Identifying Risks, Performing Qualitative Risk Analysis, Performing Quantitative Risk Analysis, Planning Risk Responses, Implementing Risk Responses, Monitoring Risks.
- Every project should have a risk management plan to ensure that the degree, type, and visibility of risk management are commensurate with the risk level of the project, the importance of the project to the organization.
- For every project we need to identify risks that may affect the project and document them in the risk register.
- The risk register is the basis for analyzing risks (qualitatively or quantitatively), preparing responses to risks, implementing responses and controlling risks throughout the project.

11.1 Project Risk 的介绍

关于 quality management 和 risk management 是有相似之处:

- 依赖的知识: Both rely on cause-and-effect analysis techniques to determine preventive and corrective actions (两者都依靠因果分析技术来确定预防和纠正措施).
- 作用: Quality and risk management serve as an opportunity to learn, innovate, and improve projects to satisfy the stakeholder.

11.1.1 什么是 Project Risk

- Project Risk 的定义: Project risk is an uncertain event or condition that, if it occurs, has a positive or negative effect (opportunity or threat) on one or more project objectives such as schedule, cost, and quality.
- Project Risk 的性质: A risk may have one or more causes and, if it occurs, it may have one or more impacts. (一个 risk 会有不同的产生的原因)

- Organizations and stakeholders are willing to accept varying degrees of risk depending on their risk attitude (some can be more risk-averse while others can have a significant risk appetite willing to take risks in anticipation of rewards) (每个人接受 risk 的程度是不一样的).
- Project risk management 的目的: Project risk management aims to decrease the likelihood and impact of negative events in the project and increase the likelihood and impact of positive events (减少不好的影响, 增加好的影响).

11.2 Project Risk Management 的 7 个步骤

在 Project Risk Management 中包含 7 个步骤:

- Planning Risk Management: defining how to conduct risk management activities for a project.
- Identifying Risks (识别出哪些 risks 会有影响, 标出他们的特点): determining which risks may affect the project and documenting their characteristics.
- Performing Qualitative (定性) Risk Analysis: assessing (估计) the probability of occurrence and impact of each risk identified to prioritize risks for further analysis or action (评估已识别的每种风险的发生和影响的可能性，以对风险进行优先级排序以进行进一步分析或采取措施).
- Performing Quantitative (定量) Risk Analysis: numerically analyzing the effect of identified risks on overall project objectives.
- Planning Risk Responses: developing options and actions to enhance opportunities and to reduce threats to project objectives.
- Implementing Risk Responses: implementing risk response plans.
- Monitoring Risks: monitoring if risk response plans are followed, tracking identified risks, identifying new risks, and evaluating risk process effectiveness throughout the project.

In every project we should at least perform key risk management processes (在一个项目中, 我们至少要执行下面的 processes):

- plan risk management
- identify risks,
- implement risk responses,
- monitor risks.

Additionally, we may perform a qualitative and quantitative risk analysis and a detailed plan for risk responses.

一个整体的流程图如图11.1所示:

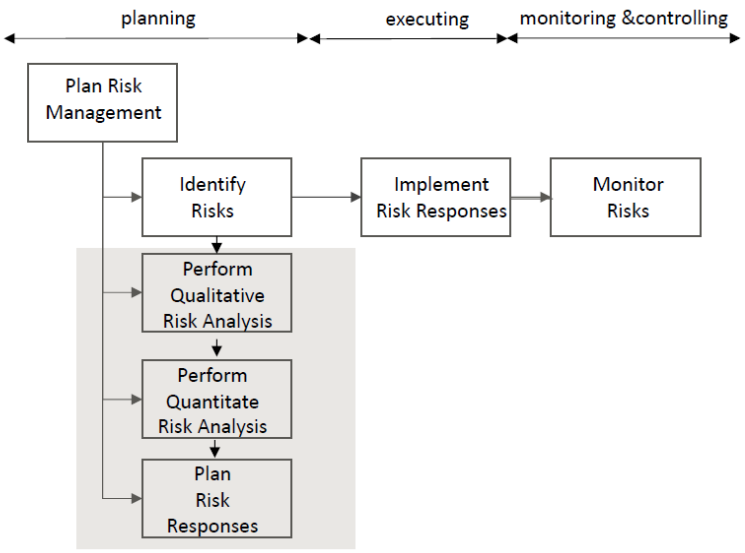


图 11.1: Project Risk Management 的 7 个步骤

11.2.1 Plan Risk Management 阶段

Every project should have a **risk management plan** to ensure that the degree, type, and visibility of risk management are commensurate with (以确保风险管理的程度, 类型和可见性与以下各项相称):

- the risk level of the project,
- the importance of the project to the organization.

关于 risk management plan 的开始和结束的时间. Work on the risk management plan should begin when a project is conceived and should be completed early during project planning.

关于 risk management plan 主要写一些什么内容. The risk management plan describes how risk management activities will be structured and performed and includes the definitions of risk probability and impact to be used throughout the project.

图11.2是关于 negative impact 的定义. 也就是当 cost 大于某个值, time 大于某个值, 则 impact 是一个什么样的程度.

SCALE	+/- IMPACT ON PROJECT OBJECTIVES		
	TIME	COST	QUALITY
Very High	>6 months	>$5M	Very significant impact on overall functionality
High	3-6 months	$1M-$5M	Significant impact on overall functionality
Medium	1-3 months	$501K-$1M	Some impact in key functional areas
Low	1-4 weeks	$100K-$500K	Minor impact on overall functionality
Very Low	1 week	<$100K	Minor impact on secondary functions
Nil	No change	No change	No change in functionality

图 11.2: Example of definitions for negative impact on project objectives

11.2.2 Identify project risks 阶段

- Identify project risks 的定义: Determining which risks may affect the project and documenting their characteristics.
- Identify project risks 的进行时间: Risks may evolve or become known as the project progresses, so risk identification is ongoing (随着项目的进行, 风险可能会演变或被人们所熟知, 因此风险识别仍在进行中).
- Identify project risks 的主要输出: Key output is the risk register which is a list of identified risks. The identified risks are described in as much detail as is reasonable.
- A list of potential responses may sometimes be identified during this process(在这一个阶段, 可以有相对应的解决方法) (especially if a separate process to "Plan Risk Responses" is not performed).

下面我们来看一下一些识别出来的 risks(Risks identified when teams started working on the semester assignment)

- Group members dropping out or not contributing
- Not being able to find people to interview
- Not relevant data from interviews
- Loss of data due to computer failure
- Misunderstanding the requirements
- Lack of cooperation between group members
- Getting sick

关于在 Software project 中的一些 risks 的例子, 这里 risks 的获取的方式:

- Authoritative list of common risk factors for software projects developed through a rigorous (谨慎的) data collection method. (通过一些数据收集分析的方式获得一些常见的 risk)
- Three simultaneous surveys were conducted in three different settings: Hong Kong, Finland, and the United States. (同时在三个国家开展调查)
- Experienced project managers were recruited (招募) in each country. (找一些有经验的 PM)

下面是得到的一些常见的 common risks:

- Lack of top management commitment to the project (缺乏高层管理人员对该项目的承诺)
- Failure to gain user commitment
- Misunderstanding the requirements
- Lack of adequate (充足的) user involvement
- Lack of required knowledge in the project personnel
- Lack of frozen requirements
- Changing scope/objectives
- Introduction of new technology
- Failure to manage end user expectations
- Insufficient/inappropriate staffing (人员配置不足/不足)

- Conflict between user departments

11.2.2.1 一种识别 risk 的方法-Pre-mortem

这里介绍一种可以识别 risk 的方法, 叫 Pre-mortem. 他的大致想法就是项目开始之前, 召集所有人, 假设现在项目失败了, 讨论一下可能失败的原因.

下面是他的详细的步骤.

- A typical pre-mortem begins after the team has been briefed on the plan.
- The leader starts the exercise by informing everyone that the project has failed spectacularly.
- Over the next few minutes those in the room independently write down every reason they can think of for the failure. (每个人写下自己认为可能失败的理由)
- Next the leader asks each team member, starting with the project manager, to read one reason from his or her list; everyone states a different reason until all have been recorded.
- After the session is over, the project manager reviews the list.

11.2.3 Qualitative Risk Analysis 阶段

- 要做的事情: Assessing probability of occurrence and impact (估计 risk 发生的可能性和影响) (according to the definitions included in the risk management plan).
- The Qualitative Risk Analysis can be used for establishing priorities for Plan Risk Responses and as a foundation for Quantitative Risk Analysis, if required. (可以为后面的两个步骤做铺垫)
- 会定期执行: The Perform Qualitative Risk Analysis process is performed regularly throughout the project life cycle, as defined in the project’s risk management plan.

关于如何进行 Qualitative Risk Analysis 这一阶段的方法:

- Risks can be assessed (评定) in interviews or meetings with participants selected for their familiarity with the risk categories on the agenda.
- Project team members and knowledgeable persons external to the project can be included.(项目之外的人也可以包含进来)
- The level of probability for each risk and its impact on each objective is evaluated during the interview or meeting. (每一个 risk 发生的可能和影响在 meeting 中讨论出来)
- Explanatory detail, including assumptions justifying the levels assigned, are also recorded (还记录了解释性详细信息, 包括证明所分配级别合理的假设).

11.2.4 Quantitative Risk Analysis 阶段

上面是定性分析, 这里是定量分析.

- Numerically analyzing the effect of identified risks on overall project objectives (对确定的风险对总体项目目标的影响进行数值分析).
- 主要技术 (Key Techniques):

  - Sensitivity analysis (how variations in different uncertainties correlate with potential variations in the project)
  - Decision Tree Analysis and Simulation.
- (产品经理需要做的事情)The project manager should exercise judgment to determine the need for and the viability of quantitative risk analysis (项目经理应做出判断, 以确定定量风险分析的必要性和可行性).

11.2.5 Plan Risk responses 阶段

- 什么是 Plan Risk responses: Developing options and actions to enhance opportunities and to reduce threats to project objectives (制定选项和行动以增加机会并减少对项目目标的威胁).
- Includes the identification and assignment of one person (an owner for risk response) to take responsibility for each agreed-to and funded risk response. (包括识别和指派一个人, 风险响应的所有者, 对每个已达成共识并提供资金的风险响应负责)
- Risk responses should be(常见的回应有)
  - appropriate for the significance of the risk (适合风险的重要性)
  - cost-effective in meeting the challenge (具有成本效益的应对挑战)
  - realistic within the project context (在项目范围内切合实际)
  - agreed upon by all parties involved (有关各方都同意)
  - owned by a responsible person.

下面是一些常见的 Strategies:

- 解决 threat 的 Strategies, which typically deal with threats are: avoid, transfer, and mitigate (减缓).
- 解决 opportunities 的 Strategies, which typically deal with opportunities are: exploit, enhance, share.
- 对于 threat 和 opportunities 都可以使用的 strategies: Two additional strategies (accept and escalate), can be used for threats as well as for opportunities.

图11.3展示了上面的不同的 Strategies:

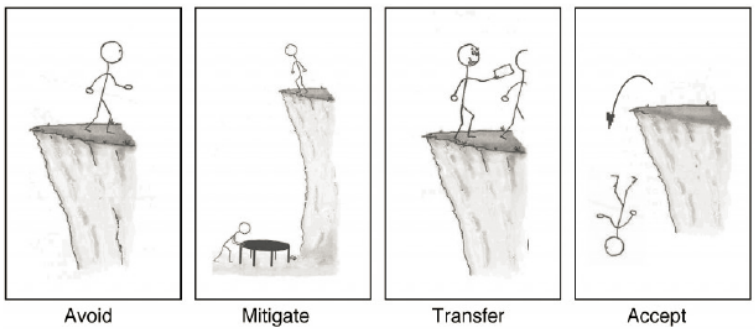


图 11.3: 不同的 Strategies

下面给出一个例子, 关于不同 Strategies 下的回复.

- Sample risk responses for a software project
- 存在的 RiskTechnical Risk of using new technological platform.
- Responses
  - Avoid: Use team members that have already used successfully the new development platform and language.
  - Transfer: Delegate (委托) this part of the development to a partner.
  - Mitigate: Train developers. Work in short iterations so that problems are identified early before they have time to impact the project significantly.

下图11.4是一张关于 Sample Risk Register 的表格. 也就是我们需要记录 risk, 记录他出现的可能性, 带来的影响, 说明解决方法和说明负责人.

ID	Description	Project Aspect Affected (e.g. Quality, Scope, Time, Cost)	Probability to occur (Low, Moderate, High)	Impact if it occurs (Low, Moderate, High)	Description of Response	Responsible for Response
1	Loss of data	Time	Low	High	Mitigate: Backup frequently	O. Hansen
2						
3						

图 11.4: Sample Risk Register

需要注意的是, 一个 risk 可能会有不同的影响, 所以有的时候需要多行来进行记录. A risk may have one or more impacts so there might be a need for multiple rows in the table for the same risk.

我们也可以很容易的对上面11.4进行拓展, 可以增加以下的内容 (Extended Risk Register Contents)

- Identification number for each risk event
- Rank for each risk event
- Name of each risk event
- Description of each risk event
- Category under which each risk event falls
- Root cause of each risk
- Triggers for each risk; indicators or symptoms of actual risk events
- Potential responses to each risk
- Risk owner or person who will own or take responsibility for each risk
- Probability and impact of each risk occurring
- Status of each risk

11.2.6 Implement Risk Responses

这个是在 execute 步骤中的.

- Proper attention to implementing the risk responses is needed (需要适当注意实施风险应对措施).
- A common problem is that project teams spend effort in identifying and analyzing risks

and developing risk responses but then they do not really take the actions required. (实际情况很可能是我们做了 risk 的各类分析, 但是没有具体采取行动)

- Implementing risk responses involves putting the appropriate risk response plans into action. (就是将上面提到的 response 实际采取行动)

11.2.7 Monitor Risks

- Monitor that the risk response plans are followed, tracking identified risks, identifying new risks, and evaluating risk process effectiveness throughout the project.
- The risk response owner reports periodically to the project manager on the effectiveness of responses (险响应负责人定期向项目经理报告响应的有效性), any unanticipated effects, and any correction needed to handle the risk appropriately (任何意外的影响，以及为适当处理风险所需的任何更正).

第 12 章 Project Procurement Management (Chapter 12)

内容提要

❑ 理解 Project Procurement Manage- ment

- Procurement means acquiring products and/or services from an outside source. Project Procurement Management includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team.
- Contracts are legal documents between a buyer and a seller. A contract can be simple or complex, reflecting the simplicity or complexity of procured products or services. Key contract types include fixed price contracts and cost reimbursable contracts.
- There are three processes for Project Procurement Management: Planning Procurement Management, Conducting Procurement and Controlling Procurement.
- In every project we should make upfront decisions to make or buy products and services (plan procurement). If there is no need to buy anything, the other processes will not be performed.
- Conducting procurements can be lengthy including multiple contacts with potential sellers and negotiations. Controlling procurements entails reviewing and documenting how well a seller is performing and closing procurements based on contract terms. All procurement processes have significant legal aspects.

12.1 Project Procurement Management 介绍

12.1.1 什么是 Procurement

Procurement(采购) means:

- acquiring products from an outside source
- acquiring services from an outside source

Other terms include **purchasing**.

- Most organizations have policies defining procurement rules and specifying who has authority to sign and administer such agreements on behalf of the organization (大多数组织都有定义采购规则并指定谁有权代表组织签署和管理此类协议的政策).
- It is project management's responsibility to ensure that project procurements meet the project needs while adhering to organizational procurement policies (在遵守组织采购政策的同时, 确保项目采购满足项目需求是项目管理层的责任).

- The project management team may seek support in early phases from specialists in contracting, purchasing, law, and technical disciplines. Such involvement can be mandated (授权) by an organization's policies (项目管理团队可能会在早期阶段寻求合同, 采购, 法律和技术学科方面的专家的支持. 组织的政策可以要求这种参与).

12.1.2 关于 Project Procurement Management

- 定义: Project Procurement Management includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team (项目采购管理包括从项目团队外部购买或获取产品, 服务或结果所需的过程).
- A project is viewed here as a "buyer" (一个项目在这里被视为" 买方", 我们是购买东西的人). Projects can also be "sellers" working under a contract issued by an outside organization (项目也可以是由外部组织签发的合同下的" 卖方")

12.1.3 关于 contracts

- Contracts 的定义: Contracts are legal documents between a buyer and a seller.
- Seller 的别名: The seller may be called: contractor, subcontractor, vendor, service provider, or supplier.
- Buyer 的别名: The buyer may be called acquiring organization, service requestor, or purchaser.
- A contract can be simple or complex, reflecting the simplicity or complexity of procured products or services.
- A project may involve managing multiple contracts with multiple sellers for different products or services simultaneously or in sequence.

下面介绍不同类型的 contracts.

12.1.3.1 Fixed Price Contracts

- Contracts with a fixed price for a defined product or service.
- **Sellers (关于卖方的要求)** under fixed-price contracts are legally obligated to complete them, with possible penalties if they do not (根据固定价格合同的卖方有法律义务完成合同, 否则, 可能会受到处罚).
- **Buyers (关于买方的要求)** under fixed-price contracts, need to precisely specify the product or services being procured (需要准确说明要购买的产品或服务). Changes in scope may be accommodated, but generally with an increase in contract price (可以适应范围的变化, 但通常会增加合同价格).
- It is the most commonly used contract type (这是最常见的合同). It is favored by most buying organizations because the price for goods is set at the outset and not subject to change unless the scope of work changes (它受到大多数购买组织的青睐, 因为商品价

格是一开始就确定的, 除非工作范围发生变化, 否则价格不会变化).

12.1.3.2 Fixed Price Contract Variants(变体)

Two key variants of Fixed Price Contracts(有两个主要的变体):

- Fixed Price with Economic Price Adjustment Contracts (FP-EPA) (适合交易时间跨度大).
  - A FP-EPA contract is intended to protect from external conditions that cannot be controlled (FP-EPA 合同旨在保护不受控制的外部条件).
  - Used whenever the seller's performance period spans a considerable number of years (当卖方的履约期限跨度相当长的几年时使用).
  - It is a fixed-price contract, but with a special provision allowing for price adjustments due to inflation or other types of cost increase or decrease for specific commodities. (它是固定价格合同, 但有特殊规定, 允许因通货膨胀或特定商品其他类型的成本增加或减少而进行价格调整)
- Fixed Price Incentive fee contracts (FPI)
  - A FPI contract Includes financial incentives for performance targets (related for example, to schedule, or technical performance of the seller) (FPI 合同包括针对绩效目标的财务激励措施, 例如, 与进度表或卖方的技术绩效有关).
  - Performance targets are established at the outset, and the final contract price is determined after completion of all work based on the seller's performance (绩效目标是一开始就确定的, 最终合同价格是在完成所有工作后根据卖方的绩效确定的).

12.1.3.3 Cost Reimbursable Contracts

上面两个都是 fixed price, 这里是 adjustable price.

- This category of contract involves payments (cost reimbursements) to the seller for all legitimate actual costs incurred for completed work, plus a fee representing seller profit (这类合同涉及为完成的工作而发生的所有合法实际费用向卖方付款 (费用偿还), 外加代表卖方利润的费用).
- A cost-reimbursable contract provides the project flexibility to redirect a seller whenever the scope of work cannot be precisely defined at the start and needs to be altered, or when high risks may exist in the effort (费用可偿还的合同为项目提供了灵活性, 可以在开始时无法精确定义工作范围并且需要更改工作范围或工作中可能存在高风险的情况下重定向卖方).
- Cost-reimbursable contracts may also include financial incentive clauses whenever the seller exceeds, or falls below, defined objectives such as costs, schedule, or technical performance targets (每当卖方超出或低于确定的目标, 例如成本，进度或技术性能目标时, 可补偿成本的合同也可能包含财务激励条款).

- Three of the more common types of cost-reimbursable contracts in use are
  - Cost Plus Fixed Fee (CPFF)
  - Cost Plus Incentive Fee (CPIF)
  - Cost Plus Award Fee (CPAF)

12.1.3.4 Cost Reimbursable Contract Variants

- Cost Plus Fixed Fee (CPFF).
  - Cost plus a fixed-fee calculated as a percentage of the initial estimated project costs. A fee is paid only for completed work and does not change due to seller performance.
  - 成本加上固定费用, 按初始估算项目成本的百分比计算. 费用仅针对完成的工作而支付, 不会因卖方的表现而改变.
- Cost Plus Incentive Fee (CPIF).
  - Cost plus a predetermined incentive fee for achieving certain performance objectives as set forth in the contract (实现合同中规定的某些绩效目标的成本加上预定的激励费).
- Cost Plus Award Fee Contracts (CPAF).
  - Cost plus a fee earned only based on the satisfaction of certain broad subjective performance criteria defined and incorporated into the contract (成本加上所获得的费用仅基于满足定义并纳入合同的某些广泛的主观绩效标准).
  - The fee is based solely on the subjective determination of seller performance by the buyer, and is generally not subject to appeals (该费用仅基于买方对卖方履约的主观判断，通常不上诉).
  - CPAF contracts have higher risk for the seller than CPFF contracts

12.2 Project Procurement Management 的 3 个 process

这里三个 processes 包括:

- Planning Procurement Management: determining what to procure and when and how to do it. It entails documenting project procurement decisions, specifying the approach, and identifying potential sellers (确定采购什么以及何时以及如何进行. 它需要记录项目采购决策, 指定方法并确定潜在的卖方).
- Conducting Procurements: obtaining seller responses, selecting a seller, and awarding a contract.
- Controlling Procurements: managing procurement relationships, monitoring contract performance, making changes and corrections as appropriate and closing out contracts.

我们需要注意的是

- In every project we should at least identify upfront if we will need to buy products or services (plan procurement) (在每个项目中, 我们至少应预先确定是否需要购买产品

或服务, 计划采购).

- If there is no need to buy anything then the other two processes will not be performed.

图12.1是整个 Project Procurement Management 的流程图.

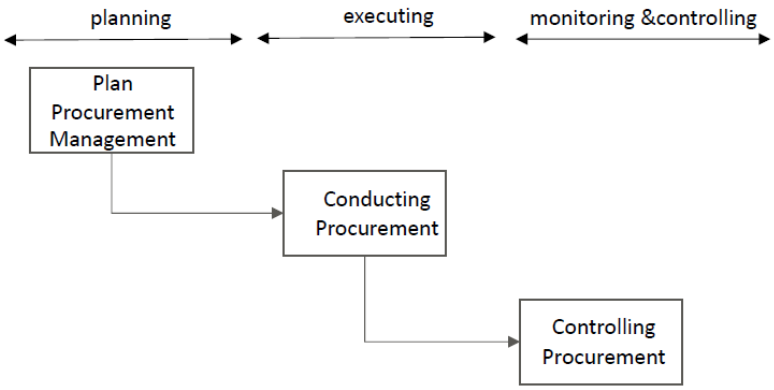


图 12.1: Project Procurement Management 流程图

12.2.1 Plan Procurement Management

- Identifying which project needs can best be met by sourcing products or services from outside and if so, what to procure, how to procure it, how much is needed, and when to procure it.
- The time requirements of the project can significantly influence the strategy during the Plan Procurement(在计划采购期间, 项目的时间要求可能会严重影响策略)
- The Plan Procurement Management process includes evaluating and taking make-or-buy decisions (计划采购管理过程包括评估和做出购买决定).
- It also includes reviewing the type of contract planned to be used with respect to avoiding or mitigating risks, sometimes transferring risks to the seller (它还包括在避免或减轻风险方面审查计划使用的合同类型, 有时将风险转移给卖方).

有的时候, 我们需要做出判断, 是 make 还是 buy (Evaluating the need of buying versus making inhouse when there is such an option.). 有下面的一些因素会影响判断.

- Capability internally compared with the vendor community(内部能力与供应商社区的比较)
- Value delivered by vendors meeting the need. (供应商提供的满足需求的价值)
- Risks associated with meeting the need. (与满足需求相关的风险)
- Market Research might be needed for taking a decision. (进行决策可能需要市场研究)
- Procurement teams may leverage information gained at conferences, online reviews and a variety of sources to identify market capabilities. (采购团队可以利用从会议, 在线评论和各种来源获得的信息来确定市场能力)

12.2.2 Conduct Procurement

下面是 Conduct Procurement 的主要步骤:

- During the Conduct Procurements process, the team receives bids or proposals and applies selection criteria to select one or more sellers who are qualified to perform the work and acceptable as a seller (在" 行为采购" 过程中, 团队会收到投标或提议, 并应用选择标准来选择一个或多个有资格执行工作且可以被接受为卖方的卖方).
- On major procurement items, a short list of qualified sellers can be established based on a preliminary proposal. A more detailed evaluation can then be conducted based on a more specific and comprehensive requirements document requested from the sellers on the short list (在主要采购项目上, 可以根据初步建议确定合格卖方的简短清单. 然后, 可以根据入围清单上卖方要求的更具体, 更全面的要求文档进行更详细的评估).
- Expert judgment may be used in evaluating seller proposals (专家判断可用于评估卖方建议). The evaluation of proposals may be accomplished by a multi-discipline review team (提案的评估可以由多学科的审查小组来完成). This can include expertise from legal, accounting, engineering, design, research, development, sales, and manufacturing (这可以包括来自法律, 会计, 工程, 设计, 研究, 开发, 销售和制造的专业知识).

在这一步中, 我们需要联系卖方, 下面介绍两种方式来联系卖方.

- Advertising
  - Existing lists of potential sellers often can be expanded by placing advertisements in general circulation publications such as selected newspapers or in specialty trade publications (通常可以通过将广告放置在一般发行的出版物如精选报纸, 或专业贸易出版物上来扩展现有的潜在卖方列表).
  - Most government procurements require public advertising and online posting of pending government contracts (大多数政府采购都要求公开广告和在线发布未完成的政府合同).
- Bidder Conferences(投标会议)
  - Bidder conferences (sometimes called contractor conferences, vendor conferences, and pre-bid conferences) are meetings between the buyer and all prospective sellers prior to submittal of a bid or proposal (投标人会议, 有时称为承包商会议, 卖方会议和投标前会议是买方和所有潜在卖方在提交投标书或投标书之前的会议).
  - They are used to ensure that all prospective sellers have a clear and common understanding of the procurement requirements), and that no bidders receive preferential treatment (它们用于确保所有潜在的卖方对采购要求有清晰而共同的理解, 并且确保没有任何投标人得到优惠待遇).

在联系了卖家之后, 我们会从 seller 中得到一些信息 (Receiving Information from Sellers).

- Request for Proposals (RFP): Used to solicit proposals from prospective sellers (投标申请书 RFP, 用于征求潜在卖方的投标书)

  - A proposal is a document prepared by a seller when there are different approaches for meeting buyer needs(提案是卖方通过多种方式满足买方需求时准备的文件)
- Requests for Tenders (RFT) or Request for Quotes (RFQ): Used to solicit quotes or bids from prospective sellers (招标书 RFT 或报价书 RFQ, 用于向潜在卖家征求报价或出价)
  - A bid, also called a tender or quote (short for quotation), is a document prepared by sellers providing pricing for standard items that have been clearly defined by the buyer (投标, 也称为投标或报价, 简称" 报价", 是卖方准备的文件, 为买方明确定义的标准项目提供价格).

一些选择 seller 的标准

- Cost.
- Technical capability.
- Past performance of sellers.
- References.
- Management approach.
- Technical approach.
- Warranty (保修).
- Financial capacity.
- Business size and type.
- Intellectual property rights.

在完成上面所有的事情之后, 我们需要进行谈判.

- Procurement negotiations clarify the structure, requirements, and other terms of the purchases so that mutual agreement can be reached prior to signing the contract (采购谈判明确了采购的结构, 要求和其他条款, 以便可以在签订合同之前达成共同协议).
- Subjects covered should include responsibilities, authority to make changes, applicable terms and governing law, technical and business management approaches, proprietary rights, contract financing, technical solutions, overall schedule, payments, and price (涵盖的主题应包括责任, 进行更改的权限, 适用的条款和适用法律, 技术和业务管理方法, 所有权, 合同融资, 技术解决方案, 总体进度, 付款和价格).
- Negotiations conclude with a contract document that can be executed by both buyer and seller (谈判以可以由买卖双方执行的合同文件结束).
- The project manager may not be the lead negotiator on procurements. The project manager and other members of the project management team may be present during negotiations to provide assistance (项目经理可能不是采购的首席谈判代表. 在谈判期间, 项目经理和项目管理团队的其他成员可能会在场以提供帮助)

下面是合同上的一些关键的点 (Key Contract Contents).

- Statement of work or deliverables,
- Schedule baseline,

- Performance reporting,
- Period of performance,
- Roles and responsibilities,
- Seller’ s place of performance,
- Pricing,
- Payment terms,
- Place of delivery,
- Inspection and acceptance criteria,
- Warranty,
- Product support,
- Limitation of liability,
- Fees and retainer,
- Penalties,
- Incentives,
- Insurance and performance bonds,
- Subordinate subcontractor approvals,
- Change request handling,
- Termination clause and alternative dispute resolution (ADR) mechanisms.

再次强调一下合同是很重要的:

- Contracts are legal relationships, so it is important that legal and contracting professionals be involved in writing and administering contracts (合同是法律关系, 因此法律和订约专业人士必须参与合同的撰写和管理, 这一点很重要)
- Project team members must be aware of potential legal problems they might cause by not understanding a contract (项目团队成员必须了解不了解合同可能导致的潜在法律问题).

12.2.3 Control Procurement

- The Control Procurements process reviews and documents how well a seller is performing or has performed based on the contract and establishes corrective actions when needed. It also includes closing the procurement based on contract terms. (控制采购流程根据合同审查并记录卖方的执行情况或执行情况, 并在需要时采取纠正措施. 它还包括根据合同条款结束采购)
- The legal nature of the contractual relationship makes it imperative that the project management team is aware of the legal implications of actions taken when controlling any procurement. (合同关系的法律性质使项目管理团队必须意识到在控制任何采购时所采取行动的法律含义)
- Control Procurements also has a financial management component that involves monitoring payments to the seller. One of the principal concerns when making payments is that there

is a close relationship of payments made to the work accomplished (控制采购还具有财务管理组件, 该组件涉及监视对卖方的付款. 付款时主要关注的问题之一是付款与完成的工作之间存在密切关系).

- On larger projects with multiple providers, a key aspect is managing interfaces among the various providers (在具有多个提供程序的大型项目中, 一个关键方面是管理各个提供程序之间的接口).

关于合同终止的相关说明:

- To close a procurement, the project team should determine if all work was completed correctly and satisfactorily, update records to reflect final results, and archive information for future use (要结束采购, 项目团队应确定所有工作是否正确且令人满意地完成, 更新记录以反映最终结果, 并存档信息以备将来使用).
- The contract itself should include requirements for formal acceptance and closure (合同本身应包括正式接受和关闭的要求)
- This information can be used for lessons learned information and as a basis for evaluating contractors for future contracts (此信息可用于汲取教训, 并作为评估承包商未来合同的基础).
- Early termination of a contract is a special case of procurement closure that can result from a mutual agreement by both parties, from the default of one party, or for convenience of the buyer if provided for in the contract (合同的提前终止是特殊的情况, 可能是由于双方之间的相互协议, 一方的违约或为合同中规定的买方提供便利而导致的采购终止).

在敏捷/自适应环境下的情况 (Considerations for Agile/Adaptive Environments)

- The Agile Manifesto values customer collaboration over contract negotiation, setting the tone for procurement relationships on agile projects (" 敏捷宣言" 重视客户协作而不是合同谈判, 这为敏捷项目的采购关系定下了基调).
- Another goal of agile/adaptive environments is speed (敏捷/自适应环境的另一个目标是速度).
- However, procurements may take significant time (但是, 采购可能会花费大量时间).