

Selection of Effective Procurement Management Method and Study of Other Parameters Affecting Procurement Management

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Abstract - *The important need of any construction projects is to complete it within the estimated cost and duration with the desired quality of project. The procurement managers have to keep eye on number of aspects of construction project like planning of the project, scheduling, estimation of the project, etc. Nowadays, it is essential to increase the productivity of the construction work as the competition in the era is increasing like anything. Hence it is important to emphasise on the patronized factors like material management, lead time analysis, procurement management, waste management etc. The project work emphasises the activities of procurement process. It has aim to select the best route for procurement management so as to optimize cost, duration & quality for the construction project and also to find out the improved ways of procurement management & advanced techniques which can be applied in the project management. The present conditions of vigorous competition in the construction sector give birth to the use of software in the construction work. Also, as the software plays an important role to reduce time required for work like planning, estimation, scheduling etc. and also reduces errors in it. The software like Microsoft Project (MSP), Primavera and Enterprise Resource Planning (ERP) help in planning and scheduling of the construction project. The project also aims towards the dependency of the working of construction sites on software and to find the ways to increase the user friendliness of software. The survey based on the discussion and fill questionnaire form from purchase manager has been carried out. The effective procurement management method has been suggested and effects of various parameters are included in the present study.*

Key Words: *Procurement management, Construction project, Design and build method and Traditional method, etc.*

1. INTRODUCTION

Civil engineering projects routinely require procurements of materials, machines and services. Projects need materials, equipment, consultants, training, and many other goods and services. Procurement planning determines whether to procure, what to procure, how to procure, when to procure, etc. [6]. Procurement is the acquisition of goods, services or works from an outside external source [1]. It is favourable that the goods, services or works are appropriate and that they are procured at the best possible cost to meet the needs of the acquirer in terms of quality, quantity, time and location. It generally involves making buying decisions under conditions of scarcity. If good data is available, it is good practice to make use of economic analysis methods such as cost-benefit analysis or cost-utility analysis.

To improve all the activities in procurement of materials and provision of the required services, the strategic planning of all becomes the task of highest priority of the productivity of the construction work. Project procurement management is the process of purchasing the products necessary for meeting the needs of the project scope. Procurement management involves planning, soliciting sources, choosing a source, administering the contract, and closing out the contract. Assuming that goods or services are to be procured, then all the processes referred to would be performed on all goods or services required.

Procurement manager should have an appropriate construction procurement method to balance the project variables and to distribute risks in procurement activities. Also one has to consider the vital importance of the use of software in project planning so as to get best results for strategic and timely procurement of the goods and services required. The procurement manager has to depend on the data to be received from planning, scheduling and estimation department; to start the actual

procurement process. Efficient procurement planning saves time and cost in later stages of the project, to deliver better design and reduce waste and also ensures that **client's requirements**.

Procurement management is still underdeveloped area and is still developing within developing countries. According to the current scenarios of procurement management, main serious problems affecting the quality of the project are: poor remuneration, lack of effective systems techniques and operating procedures, lack of specialist procurement staff, poor focus by management on cost controls, self-interests and lack of integrity, lack of professional development in the area of procurement management.

It is a prime importance of any construction site to complete project within time without compromising quality and cost. To achieve this, a strategic procurement management is necessary. As each parameters of the construction project such as tendering, lead time, planning, inventory control etc. have certain effect on the procurement, the procurement manager try to improve the routes of management so as to get maximum productivity from each activity. Sometimes though owner has some methods to follow the procurement process, managers have to test them and change if possible to come up to the expectations of the owner. It is necessary to find out suitable procurement management method to optimize quality, cost and duration of the project. Study of impact of use of software will also help us to find out results on software efficiency.

Upcoming technologies are always designed to increase the productivity of the work and decrease the human efforts. The use of software in any case is based on the same principle i.e. to reduce time required to analyse data, implement it and calculate the results and to increase the efficiency of the work to be done. In this way, in project management the use of software like Enterprise Resource Planning, Microsoft Project, Primavera etc. helps a lot to carry out the project with maximum productivity in less time. Basically, ERP analysis allows us improvement in information sharing improved transparency of management responsibilities and also the efficiency of management.

2. LITERATURE REVIEW

From the study of history of the construction project management, it is clear that owners or contractors always go for the traditional activities for procurement. In spite of having many flaws e.g. it is important to fix the risk at **owner's side or at contractor's side, which cannot be achieved** in traditional procurement process. Some developers are still using the old way of procurement. Also because of such flaws, nowadays some developers are

aware of need systematic procurement management using concurrent policy with all other departments in project.

The procurement management is the technique to optimize the inventory cost and attain cost efficiencies in procurement and supply management activities. In procurement management, it may be observed that by focusing on the parameters like life-cycle chart, the efficiency with cost and time control on delay parameters etc. may improve the relation between various stake holders (owner, designers, contractors and vendors etc.), The project must work closely with the real property contracting officer to determine the best strategy possible to acquire either architectural and engineering services, professional services or contract services. Hence for construction project, the procurement management becomes vital for high productivity. For different types of project, we can adopt different procurement management methods. The different procurement management method may be adopted based on type of project complexity; cost of project, quality level required and target duration for completion of project. Time duration, cost of project and quality level required, are the major factors influencing the choice of procurement methods. Others are risk allocation, price competition and flexibility of contract [2].

As per the needs of the procurement activities, type of site and the policies of contractor and owner, different methods can be selected for the management of the procurement activities. The methods for procurement management under consideration are traditional method, design and build method, management contraction method and construction management method. The research on the selection of the best procurement route gives us the best way to procure goods and services for the construction sites [3].

Many studies have shown that the primavera application has positively impacted the productivity of planning processes and later its execution. Its potential impact on the entire life-cycle of construction project is to the fullest extent [4]. Enterprise Resource Planning (ERP) is now being hailed as a foundation for the integration of organization-wide information systems. ERP systems link **together entire organization's operations** such as accounting, finance, human resources, manufacturing and distribution, etc. Moreover, they also connect the organization to its customers and suppliers through the different stages of the product or the process life cycle. There are very few studies conducted about the implementation of ERP systems in the construction industry, particularly for the construction contractors. The focus so far has been on client organizations, engineering and design firms. The objective of this paper is to investigate the suitability and the implementation status of ERP systems in contractor firms. The methodology employed is a mix of literature review, market studies and

detailed questionnaire survey. It is found that the majority of contractor firms have awareness about the ERP systems but very few organizations have so far implemented such systems. The major reason is that the implementation of any ERP system needs a huge investment in time, money and resources. However, when implemented to solve the right problems, these ERP systems can be a powerful tool for business improvement. The study shed light on the barriers to the implementation of ERP systems in the construction industry and also highlights valuable lessons learned and benefits gained by companies that have such systems in place [5].

3. METHODOLOGY

The procurement management needs to work on different activities in procurement. The organisation or agencies need the method for procurement management which contributes the activities of procurement beneficial in all aspects like lead time, inventory control etc. In case of use of software nowadays, software, according to all the project managers, is becoming important to complete the task within time, for estimation, scheduling, planning and hence to the procurement management too. Survey is collected with the help of the questionnaire collected from purchase managers from Pune region of Maharashtra state. The questionnaire format as follows:

3.1 Study of the procurement management

The authors prepared questionnaire for major nine points related to procurement management. The questionnaire is circulated among the procurement managers as respondents. The minimum field experience of respondents is equal or more than 10 years. The methodology adopted in the present study included following:

A. Selection of Procurement Management Method:

The set of questionnaire included in their category in such a way that after receiving the rating value, one may decide the type of procurement method. Also it will explain about the use of past experiences of the procurement management. The method selection process will give the level of risk at owner or contractor. The traditional method has the following major effects:

- Designed before tendering process
- Generally may affect cost sometimes
- Risk is at owner

The Design & Build method has the following major effects:

- Generally designed after tendering by contractor
- Merely affect the cost of the project
- Risk is at contractor side

Here the risk for design, quality, scheduling, budget, relation with prime contractor and healthy co-ordination.

The set of other questionnaire includes:

- B. Aspect affecting procurement management
- C. Data required for procurement management
- D. Use of software in construction project
- E. Effect of procurement management on Quality of the project
- F. Advanced methods of procurement management
- G. Inventory management
- H. Expectation of Owner
- I. Expectation of Vendor

4. RESULTS AND DISCUSSION

The result based on suggested methodology are given and discussed in following section:

The response related to procurement management method is given in table number 1.

Table -1: Selection of Procurement Management Method

| I | Sub-question | Priority Rating out of 5 | Rank |
|----|---|--------------------------|------|
| 1. | Selection of standard flow process | 3.93 | 4 |
| 2. | Dependency on past experiences | 4.06 | 3 |
| 3. | Design before tender process | 4.25 | 2 |
| 4. | Responsibility of contractor for design | 3 | 6 |
| 5. | Risk at owner for procurement design | 4.18 | 1 |
| 6. | Risk at contractor for procurement design | 2.31 | 8 |
| 7. | Use of subcontracting | 3.06 | 5 |
| 8. | Two stage tendering | 2.93 | 7 |

As the factor of 'risk at owner side' gets more priorities, the selection of route for procurement management tends towards the traditional side. Also the second rank to emphasise to design process and third to dependency on past experiences denotes the operation strategy of the procurement managers for the procurement managers. The remaining ratings are also of same importance to select the route.

The brief summary of survey data of 'factor affecting' and 'data required' for procurement management are given in table number 2 and 3 respectively.

Table -2: Aspects affecting procurement management

| II | Sub-question | Priority Rating out of 5 | Rank |
|----|--|--------------------------|------|
| 1. | Effect of location | 3.56 | 6 |
| 2. | Availability of equipment | 3.87 | 4 |
| 3. | Drawing sheet in time | 3.75 | 5 |
| 4. | Specifications of materials | 4.68 | 1 |
| 5. | Negotiation for cost & consistent quality | 4.56 | 2 |
| 6. | Inspection problems | 3.87 | 4 |
| 7. | Availability of the raw material | 4.31 | 3 |
| 8. | Resolve contractor grievances and claims against suppliers | 3 | 7 |

From the above results, it is clear that all sub-questions are equally important. The according to the ratings, specification of materials is more important. When aspects affecting procurement management are considered, specification of materials and negotiation for cost and consistent quality showed highest rank.

Table -3: Data required for procurement management

| III | Sub-question | Priority Rating out of 5 | Rank |
|-----|--|--------------------------|------|
| 1. | Planning | 4.75 | 1 |
| 2. | Scheduling | 4.43 | 3 |
| 3. | Estimation | 4.62 | 2 |
| 4. | Records of spend, receipt & inventory levels | 3.81 | 6 |
| 5. | ABC Analysis | 3.93 | 5 |
| 6. | Lead time analysis of each material | 4.12 | 4 |
| 7. | Waste Management | 4.62 | 2 |

In this case planning, estimation, scheduling and waste management showed highest responses with approximately same rating. Waste management is a new emerging aspect which must be considered while procurement of materials.

The sub-questions discussed below give the results for 'software for procurement management'.

Table -4: Software for procurement management

| IV | Sub-question | Priority Rating out of 5 | Rank |
|----|--------------------------------|--------------------------|------|
| 1. | Dependency on Software | 2.87 | 6 |
| 2. | ERP(SAP, Highrise) | 4.37 | 1 |
| 3. | MSP | 3.43 | 5 |
| 4. | Primavera | 2.12 | 7 |
| 5. | Certification of the employees | 3.87 | 3 |
| 6. | Efficiency of Software | 3.68 | 4 |
| 7. | Report generation | 3.93 | 2 |

As the user-friendliness of ERP is more compared to other software is more, they are having more importance according to some procurement managers.

The use of software in report generation gets the second rank as software plays a major in report generation. Basically report generation seems to be really tedious task and to carry it out very accurately is also generally takes a lot of time. Also owner requires an expertise in the software work.

Most of the firms are using ERP software. For planning 62% respondents gave preference to MSP as compared to 38% primavera. Primavera gets a bad response from the engineers.

The brief summary of survey data of 'effect on quality of project' and 'advanced methods' for procurement management are given in table number 5 and 6 respectively.

Table -5: Effect of procurement management on Quality of the project

| V | Sub-question | Priority Rating out of 5 | Rank |
|----|---|--------------------------|------|
| 1. | Consistency of quality concern from supplier | 4.62 | 1 |
| 2. | In-house quality check of the procured materials | 4.62 | 1 |
| 3. | Quality assurance during execution | 4 | 2 |
| 4. | Compromise on quality over cost and time of the project | 2.18 | 3 |

The sub question 'Compromise on quality over cost and time of the project' is with the lowest rating. In spite of this, it is more important than others. It directly tells us that the managers are always in the favor of the quality of the work and they are not ready to compromise over it by cost and period of the project.

In-house quality check of material and consistency of quality have shown more preferences.

Table -6: Advanced methods of procurement management

| VI | Sub-question | Priority Rating out of 5 | Rank |
|----|---|--------------------------|------|
| 1. | Problems in current method | 3.12 | 4 |
| 2. | Changes required for improvement of the method | 3.87 | 2 |
| 3. | Encouraging employees for innovation | 4 | 1 |
| 4. | Change in preceding activity for simultaneous project execution | 3.87 | 2 |
| 5. | Effect of type of construction | 3.18 | 3 |

Encouraging the employees will directly results into the increase in the overall productivity of the task. Actual innovation will come into picture if the manager level will encourage the employees.

The analysis from the data of survey for 'inventory management' is given in the table below:

Table -7: Inventory management

| VII | Inventory management | Priority Rating out of 5 | Rank |
|-----|------------------------|--------------------------|------|
| 1. | Inventory control | 4.25 | 2 |
| 2. | ABC Analysis | 4.18 | 3 |
| 3. | First come – first out | 4.56 | 1 |

First come - first out is the most preferred principal to follow the inventory management. Inventory control and ABC analysis are in the same way important.

VIII Expectations of Owner

In this case all the three points names quality, cost and duration appeared approximately same importance.

5. CONCLUSIONS

- To increase the efficiency of the construction project, the procurement of the materials for the project needs a strategic planning including a standard flow process and use of software.
- The result shows that at the current situation, procurement managers, project managers or construction engineers are still in the favor of the traditional approach therefore traditional method is effective considering all aspects.

- Planning, scheduling and estimation are the key departments which must provide the data for procurement management.
- The response shows that ERP and MSP are widely used for management. Primavera is also used by some firms but MSP is preferred by many firms rather than primavera.
- All the firms are cautious about the quality of the project and are not ready to compromise in it. After quality firms are proffering cost and then duration of the project.
- The principles like 'first come – first out' are also important for efficient procurement management.

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