

A Review on Effect of Selection of Procurement Methods for Road Projects

¹Kinjal J. Patel, Student of M.E.(Construction Engineering & Management) Civil Engg.,
S.N.P.I.T. & R.C., UmraKh, Bardoli, India; Email: kinjl8794@gmail.com

²Hiren A. Rathod, Assistant Professor Civil Engg. Dept., S.N.P.I.T. & R.C., UmraKh, Bardoli,
India; Email: h.rathod024@gmail.com

Abstract –Construction industry has complexity in its nature, because it contain large amount of parties involved as client, contractor, consultant, stakeholder and regulator. Procurement system are imperative in ensuring the successful implementation of a construction project. The proper selection of procurement methods is becoming increasingly important issue due to complex decision making has to be made by client early in the project life cycle. This paper aim to improve procurement methods systematically and to identified factors that affecting the selection of procurement methods in road construction project. This paper discuss the wide variety of procurement methods available to project like traditional procurement method and design & build procurement methods. Each methods has own set of criteria for best suitability for each construction project, and basic characteristic of construction industry that each project is unique.

Keywords —procurement, procurement methods, construction project

I. INTRODUCTION

Procurement is the systematic approach used for buying all the goods and service or works. It is favorable that the goods and service are appropriate and that they are procured at the best possible cost, quality, time and location to meet the need of end uses [7]. Procurement method can be defined as the organizational system that assigns specific responsibilities and authorities to people and organizations, and defines the various element in construction industry. The advantages of procurement method are organization to manage procurement process effectively & efficiently in construction industry [4].

Road construction project are consider as very complex project, as uncertainty lies at various stage. For execution of road construction project, many stakeholders are involved such as civil engineer, project manager, road contractor, consultant etc. They work together at one platform for performing various construction activity which come under their scope.

The selection of appropriate procurement method to achieve a construction project is required. Through it does not necessary lead to a successful project but with other factor taken into consideration can influence the success of the construction project. A wrong procurement method often lead to project failure. Therefore adequate project procurement method are required before the commencement of construction project.

II. TYPES OF PROCUREMENT METHODS

Different procurement methods are used for construction projects.

A. Traditional Procurement Method

traditional method is a procurement method that the design work will separate from construction and client would appoint an architect to complete the design and procedure specification of the construction project. The consultant team is appointed to take control of design and cost. Following the completion of this phase, client will appoint a main contractor to carry out the work through bidding. The contractor prepares the tender document based on the specification. The lowest tender usually will be awarded the contract. The contractor need to take responsibility to all the workmanship which including all work by sub-contractor [5].

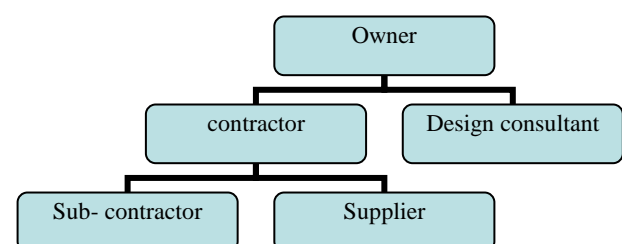


Figure-1 Traditional Procurement Method [1]

Advantages of Traditional Procurement Method:

- Helpful for the contractor to apply the tender on the same premise [4].

- Variation to the contract are comparatively easy to arrange and manage.
- Client is able to have direct influence which can facilitate a high level of functionality and improve the quality in the design [4].
- Price certainty at the award of contract.

Disadvantages of Traditional Procurement Method:

- Overall project duration may be longer than the other procurement method and construction cannot be begin prior to the completion of the design.
- Process can be timely to produce the full contract documentation. Tender documents from an incomplete design can be produce but can lead to less cost and may lead to disputes.

B. Design and Build Procurement Method

In this method, the contractor is responsible for undertaking both the design and construction of the work to appear a choice of a contractor. Contractor required to develop a design to a certain level, prepare a tender document and submit the whole package which is term a proposal to be evaluated to meet the satisfaction of client need. A team of a consultant will be needed to assess each contractor's proposal. Evaluation of tender in this case is usually difficult because the contractor are not working with one design. Tenders should be in form of the criteria to be used, weather price is to be prime factor [1].

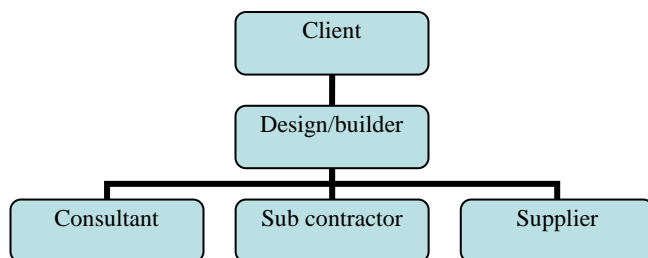


Figure-2 design and build procurement method [1]

Advantage of Design and Build Procurement method:

- Client can deal with one firm and reduce the need of resources and time to contracting designers [4].
- Overlap of design and construction activity and performance will minimize the project time [4].
- Use of maximum price with saving can stimulate the variation and reduce time and cost.
- Price certainty is obtained before construction start as client requirement are specified.

Disadvantages of Design and build Procurement Method:

- Difficulties can be experienced by clients in preparing an proper and sufficiently systematic.
- Client changes to project scope can be expensive.
- Difficulty in comparing bids, therefore each design will be difficult and price for the project will be different for each design.

III. NEED OF REVIEW

Now a days, selection of an appropriate project procurement method is complex decision- making process due to risk and uncertainties. There are number of problem in the road construction caused by wrong selection of procurement methods. Construction project are frequently delay, high- risky for the client, cost overrun, cost over budgeting and conflict is increasing, resulting in litigation and arbitration. Therefore the proper selection of procurement method is very important task for client and other project participation, which is best initial stage to ensure the success of the project.

Many client have been selecting procurement system in a perfunctory manner, and some client use a specific procurement methods by default without making a conscious choice. Inexperience client depend on expert advice when selecting a procurement approach and this could result in appropriate decision with unforeseeable consequences.

Lack of client level of knowledge regarding procurement methods of each construction project may lead to wastage of financial and material resource. The decision criteria and factor suitable to the selection of procurement approach must be carefully identified, evaluated and examined their effect on procurement method selection to overcome this problem.

IV. PAST STUDIES

Shamil Naoum and Charles Egbu have discuss a review of literatures over last three decades. In this paper to use of various procurement method for project like management contracting, project management and design and build. However there is a lack of reporting on the association between procurement method and that related issue such as innovation and technology, supply chain, lean construction, Buildability and value management [8].

Vithyashini Sethuraman, B.A.K.S.Perera have focus on any significant difference between procurement methods selection criteria in building vs infrastructure project. Three round of extensive Delphi survey were conducted through the quantitative approach with the assistance of thirty four expert toward identifying the parameter. The purpose of the Delphi round was to experts and identify the parameter which influence the selection of the procurement path of building and infrastructure project separately. The purpose of Delphi round two was to identify separately the top twenty significant factors in both infrastructure and building sector in sri lankan construction industry, the expert were requested to designate the relative importance of each parameter using a 5- level in Delphi round three, the parameter were re- ranked by the utility score and analyzed

by the calculation of the respective parson's rank correlation coefficients [10].

Ogunsanmi, o.e. have identify procurement selection criteria factor, tendering methods and variation order factor that can impact on project performance. A structural questionnaire was designed to collect information and procurement that effect of procurement selection factor on project performance. Thirty one questionnaire retrieved from this respondents that were used for the data analysis. Descriptive statistical as well as inferential statistical tool of chi- square and analysis of variance were used for the analysis of the data collected form the respondents. To selection of six procurement criteria that on effect on project performance on cost related factor, time related factor, quality related factors project characteristic and external environment [6]. Alejo, ayodele oluwole have evaluate the performance of different procurement methods used in construction industry. To identify factors that affect the selection of the traditional procurement methods and design & build procurement methods are used. Data were collected using well structure questionnaire administered to professional in the study area. In the distribution of questionnaire stratified random sampling technique was adopted. Ninety questionnaire that were distributed a total number of seventy three were collected and below are the analysis of collected questionnaires. The questions for were address to architect, builder, engineers and quantity surveyors. Data collected form construction practice practitioners were analysis using mean, percentage, method and descriptive method are used and rank as the highest factor are external, clients characteristic, project characteristic, ability to make change, cost issue and time [2].

Tarun Patel, Hiren Rathod, N. D. Sharma, have discuss based on the casual interviews, survey, and analysis of information sources. The information collect from structural interview, pilot study, questionnaire survey and from a literature review, to the material procurement management process was proposed for the commercial building project. In this paper to identify the most crucial factors affecting material procurement process and this factors are divided in to four categories: plan, conduct, Administration and close project. In this paper the data collected through the questionnaire survey was analysis by using quantitative method of important index (IMPI). The various material procurement factors are calculated based on the important index (IMPI) value and categories are ranked are as follows: plan phase, administration phase, conduct phase and close phase [9].

C.T. Ramanathan, S. Narayanan have discusses the various procurement method followed here as Traditional contracts; Design and Build Contracts; Privately Financed Infrastructure Projects; United States PPP Projects; globally used models of PPP. Comparative study on the traditional

and non-traditional procurement systems is also summarized and presented [3].

V. IDENTIFICATION OF FACTORS

To identified various factors affecting procurement method for road construction project. Further, different factors which have a grate consequence of on procurement method have been characterized into six major group are coat related factor, time related factor, quality related factor, project characteristic, client characteristic and external environment are as follows.

1. FACTORS RELATED TO COST
2. FACTORS RELATED TO TIME
3. FACTORS RELATED TO QUALITY
4. FACTORS RELATED TO PROJECT CHARACTERISTIC
5. FACTORS RELATED TO CLIENT CHARACTERISTIC
6. FACTORS RELATED TO EXTERNAL ENVIRONMENT

Figure-3 Categories of Factors

Each major group has been categorized into sub-factors which have a grate consequence on procurement methods selection on road construction project.

As the outcome, total 32 factors that may be encountered in selection of procurement method for road construction project were identified. Further, these factors were classified into six categories depending on their nature and mode of occurrence. A list of classified factors according to their group characteristic has been given as follows:

Table – 1 List of Factors

Sr. No.	Factors
A – Cost related factor	
A1	Complexity of design
A2	Construction variation
A3	Price certainty
A4	Cost control
A5	Price competition
B – Time related factor	
B1	Training and awareness on procurement
B2	Construction speed
B3	Planning & designing
B4	Time constraints
C – Quality related factor	
C1	Quality assurance
C2	Material selection
C3	Quality & safety policy
C4	Logistics
D – Factor related to project characteristic	
D1	Project size
D2	Available resource of project
D3	Guideline and procedure on procurement
D4	Payment interval of the project

D5	Vendor selection
D6	Improper planning of project schedule
D7	Inventory management
D8	Lack of coordination between contractor and supplier
D9	Quality level of project
E – Factors related to client characteristic	
E1	Client level of knowledge
E2	Funding arrangement
E3	Government policy
E4	Procurement decision making responsibility
E5	Accountability
E6	Flexibility
F – Factors related to external environment	
F1	Market competition
F2	Political & social
F3	Worker condition
F4	Globalization

Description the above listed factors is described as below:

1-Complexity of design: The factors influence the selection of the procurement methods is the complexity of the particular project. Complexity must be consider in deciding the procurement method because simple construction are best procured in one way where as the complex design.

2-Construction variation: variation may occur if the tender information is insufficient of incorrect. Subsequent changes in project scope or specification will increase construction costs.

3-Price certainty: price certainty represent the probability of completing a project within the budget agree between client and contractors before the commencement of construction.

4-Cost control: The defect or failure in construction facilities can result in very large cost. Even with minor defect re-construction may be required and increased cost and delay are the result. So that proper planning of project of project schedule are done to directly cost are reduce.

5-Price competition: Price competition is important factor to the public client because of public accountability, that often require them to get competitive tender and also mainly due to focus on obtaining the lowest price for a project.

6- Training and awareness on procurement: Training and awareness regarding procurement method that the company have admitted to increased the efficiency of the procurement process in term of time, quality and cost.

7- Construction speed: For the speed of construction, tools and equipment, labor and material should be available on the nearer site. So we can complete the project within the estimated time.

8-Planning and designing: Proper planning and design are necessary in procurement system. If planning and design is improper, due to that if any activity can delay behind that all

activity can be delay, the total project duration are delay and project are not complete within estimated project time.

9-Time constrain: At most project are required within a specific time frame. If timely completion is a critical factor then a procurement method that speedy completion may be favored. It is important that an adequate design time is recommended.

10-Quality assurance: Quality assurance is a way of preventing mistakes and defect in manufactured products and avoiding problems when delivering solution or service to customers.

11-Material selection: Availability of material should be of best quality at a lesser price and available at near site, so that reduce the transportation cost. It is found that demand, quality and government policy will increase the material cost ultimately increasing the procurement cost.

12-Quality & safety policy: Quality level of project is worth while noting that the quality level was not considered to be extremist affected by the procurement arrangement used, but this will depend on experience of the client using different procurement methods on construction project.

13-Logistic: Transportation of material are handled by the company or supplier. The way of transportation and handling of material while transportation affect the cost, time and quality of procurement.

14-Project size: According the size of project, the critical design criteria, functional requirements, complexity are differ. The size of project are decided based on the function of construction such as building, road project etc.

15-Availble resource of project: If the resource are available near the site the transportation cost can be reduce can be used when we needed.

16-Guideline and procedure on procurement: A proper guideline and procedure on procurement method are use to avoid delay and money wastage.

17-Payment interval of the project: Different payment option are followed such as payment at supply of each batch, payment at the end of the supply contract, payment at regular interval.

18-Vendor selection: Selection of vendor varies with the location, requirement, quality and cost. Most company depend on a single supplier for certain material for all their projects to ensure uniformity, uniqueness and reduce cost.

19-Improper planning of project schedule: Improper planning and schedule in procurement system are affect the time, cost and quality. So proper planning of project schedule is necessary to minimize construction cost and time.

20-Inventory management: Proper inventory management is necessary to ensure timely supply of material, avoid theft and avoid shortage cost.

21-Lack of coordination between contractor and supplier: Proper coordination are necessary to contract and supplier to avoid misunderstanding and dispute between contractor and supplier.

22-Quality level of project: A quality management process is introduced in a project towards quality planning and quality assurance. Quality assurance plan is prepare than the project in line with contract specification.

23-Client level of knowledge: A client knowledge and experience with procuring construction project will influence the procurement method adopted.

24-Funding arrangement: Public entities should use resource effectively, economically and without waste, with due regard for the total costs and its contribution to the outcome the entity is trying to achieve.

25-Goverement policy: increased tax and other duties involved in procurement to increase the procurement cost. Through occurrence possibility is less, the impact will be grate.

26-Procurement decision- making responsibility: Decision- making in procurement by the top management are influencing various aspect of procurement process especially time and cost. Clarity on the specific responsibility for each stage of procurement assist in more accountability and control.

27-Accountability: Accountability is governments obligation to demonstrate effectiveness in carrying out goals and producing the types of service that the public and needs. Lack of accountability creates opportunities for corruption.

28-Flexibility: If the change design during both design and construction period that the change in project are inevitable. The desire level of flexibility for the client to make change throughout the project will influence the selection of a procurement methods.

29-Market competition: A high degree can create more option for buyers and suppliers, with factor including speed of industry growth. Capacity utilization, product difference, cost and diversity of competitors.

30-Political & social: Constitutional construction argues that the construction has a dual nature. The characterizes this process, by which constitutional meaning is shaped within politics at the same time that politics is shaped by the constitutions.

31-Worker condition: The productivity in construction is often, defines as output per labour hour. So worker should have related work knowledge and skill.

32-Globalization: Globalizations biggest benefits is that increase option, option for source material, option for worker and option for transportation. More option mean more chance to save on spending and increase profits.

VI. CONCLUSION

It has proposed, choice of appropriate procurement methods is the beginning step to achieve project specific goals. Effective procurement methods are used for construction project is to complete it within the estimated cost and duration with the desired level of quality of project. For make procurement methods are more effective, several kinds of studies were carried out. To identify its likelihood of occurrence and its importance, relative important index (RII) and important index (IMPI) techniques are used and based on that the most effective factors affecting procurement methods can be identified. Based on the past studies an identification of factors affecting procurement method has been done and each factor has been done. After referring various literatures, the most critical factors which affects procurement methods are: complexity of design, price competition, time constraints, quality and safety policy, planning & designing, funding arrangement, government policy and market competition.

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