

ASSESSMENT OF ROLE OF MATERIAL MANAGEMENT IN CONSTRUCTION PROJECTS

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Abstract – Material management, is the management procedure including planning and controlling necessary actions to make certain that the right quality and quantity of materials as well as equipment are specified in a timely manner and are obtained at a reasonable cost and are made available when needed. In construction industries, materials management is a major target area where considerable improvements can be made. Materials constitute over 60-70% of the overall cost of a construction project, hence it is required to make certain that the materials are utilized in the most effective manner such that the material wastage and late ordering are minimised and avoided in order to keep construction costs down, especially in today's competitive market. This research aims to assess the role of material management in construction projects, to find out the various factors affecting material management. A regression model for effective material management in construction projects is also presented.

Key Words: Material Management, Construction Projects, Material Wastage, Effective Material Management, Regression Model.

1. INTRODUCTION

Material management is a management tool which controls the planning, scheduling and acquiring of materials that are required for the successful accomplishment of a project, ie it is a process of planning and controlling the flow of materials within a project. Material management make sure that it is able to buy materials at a reasonable price at required quality and quantity. It aims at utilising the materials at the most effective manner, thereby minimising the material wastage. It helps to produce the final product such that it will be successful in the market. Thus the activities in material management spans from the acquirement of raw materials to the final dispatch of the product.

1.1 Objectives of Material Management

The following are the key objectives of material management in construction projects.

- 1) Support the operational requirements.
- 2) Manage the material process efficiently and effectively.

- 3) Select, develop and maintain supply source.
- 4) Support organizational goals.
- 5) Develop strong relationship with other groups.
- 6) Develop he integrated master plans that support organizational goals.

The fundamental aspect of material management is to plan acquirement and govern the conveyance of materials assuring no wastage of materials. The technique of effective material management determines when and how much a quantity of materials are requisite as well as directs how to use the materials efficiently.

1.2 Role Of Material Management

An effective material management system can bring many benefits for a construction industry. Among these benefits are:

- 1) Reducing the overall cost of materials.
- 2) Better handling of materials.
- 3) Reduction in duplicated orders.
- 4) Materials will be available on site when needed.
- 5) Improves labour productivity.
- 6) Improvements in project schedule.
- 7) Quality Control.
- 8) Better field material control.
- 9) Better relation with suppliers.
- 10) Reduce material surplus.
- 11) Results in effective storage of materials on site.
- 12) Stock Reduction.
- 13) Purchase savings
- 14) Better cash flow management.
- 15) Stock Reduction.

2. RESEARCH METHODOLOGY

The objective of this research is to investigate the role and analyse the factors affecting material management practices of construction projects in the northern regions of Kerala, India so that ways of improving them may be formulated. In order to determine the factors affecting material management, a questionnaire survey has been conducted.

The survey was conducted by direct interview method.

2.1 Formulation of Questionnaire

The questionnaire was formulated to allow the goals of the research to be best achieved. In order to fulfill the

requirements laid down in objective of the research the questionnaire was divided into three sections.

1. **Background Information:** This section was further divided into two sub divisions, one for collecting the factual information concerning the name of the organization and the field of work they were active in. Other was to gather the data about the interviewee regarding their role in the project, experience, type of projects involved etc.
2. **Data Collection:** This final section dealt with the discussions with experts from various firms regarding the problems in material management tasks and technologies needed to manage materials better.
3. **Ranking of Factors:** This section consists of 10 main factors affecting material management which were identified based on the data available from different journals on material management in construction projects .Based on the Likert’s Scale, the respondents were asked to choose any of the 5 ordinal measures according to the level of importance.

2.2 Selection of Firms

The questionnaire survey was conducted among construction companies in the Northern regions of Kerala. A total of 24 companies were selected for the questionnaire survey. Out of these 13 firms were large industries and 8 no’s of medium size industries. Rest of the firms were small industries.

3. DATA ANALYSIS AND FINDINGS

This section of the paper analyses the results of the survey and draws the conclusions which establish the ranking of factors affecting material management. Data collected from 90 respondents were analysed from different construction firms. The responses received were relatively balanced with 32% of Site engineers, 25.56% of project engineers, 17.78% of contractors, 13.33 % of store managers, 7.78% of supervisors, and 3.34% of design coordinators. A from building and 12 from civil contractors. Most of the building contractors are involved with commercial contracts. The civil contractors are involved in road constructions and other works.

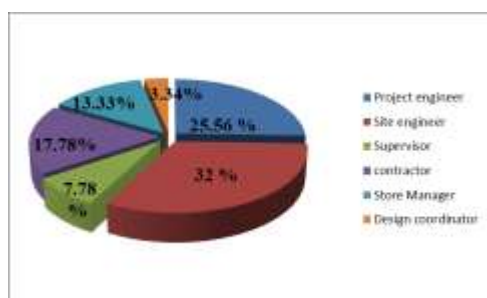


Chart -1: Respondents Position Details

The data gathered was manually analysed by the RII method by which a numerical figure for each factor is obtained ,known as its Relative Importance index. The Relative Importance (RII) index is used to rank the factors. Total 64 factors were analyzed using RII Method and ranked as shown in Table 1.

Table -1: Ranking of Factors

Name	RII	Rank
Training staff on instructions about handling the materials	0.88	1
Forecasting the market price	0.86	2
Poor communication between supplier and purchase	0.83	3
Waste in construction sites	0.83	3
Networks line of balance	0.82	4
Using excessive quantities of materials	0.82	4
Seasonal problems	0.81	5
Non Standard specification	0.80	6
Ensuring scientific record keeping	0.76	7
Level of Design complexity	0.75	8
Recycle damaged components	0.73	9
Theft	0.73	9
Unclear design detailing	0.73	9
Mode of placing orders	0.73	9
No adequate storage space	0.73	9
Damage occurring at stores	0.73	9
Undefined Scope	0.72	10

Name	RII	Rank
Damaged materials delivered	0.71	11
In complete proposals	0.70	12
Shortage of skilled and unskilled labors	0.70	12
Bar chart	0.70	12
Unavailability of material in the market	0.69	13
Implementing defect tracking mechanism	0.69	13
Changes in design by the owner	0.68	14
Inefficient workforce	0.68	14
Incorrect Type of materials delivered	0.68	14
Lack of security personnel	0.68	14
Lack of care in transportation of materials	0.68	14
Minimizing double handling	0.68	14
Labor strikes	0.67	15
Scarp disposal	0.67	16
Not determining when and what materials are needed	0.66	17
Too many suppliers to qualify	0.66	17
Poor communication	0.66	17
Improper site management practices	0.66	17
Technological Obsolescence	0.66	17
Loss of materials	0.66	17
Others	0.66	17
Inaccurate material specification	0.65	18
Daily recording of using materials in the project	0.65	18
Coordination of team work	0.65	18
Inefficient utilization of materials	0.65	18
Over ordering of material	0.65	18
No supplier quality assurance	0.64	19
Reporting the problem (wastage, defect etc.)	0.64	20

Name	RII	Rank
Material requirement planning technique used	0.64	20
Late delivery	0.63	21
Keeping track of materials	0.63	21
Cutting of material	0.63	21
Wastage control Techniques	0.63	21
Frequency of on site material check	0.63	21
Weather conditions	0.63	21
Non Availability of material	0.62	22
Incorrect size of materials delivered	0.61	23
Incorrect quantity delivered	0.61	23
Use of incorrect material	0.61	23
ABC analysis	0.61	23
EOQ analysis	0.61	23
Change in BOQ	0.61	23
Damage due to weather	0.59	24
Corrosion	0.57	25
Lack of design team experience	0.55	26
Time taken to investigate and qualify the suppliers	0.55	27
Previous experience with the supplier	0.55	27
Poor communication between purchase and finance department	0.53	28
Inflation	0.53	29

Relative Importance Index (RII) was used to derive the relative significance and ranking of the factors found.

$$RII = \sum W / (A * N)$$

where,

W= Weighting given to each factor by the respondents

A= The highest weight (ie, 5 in this case)

N= The total number of respondents.(ie, 90 in this case).

The RII ranges from 0 to 1 , higher the value more important the factor is.

The above listed factors can be categorized into ten main groups, namely:

- 1) Design Related Factors
- 2) Material Planning & Scheduling Factors
- 3) Factors Related To Vendor Selection
- 4) Labor Related Factors
- 5) Procurement Problems
- 6) Factors At Construction Site
- 7) Store Management
- 8) Waste Management
- 9) Techniques Used In Material Management
- 10) General Factors

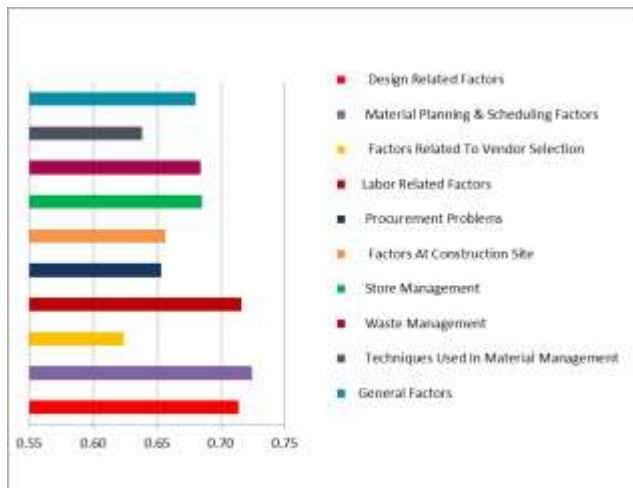


Chart -1: Main Factors Effecting Material Management Versus RII Value

Labor Related factors and material Planning and scheduling are found to be the most influential groups of factors for effective material management in construction projects. Then comes the design related factors, followed by Store Management, Waste Management, General Factors, Factors At Construction Site, Procurement Problems, Techniques Used In Material Management and finally Factors Related To Vendor Selection.

3.1 Regression Model

The arranged factors was then analyzed based on statistical tool , multiple regression analysis. . The regression analysis was done using SPSS Software (Statistical Package for Social Sciences). A number of regression models were obtained, five of these are shown in the figure (1).

It is clear from the above tables that the factor which mostly effect the effective material management in construction industries is “training of staffs about the right handling of materials within the site”. The forecasting the market price for the required materials is also found to be important for the effective material management. Construction Waste management, poor communication between suppliers, design complexities, technologies used for material management etc. plays a crucial role in the effective material management in construction.

Model	Unstandardized Coefficients	Standardized Coefficients	Coefficients ^a																	
			B	Std. Error	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF	Partial	Part								
1	(Constant)		4.846	.439	10.993	.000	3.969	5.894												
			.187	.043	4.348	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
2	(Constant)		4.888	.439	11.136	.000	4.000	5.796												
			.187	.043	4.348	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
			.192	.043	4.442	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
3	(Constant)		4.915	.439	11.199	.000	4.026	5.788												
			.187	.043	4.348	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
			.198	.043	4.579	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
			.193	.043	4.470	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
4	(Constant)		4.911	.439	11.189	.000	4.044	5.779												
			.187	.043	4.348	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
			.198	.043	4.579	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
			.193	.043	4.470	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
5	(Constant)		4.913	.439	11.192	.000	4.040	5.781												
			.187	.043	4.348	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
			.198	.043	4.579	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					
			.193	.043	4.470	.000	1.043	.083	-.732	-.156	-.310	-.118	.100	1.000	1.000					

Fig-1: Regression model coefficients

4. CONCLUSION

The Construction sector is responsible for the social and economic growth of the society. Material management is of the major challenges for the industry since it effects the overall cost of the project. A questionnaire based survey was used to judge the attitude of Contractors, Project Engineers, Store In charge and Site Supervisors towards factors affecting Material Management of construction firms in Northern Regions of Kerala. The firms chosen consist of both private and public sector. Majority of the firms chosen were large industries coming under the category of Private sector. About 90 respondents were interviewed. Out of these were 29 no of Site engineers, 23 no’s of Project Engineer 16 no’s of Contractors, 7 no’s of Supervisors, 12 no’s of Store managers, 3 no’s of design coordinators. The respondents were requested to indicate the level of importance of each of the 67 factors of Material management as critically important, Very important, Important, Fairly important, No effect at all. Results indicated that the most important factor affecting Material management of construction firms are Adequate training provided for staffs regarding how to effectively handle the materials, Poor quality of materials, Unclear and in adequate details in drawings, Material management technics used, technological obsolescence, Forecasting of market price, errors in design documents, poor waste management in construction site, Poor communication,

REFERENCES

- [1] A. A. Gulghane, Prof P. V. Khandve, “Management for Construction Materials and Control of Construction Waste in Construction Industry: A Review”, Int. Journal of Engineering Research and Applications, Vol. 5, Issue 4 (Part -1), April2015, pp.59-64.
- [2] Ashwini R. Patil, Smita V. Pataskar, “Analyzing Material Management Techniques on Construction Project”,International Journal of Engineering and

- Innovative Technology, Vol. 3, Issue 4, October 2013, pp. 96-10
- [3] Vikram Kulkarni and Rohit Sharma, (2017) Factors Affecting Material Management on Construction Site, International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 01, Jan -2017
- [4] P. Ezhilmathi and Dr.T. Shanmugapriya, (2016) Study on Material Management–An Art Of Review, International Research Journal of Engineering and Technology (IRJET), Volume: 03 Issue: 11, Nov -2016.
- [5] Hemishkumar Patel and Dr. Jayeshkumar Pitroda, (2015) Analysis Of Factor Affecting Material Management And Inventory Management : Survey,.International Conference on: “Engineering: Issues, opportunities and Challenges for Development, ISBN: 978-81-929339-1-7
- [6] Pauline Jeruto Keitany and Daniel M. Wanyoike, (2014), Assessment Of The Role Of Materials Management On Organizational Performance- A Case Of New Kenya Cooperative Creameries Limited, Eldoret Kenya, European Journal of Material Sciences Vol.1, No.1, pp.1-10, March 2014.
- [7] K.Harish, (2014) A Study of Materials Management in Existing Constructions at Coimbatore, Global Journal of Engineering Science And Researches May 2014.
- [8] Carlos H. Caldas, Cindy L. Menches and Pedro M. Reyes, (2014),Materials Management Practices In The Construction Industry, Journal of Practice Periodical on Structural Design and Construction, July 2014.
- [9] P. Lenin and L. Krishnaraj, (2014), Analysis of Improper Material Management Affecting Cost in Construction Projects, International
- [10] Journal For Research In Applied Science and Engineering Technology (IJRASET), Vol. 2 Issue V, May 2014.
- [11] Nann Lwin Phu and Aye Mya Cho, (2014) Factors Affecting Material Management in Building Construction Projects, International Journal of Scientific Engineering and Technology Research, Vol.03, Issue.10 May- 2014.
- [12] Okorocho, K.A., Factors Affecting Effective Materials Management in Building Construction Projects – A Case Study of Selected Building Sites, in Imo State, Nigeria (April 10, 2013). International Journal of Management Sciences and Business Research, Volume 2, Issue 4, 2013 .Available at SSRN: <https://ssrn.com/abstract=2711179>
- [13] Dr. Kevin Aku Okorocho, (2013) Evaluation Of Materials Management Strategies In The Nigerian Construction Industry, International Journal of Management Sciences and Business Research, Vol. 2, Issue 3, 2013.
- [14] Shehu Z., Holt G.D., Endut I.R., Akintoye A.,Analysis of characteristics affecting completion timefor Malaysian construction projects, Built Environ-ment Project and Asset Management, 5, 1, 52–68,2015.
- [15] T. Phani Madhavi and Steve Varghese Mathew,(2013), Material Management In Construction – A Case Study, International Journal of Research in Engineering and Technology, Nov 2013.
- [16] Vaisakh P.S., Dileepal J. and Narayanan Unni, “Inventory Management of Spare Parts by Combined FSN and VED (CFSNVED) Analysis”, International Journal of Engineering and Innovative Technology, Volume-2 Issue-7, January 2013, 2277-375Vanita Ahuja, Jay Yang, Ravi Shankar (2009) Study of ICT adoption for building project management in the Indian construction industry.