

STUDY ON PROCUREMENT METHOD SELECTION PROCEDURE IN CONSTRUCTION INDUSTRY

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Abstract - This Project helps in selection of appropriate procurement method in the construction industry to achieve the requirements and needs of the clients and gives more detailed information about the how does the procurement system involved in the construction industry.

- It increases the efficiency and effectiveness of the management system by constant monitoring and reporting
- The disputes arising are resolved with help of this system

This study consists of different procurement methods like traditional, design & build and management procurement, comparison of different procurement systems, influencing factors, effecting factors, key actions, variables, theoretical frame work, mechanism for analyzing the different procurement system, development of procurement strategy, advantages, detailed method selection procedure and case study. Brief study has carried out in the project work; about the procurement method selection procedure.

Procurement advice an appropriate contracting strategy, offering and preparation of tender documents, choice of experts and contractors, contract organization and avoid the un-necessary discussions

Key Words: Procurement, Variables, Frame Work, Mechanism, Case Study

1.1 Objectives of procurement system

The goal of the procurement system is for successful completion and implementation of the project. Some of the objectives are mentioned below:

1.INTRODUCTION

A procurement system can be defined as “an organizational system that assigns specific responsibilities and authorities to people and organizations, and defines the various elements in the construction industry”. It is not only applicable to developed market economics, but also construction industry development in less advanced economy.

- To carry out justifiably and truthfully
- Perform assigned work in timely manner with honesty
- Have to Satisfy the all rules of legislation and principles
- To reach the all requirements of the client’s needs
- Controls construction related dispute

1.2 Procurement activities and key actions

Table-1: Activity and key action

The procurement system benefits the organization to manage procurement process effectively and efficiently in construction industry. The system can assist an organization to achieve successful outcome for their project with necessary guidance and support. It will also control the risks involved in the construction industry and minimize the cost variation problems. The procurement system in construction industry is useful in following ways:

Activity	Sub activity	Key action	
1	Defining the objectives for the procurement	1.1 Organize wide range of activities.	To improve the title for procurement to recognize and define scope of the project.
		1.2 Evaluation of economic value for planned procurement.	For budgeting, it is necessary for evaluation of the economic value of the proposed contract.

- It helps in preparing tender documents and contracts
- Selection of contractors and consultants based on their earlier records
- This system includes checklist for effective maintenance of the contract

1.3 Scope

This study helps in establishing a construction procurement system for:

1. Goods, services, engineering and construction work relating to the construction industry in a fair, balanced, transparent, competitive and cost effective manner.
2. It deals with procurement methods which help to proper implementation and successful completion of the project as per client requirements.
3. It accomplishes future requirements, and develops the industry to give early and best adorable results to the clients with respect to cost, quality and time.

1.4 Objectives of the study

Main objectives of the present project work are as follows:

- 1) Study of various procurement methods involved in the construction industry
- 2) To determine factors influencing the selection of procurement systems in construction industry
- 3) Mechanism for analyzing the different procurement system
- 4) Procedure to develop and implement a procurement strategy
- 5) To determine the suitable procurement method for Dr. Prabhu Halakatti hospital building, Belagavi

2. METHODOLOGY

By referring different literatures, technical reports, case study and other resources related to the current study, an outline of the methodology of the present work has been discussed briefly below, to achieve the objectives of the project.

- Study involves different methods of procurement system, influence of procurement methods on project performance, mechanism for analyzing different procurement system, procedure to develop and implement a procurement strategy
- Comparison of different procurement systems and their advantages
- Based on the studies, proposal have made on Dr. Prabhu Halakatti hospital building carried out during the period of internship, problems are analyzed and solved with the procurement system and few suggestions are made.

2.1 Procurement systems

Different methods of procurements are

- a. Traditional
- b. Design and construct
- c. Management

a. Traditional procurement method: It is the oldest type of construction procurement as well as one of the most common types of procurement method. It is defined as a project delivery strategy, wherein two different companies will carry out all project processes.

Contracts are mainly divided in to three types

Lump sum contracts: Prior to the starting the construction project, the contract amount is determined with consulting various stakeholders. The amount of Lump sum contracts is decided on the basis of bill of quantities and thing which is not able to find can be found by accurate evaluation

Measurement contracts: Here, only after the completion of the project and re-measurement, the precise amount is known and it is additionally alluded towards as re-quantification contracts.

Cost reimbursement: It is as well recognized as cost plus contracts, wherein the contract amount is calculated based on actual cost of labour and materials also the profit and overhead charges are considered.

Advantages of traditional procurement

- Help full for the contractor to apply for the tender on the same premise.
- Client can have immediate impact which can encourage high state of usefulness and enhance the quality in the design.

Circumstances in which traditional procurement to be used are

- Wherein the design consultant is necessary.
- The designers and contractors are hired independently.
- If superiority of the work is essential for the clients.

b. Design and Construct Procurement: Here, the client will give all needs desires for the project and assigns different task to the contractor. The association of the D&C methods and relative freedom of the contractor helps the client in obtaining the best price for the project, which may lead to cost benefits.

Advantages of design and construct procurement

- Client can deal properly with one firm
- Overlap of design and construction performance will minimize the project time

Circumstances in which D&C procurement to be used are

- When project does not require any specialized development
- Design scope is likely to change

- When project is technically difficult to understand

c. Management Procurement system: This consists of management contracting and construction management.

Management contracting: The management contractor is working with the clients. The contractors are involved at every stage of the construction and are responsible for works that are executed with direct contracts. Due to its flexibility, this type of contracts allow the clients to change the design during the construction process as well as the project can be started early and completed on time.

Construction management: A contractor will pay amount as per the completely to control, build up a schedule and arrange the outline and development exercises, The administration contractual worker is chosen later than a vigilant determination procedure and is paid via administration prise.

Various advantages have been recognized on CM approach summarized as follows

- Construction management expertise involve met in the beginning of the project
- Overlap of design and construction

2.2 Factors influencing the selection of procurement systems in construction industry

External environment: Factors from the external environment consist of variables like market competition, information technology, regulatory environment, natural causes and globalization, politics, finance etc.

Internal environment: This can be divided under three main factors such as project characteristics, client's characteristics and client's requirement. Client requirements can be sub-divided into cost related factors, time related factors and quality related factors.

Some of the important factors mainly influence while choosing of procurement system are briefly explained below

a) Socio-economic thought: It has derived from the four factors: political thought, government (public) or private segment venture, market or monetary condition and developing innovation.

b) Client requirements: This factor incorporates: customer's particular prerequisites, political obstructions, globalization and customer's level of information.

c) Capital cost/cash flow: This Factor clarifies the total variation; in any case, it is hard to clarify this component, since just a single variable impact upon it. Customer and fee related variable. If this component measures capital cost, it is identified with factors of customer necessities variables.

d) Project characteristics: This Factor is obtained from variance that clarifies the total fluctuation. In particular, impact of the life cycle on venture, range and technical complexity of the venture.

2.3 A theoretical framework on influence of procurement methods on project performance

Fig. 1 shows, a theoretical system that simplifies, the acquisition choice criteria, in order to help in discovering their effects on construction execution. All of the certainty would affect distinctively on duration, price and quality, dependent upon the appropriateness of the details as for a given acquirement technique.

The level of impact of every fact on given venture can be dictated by allocating with a use of number utilizing a range of 1-7, where 1-3 demonstrates pessimistic impact on execution and 5-7 shows optimistic impact, 4 as no impact or nonpartisan.

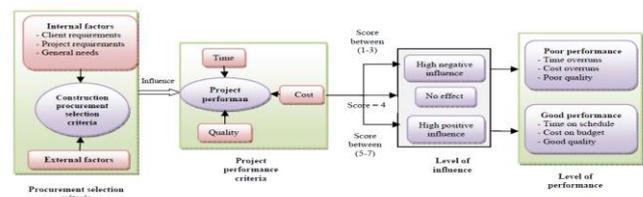


Fig-1: Theoretical framework

2.4 Mechanism for analyzing the different procurement systems

This settled structure clarifies and investigation both hard and flexible parts of authoritative administration, for example, procedure, structure, frameworks, shared values, staff and skills. It is additionally firmly related and appropriate to a venture conveyance approach, as the model is perceived for its all necessities and substantial extension. The details of the Seven S Model and its extension and clarification for the construction project are:

- **Strategy:** Describes as an arrangement in dispensing assets to accomplish recognized objectives at the time.
- **Structure:** It characterizes a framework for the organization. Though, in construction project level, it is about the general venture delivery system, especially to organize the undertakings involved and its procedure of administration.
- **Systems:** These are the standard procedures and methods followed within the association. It is comparative for the extent of works and employment exercises at the venture level.
- **Shared esteems:** It eludes to the noteworthy implications or managing ideas that authoritative

individuals share. The way of life of the overall management would decide the common values produced from alternate models at the venture level.

- **Staff:** Describes as work force classes within the organization. This identifies with the level of capacities required for the workforce at the project level.
- **Skills:** It alludes to the genuine level of abilities and capabilities of the representatives working for the organization. In the development setting, it is about the level of specialization required for the project delivery approach.

2.5 Procurement Strategies

Procurement technique, which is regularly created amid the assessment periods of a venture, is a key component for effective venture conveyance.

The acquisition system is a core venture document, which shows the result of an exact acquirement alternative assessment undertaken by the project proprietor, to differentiate the suggested conveyance model and procurement technique for a venture while considering the venture's individual qualities, risk and conditions

To build up a powerful acquirement methodology, it is critical to

- Thoroughly comprehend the venture including key drivers, imperatives and dangers
- Determine organization and market abilities and limit
- Involve key partners and specialists at right time in the arranging and improvement process

2.5.1 Procedure to develop and implement a procurement strategy

Appropriately programming the improvement and execution of the acquisition methodology with financing viewpoint, is the piece of good venture administration, as further discussed below.

a) Informing the funding decision: It is essential that the procurement system is created in an opportune way, as offices might be required to present the points of interest of acquisition alternatives under contemplations to organizations, as a feature of the business case, in help of a speculation choice for the project. Last acquisition methodology will likewise should be endorsed by association before conveyance of the project.

In creating acquirement procedures, the proprietors must permit adequate time for a capable investigation of all accessible obtainment alternatives, approval activities and surveys, and association endorsements.

Organization will have their own particular procedures for procurement, to follow so as to get administration approval for the assumption, and whether this ought to happen at the same time with a choice on the favored procurement technique.

b) Programming for development: venture conveyance, It can be depicted as the procedure by objective of a venture has acknowledged, it has to boost through a suitable acquisition strategy, to guarantee the necessary works are not postponed

Programming the growth of the acquisition strategy is subsequently significant for a project administration perspective. To accomplish best possible timing, the obtainment strategy development process ought to initiate as right on time as venture lifecycle, as a major aspect of the venture's assessment and definition stages

c) Programming for implementation: Guideline of the procurement strategy will usually starts at the initial stage of the construction venture and it will carry out till the end of the phase, with that transition to function stage, it will be conditional on which kind of deliver model has considered.

3. CASE STUDY

A Proposal is made by taking a hospital building as case study, through studying the various documents and different procurement system. From the observations, problems faced in the construction project are documented and suggestions were made for successful completion of project.

Project title : Dr. Prabhu Halakatti Hospital Building

Procurement method used: Traditional Lump Sum

Project Value: Rs. 4, 27, 00,000

Contractor: Anoop Javalkar

Client: Dr. Prabhu Halakatti

Architect: Sangolli and Associates

Project Overview

The choice to add a Traditional Lump Sum procurement strategy on this venture is intensely affected through the diverse features of the venture. All things considered, adequate time and assets were dispensed to ensure definite plan and determinations has framed.

Moreover, it is an interesting undertaking wherein, the design and requirements must be precise with particular criteria. It is consolidated with the TLS strategy for acquisition proposed to contractual worker with offering of the venture so that, procurement determination handle for this venture is moderately straight-forward.

With construction is expected to finish by 2017 with total cost of Rs 4.27cr. The new heart hospital center will provide the best heart related treatment accessible in the Belagavi city and considerably decrease the waiting time for patients.

The hospital right now care for around 1200 heart patients utilizing distinctive treatment every year, with 4000 treatment will visit, the opening of the latest Hospital center, extra 200 heart patients will be there dealt with every year.

Detailed Documentation: More attention on the plan and design was necessary. Ventures relating to health are more intricate than the most projects carried out by architects. Detailed documentation is taken into thought for expectations works and its coordination into existing structures was likewise of critical significance. The acquirement technique embraced for this venture must be adequate to help the contribution of reasonable advisors.

High Quality End Product: Effect of contributing adequate duration and assets, in the direction of deliver complete records at the major stage of plans and particular, this point of scheduling will deal by means of the coveted necessity with high quality final result. The significance of a high quality venture will be highlighted by the venture supervisor

A Balance of Risk between Client and Contractor: Importance of time and assets interested in a complete set of plans and determinations, among each of the offering that contractor offers would guarantee a more focused choice process and value affirmation of the venture. The TLS strategy, being an attempted and tried technique for acquisition alternative for venture proprietor and the market encouraged a decent balance of risk between the customer and contractors.

Problems occurred during construction

- Lagging in supply of design during construction progress
- Delay in project due to in-sufficient supply of materials
- There is not much proper communication between clients, contractor and management team
- Over run of time due to making changes in design in middle of construction
- Variation in cost due to market rates and changes in material selection by client
- Improper management makes failure of scheduled plan

Project Procurement Selection Process

The procurement method selection procedure is determined by means of the case project, the project is based on typical criteria. In this example, the client is the Dr. Prabhu Halakatti, has given the proposal for new hospital building with disabilities. Above problems have influenced to choose suitable procurement method, it is determined with the following process.

Step 1: Identifying project objectives and constraints Objectives of projects:

- Proper programming and phasing should be on time
- Design criteria has to meet the needs of the client
- Projects have to complete within the agreed rate
- There should not be any over run or delay in the project
- Cost conviction will be required preceding initiation of development

Project Constraints:

- **Programme Constraints:** Well information about the hospital building designs are prepare for the entire project to check clearly completion of the work at the different stages of construction.
- **Planning:** The design proposition has satisfied the requirements of the planning experts and local partners in the advancement.
- **Site Availability:** The site ought to be accessible in the best possible area
- **Site Condition:** Site had clearly surveyed before the start of project, by under taking it as a major aspect of plan improvement.
- **Degree of Client Involvement:** It is the most important in the construction management and Dr. Prabhu Halakatti involvement in the all stages of construction process.
- **Flexibility for Change during Design and Construction:** Design of the building had carried earlier & found good price certainty, hence there is not required to change during the execution stage.

The procurement options examined here and alternative procurement methods identified based upon preliminary discussions are:

- a. Traditional
- b. Design and Build
- c. Management

Step 2: Identify Procurement Selection Criteria

Identification of Procurement Selection Criteria carried on the following basis,

Time: Early completion of the project is necessary

Certainty of time: Project completion time is most important

Certainty of cost: Firm price needed before commitment to construction

Price competition: Selection of the construction team by price competition as needed

Flexibility: Variations are needed after work has begun on-site

Complexity: Building need to be highly specialised, technologically advanced

Quality: High quality of the product, in terms of material and workmanship and design concept are required

Responsibility: Client had the more accountability from the architecture and cost consultants.

Risk: The transfer of the risk of cost and time slippage from the client is vital

Step 3: Weightages of Client Criteria and Procurement Methods

The procurement assessment criterion for the client’s needs and for each procurement methods has clearly found below

Table-2: Determination of the importance of client criteria for the project

Procurement Assessment Criteria	Weighting
Time: Is early completion required?	5
Certainty of time: Is project completion on time important?	5
Certainty of cost: Is a firm price needed before any commitment to construction given?	3
Price competition: Is the selection of the construction team by price competition important?	3
Flexibility: Are variations necessary after work has begun on-site?	4
Complexity: Does the building need to be highly specialized, technologically advanced or highly serviced?	5
Quality: Is high quality of the product, in terms of material and workmanship and design concept important?	4
Responsibility: Is single point of responsibility to the client from the designers and cost consultants desired?	3
Risk: Is the transfer of the risk of cost and time slippage from the client important?	2

Table-3: Criteria weighting with respect to procurement method

Procurement Assessment Criteria	Traditional Procurement (P1)	D & B Procurement (P2)	Management Procurement (P3)
Time	3	5	4
Certainty of time	3	5	4
Certainty of cost	2	4	4
Price competition	4	3	3
Flexibility	4	4	3
Complexity	4	5	4
Quality	3	4	4
Responsibility	2	5	4
Risk	2	3	2

Table-4: Weighted procurement method scoring table

Procurement evaluation criteria	Weightage (W)	Traditional Procurement $W \times P1=$	D&C procurement $W \times P2=$	Management procurement $W \times P3=$
Time	5	15	25	20
Certainty of time	5	15	25	20
Certainty of cost	3	6	12	12
Price competition	3	12	9	9
Flexibility	4	16	16	12
Complexity	5	20	25	20
Quality	4	12	16	16
Responsibility	3	6	15	12
Risk	2	4	6	4
$\Sigma = Rank$		106(3)	149(1)	125(2)

From the above results can say traditional and management procurement methods are less scored than D&B procurement method. Hence, D&B can be considered as the best suitable procurement method for the proper implementation of the project to get successful out comes as per client needs.

Step 4: Procurement Appropriateness Chart

Below tables gives a suggestion on the suitability of every choice against the objectives and key criteria for the project.

Table-5: Time

Time	Traditional Procurement	D&B Procurement	Management Procurement
Completion date certainty	Poor	Good	Average
	Traditional procurement takes more time to complete the project		
Ability to meet current programme	Poor	Good	Average
	The program has to give sufficient time for characterizing the customer's necessities.		
Facility to phase construction	Average	good	Average
	Opportunity for contractual worker contribution to preplanning for staged conveyance		

Table-6: Cost

Cost	Traditional Procurement	D&B Procurement	Management Procurement
Fixing the total amount of the project before making the any bonds.	Average	Good	Average
	Conventional technique gives a great level of price sureness furnish so as to complete outline is delivered preceding to offering Similarly with D&C gives a huge level of rate assurance giving the customer's necessities is completely characterized up to execution phase.		
Shifting of amount related problems	Poor	Average	Poor
	In D&C configuration hazard will however remain with the customer through the plan group. Under customary frameworks danger of configuration is held by the customer. In D&C design risk will however stay with the client through the design team. Under traditional systems risk of design is retained by the client.		
Focused offering in current market situations	Average	Good	Average
	The D&C seems, by all accounts, to be the mainly appealing alternative for the present market circumstance.		

Table-7: Quality

Quality	Traditional Procurement	D&B Procurement	Management Procurement
Capacity for temporary worker to include an assess plan improvement.	Average	Good	Average
	Conventional: Contractor has participated in design, it may cause a few issues as far as zones, for example, buildability. Offering will get huge quality at points of interest. D&B: Gives most extreme capacity for contractual worker to include an incentive in outline.		
Adaptable to suit modify instructions	Average	Average	Poor
	Development organize changes ought to be stayed away from while embracing D&C		
Single point duty regarding design and development	Poor	good	Average
	In customary the outline and development duties are divided		
Capacity to manage/react to location circumstances	Good	Good	Average
	Temporary workers can examine the location surroundings completely		

Step 5: Procurement Review Session

Every perspective from the above Table 5 to 7 is examined at the procurement review session. The following points were audited in connection with elective procurement techniques accessible:

Client will be monetarily risk hesitant: D&C will give most significant cost assurance at every key choice period.

Client will discourage late changes: D&C is a lesser amount of adaptable to tardy changes. Therefore, it is favoured more. An unmistakable and subtle element of Client's prerequisites up to proper level will be required.

Programme is essential: For early complete, D&C will offer the best program favourable circumstances.

Quality is vital: D&C technique gives the best chance to design quality control, at an expanded cost risk evaluate with D&C. D&C can give a satisfactory level of plan.

Market conditions: A prior approach and prior participation of the contractor is valuable in present economic situations.

Partnering: The Client support's partnering arrangements; D&C will bring early contractual worker participation and so it proposes the most excellent alternative option to associates.

Preferred Option

The assent favored choice at this stage is a Design and Construct procurement method. Key contemplations are the

possibilities, to achieve the finish of the procurement method choice in development of project

Advantages

- Ability of the design team and customer to have an immediate impact. This will achieve a high level of usefulness and upgrade the nature of the general design.
- Client is certain about the venture's cost at the conferring phase of the agreement.
- Differences in the venture are generally simple to direct.

Limitations

- Incomplete reports and configuration can compromise cost conviction and increment the odds of troubles that might occur.
- Restricting the contribution of design or arranging skill from the contractual worker may not be to the greatest advantage of the venture.

Lessons Learned

- Enough allotment of assets is necessary to guarantee design and documentation of the venture will conclude at the calling for tender phase of the venture.
- For superlative activities, for example, those related with health, the traditional method of procurement gives the customer the choice for alternatives in expert advisors to help with the outline.
- This can likewise be a convenient procedure and if the documentation is not finished, the advantages of cost certainty can be extreme.

Suggestions

- By implementing the D&C procurement system, one can achieve the requirements of the client's and can complete the project on time.
- Design and build method give the appropriate solution for the above problems occurred on construction organization.
- The procurement system should be used to give specific responsibility to participants in the construction project.
- The suitable system must be selected, to complete the project successfully and efficiently.

4. CONCLUSIONS AND FUTURE SCOPE

- It has proposed, choice of appropriate procurement method is the beginning step to achieve goals in construction related projects.

- Mainly, three most three critical parameter of project performers are Cost, time and quality.
- More effective in monitoring and control to accurate implementation and to progress the work
- Who are related to the construction industry, they may be from public or private sector must be well known about the different procurement system, hence it will support to get good results
- Client's authentic needs, necessities, destinations and project objectives should be properly suggested to the project group, keeping in mind the end goal is to make proper procurement strategy
- A apparent, common system has to built up at an early phase of the project which will decide extensively what has be done, how it has be done, by whom it must be done, where it have to be done and when it must be properly finished
- Improved utilize and equivalence of data innovation is probably going to be the key, all together for development industry to have the capacity to meet the administrative, specialized and social difficulties.
- Improving the procurement strategy in building administration will get more advantages to deal with workforce, proprietor of the building, and the clients who are identified with support industry.

Future scope of study

This study can be extended to other procurement system such as

- E-procurement
- Collaborative
- Joint venture
- Private financing initiative

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