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Analysis of Different Methods Followed in Procurement Process for Building Projects and Proposing an Effective Module for Adoption

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ABSTRACT: The study on procurement process depends on the various strategies available in the construction industry and also the factors depending on the process. Procurement process associated with the purchasing, stocking, and supply of materials required for a construction project, is analyzed in this work. A study on existing procurement models has helped to formulate a new module that is expected to resolve the drawbacks present. A study is being carried out for finding the various factors influencing the procurement process. Data collected is analyzed and a suitable module is proposed.

KEYWORDS: Procurement, Centralized model, Decentralized model

I. INTRODUCTION

All products require materials to be processed at different stages using different techniques to obtain finishing goods. Procurement of those materials will certainly influence the various aspects of a project. Massive projects or handling of multiple projects at a time makes procurement a complex process. Hence, it becomes an influential factor in terms of quality, time and cost.

Procurement process involves a series of activities like purchasing, transporting, stocking, and supply. A procurement model that suits the construction industry is a necessity which is identified in this study. This study is mainly concerned with the organizations that handle multiple building construction projects at various locations.

II. LITERATURE SURVEY

Abdul RasifRazak et al (2015) have studied the potentiality in integrating information technology in procurement process coordination and, proposed a conceptual framework for operational performance in the construction industry relating the human success factors, information technology and procurement process coordination. T PhaniMadhavi et al (2013) have proposed efficient material management through integration of RFID and PDA technologies as well as FIFO method with the inventory at the site level. Lixin Li et al (2012) has analyzed the significance of centralized and decentralized procurement models in the construction industry. The study has concluded that centralized model can reduce procurement cost. The study has also given guidelines to improve the efficiency of the centralized model. QuangdungTrang et al (2011) focused on the readiness level of construction enterprises in adopting e-procurement system. The study considered various governments, organizational and technological aspects which impact on the adaptation of the approach and a theoretical model has been developed for the purpose. Mark Beukers et al (2006) has constructed Procurement Alignment Framework on the pillars of procurement maturity, information technology and

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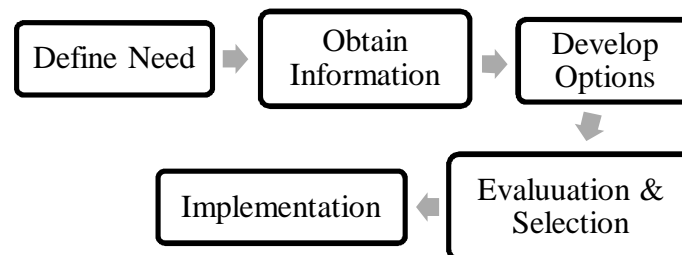
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procurement segmentation. Application of the model helped in improved assessment quality for procurement. KumponSubsomboon et al (2004) have developed FIAPP based system for procurement of materials. It has presented a fully automated material status monitoring system and a colour coding system for objects based on procurement status. The visualization model has been successfully implemented with case studies in New York. The model assists in the automatic generation of Bill of Materials, coordination between vendors and trades, facilitates status checks, and efficient communication between various stakeholders. S Thomas Ng et al (2002) identified nine criteria as crucial for procurement selection namely speed, time certainty, price certainty, complexity, flexibility, responsibility, quality level, risk allocation, and price competition. Luis F Alarcon et al (1999) has evaluated the Chilean construction industry and identified schedule pressure, cooperation and coordination with construction, high relative value, and potential criticality of supplies as the main aspects of procurement. Schedule delays and lack of specified quality have been found to be the main problems that occur in the procurement process. Hengwu Li et al (1999) have identified erratic information flow as the main problem that affects the efficiency of the procurement process. The study has suggested a conceptual approach towards modeling the procurement process of construction using Petri nets. F Caron et al (1998) have proposed a model for integrating procurement and construction processes on considering the delivery schedule and corresponding construction schedule. It calculates the safety lead time and safety stock in correspondence to the progressing activity schedule.

Since the procurement process is rather complex with the complexity of organization and projects undertaken, the study aims to consider all the factors, frameworks and technologies mentioned in the literature above to find out their significance, acceptance and suitability in the construction industry, respectively.

III. PILOT STUDY

Technical experts working in the construction field were interviewed and the literature study has provided an idea on the process involved in procurement. Procurement process in broad consideration involves basically five steps as follows;

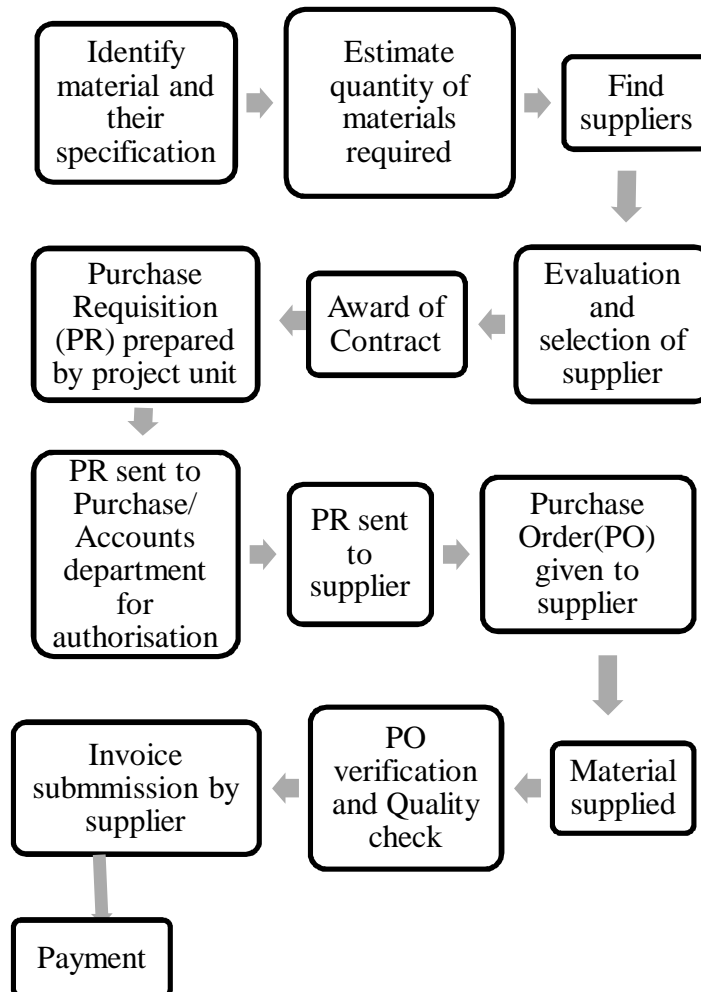


A standard sequential procurement process has been identified which are mentioned below;

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Questionnaire has been developed in order to find the various factors and trends involved in the procurement process with the help of experts.

IV. FACTORS INFLUENCING PROCUREMENT PROCESS

Study on the sequential procurement process followed by construction companies as well as site visits has helped in identifying various factors influencing the success of procurement. The questionnaire survey based on the aspects of time, cost, quality and administrative process variables has been done and weightage factors have been computed using SPSS statistics software tool to find the most influencing factors which are as follows;

- 1) Procurement decision-making responsibility– Decision-making in procurement by the top management or at the project unit level are influencing various aspects of procurement process especially time and cost. Clarity on the assigning responsibility for each stage of procurement brings in more accountability and control.
- 2) Guideline and procedure on procurement – A proper guideline and procedure on the procurement process ensures clarity, avoids delay and money wastage.

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- 3) Location of project site – Location of the project site and the distance of it from the source of material decide the mode of transportation. In cases of location across states will affect the vendor selection as well as speed and time.
- 4) Vendor selection – Selection of vendor varies with location, requirements, quality and cost. Certain companies depend on a single supplier for certain materials for all their projects to ensure uniformity, uniqueness and reduce cost.
- 5) Inventory management – Proper inventory management is necessary to ensure timely supply of materials, avoid obsolescence and theft, and avoid shortage cost.
- 6) Training and awareness on procurement – Companies have admitted that training and awareness regarding procurement have increased the efficiency of the procurement process in terms of time, quality and cost.
- 7) Logistics– Transportation of materials are handled by the company or supplier or a third party. Mode of transportation and handling of material while transportation affects the time, cost and quality of procurement.
- 8) Material Selection – Cost and quality are the basic factors influenced in the material selection process. Availability of material of optimum quality at a lesser price is the ultimate agenda of procurement. It is found that demand, quality, and government policy will increase the material cost eventually increasing the procurement cost.
- 9) Payment interval – Several payment options are followed in the industry such as payment at the supply of each batch, payment at regular intervals, payment at milestone achievement, payment at the end of the supply contract. Payment at regular intervals is found to be the most sought after.
- 10) Government policy – Increased tax and other duties on the elements involved in procurement seems to increase the procurement cost. Though occurrence possibility is less, the impact will be great.

V. PROCUREMENT MODELS

Based on extensive literature review and site visits, two basic procurement models have been identified - centralized model and decentralized model. Centralized procurement model is in which all the procurement activities are handled by the central head office while in decentralized model procurement decisions are handled by the project unit itself. After the identification of factors influencing procurement, their influence on the procurement models is analyzed through site visits for comparison to find out the merits and demerits of the models.

A. Centralized Procurement Model

i. Merits

- Discount rates–Centralized purchasing enables bulk quantity purchasing of materials needed for multiple sites attracting discount rates.
- Market fluctuation cause less impact – Centralized model helps to plan for storing of bulk quantity of required materials when price is low and this will save a significant amount spent for materials when price goes up.
- Accountability on project heads are relieved – Presence of a central procurement department to handle procurement functions reduces the workload of the project unit heads.
- Availability of specialized skill – Specialized skill necessary for carrying out procurement functions can be developed for the employees through training or be recruited.
- Good relation with suppliers –Continuous interaction with the top management, as well as procurement done for a long period with a supplier, helps in establishing a very good relation with the vendor.
- Availability of standard procedure –Presence of a standard procedure for procurement ensures quality, and avoids delays and confusion.
- Inter-project adjustments possible –Allocation of materials to a required site during shortage from another site is possible for economical advantage.
- Better control and planning – It is easy to plan and control in this model as well as ensures better accountability.

ii. Demerits

- Project specific requirement mismatch – Material requirement for different projects varies which may increase the complexity and create confusion.

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- Time delay – Ordering and lead time increases with this model which eventually increases the total procurement time.
- Affects employee morale – Since the decision-making power for procurement is not under the authority of project unit employees, it will adversely affect their leadership and morale.
- Unable to tap local resources – Materials that meets the quality and cost expectations of the company may be available at the local market about which the company may not be aware and act accordingly especially in cases of meeting the scheduled completion time as it is comparatively more time consuming.
- Increased cost –Setting up of a department exclusively for procurement and maintaining it is an additional expenditure for the company.

B. Decentralized Procurement Model

i. Merits

- Reduces burden on top management –Decentralized model eases the burden of handling procurement functions for the top management. Handling varied procurement requirements of multiple sites can result in confusion and delays and this model avoids it.
- Facilitates diversification –Identification andutilization of local and diversified resources can be easily done.
- Provide product or market emphasis –In the case of a material becomes obsolete due to the introduction of new technologies or change in customer specifications, decentralization will help to act accordingly without many complications.
- Executive development and motivation – Local managers are given more degree of authority and power which develops their leadership quality bringing in accountability which provides motivation and also integration of employees at bottom management level as they are involved in decision-making process.
- Quick and better decision making –Decentralization brings in the quick decision making of procuring materials especially in the case of emergency situations like meeting the completion deadline. Better decision making based on the characteristics of the project, location, social factors, etc...is also possible.

ii. Demerits

- Unable to follow uniform policies –Under decentralization, it is not possible to follow uniform policies or standard procedure for procurement. Policies have to be framed at unit level as per project requirements which will be unique for each project and manpower handling the procurement functions.
- Lack of coordination – Procurement policies followed at the project unit level may clash with the interests of the company as a whole and affects planning of activities.
- More financial burden – As there will be the absence of discount on bulk purchases and exchange of materials between various units is not possible, there is a probability of more cost involved.
- Less control –Supervision and control of procurement is comparatively less in this model and chances of misappropriation are more.

Most of the construction companies have been found to be using the centralized procurement model. Since both the models have their advantages and disadvantages, formulation of a hybrid model will be beneficial in increasing the value of procurement.

VI. DISCUSSION

Considering the weightage of the factors identified to be influencing procurement process decision making and inventory management have to be given more priority from the initial stage of procurement planning. ABC classification is found to be the most preferred inventory control method in the construction industry during the questionnaire survey. A Class items which have a high frequency of consumption in centralized model provides better monitoring while decentralized model reduces lead time and increases flexibility. B class items used by the company for all their projects were found to be similar.Segmented procurement of items at centralized and decentralized level may prove to be useful. Use of integrated procurement management software can bring in the networked management of procurement functions and brings in better control. It enables the project units to take the decision but controlled by the Centre or the intermediary node. FIFO (First In First Out) is the best store management technique suitable to avoid

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obsolescence. Supplier evaluation and rating shall Lead time and safety stock level have a significant impact on the procurement process.

A module is proposed hereafter analyzing the factors as well as characteristics of centralized and decentralized models;

- 1) Identification of material and their specification including quality standards are set by the Centre which is the primary node.
- 2) Detailed estimation of the quantity of materials required is also done at Centre. Demand forecasting of materials needed is also done as per activity schedule prepared for each subactivity.
- 3) The fund is allocated to the project unit for A class items after cost forecasting for till the end date of schedule.
- 4) Maximum number of suppliers for A class items shall be found from the project unit location and nearby areas by the tertiary node, i.e. project unit.
- 5) Suppliers are selected as per company policies and supply contract is awarded. Standby supply source is made in the case of emergencies. These functions are to be carried out by the tertiary node under the guidance of primary and secondary nodes.
- 6) Procurement of B class items done directly by the Centre coupled with centralized storage enables bulk purchasing for multiple projects inviting discounts.
- 7) Procurement of C class items, which are required but have low usage value, are to be carried out by secondary node (which handles multiple projects of a particular area and act as a coordinating node). The fund is allocated by the Centre on Purchase Requisition (PR) of the node, made on the basis of long-term requirement for multiple projects that come under the node.
- 8) PR for A class items are made by the project unit, after fixing the lead time and safety stock level, and sent to purchase department of the unit which is then sent to the supplier with the approval of primary node.
- 9) On the acceptance of PR by the supplier Purchase Order (PO) is placed after which material is supplied to the unit.
- 10) Quantity and quality check is necessary for each batch of A class items since it has the highest usage value.
- 11) Invoice submitted by the supplier is verified with the PO and material is accepted.
- 12) Payment shall be made per batch through cheque or bank transfer.

Suggestions to implement the module efficiently are;

- Integration of procurement activity records of all the nodes with procurement management software helps in strict monitoring and control as well as guidance for efficient decision making.
- Use of electronic media for procurement communication and functions like PO and PR approval reduces procurement time.
- Controlled decision making authority for procurement at lower management level reduces lead time and brings in more accountability thus increasing leadership skills, but at the same time improves monitoring.
- Periodic physical verification of stock with records is needed.
- be done by the Centre and steps to improve the relationship with them shall be taken.

VII. CONCLUSION

Procurement strategy is unique for every building project in the construction industry. The module proposed here is a mere attempt to standardize the process considering all the aspects of the procurement process. It is a networked model involving both the features of centralized and decentralized models. Validation of the module is needed to assess its efficiency and drawbacks.

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