مدیریت پروژه بر اساس PMBOK به همراه الحاقیه ساخت

(ویرایش هفتم)

بخش چهارم:

بررسی تفصیلی راهنمای پیکره دانش مدیریت پروژه PMBOK + الحاقیه ساخت

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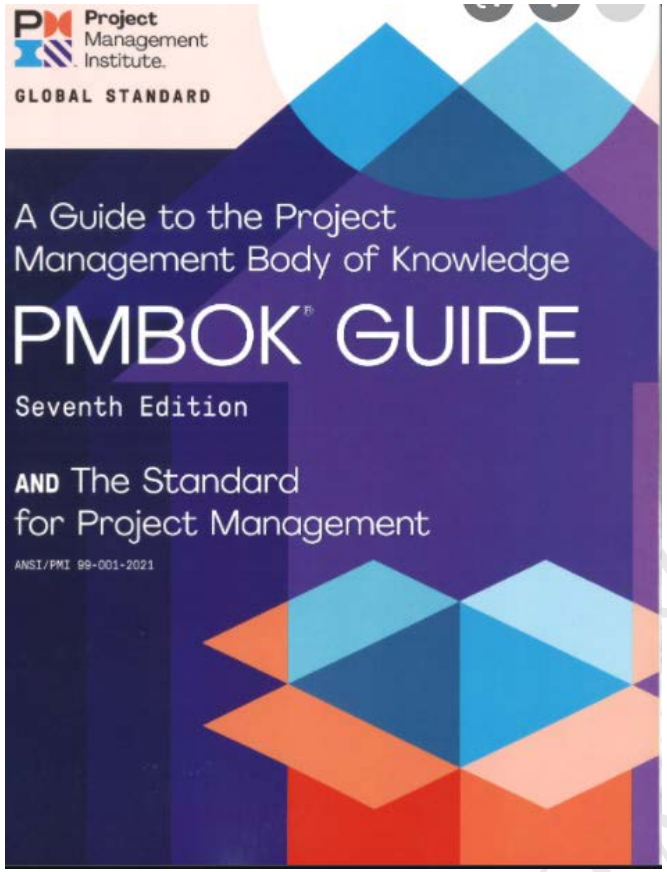
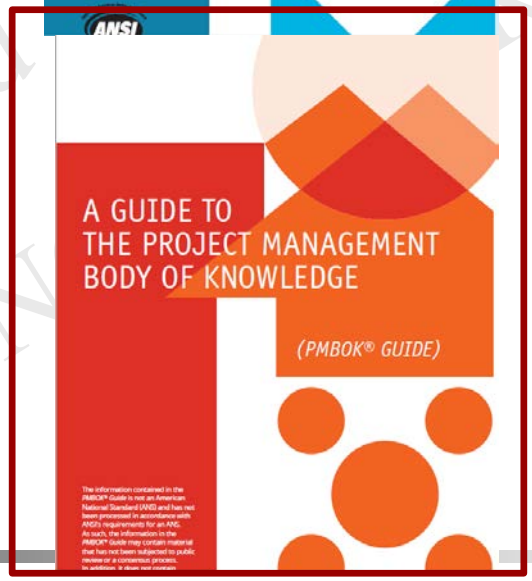
What we will learn?

- Introduction
- A Guide To the Project Management Body of Knowledge
  - 7th Edition – Project Performance Domains
  - Domain 1 (7th edition + PMBOK Construction Extension)
  - Domain 2 (7th edition + PMBOK Construction Extension)
  - Domain 3 (7th edition + PMBOK Construction Extension)
  - Domain 4 (7th edition + PMBOK Construction Extension)
  - Domain 5 (7th edition + PMBOK Construction Extension)
  - Domain 6 (7th edition + PMBOK Construction Extension)
  - Domain 7 (7th edition + PMBOK Construction Extension)
  - Domain 8 (7th edition + PMBOK Construction Extension)

Introduction

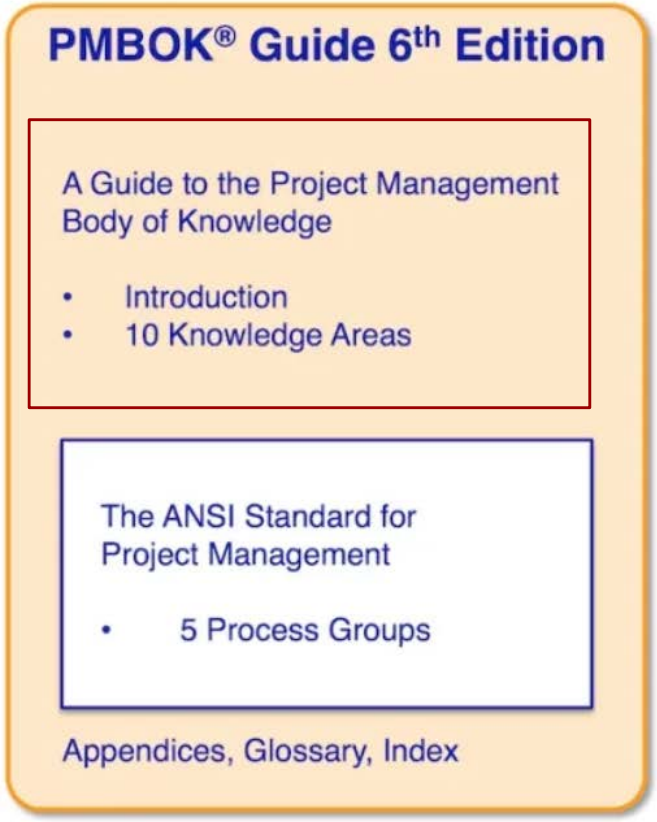
A guide to the project management body of knowledge in PMBOK 7th Edition

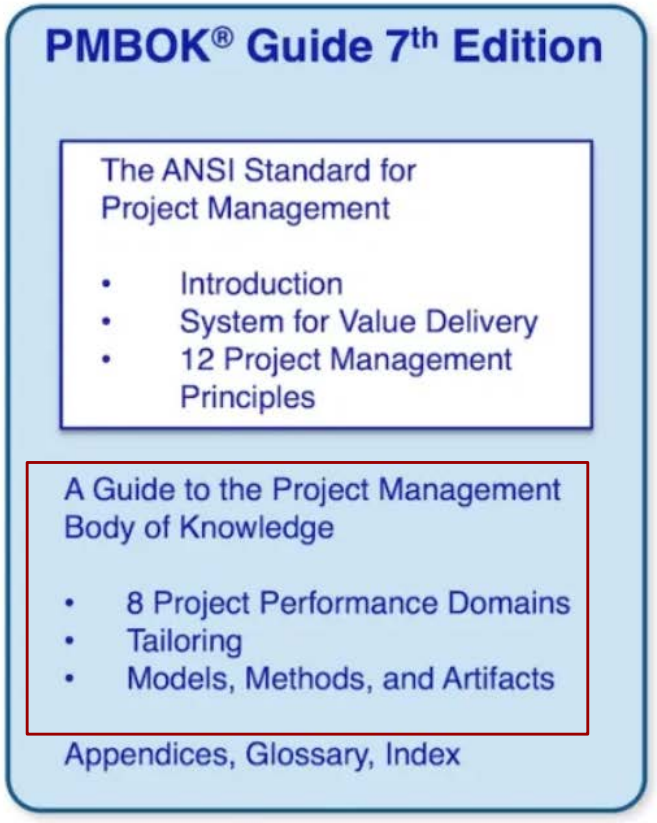




What is the difference with 6th Edition?

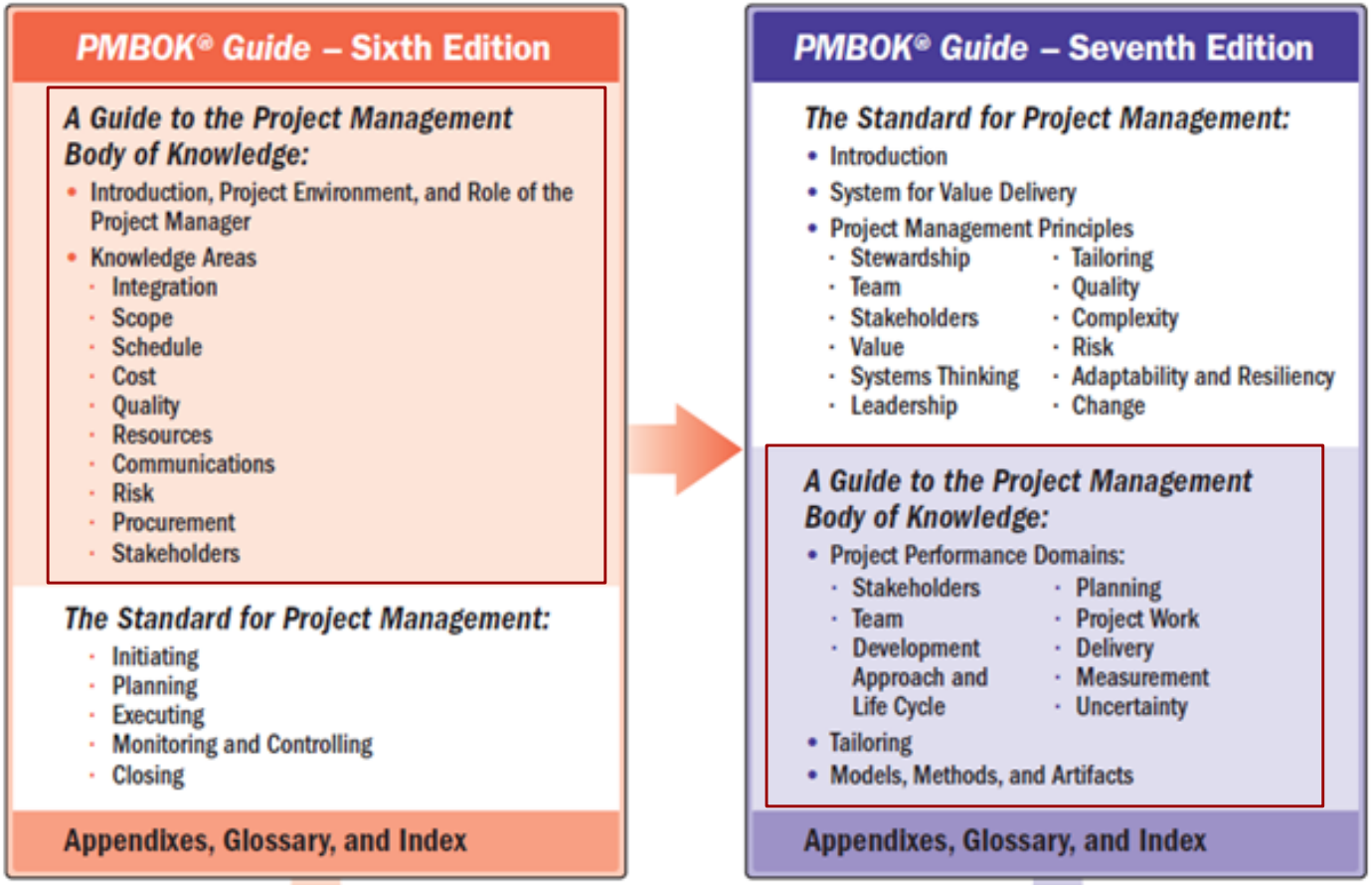
A guide to the project management body of knowledge in PMBOK 6th vs. 7th





Let's see more detail!

A guide to the project management body of knowledge in PMBOK 6th vs. 7th



(Domain 4: Planning Performance Domain)

Construction Extension to the PMBOK Guide

(Project Financial Management)

ACEMI

Introduction

- **How** the project will be financed
- **Process** of **acquiring** and **managing** the financial resources of project
- **Revenue** sources and monitoring **net cash flows**
- While **construction professionals** are skilled in the technical side of their work, they often **lack financial management knowledge** and understanding.

Research has shown that project managers in construction need to know financial management fundamentals in order to better understand and navigate the financial decisions that are part of every construction project.

Project financial management in construction

- Owner's and contractor's perspective
- Traditional construction projects
  - Advance payment
  - Short-term loan for contractors
  - Initial working capital to pay in advance to the contractor
- New construction projects
  - Different types of project delivery methods (BOT, DBOO, DBOM, etc.)
  - Public-private partnership (PPP) financing

What project managers do here?

Project financial management in construction

- **Project manager's responsibilities** for **financial management** may be broken down into **four broad areas**:
  1. Accounting for financial resources of the project,
  2. Managing costs and profits,
  3. Managing cash flows, and
  4. Making financial decisions or providing the necessary verified information to the project sponsor for making such decisions.

Let's see

1. **Project financial management planning**
2. **Project financial management monitoring and controlling**

Project financial management planning

- Financial planning is no different from standard project planning
  1. Sources of funds for construction projects
  2. Short-term financial fluctuations
  3. Economic environment
  4. Analytical techniques, feasibility study, and sensitivity analysis
  5. Construction project finance and corporate finance
  6. Legal entity
  7. Contract requirements
  8. Financial impact risk factors
  9. Tax planning as a financial factor

Project financial management planning – Sources of funds

The funds for a traditional project are often obtained from a company's central financing system, which may be a combination of borrowing from financial institutions, retained profits, and financial reserves. The financing costs are normally charged as interest to the project's cost account for construction projects.

Project financial management planning – Sources of funds

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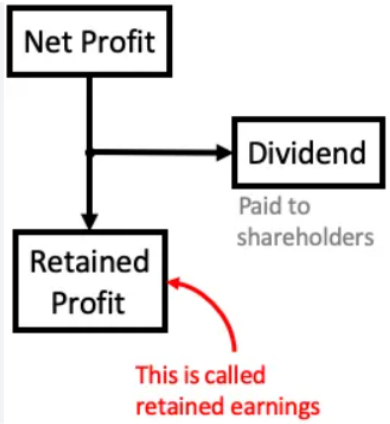
Retained profits vs. financial reserves

Project financial management planning – Sources of funds

Retained profit is **the amount of a business's net income that is kept within its accounts, rather than paid out to shareholders**. Retained profit is a strong indicator of the long-term financial stability of a business.



OWNER'S EQUITY		
Capital Stock	10,000	10,000
Retained Earnings	436,917	358,904
Current Period Net Income	0	0
Total Equity	446,917	368,904
Total Liabilities and Equity	1,024,039	835,190

Do you remember this?

Project financial management planning – Sources of funds

financial reserves means liquid assets tied up in a credit institution (cash deposits or debt securities issued or guaranteed by a credit institution or the government with a remaining maturity of more than 180 days that can be redeemed or liquidated on demand) or a bank guarantee;

What happens in institutional sector?

Project financial management planning – Sources of funds

In the institutional sector, funds frequently come from donors, through government, or from other grants. Government funding is secured through a process that requires project applicants to provide comprehensive documentation. Critical input is reviewed to:

- Verify definition and clarify scope, schedule, and budget;
- Assess project objectives and benefits;
- Justify the return on investment;
- Establish correlation to business strategic plans;
- Validate the ability to perform effective project management; and
- Determine realistic milestones to meet schedule dates and asset goals.

What happens in privately funded projects?

Project financial management planning – Sources of funds

For privately funded projects, there are many possible sources, such as commercial paper backed by a bank or credit facility, bank loans, public debt offerings, private placements in the U.S. and international markets, syndicated commercial long-term loans, government entity loans, etc. In some cases, funding may occur incrementally in different phases of the project. The financial plan and the overall project plan should consider the funding milestones of the project in order to maintain the momentum and the continuation of the project. Final determination of funding sources depends in large part on the project's creditworthiness and project sensitivity to changes in interest rates. In almost all of these types of projects, the participants acquire some equity in the project.

What should be done before being able to draw a loan?

Project financial management planning – Sources of funds

On project-financed projects (see Section 15.2.5, Construction Project Finance and Corporate Finance), an initial investment is required before being able to draw a loan. Costs for the initial study of the project from the feasibility analysis to the final development of the business and financial planning, which are submitted to eventual lenders, are usually covered by company/owner equity.

The common phase to finance?
The prerequisite to find financing needs?

What are the common finance techniques?

Project financial management planning – Sources of funds

Finance techniques may differ by country or region, type of project, owner, and total funding sought. Nevertheless, the following are some of the most commonly used finance techniques in privately funded construction projects in the global construction industry:

Let's see!

Project financial management planning – Sources of funds

- **Traditional.** Projects have traditionally relied upon well-known project finance techniques, such as funding by the owner organization's existing funds, and equity or debt made available by commercial banks.
  - *Senior debt.* Senior debt refers to debt that is in first-lien position. In cases of default, senior lenders have priority in recouping their investment.
  - *Construction loan.* Construction loan is debt granted to the owner to finance the project construction.
- **Subordinated debt.** A subordinated debt is a loan or security that is not reimbursed in instances of default until senior debt holders are paid in full.
- **Mezzanine financing.** Mezzanine financing takes the form of subordinated loans as a short-term project financing solution that is paid back after the senior debt. For example, real estate developers draw upon mezzanine loans for supplementary financing development projects.
- **Asset backed securitization (ABS) financing.** This financing method collects funds for the construction of the project by means of issuing bonds and asset-backed securities in the finance market, using the future cash flow the project can generate as a guarantee.

Project financial management planning – Sources of funds

- **Project finance bonds.** A project bond issued by a company is a debt tradable document where the issuer (in this case, the organization executing the project) agrees to repay the bondholder the amount of the bond plus interest on fixed future installments dates.
- **Miscellaneous financing methods.** Other types of financing methods involving bond issuance as a means to fund state capital projects are general obligation bonds, revenue bonds, and certificates of participation.
- **Project leasing.** The organization performing the project may lease vehicles and equipment as a way of raising finance. A land or facility may also be leased as an alternative to the acquisition.

Project financial management planning – Sources of funds

- **Contractual (vendors/contractors finance).** A contractor, subcontractor, or equipment and materials supplier may offer finance as part of the bid (as a way to secure the contract). For example, an equipment supplier may be willing to take the financial risk of offering a loan (selling on credit) or a lease of equipment as a way to increase sales or open up to new markets.
- **Preconstruction sales in real estate construction projects.** For-sale real estate construction project developers may sell properties prior to construction in order to financially secure their project. In such cases, lenders may require a percentage of the project be pre-sold in order to approve the construction loan.
- **Factoring.** Sometimes a business may find immediate short-term financing by selling its receivables (e.g., invoices) to a specialized third party entity known as a "factor" (usually a bank or factoring company) that charges a commission.
- **Other possible sources of funds.** Project funding may also be found in commercial paper backed by a bank, credit agency, or multilateral development bank; public debt offerings; private placements in the local and international markets; and subsidies.

How about short-term financial fluctuations?

Project financial management planning – Short-term financial fluctuations

The construction progress of work may experience shortfalls in financial resources or cash flow both from the owner's and contractor's perspectives. In some cases, the following informal methods are used to confront these short-term financial fluctuations in the construction industry:

- **Overdraft facilities.** Banks may permit withdrawals from a company bank account in amounts exceeding the available funds. Usually the withdrawal period, maximum amount, financial cost, etc., are previously agreed upon with the bank.
- **Lines of credit.** A line of credit consists of an agreed-upon amount of money available on an as-needed basis to be borrowed at any given time at a variable interest rate usually accrued monthly.
- **Payment delays.** In some cases, the owner will shift financing expenses to other parties of the project (contractor, subcontractor, suppliers, etc.) to overcome momentary shortfalls in financial resources.
- **Cost in excess of billings (underbilling) and billings in excess of costs (overbilling).** This accounting concept linked with the construction progress of work and invoicing may create cash flow shortfalls. In such cases, the owner may advance amounts to contractors looking for a gain in lower financing costs shared by both parties through prior agreement.
- **Owner resources.** Owners that manage recurring programs of capital projects, such as government agencies, may provide additional funding from reserve accounts to ensure projects with forecast cost overruns can be completed.

Project financial management planning

- Financial planning is no different from standard project planning

1. **Sources of funds for construction projects**
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8. Financial impact risk factors
9. Tax planning as a financial factor

Let's see project financial management monitoring and control now!

Project financial management monitoring and control

Financial control ensures that bonds are reduced when necessary, calls for funds from project partners are made as needed, and all insurance and bank withdrawals/deposits are performed at the appropriate times. Financial control and cost control should be executed effectively to ensure all items are within budget and the financial cash forecast. Effective project financial monitoring and control is better achieved when a project produces regular progress reports.

1. Project accounting systems
2. Financial internal and external audits
3. Cash flow analysis
4. Financial reports
5. Professional expertise: Project monitor, lender's engineer, inventor's engineer, or technical advisor
6. Ex-post evaluations

Project financial management monitoring and control – Project accounting systems

The project accounting system should be similar in structure to the WBS, showing the breakdown of the total project in more controllable modules. As stated in Section 7.2.7.2, a cost breakdown structure (CBS) is sometimes developed as a mapping tool between the WBS and COA to aid in reporting costs. A CBS links cost activities in an estimate to the COA. A WBS is project-specific while a CBS is organization-specific.

Remember what you learned in Financial Management Course in ACEMI?

On small- to medium-size projects, the breakdowns can be kept on simple spreadsheet-generated S-curves. Accounting systems are usually more sophisticated for large projects. Financial control is exercised by closely monitoring actual spending and revenue against budget and cash flow forecasts, adjusting either the work methods or problem areas where this mechanism shows deviations. It is imperative to keep proper financial records, including records of income, expenses, and all other financial transactions for the project. It is good practice for the project manager to check that all financial information is recorded and reported appropriately.

Project financial management monitoring and control – Financial internal and external audits

Internal and/or external audits ensure correct accounting methods and financial practices are being maintained. These audits are often helpful to the project manager in uncovering otherwise unseen problems. External audits are often a statutory requirement of the local government or are mandatory under the financing conditions arranged with lenders.

These audits focus primarily on the basic financial statements of the project, such as statement of income or revenue and expense accounts, statement of retained earnings, statement of cash flows, work-in-progress schedule, supplemental schedules, contact retention status, etc. Periodic financial audit reports may also contain warnings of over investment on fixed assets, poor credit arrangements, and improper use of project funds.

Remember what you learned in Financial Management Course in ACEMI?

Project financial management monitoring and control

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Remember what you learned in Financial Management Course in ACEMI?

A Guide To the Project Management Body of Knowledge

(Domain 5: Project Work Performance Domain)

Project performance domains

Project work performance domain

PROJECT WORK PERFORMANCE DOMAIN

The Project Work Performance Domain addresses activities and functions associated with establishing project processes, managing physical resources, and fostering a learning environment.

Effective execution of this performance domain results in the following desired outcomes:

- Efficient and effective project performance.
- Project processes are appropriate for the project and the environment.
- Appropriate communication with stakeholders.
- Efficient management of physical resources.
- Effective management of procurements.
- Improved team capability due to continuous learning and process improvement.

Figure 2-19. Project Work Performance Domain

Project work performance domain

The following definitions are relevant to the Project Work Performance Domain:

Bid Documents. All documents used to solicit information, quotations, or proposals from prospective sellers.

Bidder Conference. The meetings with prospective sellers prior to the preparation of a bid or proposal to ensure all prospective vendors have a clear and common understanding of the procurement. Also known as contractor conferences, vendor conferences, or pre-bid conferences.

Explicit Knowledge. Knowledge that can be codified using symbols such as words, numbers, and pictures.

Tacit Knowledge. Personal knowledge that can be difficult to articulate and share such as beliefs, experience, and insights.

Project work performance domain

- We will talk about the following in this section:

1. **Project processes**
2. **Balancing competing constraints**
3. **Maintaining project team focus**
4. **Project communications and engagement**
5. **Managing physical resources**
6. **Working with procurements**
7. **Monitoring new work and changes**
8. **Learning throughout the project**
9. **Interactions with other performance domains**
10. **Checking results**

Project work performance domain

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Project work performance domain – Project processes

- Large projects and critical projects have more processes
- Ways of optimizing the processes for the environment include:
  - **Lean production methods.** Lean production uses techniques such as value stream mapping to measure the ratio of value-adding activities and non-value-adding activities. The metrics calculated form a basis and measurement system for identifying and removing waste from production systems.
  - **Retrospectives or lessons learned.** These meetings provide an opportunity for the project team to review the way in which it works and to suggest changes to improve process and efficiency.
  - **Where is the next best funding spent?** Asking this question can help project teams determine if they should continue with the current task or move onto the next activity to optimize value delivery.

Remember what you learned in Lean Construction Course in ACEMI?

Project work performance domain

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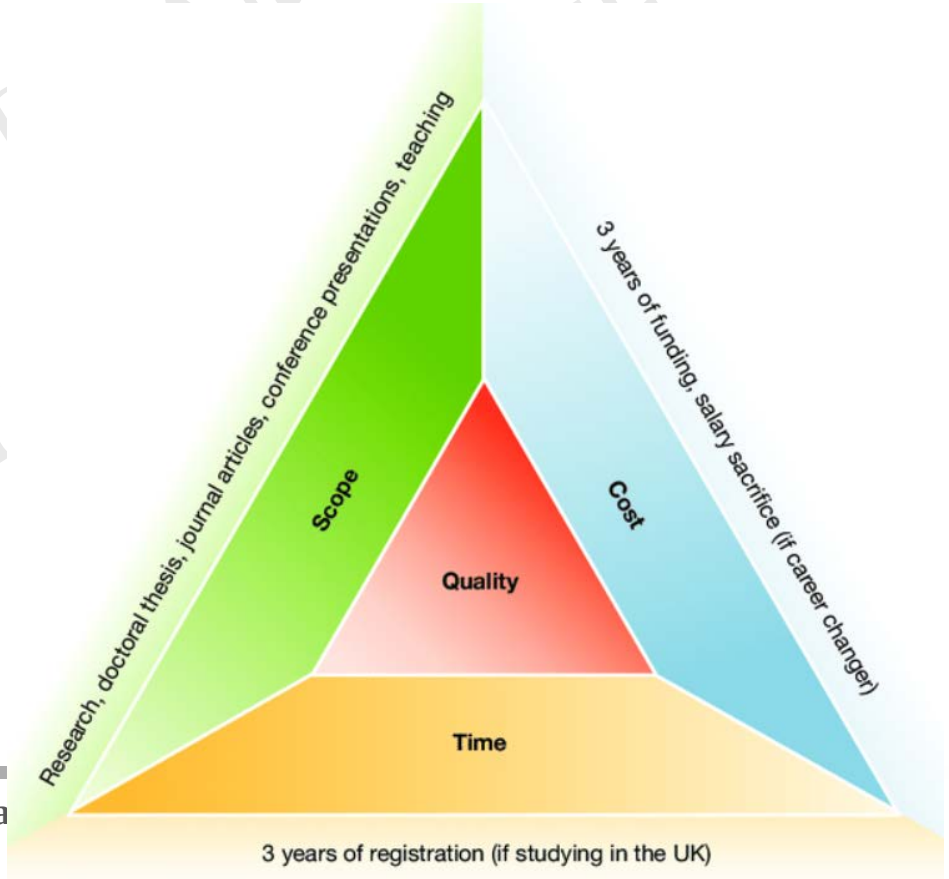
Project work performance domain – Balancing competing constraints

Successfully leading a project includes understanding the constraints associated with the work. Constraints can take the form of fixed delivery dates, compliance to regulatory codes, a predetermined budget, quality policies, considerations of the triple bottom line, and so forth. The constraints may shift and change throughout the project. A new stakeholder requirement may entail expanding the schedule and budget. A reduction in budget may entail relaxing a quality requirement or reducing scope.



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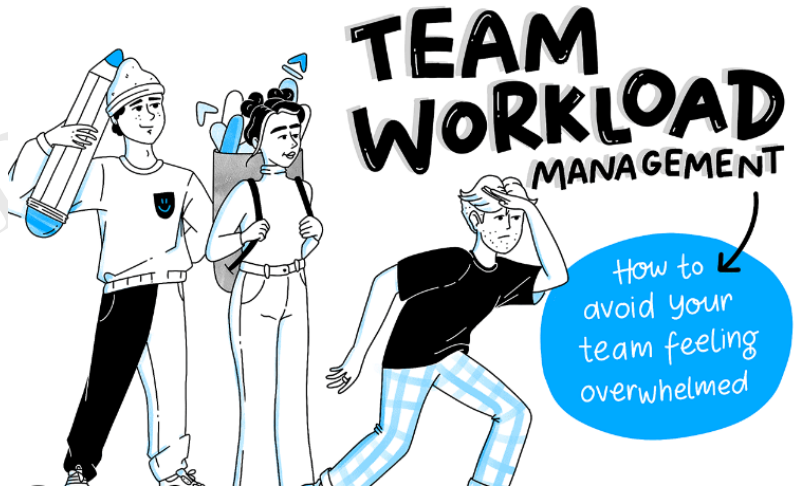
Project work performance domain – Maintaining project team focus

Project managers have a responsibility for assessing and balancing the project team focus and attention. This involves evaluating short- and long-term projections of progress toward delivery goals.

Leading the project team includes balancing the workload and assessing if project team members are satisfied with their work so they remain motivated. To maximize business and stakeholder value delivered throughout the project, project team attention needs to be kept in a healthy balance. Leading with a goal of maximizing overall delivered value involves focusing on production (delivering value) and protecting the project team's production capability (project team health and satisfaction). The goal is to keep the project team focused on delivering value and maintain awareness of when potential issues, delays, and cost overruns enter the project.



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Project work performance domain – Project communications and engagement

On a day-to-day basis, there are ad hoc requests for information, presentations, reports, and other forms of communication. An abundance of ad hoc communication requests may indicate that the communication planning was not sufficient to meet stakeholder needs. In this situation, further stakeholder engagement may be necessary to ensure stakeholder information requirements are met.

Do we have hoc request for information in construction industry?
What does not sufficient mean?

Project work performance domain

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Project work performance domain – Managing physical resources

Large amounts of physical resources require an integrated logistics system. This is usually documented in company policies that are then implemented in projects. A logistics plan describes how the company policy will be implemented on the project. Supporting documentation includes estimates for the type of material, basis of estimates, expected usage over time, specifications for grade, and the time and location for deliveries.

All of this work is integrated with the master project schedule to provide clear expectations and communications for all parties involved.

Remember IMS?

Project work performance domain

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Project work performance domain – Managing physical resources

Many projects involve some form of contracting or procurement. Procurement can cover everything from material, capital equipment, and supplies to solutions, labor, and services. In most organizations, project managers do not have contracting authority. Rather, they work with contracting officers or other people with expertise in contracts, laws, and regulations. Organizations usually have rigorous policies and procedures associated with procurements. The policies identify who has authority to enter into a contract, the limits of authority, and the processes and procedures that should be followed.

Prior to conducting a procurement, the project manager and technically qualified project team members work with contracting professionals to develop the request for proposals (RFP), statement of work (SOW), terms and conditions, and other necessary documents to go out to bid.

Do all projects have RFP?

Project work performance domain – Managing physical resources

The bid process includes developing and publicizing bid documents, bidder conferences, and selecting a bidder.

Bid documents can include:

- **Request for information.** A request for information is used to gather more information from the market prior to sending out bid documents to a set of selected vendors.
- **Request for proposal.** This bid document is used for complex or complicated scope where the buyer is looking for the vendor to provide a solution.
- **Request for quote.** This bid document is used when price is the main deciding factor, and the proposed solution is readily available.

How about contracting?

Project work performance domain – Managing physical resources

For projects that use an adaptive approach for some deliverables and a predictive approach for others, a master agreement may be used for the overall contract. The adaptive work may be placed in an appendix or supplement. This allows the changes to occur on the adaptive scope without impacting the overall contract.

Once the vendor is selected, the project plans and documents are updated to incorporate vendor dates, resources, costs, quality requirements, risks, etc. From that point, the vendor becomes a project stakeholder. Information in the Stakeholders Performance Domain and Measurement Performance Domain will apply to the vendor(s) throughout the project.

Project work performance domain

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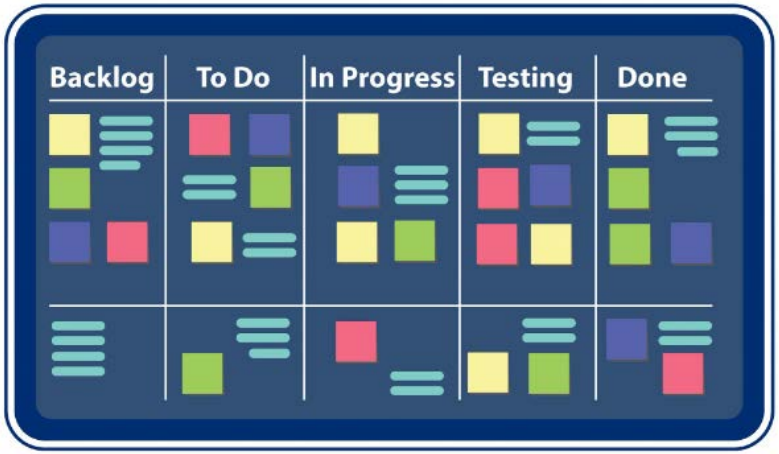
Project work performance domain – Monitoring new work and changes

In adaptive projects, there is an expectation that work will evolve and adapt. As a result, new work can be added to the product backlog, as needed. However, if more work is added than is being completed, or if the same amount of work is added that is being completed, the project will continue without end. The project manager works with the product owner to manage expectations around adding scope, the implications to the budget, and the availability of project team members. The product owner prioritizes the project backlog on an ongoing basis so that high-priority items are completed. If the schedule or budget is constrained, the product owner may consider the project done when the highest priority items are delivered.



How about predictive projects?

Project work performance domain – Monitoring new work and changes

In predictive projects, the project team actively manages changes to the work to ensure only approved changes are included in the scope baseline. Any changes to the scope are then accompanied by appropriate changes to the people, resources, schedule, and budget. Scope changes can add to uncertainty; therefore, any change requests should be accompanied by an evaluation of any new risks that are introduced due to the addition to or change in scope. The project manager works with the change control board and the change requestor to guide change requests through the change control process. Approved changes are integrated into the applicable project planning documents, product backlog, and project scope. The changes are also communicated to the appropriate stakeholders.


AIA Document G701™ – 2017
Change Order

Do we have procedure for this?

Project work performance domain

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Project work performance domain – Learning throughout the project

2.5.8 LEARNING THROUGHOUT THE PROJECT

Periodically, the project team may meet to determine what they can do better in the future (lessons learned) and how they can improve and challenge the process in upcoming iterations (retrospectives). Ways of working can evolve to produce better outcomes.

2.5.8.1 Knowledge Management

A lot of learning takes place during projects. Some of the learning is project specific, such as a faster way to accomplish specific work. Some learning can be shared with other project teams to improve outcomes, such as a quality assurance approach that results in fewer defects. Still other learning can be shared throughout the organization, such as training users how to work with a new software application.

2.5.8.2 Explicit and Tacit Knowledge

Throughout the project, project teams develop and share explicit knowledge. Explicit knowledge can be readily codified using words, pictures, or numbers. For example, the steps to a new process are explicit knowledge that can be documented. Explicit knowledge can be distributed using information management tools to connect people to information, such as manuals, registers, web searches, and databases.

Project work performance domain – Learning throughout the project

Job: 317 Weston Apartments — July 16, 2004

Code	Description	Contract Amount	Billed to Date	Costs: Actual	Costs: Budget	Costs: Overrun	Hours: Actual	Hours: Budget	Hours: Overrun
	Phase 1: Bldg 1								
06110	Rough Carpentry	35,000.00	25,000.00	29,375.21	29,200.00	175.21	1,295	1,300	-5
06120	Lumber	42,000.00	39,000.00	36,579.32	37,000.00	-420.68	0	0	0
06150	Trusses	15,000.00	0.00	13,560.00	13,560.00	0.00	0	0	0
	Phase Total	92,000.00	64,000.00	79,514.53	79,760.00	-245.47	1,295	1,300	-5
	Phase 2: Bldg 2								
06110	Rough Carpentry	35,000.00	0.00	11,526.33	29,200.00	-17,673.67	526	1,300	-774
06120	Lumber	42,000.00	0.00	18,265.35	37,000.00	0.00	0	0	0
06150	Trusses	15,000.00	0.00	0.00	13,560.00	-13,560.00	0	0	0
	Phase Total	92,000.00	0.00	29,791.68	79,760.00	-31,233.67	526	1,300	-774
	Job Total	184,000.00	64,000.00	109,306.21	159,520.00	-31,479.14	1,821	2,600	-779

Sample Job Cost Report

Project work performance domain

- We will talk about the following in this section:

1. **Project processes**
2. **Balancing competing constraints**
3. **Maintaining project team focus**
4. **Project communications and engagement**
5. **Managing physical resources**
6. **Working with procurements**
7. **Monitoring new work and changes**
8. **Learning throughout the project**
9. **Interactions with other performance domains**
10. **Checking results**

Project work performance domain – Interactions with other performance domains

The Project Work Performance Domain interacts and enables other performance domains on the project. Project work enables and supports efficient and effective planning, delivery, and measurement. It provides the environment for project team meetings, interactions, and stakeholder engagement to be effective. Project work supports navigating uncertainty, ambiguity, and complexity; and it balances their impacts with the other project constraints.

Project work performance domain

- We will talk about the following in this section:

1. **Project processes**
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5. **Managing physical resources**
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7. **Monitoring new work and changes**
8. **Learning throughout the project**
9. **Interactions with other performance domains**
10. **Checking results**

Project work performance domain – Checking results

Table 2-7. Checking Outcomes—Project Work Performance Domain

Outcome	Check
Efficient and effective project performance	Status reports show that project work is efficient and effective.
Project processes that are appropriate for the project and the environment	Evidence shows that the project processes have been tailored to meet the needs of the project and the environment. Process audits and quality assurance activities show that the processes are relevant and being used effectively.
Appropriate communication and engagement with stakeholders	The project communications management plan and communication artifacts demonstrate that the planned communications are being delivered to stakeholders. There are few ad hoc requests for information or misunderstandings that might indicate engagement and communication activities are not effective.
Efficient management of physical resources	The amount of material used, scrap discarded, and amount of rework indicate that resources are being used efficiently.
Effective management of procurements	A procurement audit demonstrates that appropriate processes utilized were sufficient for the procurement and that the contractor is performing to plan.
Effective handling of change	Projects using a predictive approach have a change log that demonstrates changes are being evaluated holistically with consideration for scope, schedule, budget, resource, stakeholder, and risk impacts. Projects using an adaptive approach have a backlog that shows the rate of accomplishing scope and the rate of adding new scope.
Improved capability due to continuous learning and process improvement	Team status reports show fewer errors and rework with an increase in velocity.

(Domain 5: Project Work Performance Domain)

Construction Extension to the PMBOK Guide

(Project Procurement Management)

Project procurement management in construction

Construction projects are often multilayered hierarchies characterized by numerous buyers and sellers, with many of the project stakeholders serving in both capacities, and multiple levels of procured goods and services. Typical contractual relationships exist between the owner and the general contractor, and between the general contractor and its subcontractors and suppliers. Examples of project procurements include acquisition of property, engineering and design or turnkey services, construction, and even operational services. From a contractor's perspective, this may include the acquisition of labor, lower-tier subcontracting services, materials, and equipment from vendors and suppliers. Basically, procurement in construction is conducted to better transfer the performance risk to sellers who specialize and are skilled in a particular scope of work.

Project procurement management in construction

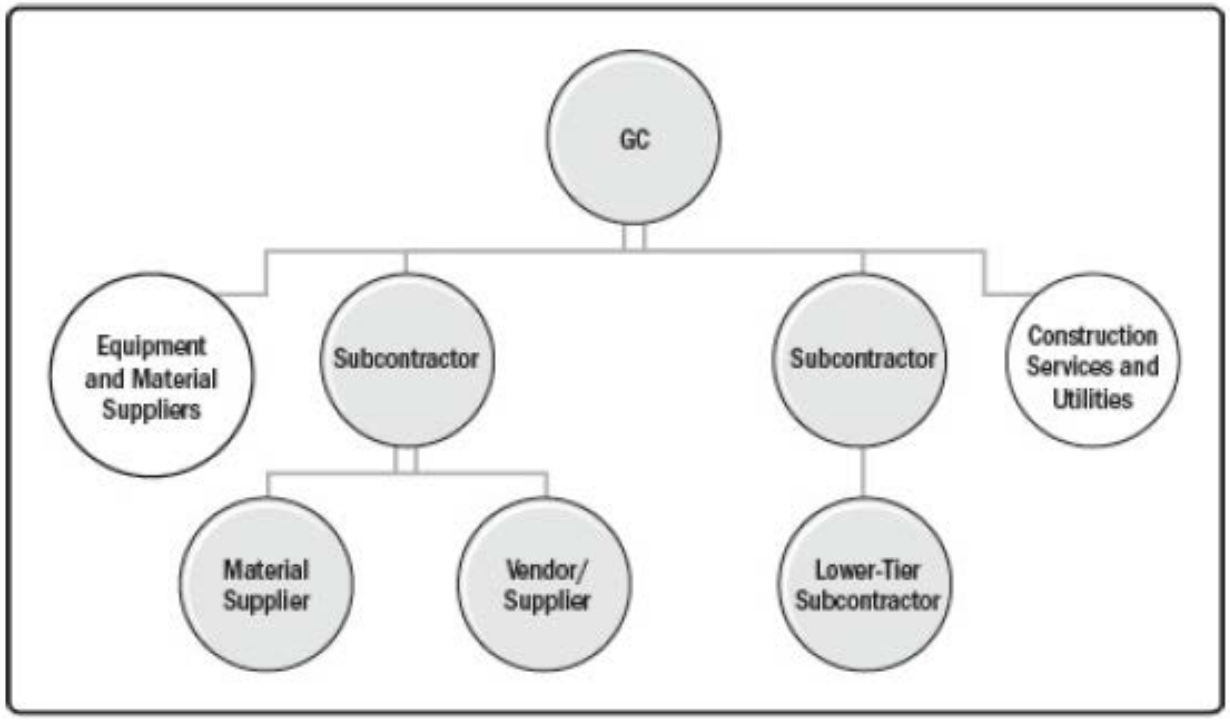

Figure 12-1. General Contractor Procurement Relationships

Let's see the procurement from the perspective of owner and contractor

Project procurement management in construction – Contractor's perspective

The bidding process can be extensive for a contractor seeking work. If unsuccessful, the organization needs to focus on the next opportunity and the bidding process starts over. From an organizational process asset perspective, the bidding exercise is considered a cost of doing business for the contracting organization. For successful bids, an agreement, often dictated by the contract clauses, is established between the various sellers and buyers. Special attention is needed in managing scope, risk, cost, and time through the integration processes and activities given the competitive nature of construction procurement. For that reason, it is necessary that the organization has the expertise in preparing wining offers.

Project procurement management in construction – Owner's perspective

From an owner's perspective, the decision to construct a new project can depend on various project delivery methods, most of which affect the overall cost and time for completion.

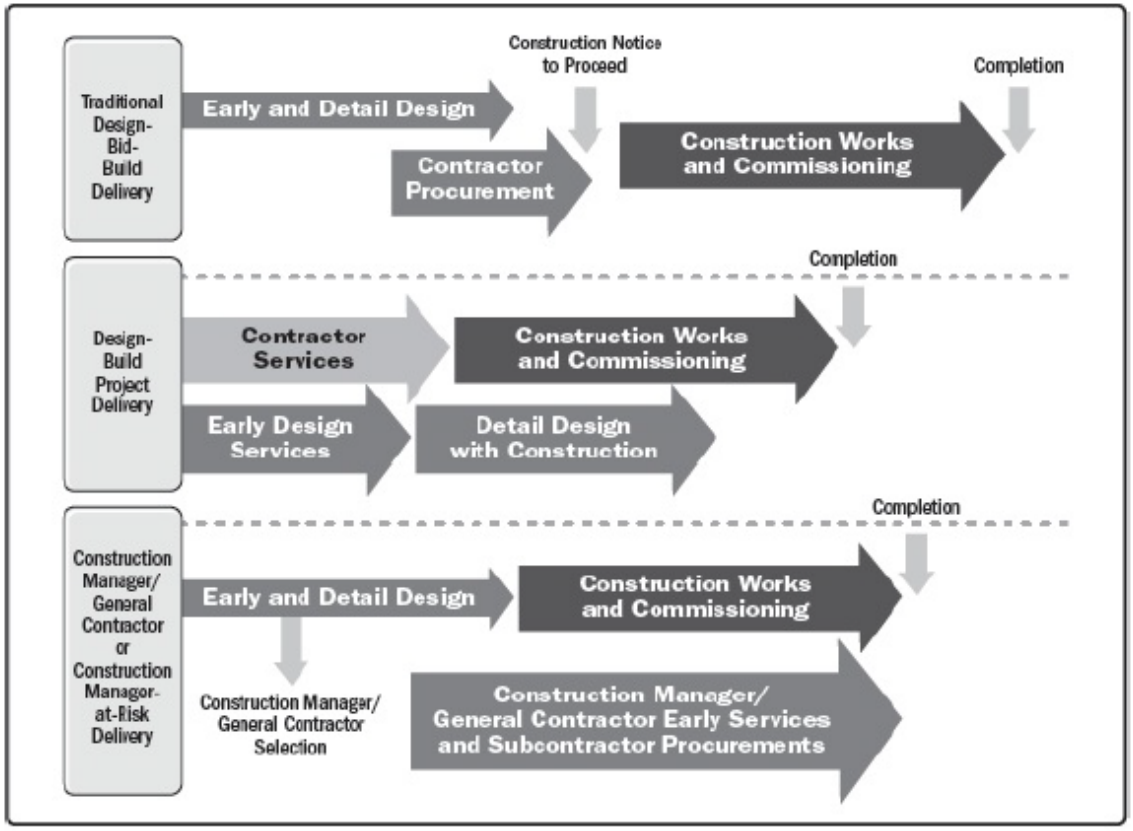

Figure 12-2. Traditional Versus Integrated Project Delivery, D-B, and CM/GC

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Project procurement management in construction

Let's see

1. **Project procurement management planning**
2. **Project procurement management monitoring and controlling**
3. **Project procurement management closing**

Project procurement management planning

1. Procurement management plan
2. Enterprise environmental factors
3. Supply chain management
4. Organizational process assets
5. Project scope statement
6. The WBS in procurement
7. Other service provider procurements
8. Make-or-buy analyses
9. Project delivery methods
10. Construction contracts
11. Contract risk allocation
12. Procurement planning outputs

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Project procurement management planning – Procurement management plan

The procurement management plan (sometimes referred to as the project "buy-out") defines what, how, and when procurements will be carried out. It is an important component of the acquisition process and is influenced by organizational policies, culture, and procedures, and by lessons learned from previous construction projects. It also has significant influence over how controls of cost, time, and quality functions will be exercised on contracts. Moreover, this plan reflects senior management's guidance, which considers the threshold for procurement risks and its allocation among the stakeholders. The construction project has stakeholders that are more often bound by contract requirements, which raises the projects' financial risk and also the technical and quality risks that could jeopardize the stakeholder relationships and success of the project.

Project procurement management planning

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Project procurement management planning – Other service provider procurements

Construction projects are almost entirely based on agreement both by choice and by the requirements to satisfy contract obligations. Beyond the typical designer and contractor service procurements, other provider procurement types specific to construction are:

- Bonding:
  - Bid bonds,
  - Performance bonds, and
  - Payment bonds.
- Insurances:
  - Project site insurance,
  - Project liability insurance,
  - Workers' compensation insurance,
  - Professional Indemnity, and
  - Other specialty insurance (delay in start-up [DSU], transport and shipping services, builder's risk, etc.).
- Inspection services:
  - Topography,
  - Geotechnical,
  - Third-party construction inspection,
  - General quality control inspection, and
  - Health, safety, and security inspection.
- Permits and other purchases:
  - Utility locate services,
  - Utility relocation and service connections,
  - Road and public access permits,
  - Environmental and land use permits,
  - Building permits (including specific electrical and service permits), and
  - Commissioning services.

Project procurement management planning

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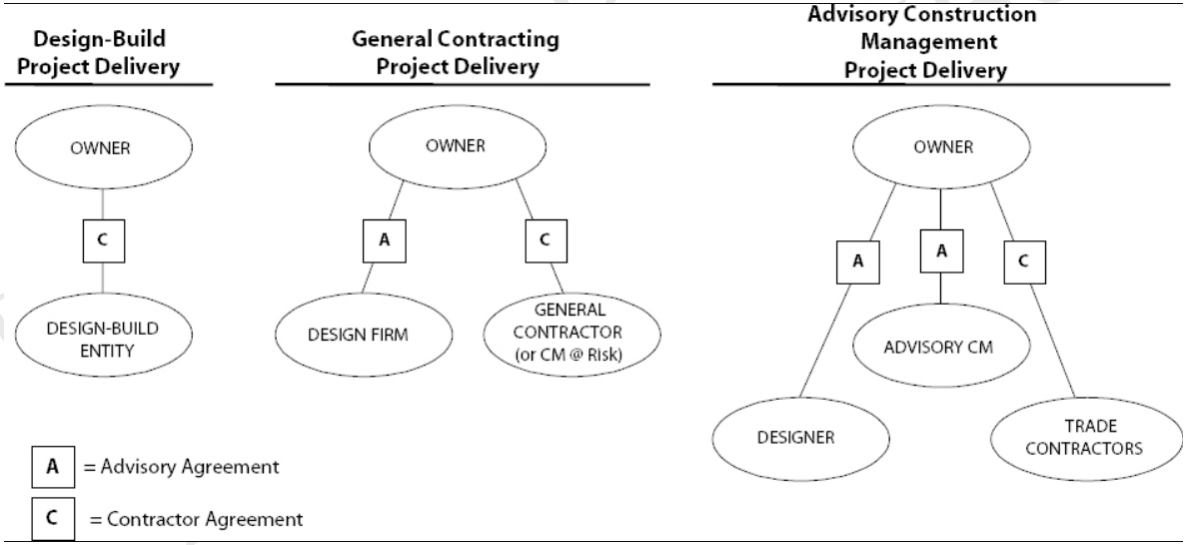
Project procurement management planning – Project delivery methods

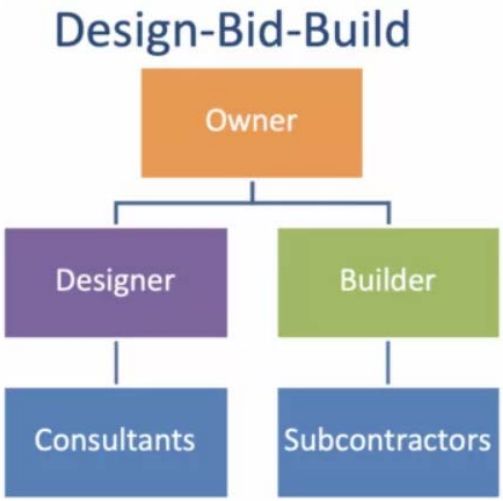
Selecting the appropriate strategy for project delivery considers factors such as degree of design definition, time of completion desired, budget limitations, owner engagement, and often jurisdictional statutes for public projects. Determining which aspects of the project are best suited for a particular procurement approach can involve the dynamics of the business environment and the needs of the project itself. The project delivery approaches are traditional, integrated, and turnkey; however, one should keep in mind that these form only the general approach for delivering the project and each method can be further modified or enhanced by the contract agreement.



Project procurement management planning – Project delivery methods

12.2.9.1 Traditional Approach

The design-bid-build (DBB) project delivery is considered to be the traditional approach, whereas its construction functions are performed by organizations under separate contracts with the owner. This traditional delivery method relies upon a construction design that is essentially complete, and contractor solicitations are performed by way of competitive bidding for all component and trade disciplines of the project. Figure 12-1 illustrates this contractual arrangement.



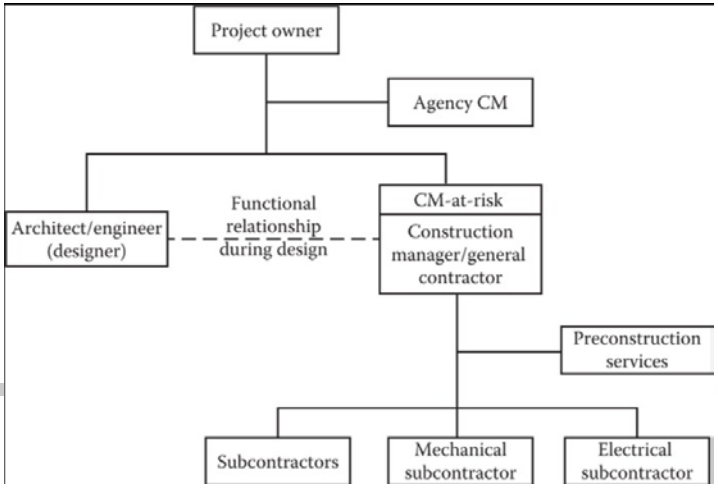
Project procurement management planning – Project delivery methods

12.2.9.2 Integrated Project Delivery and Turnkey Approaches

Integrated and turnkey project delivery methods integrate people, systems, business structures, and practices most often into a single construction project contract process. These methods combine the expert knowledge and skills of participants for all phases of design, fabrication, and construction with the intention to optimize efficiency in project cost and schedule. A few of the integrated project delivery and turnkey approaches are listed below:

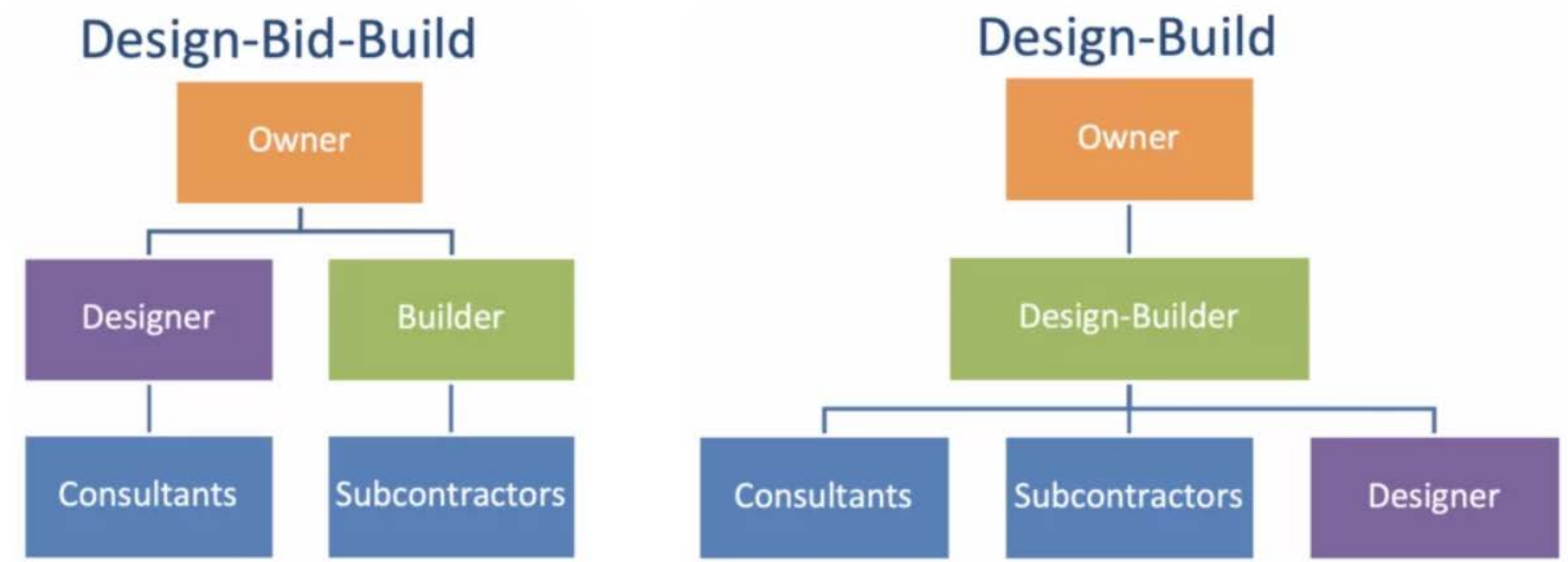
Project procurement management planning – Project delivery methods

- **Construction manager/general contractor (CM/GC).** Similar to the DBB delivery method, the owner solicits a contractor based on an early development set of design criteria. The general contractor is selected based on qualifications, past experience, and best value for its capability in performing preconstruction services, feasibility studies, and constructability reviews, and in estimating services during the design processes. The CM/GC provides input regarding scope, time, cost, and constructability, which all contribute to reducing the risk and construction unknowns. Once design has reached 60% to 90% completion, a contract for construction is negotiated based on the defined scope, time of completion, and total project cost, most often in the form of a maximum price type contract. The CM/GC subsequently conducts procurement solicitation for subcontractors, materials, and equipment. Variations of this method, which may be governed by jurisdictional law, include construction manager-at-risk (CMR) and construction manager as advisor or agent (CMA).



Project procurement management planning – Project delivery methods

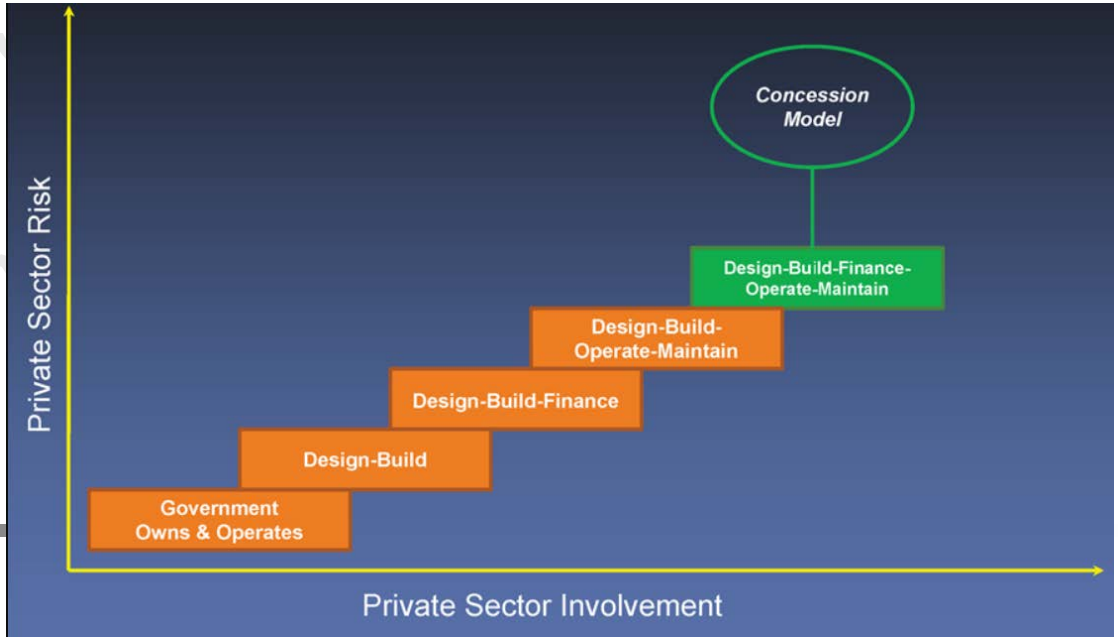
- **Design-build (DB).** The responsibility for both design and construction is obtained from a single source solicitation. That single source may in turn be a specially formed collaboration between the designer and contractor specifically for a project. Sellers (subcontractors) are subsequently solicited and retained by the DB organization.



Project procurement management planning – Project delivery methods

- **Design-build-operate-maintain-(transfer) (DBOM).** This method encompasses the design-build method with the added feature of time-scaled functions for operating and maintaining the product after construction is completed. After the DBOM contract is completed, the finished product can be transferred to the owner or another contract for ongoing operation and maintenance. Alternate terms for this method is build-operate-transfer (BOT) or design-build-operate (DBO).

  In certain cases the responsibility to obtain financing for the project and the long-term right to use all the finished project assets, is recognized as a concession. Governments use this method mainly for major public projects, which could not be financed without the participation of the private sector. (See also public-private partnership below.)



Project procurement management planning – Project delivery methods

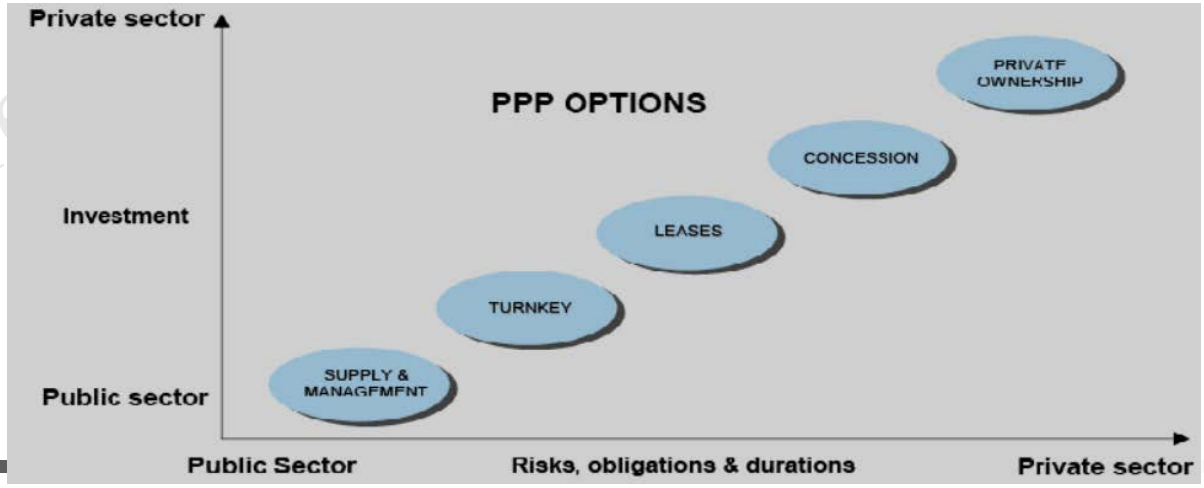
- **Engineering-procurement-construction (EPC).** The EPC project delivery method has emerged as a preferred choice for many industries and is most often used for processing or equipment-driven projects, such as oil refineries, mining plants, or electrical energy production. The owner procures a single contract for performance of the design, equipment/material acquisition, and construction services for turnkey delivery of the facility. The EPC firm has responsibility for preconstruction services to define the scope, schedule, and costs of the project, and ultimately final responsibility for the design and construction. The advantage of this method is optimal project performance resulting in a collaborative, value-based construction process that reduces project risks, delivers predictable results, and obtains effective financial capital planning. A derivative of the EPC method is the engineering-procurement-construction and installation (EPCI) method. Front-end engineering and design (FEED) is commonly used in conjunction with EPC. FEED is a more mature basic design, allowing the timely procurement of long-lead items and reducing the uncertainty in final design for the detailed engineering, with a subsequent reduction in risk and overall project duration. With FEED in hand, the owner can move to procure an EPC-based contract.

Project procurement management planning – Project delivery methods

- **Construction management (CM).** The CM organization, under contact with the owner, sometimes known as the professional services contractor, manages the overall functions of the project including designing, bidding, purchasing, and construction, and can execute the delivery of construction "at-risk" or as an agency (CM at-fee). The at-risk CM functions much like a prime contractor with its subcontractors, whereas the CM as an agency manages the work of multiple general contractors and their subcontractors. The expectation of this method is to provide high construction value at a lower cost while providing preconstruction services during design. Owners that do not have the skills or capacity to manage in-house large construction programs and/or are less inclined to add internal staff to do so are turning to professional firms for a wider spectrum of services. Construction management for fee and program management (CMF-PM) is a growing market in both the public and private sectors.

Project procurement management planning – Project delivery methods

- **Public-private partnership (PPP).** This alternative delivery method is a form of alliance or partnership and is best used when owner financing is limited or sometimes nonexistent. It is a means of funding and managing the end-to-end life of the delivery and/or ownership of the project. It can provide new sources of financial support for the construction and maintenance of public infrastructure by combining the resources of public and private sectors. The approach can provide the owner with design, construction, financing, operations, and maintenance services with a single source of project responsibility. Stakeholders form a hybrid joint venture entity with a contractor who may provide expertise in a variety of roles including the design/engineering lead, owner's representative, construction contractor, consultant, or even equity partner.



Project procurement management planning – Project delivery methods

This method can facilitate projects that might otherwise be delayed or not built at all. Project risk is of particular importance to these partnerships due to the participation of insurance underwriters who should look beyond the construction period and into long-term operations. The PPP approach can also incorporate delivery methods previously described as DBOM, DBO, and BOT. Yet another method is the BOOT (build-own-operate-transfer). A BOOT project model is often seen as a way to develop a large public infrastructure project with most if not all private funding. BOOT is sometimes known as BOT (build-own-transfer) with variations of the model as BOO (build-own-operate), BLT (build-lease-transfer) and BLOT (build-lease-operate-transfer).

- **Single source, noncompetitive.** In cases where the construction requirements are unique or where there is only one source for the desired result, a negotiated contract with the source is the usual route.
- **Job order contracting.** This method reduces the need for unnecessary levels of engineering, design, and contract procurement by awarding a single contract for a wide variety of renovation, repair, and construction projects. It is most often used by organizations that need to construct numerous projects quickly and easily through multiyear contracts while also reducing time and procurement costs.

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Project procurement management planning – Construction contracts

The type of contract for service providers might not remain the same throughout the project life cycle and may be different for specific services. Reimbursable contracts are often used for conceptual and early design definition while a fixed-price contract is most commonly used for the construction services. Factors that can affect the selection of the contract type for specific work packages include:

- Level and maturity of design detail available;
- Urgency of the procurement;
- Level of competition desired or level of competition available;
- Organization's risk utility or tolerance;
- Buyer competency in managing a construction project;
- Unique requirements committed to by owner;
- Funding source, such as government funding, financial institutions, or self-funded; and
- Owner familiarity and experience with construction contracts.

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Project procurement management planning – Construction risk allocation

How one intends to allocate contract risk on a project influences the type of contract selected. For government-type projects, contracts should be drafted according to the specific country's legislation, if such legislation exists and is obligatory for all government projects.

The most common types of construction contracts, each with their own parameters, are as follows:

- **Fixed-price or lump-sum contracts.** Work is performed and paid for based on a fixed value or lump-sum price according to the contract. These contracts are suitable for projects that are sufficiently defined, which allows for an estimate of the total project cost.
- **Unit-rate (price) or remeasurable contracts.** Work is performed and paid for based on a fixed amount (unit rate) for each unit of work. Purchase orders most often fall in this category. These contracts are suitable for projects where the types of items are known, but not necessarily the quantity of units. Contracts can be written that combine the unit price and lump-sum method of payment.

Project procurement management planning – Construction risk allocation

- **Cost-reimbursable contracts.** The contractor performs the work on a reimbursable cost basis plus a fee. These contracts often include variations of one another, often with the final fee determination being the result of negotiations. Examples are:
  - Cost plus fixed-fee contract,
  - Cost plus fixed fee with bonus contract,
  - Cost plus fixed percentage contract,
  - Cost plus fixed fee with guaranteed maximum price (GMP) contract (also known as maximum allowable construction cost (MACC)),
  - Cost plus fixed fee with guaranteed maximum price (GMP) and bonus contract, and
  - Cost plus fixed fee with agreement for sharing any cost-savings contract.
- **Time and materials contracts.** The contractor is reimbursed for the time spent and resources expended on the work performed.
- **Incentive contracts.** Payment is based on the services provided in accordance with an agreed-upon scope, budget, schedule, and quality. These contracts take the form of fixed-price incentive and cost-reimbursement incentive contracts.
- **Hybrid contracts.** Large projects may create a hybrid form using one or more combinations of contracts. For example, on a large design-build project, the civil works may be under a unit-price contract, while other bid packages are awarded on a fixed-price basis upon design completion. Occasionally, a provisional sum may be reserved for work in which the design is not yet completed.

Project procurement management planning – Construction risk allocation

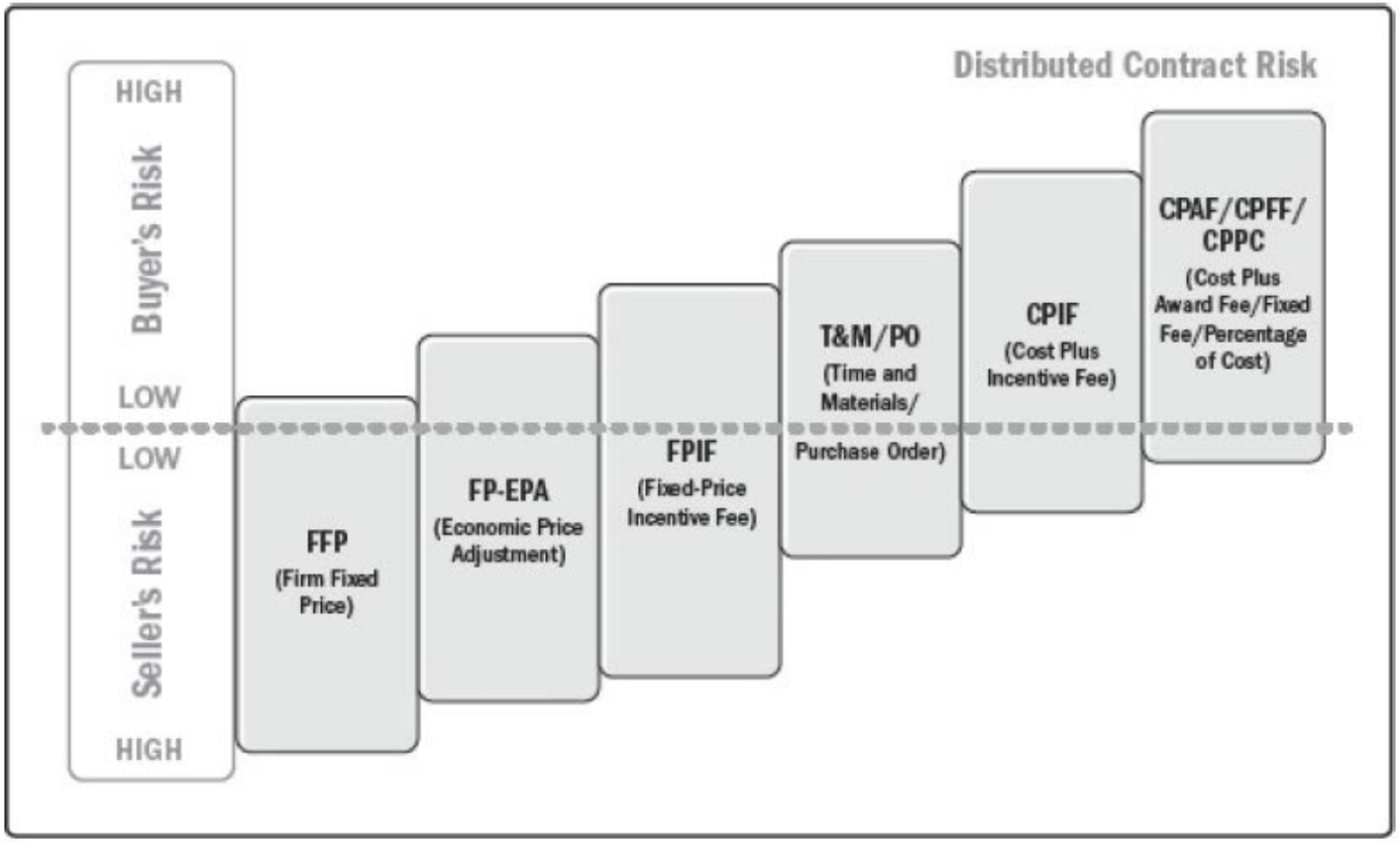

Figure 12-3. Spectrum of Distributed Contract Risk

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Project procurement management executing

Using the statements of work as a foundation, conducting procurements is focused on soliciting and acquiring the various sellers to provide construction services for the project. This process may be a well-defined and regulated government mandate or an entirely private undertaking, such as searching the internet for contractors, briefly describing the project needs, and signing an agreement for services. Executing procurement in public or government sectors can be a lengthy and heavily regulated process. Regardless of the procurement methodology, documents will be produced that prescribe the scope of work and form the contract agreements.

1. Procurement solicitation
2. Contract statement of work
3. Procurement documents
4. Prequalification of service providers
5. Nongovernment organizations (NGO) solicitation of seller responses
6. Public and government solicitations
7. Evaluation and selection of sellers
8. Single-source procurement

موسسه مهندسی و مدیریت ساخت علوی پور (ACEMI)

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