

# Analysis of parameters affecting material procurement in construction industry

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**Abstract** - This paper is written to show the issue in material procurement management system in construction projects. In the construction industry to manage a productive and cost effective site, efficient material management is very essential. An important factor that affects the performance of construction projects is the improper handling of materials during site activities. This effort to analyze factors affecting materials procurement in construction industry. The methodology was applied to study factors affecting materials procurement process in the four stages plan, conduct, administration and close projects. The information gathered the literature, structural interview and pilot study.

**Keywords** - construction industry, materials, procurement management, problems

## I. INTRODUCTION

Procurement is the acquisition of goods or services at the best ownership cost, in the right quantity and quality, at the right time and place for the organization. Various problems are present in the material procurement during every stage of the project life and the reasons of these problems are presented material procurement management system of the contracting organizations. Materials represent a major expense in construction, so minimizing procurement costs improves opportunities for reducing the overall project costs. Procurement planning determines whether to procure, what to procure, how to procure, when to procure, etc. Procurement management involves planning, soliciting sources, choosing a source, administering the contract, and closing out the contract. Hence, the efficient use and management of material have an important influence on a company's profit and can avoid delay in construction.

## II. OBJECTIVES OF MATERIALS PROCUREMENT MANAGEMENT

- The Objectives of material procurement are stated as buying the best item at right Quality, Quantity, Time and Cost
- To purchase at the lowest possible cost consistent with quality and service requirements
- To maintain continuity to ensure that scheduled activities are not interrupted

## III. METHODOLOGY

The methodology was based on the literature review, casual interviews, surveys, and the analysis of information sources. The study of cases was focused on going commercial building construction projects from which it was possible to obtain specific information regarding the Material procurement process. Identification of the Major problem involved in the material procurement management systems carried out through different literature case studies, case studies and study of Material Procurement management Process processed for the base building construction and the interior fit out of commercial building projects. From the information gathered from structural interviews, pilot study, and questionnaire survey and from a literature, improved strategies were obtained and a proper strategic approach to the material Procurement management process was proposed for the commercial building projects.

## IV. QUESTIONNAIRE SURVEY

### Importance Index (IMPI.) Method

Importance Index Method helps to determine the relative importance of the various factors as a function of severity & frequency of their occurrence.

### Frequency Index (F.I.):

A formula is used to rank risk event based on frequency of occurrence as identified by the participants.

$$\text{Frequency Index (F.I.) (\%)} = \frac{\sum a_n / N \times 100}{4}$$

Where,

a = constant expressing weighting given to each response (ranges from 1 for rarely up to 4 for always),

n = frequency of the responses,

N = total number of responses.

### Severity Index (S.I.):

A formula is used to rank risk event based on severity as indicated by the participants.

$$\text{Severity Index (S.I.) (\%)} = \frac{\sum a_n / N \times 100}{4}$$

Where,

a = constant expressing weighting given to each response (ranges from 1 for little up to 4 for severe),

n = frequency of the responses,

N = total number of responses.

#### Importance Index (IMP.I.):

The importance index of each event is calculated as a function of both frequency and severity indices, as follows:

$$\text{Importance Index (IMP.I.) (\%)} = [F.I. (\%) \times S.I. (\%)]/100$$

## V. RESULT AND CONCLUSION

After structural interviews, pilot study and literature review we get 38 factors in four stages of material procurement management as per contractors, engineers, architects and developers.

The various factors affecting the Material procurement management are:

Table 1:- Factors affecting the Material procurement management

Sr. No.	FACTORS
<b>Factors related to Plan Procurement</b>	
A1	Material procured without planning
A2	Schedule is not planned before starting the project
A3	Undefined Scope/ Clarity of Scope
A4	Improper specification
A5	Degree of project complexity
A6	Quality level of project
A7	Time constrains
A8	Financial risk
A9	Resource availability/lack of resource
A10	Type of procurement system
A11	Project type & nature
A12	Forecasting of materials price in market
<b>Factors related to Conduct Procurement</b>	
B1	Delay in approval
B2	Delivery time schedule
B3	Price competition
B4	Uncontrollable bid list
B5	Non competent vendor selected
B6	Vendor satisfaction
B7	Socio cultural suitability
B8	Incompetent material supplier are selected for project
B9	Delay in issue of purchase order
B10	Client reputation
B11	Materials transportation cost
<b>Factors related to Administer Procurement</b>	
C1	Flexibility for changes
C2	Lack of coordination between prime contractor and supplier
C3	Rejection of material due to non compliance to the specification
C4	Over ordering of construction materials
C5	Client's specific requirement
C6	Compliance with safety procedure
C7	Too many variation
C8	Political issue/Transport strike
C9	Material shortage or late delivery
C10	Scarcity of materials in market
<b>Factors related to Close Procurement</b>	
D1	Prompt honoring of payment certificates
D2	Disputes between parties to the contract
D3	Variation between contract sum and final account
D4	Payment method of project
D5	Complaints of other parties to the contract

#### Overall Ranking by IMPI Method

The importance index is computed for each cause to identify the most Crucial factors. The factors are ranked based on IMPI values. From the ranking assigned to each factor of procurement, it is possible to identify the most important factor of material procurement in construction industry.

Table 5.1 Overall FI

no	FACTORS	TOTAL FI
	PLAN PROCUREMENT	
1	Material procured without planning	70.78
2	Schedule is not planned before starting the project	67.5
3	Undefined Scope/ Clarity of Scope	41.4
4	Improper specification	44.69
5	Degree of project complexity	68.44
6	Project type & nature	40.47
7	Quality level of project	39.06
8	Type of Procurement system	67.03
9	Time constrains	44.21
10	Financial risk	40.15
11	Resource availability/lack of resource	40.47
12	Forecasting of materials price in market	69.53
	CONDUCT PROCUREMENT	
13	Delay in approval	66.71
14	Price competition	68.75
15	Incompetent material supplier are selected for project	39.38
16	Delivery time schedule	38.9
17	Uncontrollable bid list	42.03
18	Non competent vendor selected	37.96
19	Vendor satisfaction	41.4
20	Socio cultural suitability	40.62
21	Delay in issue of purchase order	68.75
22	Client reputation	41.56
23	Materials transportation cost	41.72
	ADMINISTRATION PROCUREMENT	
24	Flexibility for changes	73.44
25	Lack of coordination between prime contractor and supplier	68.75
26	Rejection of material due to non compliance to the specification	39.37
27	Too many variation	65.78
28	Over ordering of construction materials	40.31
29	Political issue/Transport strike	69.53
30	Material shortage or late delivery	40.78
31	Client's specific requirement	42.18
32	Compliance with safety procedure	37.97
	CLOSE PROCUREMENT	
33	Scarcity of materials in market	41.4
34	Prompt honoring of payment certificates	61.4
35	Disputes between parties to the contract	37.34
36	Variation between contract sum and final account	36.43
37	Payment method of project	42.96
38	Complaints of other parties to the contract	40.78

Table 5.2 Overall SI

no	FACTORS	TOTAL SI
	PLAN PROCUREMENT	
1	Material procured without planning	71.88
2	Schedule is not planned before starting the project	71.25
3	Undefined Scope/ Clarity of Scope	40.94
4	Improper specification	42.97
5	Degree of project complexity	69.38
6	Project type & nature	40.31
7	Quality level of project	39.21
8	Type of Procurement system	67.03
9	Time constrains	43.9
10	Financial risk	42.5
11	Resource availability/lack of resource	42.66
12	Forecasting of materials price in market	70.63
	CONDUCT PROCUREMENT	

13	Delay in approval	68.44
14	Price competition	69.84
15	Incompetent material supplier are selected for project	37.65
16	Delivery time schedule	37.63
17	Uncontrollable bid list	39.06
18	Non competent vendor selected	36.4
19	Vendor satisfaction	37.65
20	Socio cultural suitability	40.62
21	Delay in issue of purchase order	69.68
22	Client reputation	38.28
23	Materials transportation cost	42.5
	ADMINISTER PROCUREMENT	
24	Flexibility for changes	74.06
25	Lake of coordination between prime contractor and supplier	72.96
26	Rejection of material due to non compliance to the specification	38.125
27	Too many variation	67.5
28	Over ordering of construction materials	38.37
29	Political issue/Transport strike	75.63
30	Material shortage or late delivery	40.93
31	Client's specific requirement	37.18
32	Compliance with safety procedure	38.9
33	Scarcity of materials in market	37.34
	CLOSE PROCUREMENT	
34	Prompt honoring of payment certificates	63.12
35	Disputes between parties to the contract	40.78
36	Variation between contract sum and final account	68.9
37	Payment method of project	42.65
38	Complaints of other parties to the contract	40.31

Table 5.3 Overall Ranking by IMPI Method

RANK	FACTORS	IMPI
1	Flexibility for changes	54.38
2	Political issue/Transport strike	52.58
3	Material procured without planning	50.87
4	Lake of coordination between prime contractor and supplier	50.16
5	Forecasting of materials price in market	49.1
6	Degree of project complexity	48.17
7	Schedule is not planned before starting the project	48.09
8	Price competition	48.01
9	Delay in issue of purchase order	47.9
10	Delay in approval	45.65
11	Type of Procurement system	44.93
12	Too many variation	44.4
13	Prompt honoring of payment certificates	38.76
14	Variation between contract sum and final account	25.1
15	Time constrains	19.4
16	Improper specification	19.2
17	Payment method of project	18.45
18	Materials transportation cost	17.73
19	Resource availability/lack of resource	17.26
20	Financial risk	17.06
21	Undefined Scope/ Clarity of Scope	16.94
22	Material shortage or late delivery	16.69
23	Socio cultural suitability	16.49
24	Complaints of other parties to the contract	16.43
25	Uncontrollable bid list	16.41
26	Project type & nature	16.31
27	Client reputation	15.9
28	Client's specific requirement	15.68
29	Vendor satisfaction	15.58
30	Over ordering of construction materials	15.46

31	Scarcity of materials in market	15.45
32	Quality level of project	15.31
33	Disputes between parties to the contract	15.22
34	Rejection of material due to non compliance to the specification	15
35	Incompetent material supplier are selected for project	14.82
36	Compliance with safety procedure	14.77
37	Delivery time schedule	14.63
38	Non competent vendor selected	13.81

Table 5.4: Top 10 factors important index (IMPI) techniques

RANK	FACTORS	IMPI
1	Flexibility for changes	54.38
2	Political issue/Transport strike	52.58
3	Material procured without planning	50.87
4	Lake of coordination between prime contractor and supplier	50.16
5	Forecasting of materials price in market	49.1
6	Degree of project complexity	48.17
7	Schedule is not planned before starting the project	48.09
8	Price competition	48.01
9	Delay in issue of purchase order	47.9
10	Delay in approval	45.65

Table 4.5 Phase ranked by Important Index (IMPI) techniques

No	FACTORS	IMPI	RANK
<b>PLAN PROCUREMENT</b>			
1	Material procured without planning	50.87	1
2	Schedule is not planned before starting the project	48.09	
3	Undefined Scope/ Clarity of Scope	16.94	
4	Improper specification	19.2	
5	Degree of project complexity	48.17	
6	Project type & nature	16.31	
7	Quality level of project	15.31	
8	Type of Procurement system	44.93	
9	Time constrains	19.4	
10	Financial risk	17.06	
11	Resource availability/lack of resource	17.26	
12	Forecasting of materials price in market	49.1	
	AVERAGE	30.22	
<b>CONDUCT PROCUREMENT</b>			
			3
13	Delay in approval	45.65	
14	Price competition	48.01	
15	Incompetent material supplier are selected for project	14.82	
16	Delivery time schedule	14.63	
17	Uncontrollable bid list	16.41	
18	Non competent vendor selected	13.81	
19	Vendor satisfaction	15.58	
20	Socio cultural suitability	16.49	
21	Delay in issue of purchase order	47.9	
22	Client reputation	15.9	
23	Materials transportation cost	17.73	
	AVERAGE	24.27	
<b>ADMINISTRATION PROCUREMENT</b>			
			2
24	Flexibility for changes	54.38	
25	Lake of coordination between prime contractor and supplier	50.16	
26	Rejection of material due to non compliance to the specification	15	
27	Too many variation	44.4	
28	Over ordering of construction materials	15.46	
29	Political issue/Transport strike	52.58	
30	Material shortage or late delivery	16.69	
31	Client's specific requirement	15.68	
32	Compliance with safety procedure	14.77	



33	Scarcity of materials in market	15.45	
	AVERAGE	29.45	
	<b>COLOSE PROCUREMENT</b>		<b>RANK</b>
34	Prompt honoring of payment certificates	38.76	4
35	Disputes between parties to the contract	15.22	
36	Variation between contract sum and final account	25.1	
37	Payment method of project	18.45	
38	Complaints of other parties to the contract	16.43	
	AVERAGE	22.79	

Table 5.6 : Overall Ranking by IMPI Methods

CONSTRUCTION PHASES	IMPI	RANK
Plan phase	30.22	<b>1</b>
Administration phase	29.45	<b>2</b>
Conduct phase	24.27	<b>3</b>
Close phase	22.79	<b>4</b>

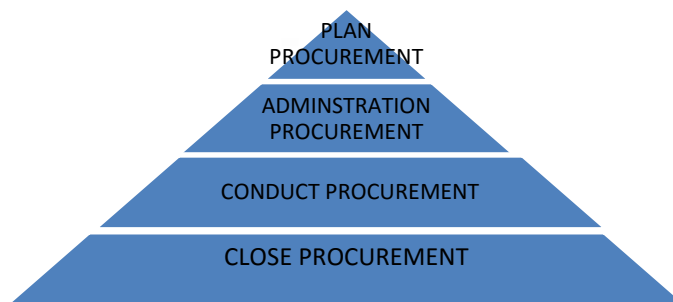


Figure 5.2: Pyramid showing descending order or Ranking of Group of Phases

## VI. RECOMMENDATION FOR FURTHER RESEARCH

Find out the most important factors that are affecting materials procurement management by other methods and comparing factors by different methods, developing effective framework for affected problems and their mitigating measures.

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