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Analysis of Materials Management Systems in Construction Related Industries

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Abstract - *Materials are one the most important resources in all industries and particularly in construction related industries. For this resource, a proper management system is very much necessary. Due to uncertainties involved in construction related industries, it may prove to be difficult to set up a rigid proper materials management system. Continuous update should be there as per the need of the project. In this study, with the help of questionnaire survey, responses are collected for various facts and aspects related to current materials management from construction industry related firms. The materials management system is analyzed and the results are discussed.*

***Key Words*: Materials management, survey, importance, effects, problems, possible improvements**

1. INTRODUCTION

Materials management is one of the vital aspects in all types of industries like manufacturing, service and combined industry like Construction industry. Man, Money, Machinery, Time and Materials are the main resources that are required for the setup and working of that industry. In these resources, material is the resource which is very important in all aspects like economical, usage, quality, etc. So materials management is an important aspect to be done for taking care of overall progress of the project and of the overall industry. As per the surveys and studies, about 60% or more than that of the entire economy of the project or industry is installed in to materials resource. And overall economy, quality, customer satisfaction, satisfaction and profit to the firm is also dependent on materials and hence materials management is important. With the help of questionnaire survey from construction related firms, importance, aspects of materials management are studied

1.1 Definition, concept of materials management

As per a comprehensive guide on materials management, Materials management is defined as function responsible for co-ordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner so as to provide a pre-decided service to the customer at minimum cost.

Basically the overall focus of materials management is on achieving the increased productivity and reduction in large amount of capital locked up for long periods in the form of inventories. More caution is made on achieving economy of the project regarding materials without hampering the flow of materials at and whenever required.

To perform materials management effectively, it is better to have one separate department within an industry which has a responsibility for coordinating the various activities concerned with material management and it should be looked after by a materials manager having the status of senior department head and reporting directly to the chief executive.

2. LITERATURE REVIEW

Dardouri Safa, et. al. [1] have have explained about implementation of Radio-Frequency Identification (RFID) systems in materials management on construction site. A prototype of onsite inventory, material tracking and managing was developed. The method that was proposed was based on a Human Machine Interface (HMI) with electronic card. The Human Machine Interface (HMI) is composed by an admin interface that controls the system and that allocates rights for the supervisors and stakeholders. The supervisor is then capable to follow the track of products and manage products and storage. A dedicated interface is used for monitoring product flows of input and output. According to researchers' analysis, the system and technology can enable automation, real-time monitoring, error-free tracking and inventory of unique materials through supply chain. Technique that is applied on the site is explained with basic information.

Hannure N. K., Dr. Sushma Kulkarni [2] have given a report of comparative study conducted amongst 7 construction companies in Pune related to the materials management systems on the construction site. The materials management system in individual construction companies, advantages-disadvantages of the system used, problems that companies are facing in materials management, overall satisfaction from the current system and opinions for further improvisation are collected. Then different tools of Information Communication System, benefits and barriers of the system and use in current scenario are explained. A brief report of bar code technique implemented on the site is also given in this paper with

profitability index, net present value, payback period, percentage of materials.

Harish K. [3] with the help of pilot study, questionnaire survey and actual site data collection, materials management system, tasks involved in it, priorities of different tasks, problems and the frequency of those problems in respective materials management system and also wastage occurred are studied for construction sites in Coimbatore. With this data collected, research have formed Relative Important Index and Chronbach's alpha these values are formed. The applications or computer softwares like Microsoft office excel and Medcal were used. As per the values rankings were given for different materials management related aspects. The conclusion was derived and suggestions were given.

Kanimozhi G., Latha P., [4] have explained all basics about the materials management system, then with the help of surveys, literature reviews and experience major factors affecting materials management system are addressed. Then with the help of data collected so far, researchers have developed materials management software with the help of Microsoft Excel platform. This software was tested by the contractors and the survey about the software was conducted.

Kumar A., Shoghli O., [5] have tried to explore and identify various remote sensing devices and IOT applications that can be used to manage the materials management in construction industry particularly by supply chain management. The advantages of IOT devices in construction materials procurement management is highlighted by addressing use of devices like RFID, Laser tags, Low frequency tags, Battery Assisted Passive tags, cameras, Bluetooth LE, GPS, etc. Also various problems and issues of such technique in actually working are also explained. This paper guides further to minimize those problems.

Madhavrao B., Mahindra K., Asadi SS., [6] have explained materials management system, steps, objectives and inventory control techniques on the construction site with the help of s-curve, ABC analysis and EOQ technique mainly focused on four materials cement, sand, aggregate and brick. With reference of these four materials, the techniques and analysis is done. A case study of building with G+6 floors was taken and variation in planned and actual cost was analyzed.

Nanaware Monika R., Saharkar U.R., [7] have conducted a research with case study related to materials management and in particular related to inventory management. For this purpose they have selected ABC analysis and EOQ techniques for inventory management. Cost effectiveness of use of materials management techniques is shown with respect to overall economy.

Shet Sayali, Narwade Raju, [8] have stated basics about materials management. Then with the help of case study of a construction firm various processes of materials management system are explained. Here the materials management related processes in the construction firm are explained step by step separately. Then the cost details of different materials used on the site is taken and inventory control techniques are applied. In this research work, ABC analysis, VED analysis and SDE analysis are used. Also advantages and feasibility of techniques is explained.

3. METHODOLOGY

For this study, two aspects are considered one is analysis through data from questionnaire survey and second is of case study of construction related organization. In fig. 1 overall methodology is briefly explained.

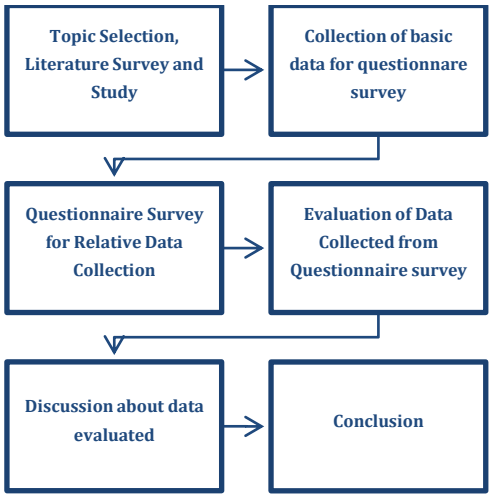

Fig. – 1 Methodology Flow chart

3.1 Questionnaire Survey:

For collection of data related to materials management in construction related industries, a questionnaire survey was conducted. The data was collected from 72 different respondents working in construction sector. From this questionnaire survey, the aim was to collect information related to materials management system employed in construction related organizations. The information related to application of materials management system, tools and techniques used, importance of various activities involved in materials management, effect of system on various aspects of materials management, various problems that are faced and need of improvement in current scenario in various aspects related to materials management.

The questionnaire was divided in to 5 different sections. First section was related to general information related to materials and materials management. From second section, importance of various activities related to materials management was understood. Third section was related to understanding importance of different effects if materials management system. Forth section was aimed to understand different problems faced in current materials management system. Fifth section was designed to understand need of improvement in different activities related to materials management.

3.1.1 Data measurement:

First section was of hybrid nature for accepting the responses which included multiple option selection type, single option selection type, short answer type questions. Second section onwards, 5 point Likert scale was used for taking the responses. Likert scale was of ascending order ranging from lowest degree to highest degree for the assigned numbers from 1 to 5.

For this Likert scale response analysis, method of Relative Importance Index (R.I.I.) was used. R.I.I. was calculated by using the following formula:

$$RII = \frac{\Sigma W}{A * N}$$

Where,
W = Weight given by each respondent to each factor (here from 1 to 5)
A = The highest weight assigned (here it is 5)
N = Total number of respondents

Along with this, for checking the internal consistency or reliability of sections with Likert scale, Cronbach's alpha (α) value was found. The Cronbach's alpha α value was found by using following formula:

$$\alpha = \frac{n}{(n-1)} * \left(1 - \frac{\Sigma var}{var}\right)$$

Where,
n = number of items or questions in subset
Σvar = summation of variance
var = variance

4. DATA ANALYSIS AND DISCUSSION

4.1 Questionnaire Survey Data Analysis & Discussion:

The questionnaire survey was done for understanding the aspects related to materials management in construction industry. The questionnaire was divided in to 5 sections. For this questionnaire, 72 responses were taken from individual entities. Analysis and discussions are as follows.

4.1.1 1st Section: Basic information related to materials management

1. What is approximate cost of materials from overall budget of the project?

Table 1- Response for Cost of Materials

Approximate materials percentage	No. of Respondents	Percentage of Responses
50%	12	17%
60%	37	51%
70%	19	26%
80%	4	6%

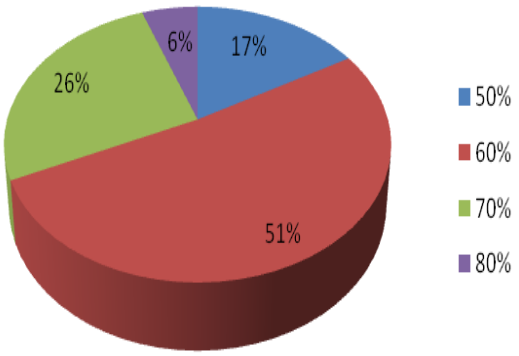

Fig. 2 - Percentage response for Cost of Materials

2. Which activity/activities are focused for materials management aspects?

Table 2 - Responses for Activities Focused

Activities	No. of Respondents
Estimating & Planning	71
Ordering & Procurement	66
Receiving	61
Inspection	63
Inventory Storage	64
Movement & Use	63

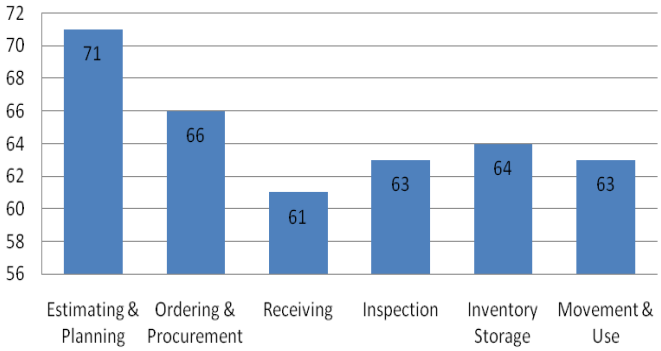

Fig. 3 - Activities Focused for Materials Management

3. Which method is adopted for materials management on site generally?

Table 3 - Method Adopted for Materials Management

Method	Responses
Manual	15
Software	0
Both manual and software partially	55
RFID	1
Barcode	6
Anyother (MS-Excel)	1

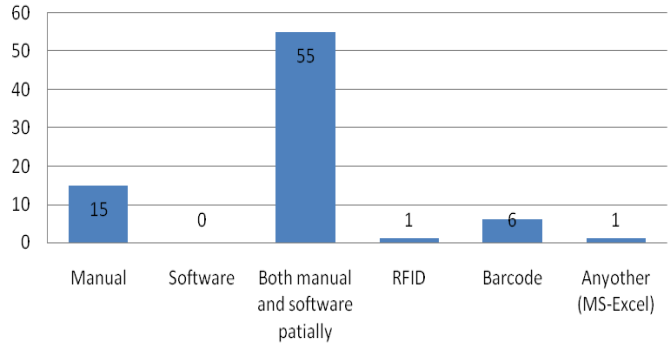

Fig. 4 - Method adopted for materials management

4. Which software is preferred for materials management?

Table 4 - Softwares Preferred for Materials Management

Software	Responses
Primavera	12
Microsoft Project	20
MS-Excel	48
Enterprise Resource Planning	23
Personalized software	1

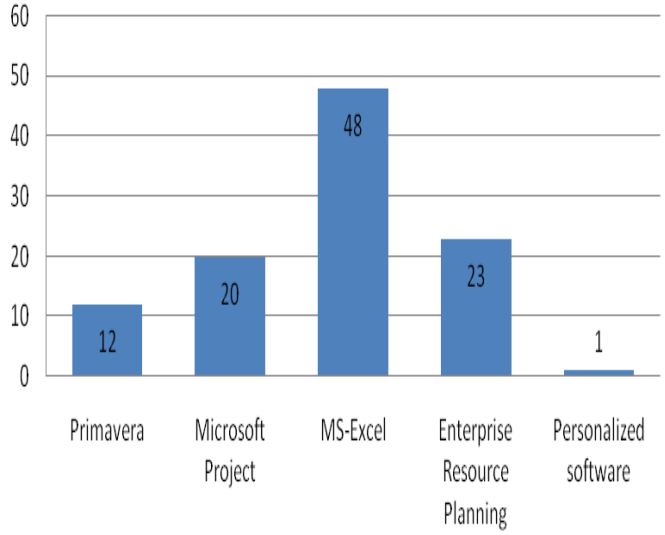

Fig. 5 - Softwares preferred for Materials Management

5. How order for materials is placed for main (primary) materials used?

Table 5 - Method of Placing Order for Main Materials

Method	Responses
Tenders	17
Quotation	43
Market survey then selection	46
Fixed vendors	24

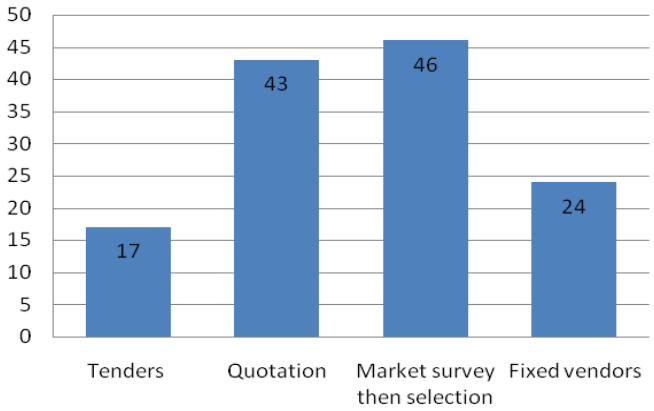

Fig. 6 - Method of Placing Order for Main Materials

6. How order for materials is placed for miscellaneous (secondary) materials used?

Table 6 - Method of Placing Order for Miscellaneous Materials

Method	Responses
Tenders	11
Quotation	29
Market survey then selection	42
Fixed vendors	34

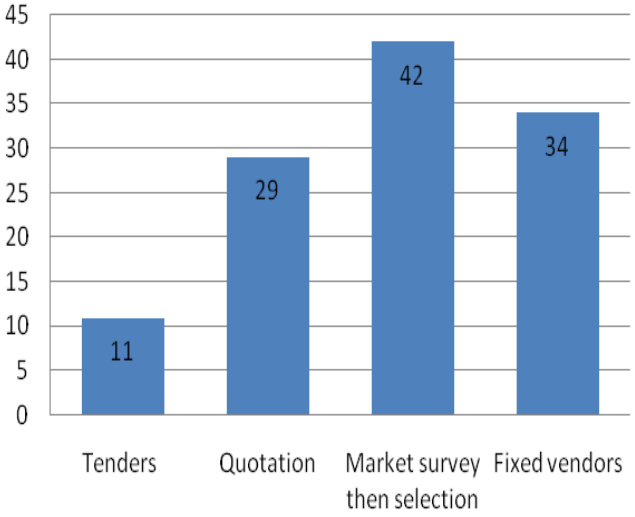

Fig. 7 - Method of Placing Order for Miscellaneous Materials

7. How receiving, inspection records are kept for materials?

Table 7 - Method for Receiving, Inspection Records

Method	Responses
Manual	15
computer based	5
Manual + Computer based	52

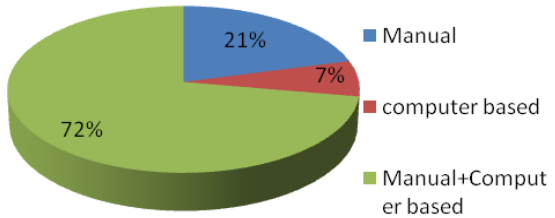

Fig. 8 - Method for Receiving and Inspection Records (percentage)

8. How storage and consumption records are kept for materials?

Table 8 - Method for Storage and Consumption Records

Method	Responses
Manual	13
computer based	10
Manual + Computer based	49

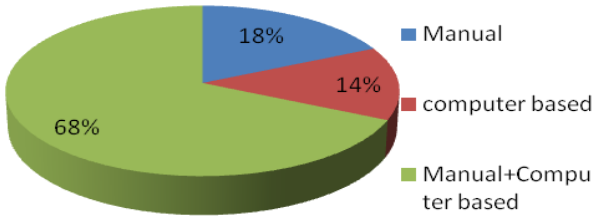

Fig. 9 - Method for Storage and Consumption Records (percentage)

9. What are the inventory management techniques used?

Table 9 - Inventory Techniques used

Technique	Responses
ABC analysis	35
(EOQ) Economic order quantity	31
Forecasting as per need	27
Just In Time	8
Safety Stock	25
Fixed Stock	12

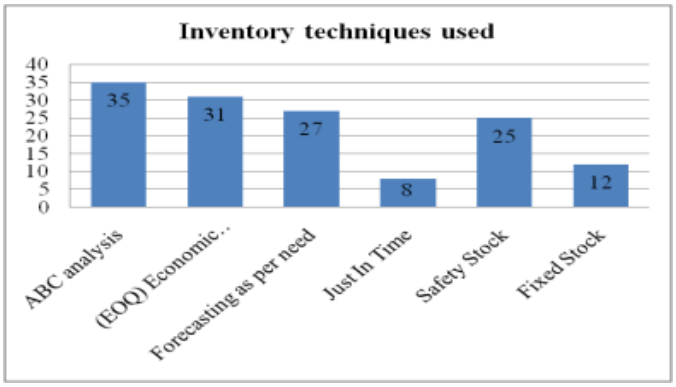

Fig. 10 - Inventory Techniques used

10. What are the most important or primary materials used in economical, utilization aspects?

This question was not compulsory type question. Most of the responses were given for common materials in construction industry including materials like cement, steel, aggregate, natural sand, crushed sand, bricks, formworks, etc. In some companies, fly ash is also being used. Also some respondents stated to go for sustainable approach and giving preference to use of locally available materials ensuring quality as well as reduction in the cost. In ABC analysis, the materials which are in the range of A class items are considered to be most important and primary type of materials. This summarizes overall and general responses highlighting most commonly used materials in construction sector.

4.1.2 2nd Section: Importance of activities related to materials for materials management

This section was used to understand relative importance of activities related to the materials management. For this section, five point Likert scale was used from 1 to 5 representing a range of very low to extremely high. For understanding the relative importance of activities, relative importance index (RII) was used. The responses, RII and ranks are tabulated as follows:

Table 10 - RII for activities related to materials for materials management

Sr. No.	Rating / Activities	1	2	3	4	5	RII	Rank
1	Estimating and Planning	1	1	5	20	45	0.910	1
2	Ordering and Procurement		2	12	29	29	0.849	4
3	Receiving	1	2	14	34	21	0.811	6
4	Inspection			5	28	39	0.907	2
5	Inventory Storage	1	1	15	28	27	0.831	5

6	Movement of Materials and Use		2	12	26	32	0.856	3

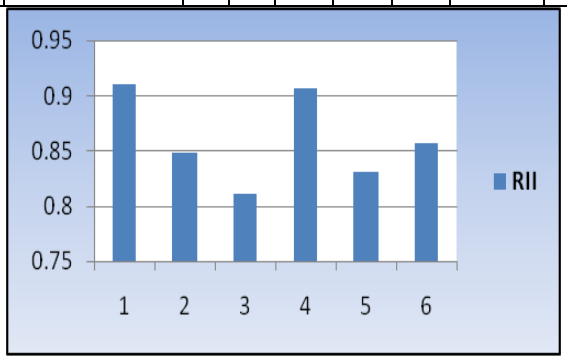

Fig. 11 - RII for activities related to materials for materials management

Along with RII for each activity, Cronbach's Alpha (α) value for this particular section is also calculated. The Cronbach's Alpha (α) for 2nd Section is 0.74 and as per the thumb rule this (α) value is of acceptable range. So it is concluded that the internal consistency of this 2nd section is acceptable.

As per RII values, order of priority and relative importance of activities related to materials for materials management from relatively very important to less important is observed as: (1) Estimation & Planning, (2) Inspection, (3) Movement of materials & Use, (4) Ordering & Procurement, (5) Inventory Storage, (6) Receiving. The digits in the bracket at start represent the ranking of respective activity.

Apart from relative importance as mentioned above, it is observed that all the activities are relative within range as per RII value. There is no drastic change in importance value. So it can be concluded that all the 6 activities are important for developing proper materials management system. And the RII values and ranks are like guide for which activity should be taken care relatively more or less accurately and precisely. For all the 6 activities mentioned, it is preferable and useful to have a close look for ensuring all the activities are taking place properly as per standards and decisions made by the authorities.

4.1.3 3rd Section: Effects of proper materials management system

For this section, five point likert scale was used from 1 to 5 representing a range of very low to extremely high. For understanding the relative importance and priority of the effects, relative importance index (RII) was used. The responses, RII and ranks are tabulated as follows:

Table 11 - RII for effects of proper materials management

Sr. no.	Rating / Activities	1	2	3	4	5	RII	Rank
1	Proper Materials Quantity Estimation & Planning	1	1	6	23	41	0.896	2
2	Time Optimization	1	1	6	28	36	0.882	5
3	Cost Optimization		1	7	26	38	0.893	3
4	Quality Enhancement		1	4	29	38	0.901	1
5	Improve customer service and satisfaction		1	8	28	35	0.882	4
6	Reduction in the wastage and loss	2	1	10	20	39	0.870	6

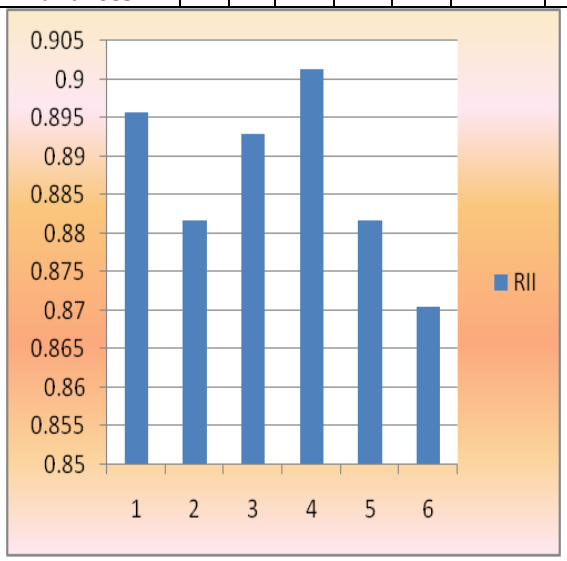

Fig. 12 RII for effects of proper materials management

Along with RII for each activity, Cronbach's Alpha (α) value for this particular section is also calculated a stated in point 4.3.2.2. The Cronbach's Alpha (α) for 3rd Section is 0.79 and as per the thumb rule this (α) value is of acceptable range. So it is concluded that the internal consistency of this 3rd section in acceptable.

As per RII value, from the effects of proper materials management listed, an order of relatively most importantly observed effect to the less importantly observed effect is observed as: (1) Quality enhancement, (2) Proper materials quantity Estimation & Planning, (3) Cost optimization, (4) Improve customer service and satisfaction, (5) Time optimization, (6) Reduction in the wastage and loss. The digit in bracket at start represents respective rank.

In this section, from responses it is observed that, the values of mean and RII are very close to each other. All the 6 effects stated are observed as a benefit of proper materials management system. The order of relatively more observed to less observed effect is as stated above. From that order, it is observed that a proper materials management system gives benefits to the organization in the form of quality improvement, economic benefits, and increase in the goodwill of the organization. Wastages and losses are depending on various factors including natural and manmade errors so materials management system is relatively less effective for reduction of wastages and losses. So a proper materials management system contributes in a positively effective way in both tangible and intangible effects. As all the 6 effects are important, the need of proper materials management system is also observed.

4.1.4 4th Section: Problems faced during materials management process

For this section, five point Likert scale was used from 1 to 5 representing a range of 0% to 20% up to 80% to 100%. For understanding the relative importance of occurrence of problems, relative importance index (RII) was used. The responses, RII and ranks are tabulated as follows:

Table 12 - RII for Problems faced in materials management

Sr. no.	Rating / Activities	1	2	3	4	5	RII	Rank
1	Problems due to unavailability or scarcity of the materials	5	10	21	24	12	0.687	1
2	Problems occurred due to natural errors	13	11	26	18	4	0.578	6
3	Problems due to manual errors	8	14	19	26	5	0.625	2
4	Problems due to computer or software errors	20	23	16	10	3	0.476	10
5	Error in estimation and planning	16	14	18	16	8	0.569	8
6	Problems in materials ordering and procurement	12	17	10	22	11	0.617	3
7	Problems in materials receiving from vendors	13	15	20	15	9	0.586	5
8	Errors found in inspection	16	20	15	14	7	0.541	9
9	Problems in inventory storage on site	13	18	14	23	4	0.572	7
10	Problems in movement of materials and Use	11	13	23	17	8	0.603	4

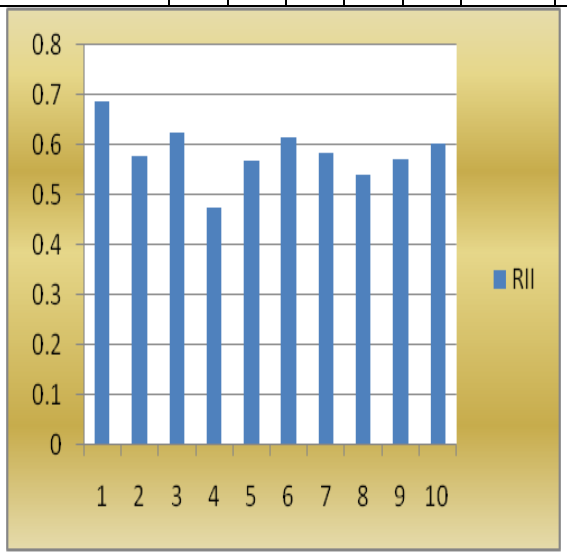

Fig. 13 - RII for problems faced in materials management

Along with RII for each activity, Cronbach's Alpha (α) value for this particular section is also calculated. The Cronbach's Alpha (α) for 4th Section is 0.93 and as per the thumb rule this (α) value is of excellent range. So it is concluded that the internal consistency of this 4th section is excellent.

As per RII values for problems faced during materials management, an order of relatively most occurring problems to the less occurring problems is observed as follows: (1) Problems due to unavailability or scarcity of the materials, (2) Problems due to manual errors, (3) Problems in materials ordering and procurement, (4) Problems in movement of materials and Use, (5) Problems in materials receiving from vendors, (6) Problems occurred due to natural errors, (7) Problems in inventory storage on site, (8) Error in estimation and planning, (9) Errors found in inspection, (10) Problems

due to computer or software errors. The digits in the bracket at start represent the ranking of respective activity.

As observed from the responses, the RII values for this section are in between 0.470 to 0.690 for 5 point Likert scale. So primarily it is observed that once a proper materials management system is designed, probability of occurring problems becomes less, the problems can be avoided.

Relatively, most occurring problem related to materials is unavailability or scarcity of the materials. As construction industry is one of the dynamic industries and mainly materials required are depending upon natural sources, this problem has high potential to occur. To minimize this problem, for materials procurement, more number of vendors can be contacted for placing an order. Also for materials which have high potential of scarcity can be stored to a considerable safety stock.

The problem of manual errors and Problems in movement of materials and Use can be removed by giving proper training to the employers and workers related to the materials and materials management by proper activities like records, movement and use of materials to avoid errors and wastes.

Problems in materials ordering and procurement and Problems in materials receiving from vendors are related to each other. These problems can be removed by using different techniques for ordering and procurement as per the need of materials rather than relying on a single method. Also once the order is placed, a close tracking of the order should be ensured for minimizing receiving problems. A healthy competition should be there in vendors. Also sometimes such problems arise due to miscommunication, so the care for if the communication is proper should be taken.

Problems occurring due to natural errors are difficult to avoid completely. The construction industry is directly affected due to natural errors. As far as materials are concerned, care should be taken to ensure the losses due to natural errors should be as minimized as possible. Problems in inventory storage on site arises when the site is relatively compact and proper storage place for different materials as per IS standards guidelines is not available. This problem can be rectified by following IS standards guidelines for individual materials in the best way possible. Inventory storage should be in a closed place to ensure there are no losses due to natural substances and also no losses from manual errors like theft, ignorance, etc.

In a well designed materials management system, Error in estimation and planning, Errors found in inspection, Problems due to computer or software errors, these three errors have very less potential to occur. These errors can be removed by keeping proper records at every step of materials management. Estimation and planning of materials should be proper by the concerned departments and it should get updated time to time. While ordering of materials, quality of materials that is required for materials should be clearly mentioned and with the order, quality assurance should be there by this practice, errors found in inspection can be removed. As far as computer and softwares used for materials management are concerned, the maintenance of those should be perfect. As per the time, updated in the computer and software should be ensured. Overall technical health of computers and softwares should be examined and taken care. In this technologically advanced age, computers and software play a vital role so they are taken care precisely and as very small error may have potential of larger damages, problems due to computer and software errors are ensured to be very less by the organization. By developing materials management and looking for the problems occurring, an advanced materials management can be designed by continuously updating the existing aspects of the system.

4.1.5 5th Section: For activities in current materials management, need of improvement by advance tools & techniques

From this section, for activities need of improvements was checked. For responses, 5 point likert scale 1 to 5 was used, representing range from very less needed to vary much needed. For understanding, relative importance of need of improvement for activities, relative importance index (RII) was used. The responses, RII and ranks are tabulated as follows:

Table 13 - RII for need of improvement in activities

Sr. No.	Rating / Activities	1	2	3	4	5	RII	Rank
1	Estimating and Planning	3	3	10	25	31	0.828	3
2	Ordering and Procurement	1	2	19	27	23	0.803	5
3	Receiving	2	8	9	34	19	0.778	6
4	Inspection	2		19	20	31	0.828	4
5	Inventory Storage	1	4	8	29	30	0.842	2
6	Movement of materials and Use	2	3	9	26	32	0.842	1

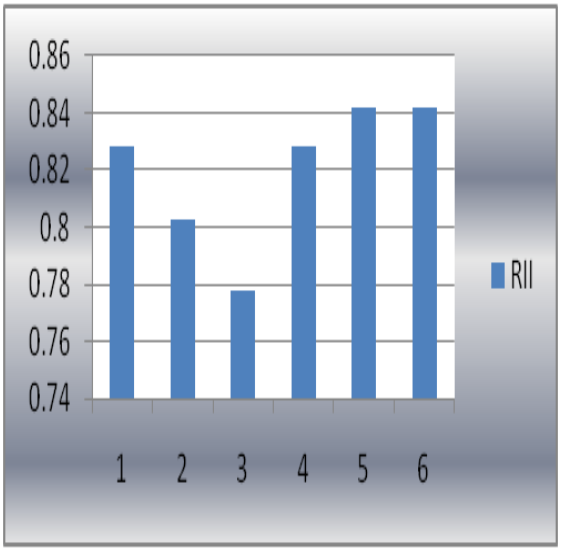

Fig. 14 - RII for need of improvement in activities

Along with RII for each activity, Cronbach's Alpha (α) value for this particular section is also calculated. The Cronbach's Alpha (α) for 5th Section is 0.88 and as per the thumb rule this (α) value is of good range. So it is concluded that the internal consistency of this 5th section is good.

As per RII values for need of improvement in activities, an order for activities with relatively higher need of improvement to relatively lower need of improvement is observed here as follows: (1) Movement of materials and Use, (2) Inventory storage, (3) Estimating and Planning, (4) Inspection, (5) Ordering and Procurement, (6) Receiving. The digits in the bracket at start represent the ranking of respective activity.

From RII value, it is observed that for all the 6 activities there is need of improvement in current materials management system. For the 6 activities, RII value is ranging from 0.778 to 0.842, which indicates that there is considerable need of improvement and possible advancements for activities in current materials management system. Though proper materials management system is adopted by the organization, nature of construction industry is dynamic and uncertainties involved in construction industry and in materials related to it. Due to this fact, the need for improvement is observed to get adopted with dynamic nature and uncertainties faced.

Most important activity related to materials and materials management that needs improvement is movement of materials and use on project site. Since construction project site is under operation for a particular limited time period, the nature of construction sites vary as per the change in location of project, also availability of place for materials movement is not fixed always; it is very much difficult to design a fully automatic system for materials movement. But by proper balance and communication between human and technology, it is possible to develop a system for materials movement and use. In large scale construction project for movement of materials like concrete, concrete lifts are used, along with this use of compact and movable conveyors is also possible. For large scale projects use of cranes for materials movement is also possible. As far as use of materials is concerned, for different phases of construction, standardization for use of materials should be done by the authorities. This standardization should be explained to workers in the simple language so that they can practice it. Also losses of materials in materials movement and use can be minimized by having close look on the activities and designing proper movement channels and methods for materials as per the nature and need.

Inventory storage is another important factor for which there is need of improvement. As stated in earlier points, materials inventory have a considerably large share in overall economy of the project. In construction projects, it is difficult to provide a perpetual inventory storage like in manufacturing industry due to reasons like limited time span projects, change in locations, varying availability if place on site, etc. For inventory storage basic principle is inventory should be protected from all possible natural and manmade hazards. To ensure this, movable closed container type inventory storages can be designed which will protect the materials in inventory from natural hazards like air, water, snow, insects, termites, etc. Also by ensuring digital locks for storages with expensive and important materials, entry can be restricted and authorized person only or under his/her supervision workers should allowed to enter. Also to have a close look on quantity of materials in inventory storage, weight or volume measuring gadgets should be installed, since most of the materials used in construction industry are of bulk quantity nature. And as these storage containers would be movable type, it is easy and possible to move those from one project to another project after completion.

For proper estimation and planning, there is need to enhance use of softwares like excel, Google sheets, MS-Project, etc. Once the construction project is finalized and all the project related drawings are received, materials required for the project should be estimated properly. In course of construction some aspects may change in project and hence materials are also changed at such moment estimation should be updated neatly and with the use of above mentioned softwares, it is comparatively easy to update the estimation. For planning of materials analysis like ABC, VED, HML can be used which will guide the overall importance of the material and frequency of ordering. Materials ordering and procurement schedule with mentioned quality and quantity should be formed properly at the beginning and it should be updated time to time. For this purpose, using digital platforms as mentioned above would give overall ease in the activity.

For inspection, a proper standardization should be developed by the concerned authorities for materials to ensure that proper quality of materials is received on site along with proper quantity. In situ type tests for different

materials should be used frequently, but along with this for important projects, lab tests should also be done for materials time to time. For this a small scale is also possible to develop near or within the site. The records related to inspection are to be kept and stored very precisely, for this purpose digital platforms, computer based softwares should be emphasized to use rather than paper records. Results of inspection should be conveyed to the vendors should be discussed.

In the activity, ordering and procurement of materials by ensuring proper communication between vendors and constructor there would be more ease. For this activity also use of digital platforms like Google sheets, GIS-GPS systems can be emphasized for quotations, market survey, tenders, etc. and also for the part like placing an order, tracking the order, etc. the possibilities of errors by using such advance techniques become less in ordering and procurement of the materials and records are also kept well and proper.

As far as receiving activity is concerned, proper transportation system, proper tracking of materials and availability of proper arrangement at receiving end of materials should be ensured. For this, various communication devices should be emphasized more. For keeping the receiving records, digital storage platforms prove to be very effective. Mostly in this time, these advance tools are being practiced more.

5. CONCLUSION:

From the questionnaire survey, overall scenario related to materials management was understood. In construction industry, despite of dynamic behaviour and uncertainties involved related to materials management, there is awareness about materials management system. Depending on the nature of work of involved, small, medium, large scale industries related to construction industry try to implement and adopt materials management system completely or partially. As the higher authorities are serious about materials management system, lower authorities are directed as per the policy. Also workers are instructed in simple way for materials related aspects so that they can also contribute towards materials management. With the help of advanced technologies, softwares, applications available, materials management systems can be adopted and improved further in a simple and user friendly manner. By using current technologies as the base, materials management can be done by implementation at different activities. And this would be suitable for any scale of construction related industries to work effectively and also to grow further.

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