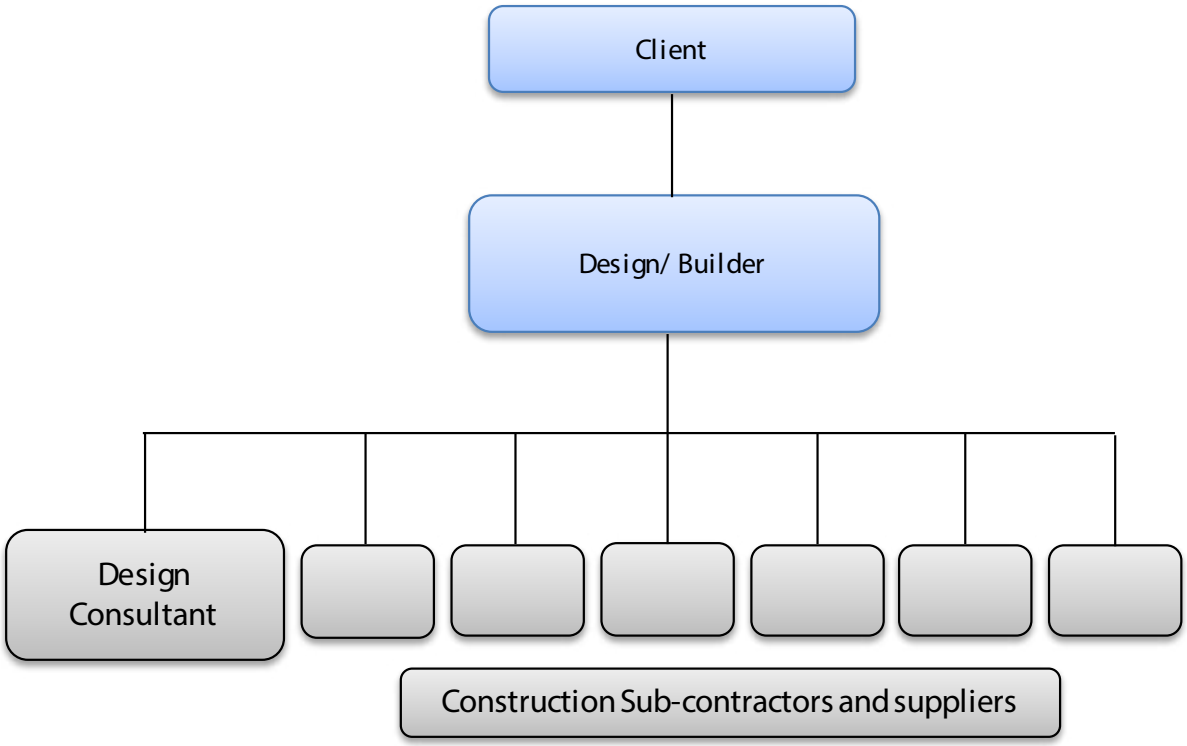

FEEDLOT DESIGN AND CONSTRUCTION

45. Feedlot construction delivery

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Introduction

This section provides a framework to aid lot feeders with the planning, designing and construction of new or upgraded feedlot infrastructure.

The process of delivering a major or minor construction project at a feedlot involves a number of phases and can be complex, as there are usually numerous parties involved with relatively little direct acquisition of individual plant and equipment.

Each phase requires specific tasks to be performed and deliverables to be produced. Some of these, such as plans and specifications, will be needed before obtaining the necessary regulatory approvals to move forward. These tasks, approvals and deliverables combine to create an organised set of process controls.

The phases in the process are outlined in the following table along with the potential parties which may be involved in each phase.

Phases	Tasks	Potential parties involved
Delivery method	Decide the framework for taking the project from concept through to completion. Relationships between the parties (by way of contract), responsibilities and risks of each party are determined at this stage.	Lot feeder, project manager, design consultant, construction contractor, construction subcontractors, suppliers.
Project definition	Scoping, feasibility, schematic design.	Lot feeder, design consultant
Initial project design	Prepare detailed layout and design calculations for the aspects of the project that require regulatory approval.	Lot feeder, design consultant
Project approval	Obtain regulatory approval for the project to proceed.	Lot feeder, design consultant
Detailed design, drawings and technical specifications	Detailed design drawings, Bill of Quantities, technical construction specifications prepared.	Design consultant
Project tendering	The process for procuring construction services.	Lot feeder, design consultant, project manager, tenderers
Project management	Managing the construction process.	Lot feeder, design consultant, project manager or construction contractor.
Construction	Construction activities, project completion, project handover.	Lot feeder, project manager, construction contractor, construction subcontractors, suppliers.
Post construction	Defects period, warranties, post-construction activities (e.g. survey), financial closure.	Lot feeder, project manager, construction contractor, construction subcontractors

One of the first decisions that a lot feeder faces after deciding to undertake a construction project is how to manage the project from concept through to completion.

To ensure maximum efficiency of all elements involved in any construction project, it is important to bring organisation and structure together in the planning, design, estimation and project management phases. The lot feeder must decide if and when to engage a consultant (e.g. designers, project managers) and when to engage the construction contractor.

Each project has its own set of circumstances. These include the project type, scope, complexity, budget and schedule, as well as financing objectives, available resources and the level of lot feeder

involvement and risk. Lot feeders should not underestimate the work involved in managing construction projects and the time that will be taken away from day to day management of the feedlot.

The method of delivery forms the framework for organising the management of the design and construction elements of the project.

The selection of a method of project delivery will determine what parties will be involved in the project, such as the lot feeder, design consultant, project manager, construction contractor and subcontractors, and defines the relationships between each of them.

These relationships, which are usually bound by specific contractual terms, can have wide-reaching effects on the project budget, schedule, quality and the amount of lot feeder involvement required for the project. Within each project delivery method, parties have varying roles and contractual responsibilities.

The different project delivery methods are distinguished by the way the contracts between the lot feeder, consultants (e.g. designers, project manager) and the construction contractors are formed and the technical relationships, responsibilities and the allocation of risk that evolves between each party inside those contracts.

Each project has a delivery method that is optimum for its unique environment and the business conditions in which it must be delivered. Each project delivery method has its advantages and disadvantages. Lot feeders alone or in conjunction with consultants (e.g. design consultant, project managers) must carefully analyse those conditions before selecting the specific method by which a project is to be delivered. Not doing so may lead to contractual disputes, project delays and project cost overruns.

Project delivery methods have evolved to deal with the many ways in which contracting parties wish to allocate their risk, from the traditional stipulated price/general contract, to the development of alternative financing and procurement methods.

Objectives

Selection of a delivery method that is right for each project starts with a clear understanding of the project objectives and constraints. The objectives of the delivery method are to

- select which parties will be involved with the project
- define the roles of various parties
- consider the fair allocation of risks and obligations between the parties
- ensure maximum efficiency for all elements involved in the project
- provide best value for construction costs
- ensure compliance with all WH&S obligations
- ensure the project is completed within time and budget and all contractual obligations are met.

Mandatory requirements

Compliance with

- relevant Commonwealth, state and local authority codes, regulations and relevant Australian standards as applicable to conditions of contract, tendering, project and risk management.
- legal obligations that must be complied with to provide for the health and safety of workers within work health and safety regulations and legislation (Work Health and Safety Act 2011/ Work Health and Safety Regulations 2011).

Delivery methods

Because of financial, organisational and time constraints, various project delivery methods have evolved. Most delivery methods used today are variations of three primary methods.

The three primary methods have their own contract structure and set of characteristics and are:

- **Design-Bid-Build**
- **Design-Build**
- **Project Management**

Design-Bid-Build (the traditional method)

The traditional method is characterised by a linear process where one task follows the completion of another, with virtually no overlap.

A design consultant is selected, and will be responsible for the project's design including detailed drawings, specifications and preparation of the tender documents based on the lot feeder's needs. The design consultant would also prepare a Bill of Quantities or Schedule of Rates. A Bill of Quantities or Schedule of Rates itemises all work for the project including materials, parts, and labour. This document is important as it allows a prospective tenderer to accurately price the work. The design consultant is responsible to the lot feeder for the design of the project.

A tender process follows where tenders are solicited from construction contractors, who then tender for the project works as per the tender documents provided (see *Section 47 – Project tendering*). The project is then awarded to a construction contractor and the design consultant may, to varying degrees, also undertake the supervision, contract administration and certification of the work performed under the construction contract as the lot feeder's representative. The lot feeder is responsible for the details of design and liable to the construction contractor for the quality of the construction contract documents.

The consultant's contract is most often a fixed-price contract with a date-certain construction period. Through the consulting agreement, the lot feeder gains the benefit of the design consultant's experience and expertise. Once the design has been completed and the work offered for tender, the lot feeder will contract the construction contractor, who is wholly responsible for the construction of the project in accordance with the consultant's design. The construction contractor under this delivery method is responsible to the lot feeder and accepts the responsibility and risks for the construction means and methods and for the performance of the various subcontractors that are retained.

This project delivery method is commonly referred to as a Design-Bid-Build project since each of these phases is undertaken separately (Figure 1). Throughout each component of the project, each of the parties will subcontract with various other consultants, suppliers, service providers, in order to fulfil their obligations. The design consultant may subcontract portions of its scope of work to other consultants. For example, environmental, structural, and/or geotechnical engineering services may be required to complete the design tasks for which the consultant was retained. In addition, the construction contractor will retain subcontractors and suppliers of various specialisations who will supply labour and materials to the project e.g. concrete, fencing.

The traditional method is distinguished by the fact there is no construction contractor input during the design phase. The lot feeder must rely on the consultant alone for a constructability review, if there is any at all.

The traditional method creates independent relationships between the consultant and the construction contractor, with each directly responsible to the lot feeder. These relationships create a system of checks and balances that serve to protect the lot feeder from inferior design and construction. Since the consultant acts on behalf of the lot feeder, he protects the interest of the lot feeder in obtaining a project that complies with the project scope, specifications and contract documents. He also has the responsibility of being fair and impartial toward the construction contractor.

Setting out of works for a new feedlot site

Characteristics

- Selection of the construction contractor is typically based on price, experience and qualifications
- Lot feeder and design consultant are responsible for completeness and accuracy of construction documents
- Firm project pricing can only be established after the lot feeder has incurred the majority of the cost for a complete design
- Lot feeder is financially responsible for conflicts among project team members (design consultant and construction contractor) and cost overruns
- Risks are somewhat evenly distributed between lot feeder and construction contractor

This delivery method is best suited for less complicated projects that are budget sensitive but not schedule sensitive, not subject to change, and where the lot feeder can completely control the design.

A busy economy may add to problems with this method. The best construction contractors will not 'gamble' to get work when there are other lot feeders lined up to negotiate contracts. Also, the best subcontractors align themselves with the best contractors. If subcontractors are busy, a construction contractor bid may only partially estimate the work involved. The tender bid may be padded with an extremely high profit margin to cover the possibility that they may have underestimated the actual work. This causes the lot feeder to seek alternative construction contractors who are not as busy and therefore willing to give a better price, but this can often be at a reduced quality of workmanship.

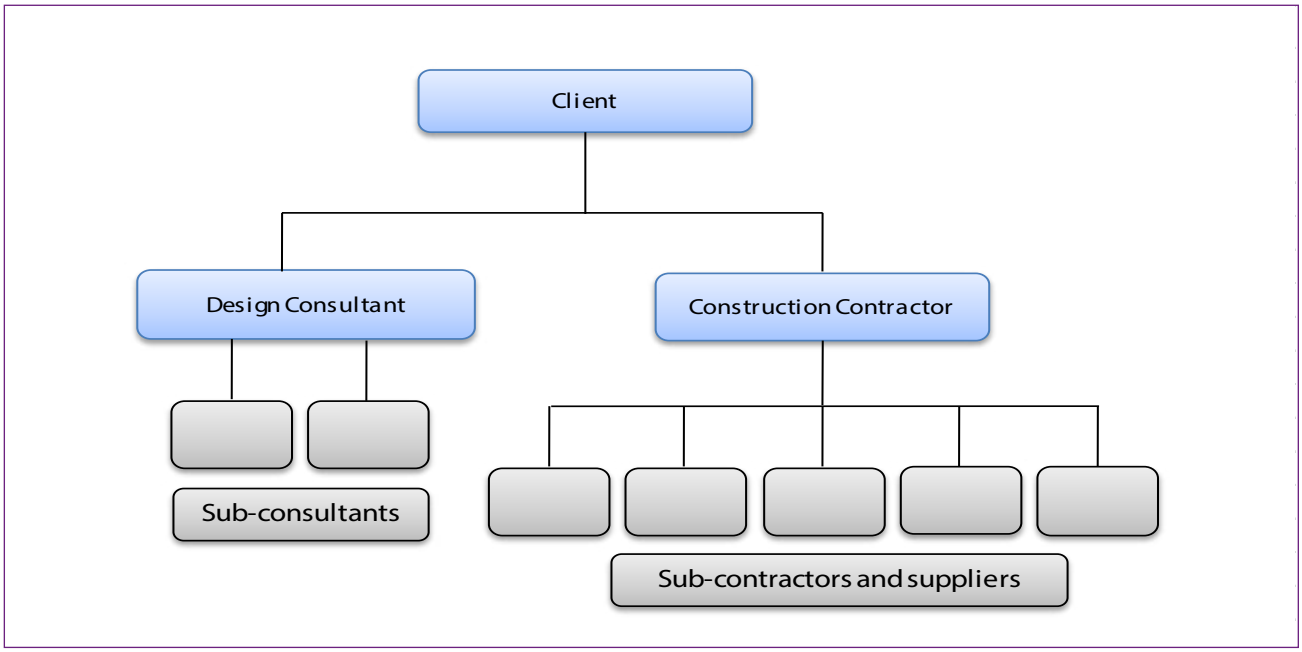

Figure 1. Structure of a Design-Bid-Build delivery method

Advantages	Disadvantages
Familiar delivery method	Can promote adversarial relationships between all parties increasing the probability of disputes
Competitive bidding is used to achieve the lowest price for the scope of works	Typical project duration is longer than all other delivery methods due to linear process
Simpler process to manage	No construction input during design and this may cause issues with cost savings and alternative methods
Fully defined project scope for both design and construction	Price not established until bids are received; may require redesign and rebid if bids exceed budget
Both design team and contractor accountable to lot feeder	Cost estimates can change during the design process
Creates the most bidding opportunities for construction contractors and subcontractors	Not optimal for projects that are sequential, schedule or change sensitive
Pricing is developed competitively, and can result in the 'best price'	Change orders and claims may increase final project cost
Design consultant assists less experienced lot feeder	

Design-Build or Design-Construct

Design-Build is a project delivery method in which the lot feeder procures both design and construction services in the same contract from a single, legal entity (or consortium). The entity is referred to as the design-builder. The design-builder is retained by the lot feeder to deliver a complete project, inclusive of design services. There are a number of variations on the Design-Build delivery method, but all involve three major components (Figure 2).

Firstly, the lot feeder develops (with or without the aid of a design consultant) a project brief. The project brief will define the lot feeder's project requirements and will typically include the functional, performance, quality and design life requirements. The

project requirements will also include any constraints on the design, such as land acquisition, approvals and the like.

Next, the lot feeder (with or without the aid of a consultant) calls for tenders and evaluates tenders of those offering proposals. Finally, with evaluation complete, the lot feeder must engage in a contract with the accepted tenderer on a fixed price basis for both design and construction services. The contracted Design-Builder carries out the design using its own designer.

The Design-Builder is liable for all design and construction costs and normally must provide a firm, fixed price and delivery schedule in its tender. The Design-Builder may award a proportion of the project to subcontractors.

From the lot feeder's perspective, the project's chain of responsibility has been considerably simplified. The construction contractor has early constructability input to the design process which is an advantage. The Design-Builder literally controls this project delivery process. As a result, Design-Build is the delivery method which has the greatest ability to compress a project delivery period and as a result is often used for 'fast-track' projects.

Characteristics:

- Design-Builder team selection is based on qualifications, experience and individual team members
- Collaborative team approach
- Lot feeder responsible for variations in project scope.

This type of delivery method is best suited for new construction projects that are highly time sensitive, projects with smaller user groups or reduced need for user reviews and mid-course design changes.

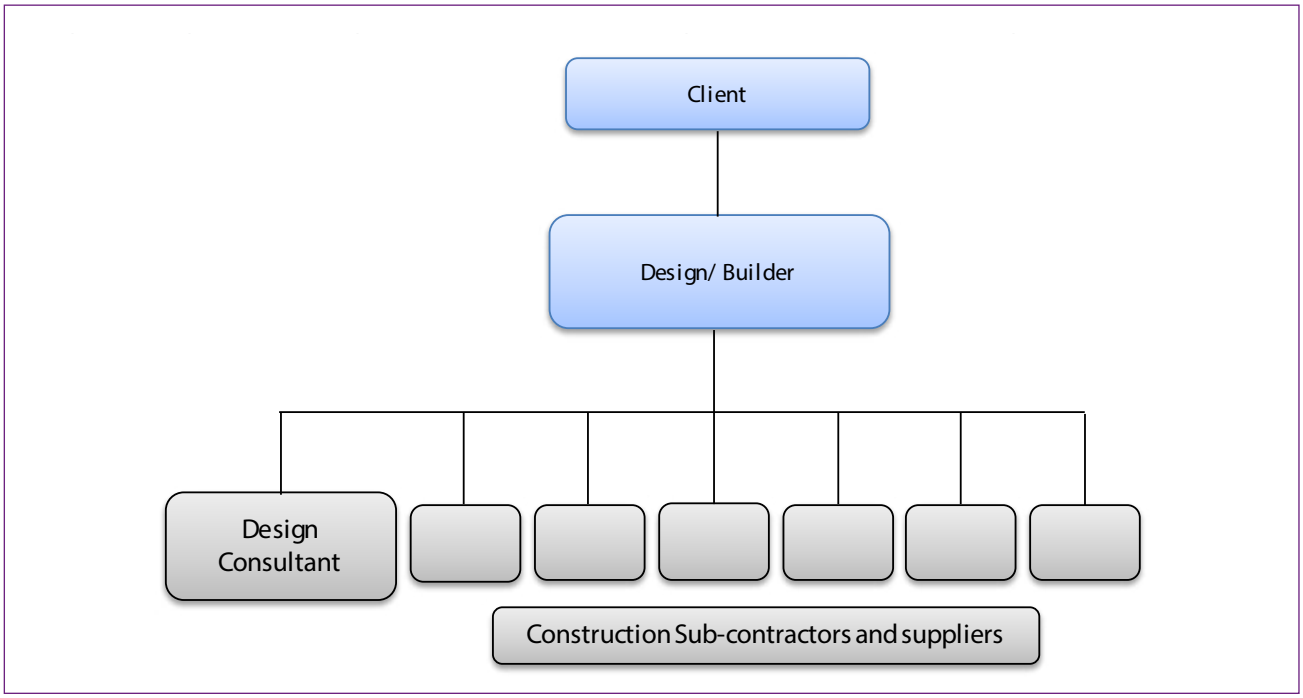

Figure 2. Structure of a Design-Construct delivery method

Advantages	Disadvantages
Fixed cost	Difficult for lot feeder to determine whether the best price and quality has been achieved for the work
Reduced claims/change-orders. Decreased opportunities for claims compared to separate design and construct responsibilities.	Initial costs are likely to be higher than traditional delivery methods due to increased contractor risk, reduced competition in pricing of contractor overhead, fee and subcontract costs
Guaranteed contract value can be established early in the process	Changes during the project can be difficult and expensive to make once construction begins, due to phased construction and cost driven, inflexible budget
Fastest project completion when compared to other delivery methods (design and construction activities can overlap)	Lot feeder must have a clear idea and definition of scope and concept before selection of Design-Builder.
Lot feeder looks to one entity for responsibility of design and construction and project performance	Lot feeder has no input on selection of proposed design team
Price tends to match quality	Over-emphasis on price may compromise quality
The lot feeder benefits from early construction input during design, budget and planning phases (value-engineering, innovation, constructability review)	Increased speed and fewer reviews increase potential for mistakes, missed items etc.
No variations for errors and omissions	No check and balance between contractor and designer
Most of the project is competitively bid	Lot feeder left to fend for himself versus the Design-Builder, creating potential for reduced quality and increased potential for conflict between lot feeder and Design-Builder
Lot feeder's contract administration and site representative risks and costs are reduced, since the Design-Builder is responsible for all coordination efforts	Once the contract is issued, lot feeder relinquishes control of the selection of the contractors used in the detailed design and construction process

Project management

The Project Management method of project delivery allows the lot feeder to engage the services of a professional project manager to manage the construction process but accepts some risk and reward on the cost outcomes (Figure 2). The Project Manager represents the lot feeder in overseeing the activities of the contractor(s) performing the construction on site.

First, a design consultant is selected, who is responsible for the project's design including detailed drawings and specifications and preparation of the tender documents based on the lot feeder's needs. The consultant would also prepare a Bill of Quantities or Schedule of Rates. A Bill of Quantities or Schedule of Rates itemises all work for the project including materials, parts, and labour. The design consultant team may report directly to the lot feeder and project manager.

The greatest benefits are obtained when the project manager is employed during the project planning and design process. In this capacity, project management assistance is provided to the lot feeder prior to construction, offering schedule, budget and constructability advice. This may result in advantageous changes to the project.

Depending on the circumstances and the lot feeder's ability to assume risk, the project manager might be assigned as 'Agent for' the lot feeder, with clearly defined areas of authority for committing the lot feeder financially, authorising payments, proactively negotiating and approving changes and resolving disputes.

In some cases the project manager might be asked to manage the project 'at risk', meaning that at some point in the project, the project manager would be required to agree to a not-to-exceed price for the work (Guaranteed Maximum Price – GMP), thus again providing a level of financial protection for the lot feeder. That is, the project manager holds the risk of construction performance and guarantees completion of the project for a negotiated price which is usually established when the design is somewhere between 50% and 90% developed. The final construction price is the sum of the project manager's fee, overhead and contingencies and the subcontractors' proposals. Any unused contingency at the end of the project reverts to the lot feeder.

The Project Management method is a fast track method. This enables the project manager to tender and subcontract portions of the work with an approved design and commence construction while the design and documentation of unrelated portions are being finalised.

The project manager does not employ the actual construction subcontractors, only approves their work and payments. The subcontractors are actually under direct contract with the lot feeder and not the project manager. Contracts are awarded to subcontractors based on their submitted tenders (see *Section 47 – Project tendering*).

The Project Management method is useful in volatile economic and industrial climates by helping to reduce the time and cost of project delivery. The lot feeder can modify specifications of later portions of work according to changing project requirements.

The largest setback to this method is construction responsibility after the project's completion. Since the subcontractors are paid directly by the lot feeder, they are each individually responsible to the lot feeder. This removes a single source of responsibility for construction defects during the warranty period. If a problem arises, the lot feeder must find the subcontractor and obtain a warranty correction. Typically, the lot feeder lacks the leverage a construction contractor would have in obtaining this warranty work from subcontractors.

Characteristics

- Fewer changes required once construction begins
- Best suited for large new or renovation projects that are schedule-sensitive, difficult to define or subject to potential changes; also for projects requiring a high level of construction management due to multiple phases, technical complexity or multi-disciplinary coordination.

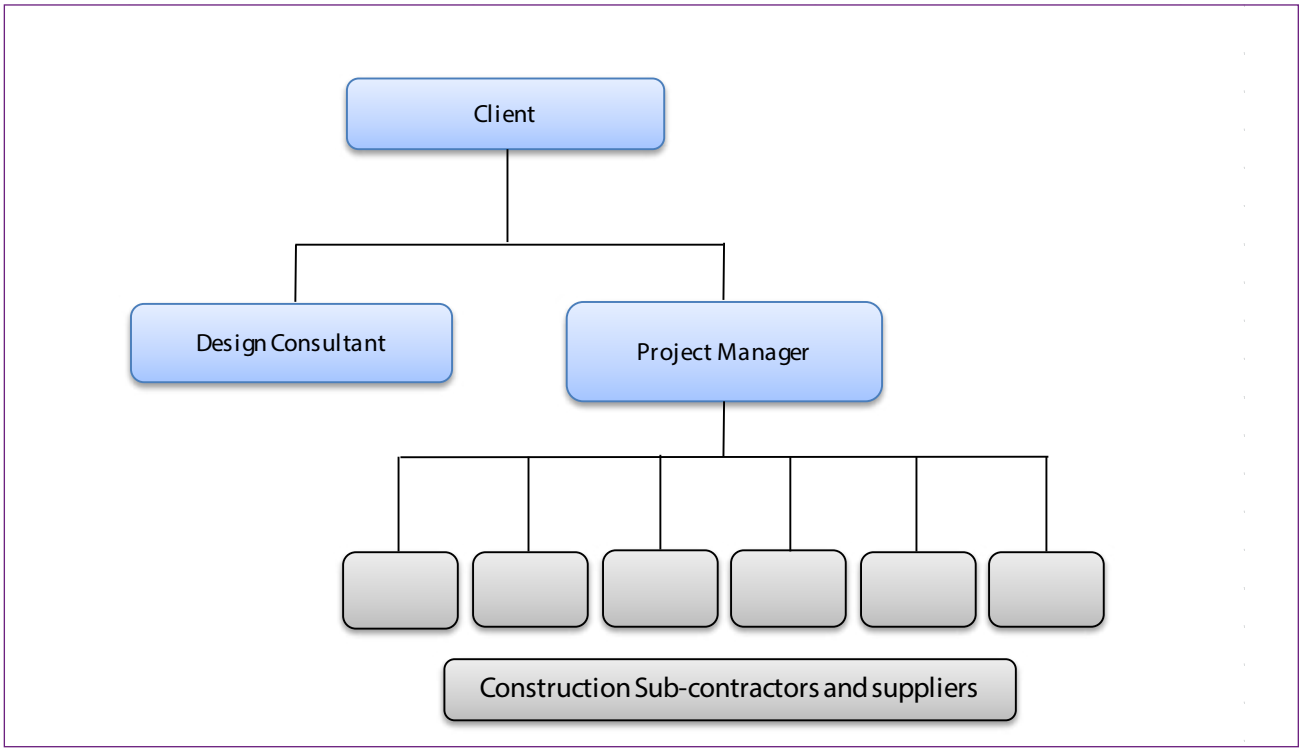

Figure 3. Structure of a Project Management delivery method

Advantages	Disadvantages
Selection of project manager based on qualifications, experience of individual team members	Difficult for lot feeder to evaluate the GMP or determine whether the best price has been achieved for the work
Project manager can provide design phase assistance for budget, project planning, and value-engineering analysis	Costs more than traditional bid due to reduced competition in pricing of contractor overhead, fee and subcontract costs
Continuous budget and schedule control/feedback possible	Costs often increase due to 'details' not in the GMP
Faster schedule than traditional bid; fast track construction possible	Project manager may inflate the budget to cover potential cost overruns
Theoretically, more teamwork between design consultant and project manager	Conflict between subcontractors may still be a problem even though they are coordinated by a project manager
Provides more ability to handle change in design and scope	Lot feeder must deal with post construction warranty issues
Theoretically, reduced changes and claims once in construction	
Lot feeder may be less experienced in project management and time constrained	

Quick tips

- The project delivery method must be selected very early in the life of a project.
- Identify stakeholders and resource constraints, and seek specialist guidance
- Match project/lot feeder needs/characteristics to delivery method for characteristics/ risks/benefits
- A project delivery method should be selected that will best suit the project and maximise the benefits obtained from the expertise involved
- It is important to understand that the responsibilities and risks performed during the phases of a project differ amongst the various parties, depending upon the method implemented
- Have a contract system in place for each of the elements involved in the chosen project delivery method

Further reading

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