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## DCC5183 – PROJECT MANAGEMENT AND PRACTICES

### TOPIC 1

### INTRODUCTION

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#### Introduction

##### What is a project?

A project is an assignment/task/job that has to be undertaken and completed within a set time, budget, resources and performance specifications designed to meet the needs of stakeholder and beneficiaries.

##### Characteristics of projects

Projects have a purpose: projects have clearly-defined aims and set out to produce clearly-defined results. Their purpose is to solve a “problem”, and this involves analyzing needs beforehand. Suggesting one or more solutions, it aims at lasting social change.

**Projects are realistic:** their aims must be achievable, and this means taking account both of requirements and of the financial and human resources available.

**Projects are limited in time and space:** they have a beginning and an end, and are implemented in a specific place and context.

**Projects are complex:** projects call on various planning and implementation skills, and involve various partners and players.

**Projects are collective:** projects are the product of collective endeavour. They are run by teams, involve various partners and cater for the needs of others.

**Projects are unique:** all projects stem from new ideas. They provide a specific response to a need (problem) in a specific context. They are innovative.

**Projects are an adventure:** every project is different and ground-breaking; they always involve some uncertainty and risk.

**Projects can be assessed:** projects are planned and broken down into measurable aims, which must be open to evaluation.

**Projects are made up of stages:** projects have distinct, identifiable stages.

## What is Management ?

Management is the process of getting activities completed efficiently and effectively with and through other people.

Management functions:

- Planning
- Organizing
- Staffing
- Directing
- Coordinating
- Reporting
- Budgeting

(Gulick & Urwick 1937. Papers on the Science of Administration)

Management roles:

- Interpersonal roles Figurehead, Leader, Liaison
- Informational roles Monitor, Disseminator, Spokesperson
- Decisional roles Entrepreneur, Disturbance handler, Resource allocator, Negotiator

## What is project management?

Project Management is the use of knowledge, skills, tools, and techniques to plan and implement activities to meet or exceed stakeholder needs and expectations from a project.

### The concept of project management

Project management is the application of processes, methods, knowledge, skills and experience to achieve the project objectives. A project is a unique, transient endeavour, undertaken to achieve planned objectives, which could be defined in terms of outputs, outcomes or benefits. Project management is the science (and art) of organizing the components of a project, whether the project is development of a new product, the launch of a new service, a marketing campaign, or a wedding. A project isn't something that's part of normal business operations. It's typically created once, it's temporary, and it's specific. As one expert notes, "It has a beginning and an end." A project consumes resources (whether people, cash, materials, or time), and it has funding limits.

Project management is the discipline of carefully projecting or planning, organizing, motivating and controlling resources to achieve specific goals and meet specific success criteria.

[1] **A project is a temporary endeavor** designed to produce a unique product, service or result with a defined beginning and end (usually time-constrained, and often constrained by funding or deliverables) undertaken **to meet unique goals** and objectives, typically to bring about beneficial change or added value.

[2] **The temporary nature** of projects stands in contrast with business as usual (or operations), [3] **which are repetitive, permanent, or semi-permanent functional** activities to produce products or services. In practice, the management of these two systems is often quite different, and as such requires the development of distinct technical skills and management strategies.

[4]. The primary challenge of project management is to **achieve all of the project goals**

[5] and objectives while honoring the **preconceived constraints**.

[6] **The primary constraints** are scope, time, quality and budget.

[7] The secondary — and more ambitious — challenge is to optimize the allocation of **necessary inputs and integrate them** to meet pre-defined objectives.

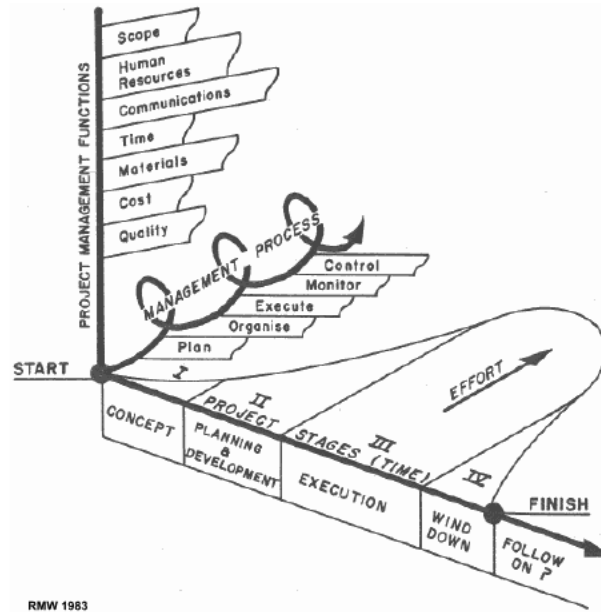


Figure 2: The Function-Process-Time relationship in project management

### What Is Construction Project Management (CPM)?

The Project Management Institute (PMI) defines project management as “the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality, and participating objectives.” In the case of construction project management, you can simply take PMI’s definition and put it into a construction context for a definition of a construction project manager.

Construction project management involves the planning, coordination, and control over the various tasks involved in construction projects. This could include different types of construction projects, like agricultural, residential, commercial, institutional, industrial, heavy civil, and environmental.

It typically includes complex tasks that change dramatically from project to project, and requires skills like strong communication, knowledge of the building process, and problem solving.

PMBOK,

### Nine Project Management Knowledge Areas

Knowledge areas describe the key competencies that project managers must develop.

- Four core knowledge areas lead to specific project objectives (**scope, time, cost, and quality**).
- Four facilitating knowledge areas are the means through which the project objectives are **achieved (human resources, communication, risk, and procurement management)**.
- One knowledge area (**project integration management**) affects and is affected by all of the other knowledge areas.
- All knowledge areas are important!

#### *Project integration management*

Includes the processes required to ensure the various element of the project are properly coordinated

Project plan development  
Project plan execution  
Integrated change control

*Scope*

Is concerned with defining and controlling what is in or is not in the project  
Ensures that the project contains all of the work required  
And only the work required to complete the project successfully

*Time*

This is the name given to the collection of the processes required to ensure timely completion of a project  
Establishes and maintains the appropriate allocation of time  
By planning, estimating, scheduling, trending and schedule control  
Through the successive stages of the project's natural life-span  
i.e. definition, concept, execution and finishing

*Cost*

Is the controlling of costs as they apply to the project. It includes the estimation of costs, cash flows, direct and indirect costs and costs associated with the project life cycle

*Quality*

Quality Management Definition  
Processes required to ensure the project will satisfy the needs for which it is was undertaken  
It includes

- Quality planning
- Quality assurance
- Quality Control

*Human resource*

Team Building,  
Team Management,  
Team Models  
Role responsibility,  
Power and authority  
Leadership  
Managing conflict

*Communications*

A subset of project management that includes the processes required to ensure the proper dissemination of project information. It consists of

- Communication planning
- Information distribution
- Performance Reporting
- Administrative closure

*Risk*

Risk Management

- Types of risk: schedule, cost, requirements, personnel

Risk Identification  
Risk Analysis  
Risk Prioritisation  
Risk Control – risk management plan  
Risk acceptance or risk avoidance

## Procurement

Procurement planning: determining what to procure and when

Solicitation planning: documenting product requirements and identifying potential sources

Solicitation: obtaining quotations, bids, offers, or proposals as appropriate

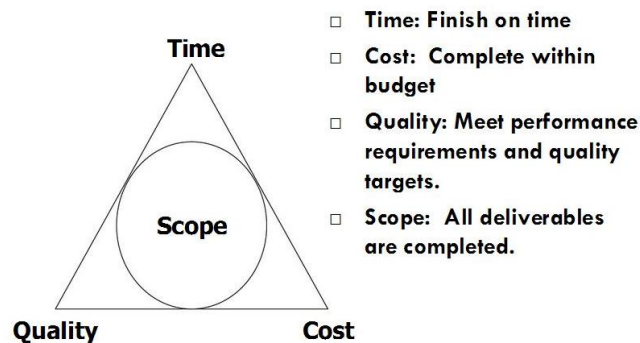
Source selection: choosing from among potential vendors

Contract administration: managing the relationship with the vendor

Contract close-out: completion and settlement of the contract

## Triple Constraint.

All projects are carried out under certain **constraints** – traditionally, they are cost, time and scope. These three factors (commonly called 'the **triple constraint**') are represented as a triangle



**Construction Project Management (CPM)** is the overall planning, coordination, and control of a project from beginning to completion. CPM is aimed at meeting a client's requirement in order to produce a functionally and financially viable project.<sup>[1]</sup> The construction industry is composed of five sectors: residential, commercial, heavy civil, industrial, and environmental. A construction manager holds the same responsibilities and completes the same processes in each sector. All that separates a construction manager in one sector from one in another is the knowledge of the construction site. This may include different types of equipment, materials, subcontractors, and possibly locations.

## Functions

The functions of construction management typically include the following:

1. Specifying project objectives and plans including delineation of scope, budgeting, scheduling, setting performance requirements, and selecting project participants.
2. Maximizing the resource efficiency through procurement of labor, materials and equipment.
3. Implementing various operations through proper coordination and control of planning, design, estimating, contracting and construction in the entire process.
4. Developing effective communications and mechanisms for resolving conflicts.

## Seven types of construction

- **Agricultural:** Typically economical buildings, and other improvements, for agricultural purposes. Examples include barns, equipment and animal sheds, specialized fencing, storage [silos](#) and [elevators](#), and water supply and drains such as wells, tanks, and ditches.

- **Residential:** Residential construction includes houses, apartments, townhouses, and other smaller, low-rise housing types.<sup>[2]</sup>
- **Commercial:** This refers to construction for the needs of private commerce, trade, and services. Examples include office buildings, "big box" stores, shopping centers and malls, warehouses, banks, theaters, casinos, resorts, golf courses, and larger residential structures such as high-rise hotels and condominiums.
- **Institutional:** This category is for the needs of government and other public organizations. Examples include schools, fire and police stations, libraries, museums, dormitories, research buildings, hospitals, transportation terminals, some military facilities, and governmental buildings.
- **Industrial:** Buildings and other constructed items used for storage and product production, including chemical and power plants, steel mills, oil refineries and platforms, manufacturing plants, pipelines, and seaports.
- **Heavy civil:** The construction of transportation [infrastructure](#) such as roads, bridges, railroads, tunnels, airports, and fortified military facilities.<sup>[2]</sup> Dams are also included, but most other water-related infrastructure is considered environmental.
- **Environmental:** Environmental construction was part of heavy civil, but is now separate, dealing with projects that improve the environment. Some examples are water and wastewater treatment plants, sanitary and storm sewers, solid waste management, and air pollution control.<sup>[2]</sup>

### **Construction Management jobs**

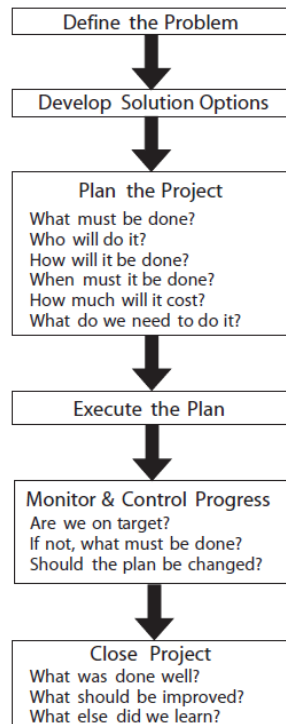
- Project Manager
- Construction Manager
- Design Manager
- Project Co-ordinator
- Planning Engineer
- Design Engineer
- Field Engineer
- Project Engineer
- Quantity Surveyor
- Estimator
- Project Document Controller
- Scheduler / Scheduling Engineer

### **The role of a contractor**

A contractor is assigned to a construction project once the design has been completed by the person or is still in progress. This is done by going through a bidding process with different contractors. The contractor is selected by using one of three common selection methods: low-bid selection, best-value selection, or qualifications-based selection.

A Construction Manager should have the ability to handle public safety, time management, cost management, quality management, decision making, mathematics, working drawings, and human resources.<sup>[2]</sup>

#### The steps in managing a project.



### Project stages

#### Design

The design stage involves four steps: programming and feasibility, schematic design, design development, and contract documents. It is the responsibility of the design team to ensure that the design meets all building codes and regulations. It is during the design stage that the bidding process takes place.<sup>[2]</sup>

- **Conceptual/Programming and feasibility:** The needs, goals, and objectives must be determined for the building. Decisions must be made on the building size, number of rooms, how the space will be used, and who will be using the space. This must all be considered to begin the actual designing of the building.
- **Schematic design:** Schematic designs are sketches used to identify spaces, shapes, and patterns. Materials, sizes, colors, and textures must be considered in the sketches.<sup>[2]</sup>
- **Design development (DD):** This step requires research and investigation into what materials and equipment will be used as well as their cost.
- **Contract documents (CDs):** Contract documents are the final drawings and specifications of the construction project. They are used by contractors to determine their bid while builders use them for the construction process. Contract documents can also be called working drawings.

#### Pre-construction

The pre-construction stage begins when the owner gives a notice to proceed to the contractor that they have chosen through the bidding process. A notice to proceed is when the owner gives permission to the contractor to begin their work on the project. The first step is to assign the project team which includes the project manager (PM), contract administrator, **superintendent**, and field engineer.

- **Project manager:** The project manager is in charge of the project team.
- **Contract administrator:** The contract administrator assists the project manager as well as the superintendent with the details of the construction contract.

- **Superintendent:** It is the superintendent's job to make sure everything is on schedule including flow of materials, deliveries, and equipment. They are also in charge of coordinating on-site construction activities.<sup>[2]</sup>
- **Field engineer:** A field engineer is considered an entry-level position and is responsible for paperwork.

During the pre-construction stage, a site investigation must take place. A site investigation takes place to discover if any steps need to be implemented on the job site. This is in order to get the site ready before the actual construction begins. This also includes any unforeseen conditions such as historical artifacts or environment problems. A soil test must be done to determine if the soil is in good condition to be built upon.

### **Procurement**

The procurement stage is when labor, materials and equipment needed to complete the project are purchased. This can be done by the general contractor if the company does all their own construction work. If the contractor does not do their own work, they obtain it through subcontractors. Subcontractors are contractors who specialize in one particular aspect of the construction work such as concrete, welding, glass, or carpentry. Subcontractors are hired the same way a general contractor would be, which is through the bidding process. Purchase orders are also part of the procurement stage.

- **Purchase orders:** A purchase order is used in various types of businesses. In this case, a purchase order is an agreement between a buyer and seller that the products purchased meet the required specifications for the agreed price.

### **Construction**

The construction stage begins with a pre-construction meeting brought together by the superintendent. The pre-construction meeting is meant to make decisions dealing with work hours, material storage, quality control, and site access. The next step is to move everything onto the construction site and set it all up.<sup>[2]</sup>

A **Contractor progress payment schedule** is a schedule of when (according to project milestones or specified dates) contractors and suppliers will be paid for the current progress of installed work.

**Progress payments** are partial payments for work completed during a portion, usually a month, during a construction period. Progress payments are made to general contractors, subcontractors, and suppliers as construction projects progress. Payments are typically made on a monthly basis but could be modified to meet certain milestones. Progress payments are an important part of contract administration for the contractor. Proper preparation of the information necessary for payment processing can help the contractor financially complete the project.

### **Owner occupancy**

Once the owner moves into the building, a warranty period begins. This is to ensure that all materials, equipment, and quality meet the expectations of the owner that are included within the contract.

## **Types of Construction Work, Contents of Construction Work, Examples, and Classification by Type of Permit**

Types of Construction Work Construction Industry Law ☒ Additional Sheet Nr. 1 (Top Column)	Content of construction work Ministry of Construction Notice Nr. 350, March 3, 1972
Public engineering	Construction of public works based on general planning, instruction, and control (incl. repair, improvement, or demolition work)
Construction engineering	Construction of buildings based on general planning, instruction, and control (incl. repair, improvement, or demolition work)
Carpentry	Construction of works by processing or applying wooden materials or application of wooden structures to work
Plasterwork	Applying, spraying, or affixing plaster, mortar, stucco, cement, fibers, etc. to work



Scaffold/construction/concrete work	a)	Assembly of scaffolding, transport and placement of heavy objects, such as mechanical apparatuses and construction materials, assembly of steel frames, and demolition
	b)	Driving in or pulling out piles and in-place-casting of piles
	c)	Excavation, piling up, or compression of earth or sand
	d)	Construction work using concrete
	e)	Other basic or preliminary work
Stone work	Processing of stone materials (including quasi-stones such as concrete block and imitation stone) and production of stone works using masonry or by attaching stone to work	
Roof work	Roof-cladding with tiles, slate, or metal sheet	
Electrical work	Installation of power generation, transformer, power distribution, and interior electrical facilities	
Piping work	Work for installation of coolers, air conditioners, water supplies, hygiene facilities, and facilities for transport of water, oil, gas, and steam using metal pipes	
Tile/brick/block work	Constructions with bricks or concrete blocks or work to apply or attach bricks, concrete blocks, or tiles to structures	
Steel construction work	Processing steel forms or sheets or assembly of derived items from them	
Steel reinforcement work	Processing, connecting, and assembly of steel bars and other steel materials	
Paving work	Paving streets and other flat surfaces with asphalt, concrete, sand, gravel, or rubble	
Dredging work	Dredging the bottoms of rivers and bays	
Sheet metal work	Attaching metal sheet to structures or attaching metal sheet fixtures to structures	
Glass work	Installation of glass in structures	
Coating work	Spraying, coating, or attaching coating materials to structures	
Waterproofing work	Waterproofing with asphalt, mortar, or sealing materials	
Interior finishing	Interior finishing using wood, plaster board, sound absorbing board, wallpaper, tatami mat, vinyl floor tiles, carpeting, or fusuma sliding doors	
Machinery installation	Building of structures through assembly of machinery or attaching machinery to structures	
Thermal insulation work	Thermally insulating structures or their facilities	
Telecommunications work	Installation of wired telecommunication facilities, wireless telecommunication facilities, broadcasting machinery facilities, or data communication facilities	
Landscape gardening	Land forming, tree planting, and construction of gardens, parks, and green areas by placement landscape stones	
Well drilling work	Hole and well drilling using well drilling machinery and subsequent water pumping facilities work	
Fittings work	Attachment of wooden or metal fittings to structures	
Water facilities work	Construction of facilities for water intake, water purification, or water distribution for public water supplies or factories or installation of public sewage or basin sewage handling facilities	
Firefighting facilities work	Installation of disaster warning facilities, fire extinguishing facilities, evacuation facilities, or facilities for firefighting or installation of such facilities in structures	
Waste facilities work	Installation of human waste management or garbage management facilities	

## 15 Project Manager Job Functions

- Define scope of project
- Identify stakeholders, decision-makers, and escalation procedures
- Develop detailed task list (work breakdown structures)
- Estimate time requirements
- Develop initial project management flow chart
- Identify required resources and budget
- Evaluate project requirements
- Identify and evaluate risks Prepare contingency plan
- Identify interdependencies
- Identify and track critical milestones
- Participate in project phase review
- Secure needed resources
- Manage the change control process
- Report project status

### **Team members responsibilities**

- Provide realistic task/deliverable estimates
- Inform project manager of task deliverable status on a regular [agreed basis]
- Bring risks, issues, impacts, potential solutions to project manager for resolution
- Be prepared to make commitments to others
- Clearly define the commitment they undertake
- Make every reasonable effort to deliver against those commitments
- Communicate honestly, immediately if they realise that a commitment may be at risk

### **Team Members Need from the Project Manager**

- Success criteria and measures
- Internal and external Roles and Responsibilities
- Methods for:
  - Where and when to attend team meetings
  - How to raise and track issues and risks
  - How, when to submit a Scope/Change request
  - How to resolve disagreements
  - How to report status on assigned tasks
  - How to report budget data

### **Project Stakeholders**

A person, group or organization that has interest or concern in an organization. Stakeholders can affect or be affected by the organization's actions, objectives and policies. Some examples of key stakeholders are creditors, directors, employees, government (and its agencies), owners (shareholders), suppliers, unions, and the community from which the business draws its resources.

Not all stakeholders are equal. A company's customers are entitled to fair trading practices but they are not entitled to the same consideration as the company's employees.

An example of a negative impact on stakeholders is when a company needs to cut costs and plans a round of layoffs.

### **Key stakeholders include**

- Project Manager – the individual responsible for handling the project
- Customer – the individual or organisation who will use the project's product
- Performing Organisation – the enterprise whose employee's are most directly involved in doing the work of the project
- Project Team Members - the group that is performing the work of the project
- Project Sponsor- the individual or group that provides the resources for the project
- Regulatory or government agencies
- Sellers and contractors
- Individual citizens or groups of citizens

### **Will concentrate on four stakeholders**

- Project Manager
- Project sponsors
- Project team members
- Functional managers

### **Sponsor's responsibilities**

- Provides resources (Budget, people, equipment)
- Helps define project requirements, success criteria
- Reviews and approves project plans, budgets, scope changes
- Ideally executive champion for the project

- Visible on-going support
- “Bodyguard” for project manager, project charter
- Keeps team interfaces in balance by resolving escalating cross-functional policy issues
- Primary responsibility maintaining executive client contact
- Ensures there is no filtering of information from the client to the customer
- Customer’s money is being wisely spent
- Usually informs the customer of cost and deliverable information

### **Traditional design–tender–build**

We call this approach to construction project delivery ‘traditional’ because it has been the approach of choice for owners of most construction projects during many centuries. With this method, the owner contracts with a design organisation to perform preliminary planning, carry out design work and prepare contract documents. Following the completion of this phase, a construction organisation is selected,

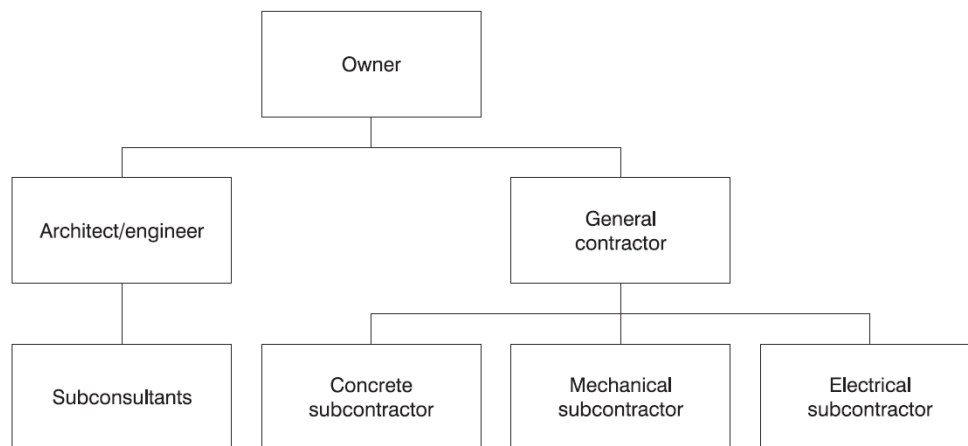


Figure 2.1 Traditional design–tender–build relationship chart.

### **Design–build**

The distinguishing characteristic of the design–build, or design–construct, method is that the owner executes a single contract with an organisation that becomes responsible for both the design and the construction of the project. This approach closely resembles the ‘master builder’ whose tradition goes back to Biblical times (Tenah, 2001). If you needed a project built, you needed only to contact a single expert, a master builder, whose expertise, experience and contacts would assure a successfully completed project. lists potential benefits from the design–build method as follows.

- \_ Singular responsibility. There is a single point of responsibility for quality, cost and schedule adherence, avoiding ‘buck passing’ and ‘finger pointing’.
- \_ Quality. The greater responsibility implicit in this method provides motivation for highquality and proper performance.
- \_ Cost savings. The single entity with whom the owner contracts can work together as a team to evaluate alternative methods and materials efficiently and accurately.
- \_ Time savings. Design and construction can be overlapped, and bidding time after design is eliminated, thus offering the possibility of substantially reduced project duration.
- \_ Potential for reduced administrative burden. After the contract is agreed upon, the owner will have relatively little investment in coordinating and arbitrating between designer and contractor, since they are a single entity.
- \_ Early knowledge of firm costs. The single design–construction entity is responsible for both design and cost estimates at an early stage, thus allowing early establishment of financing and reduced exposure to cost escalation.

\_ Risk management. Cost, schedule and quality can be clearly defined and appropriately balanced. The design–build organisation will manage many of the risks that the owner might otherwise be responsible for.

\_ Balanced award criteria. The owner can give credit in the award process for such considerations as design quality, functional efficiency and team experience, as well as lowest first cost.

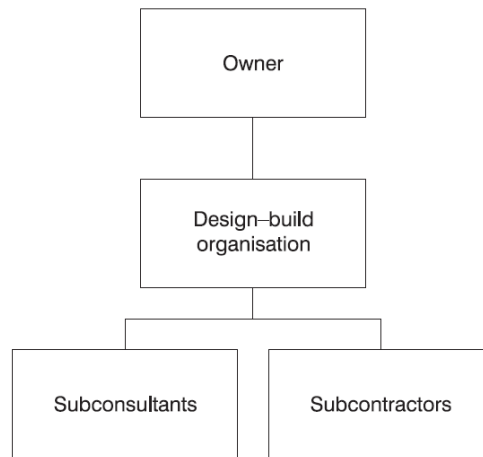


Figure 2.2 Design–build relationship chart.

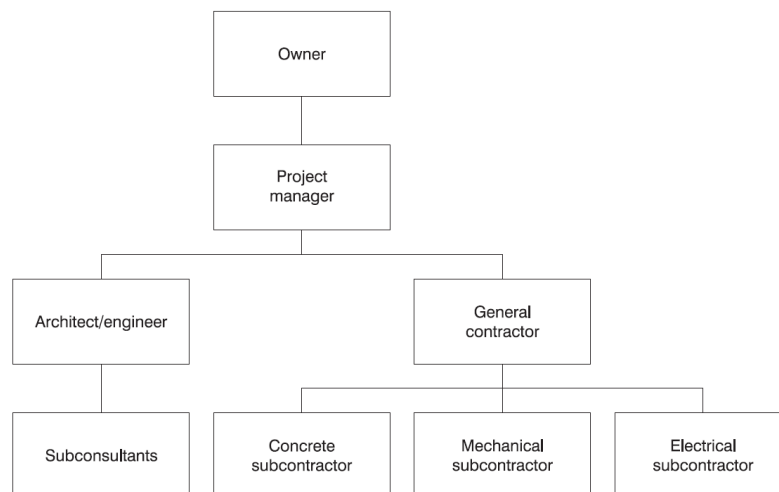


Figure 2.5 Project manager relationship chart.

### **Turnkey**

A turnkey contract is one in which the owner and contractor agree on a fixed contract sum for a contract under which the contractor will take responsibility for the entire project. Such agreements are often designated as EPC contracts, because of the prime responsibilities for engineering – providing basic and detailed design, procurement – supplying parts and other goods required for the project and construction – erecting and commissioning the project.

### **Build–own–operate–transfer**

The build–own–operate–transfer (BOOT) type of project has evolved as a means of involving the private sector in the development of the public infrastructure. The concept, in use in some parts of the world for some centuries, requires the private sector to finance, design, build, operate and manage the facility and then transfer the asset to the government free of charge after a specified concession period (Tiong, 1992). The term BOT, for build–operate–transfer, was first coined by the Turkish Prime Minister in 1984 in connection with the privatisation of that country’s public-

sector projects. The terms BOOT and BOT are used synonymously, while terms like DBO (design–build–operate) and BOO (build–own–operate) imply construction and operation but no transfer (Carson Group, 2000). In Australia, for example, the transfer option is omitted (McMullan, 1995).

It is apparent that such an approach requires a complex organisational structure and carries considerable long-term risk for the project sponsor, while minimising such risk for the governmental owner. In a typical BOOT project, the parties are likely to include the following (Tiong, 1992; McMullan, 1995):

client – usually a governmental agency;

constructor – often responsible for both design and construction, although the general design will usually be dictated by the client and may be carried out by the client;

operation and maintenance contractor;

offtakers – entities that agree to purchase the outputs of the project, such as water or electricity, usually a governmental agency, not always ‘the client’ as listed above;

suppliers of materials, equipment and so on for both the construction and long-term operation of the facility;

lenders and investors;

sponsor – a consortium of interested groups, usually including the constructor, operator and financial institution, that prepares the proposal and, if successful, contracts with the client to carry out the design, financing, construction and operation (note that the ‘sponsor’ thus includes at least three of entities named earlier in this list).

**Table 2.1** Project delivery system options

System	Features	Advantages	Limitations
Traditional design–tender–build	Separation of design and construction responsibilities Completion of design prior to selection of contractor	Certainty of price Clarity of roles No coordination risk to owner Easy to accomplish changes during design	No opportunity for phased construction Fixed price established late in process Owner administers all design and construction contracts No contractor input to design
Design–build	Single organisation responsible for design and construction	Single point of responsibility Constructability input during design Fixed price early in process Opportunity for phased construction	Difficulty of formulating price prior to design Lack of oversight by designer Costly tendering process Less control by owner
Construction manager	Professional manager to advise owner and designer on construction aspects May be agency type (advisory role only) or at-risk type (more responsibility for on-site performance)	Construction expertise available during design phase Construction manager provides advice to owner during construction phase Under ‘at risk’, some risk is removed from owner	Increased overhead costs Owner may take on greater risks under ‘agency’ type, especially if multiple primes are used Owner relinquishes some control
Project manager	Professional manager to advise owner and designer on all aspects of project	Owner relies on project manager for coordination of most aspects of project Potential for rapid project start-up and prosecution	Owner relinquishes considerable control Increased overhead costs
Document and construct	Early design performed under contract to owner Later design performed (possibly by same designer) under contract to contractor	Fixed-price contract and complete documentation before construction begins Centralised responsibility Constructability considered during design	Designer may not control whom it ultimately works for New and unfamiliar method Limitations similar to design–build

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## 1.0 INTRODUCTION

- 1.1 Know the concept and characteristic of construction management
  - 1.1.1 Define construction management
  - 1.1.2 State the characteristic of construction management
  - 1.1.3 Describe the concept of construction management.
- 1.2 Understand the concept and characteristic of project management
  - 1.2.1 Describe the characteristics of civil engineering project.
  - 1.2.2 Identify the concept of project management.
  - 1.2.3 Discuss the roles of the parties involved during construction.
- 1.3 Apply the concepts of project management in construction
  - 1.3.1 Relate between the concepts of project management in various projects:
    - a. traditional
    - b. design and build
    - c. turnkey

**Table 2-1: Four Common Construction Industry Divisions and Example Projects<sup>1</sup>**

Type	Residential	Building	Engineering	Industrial
Examples	Single-family house	Healthcare	Bridges	Refineries
	Multifamily house	Offices	Tunnels	Steel mills
	Condominiums	Educational	Dams	Power plants
	Low-rise apartments	Religious	Levees	Smelters
	High-rise apartments	Public safety	Sewage treatment	Chemical plants
		Amusement	Water treatment	Nuclear
		Recreation	Railroads	Aviation
		Government	Pipelines	
Market Share	40-45 percent	25-30 percent	20-25 percent	5-10 percent
Ownership	Mostly private	Mostly private	Public	Private