

Material Management System of Government Building Construction Projects in Kathmandu Valley

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Abstract

Material management is an essential element in construction projects. Improper material management systems lead to adverse impact on time, cost and quality of the construction projects. Most of the construction projects have not been completed on time, partly due to the poor material management system. Therefore, the aim of this study is to assess status of material management system (MMS) of building construction projects. Sixteen government building construction projects were selected in Kathmandu Valley for determining existing practices of MMS. Questionnaires survey, field visit and key informant interviews (KII) were used to collect the primary data and related literatures and documents available at site were reviewed for collecting secondary data. Quantitative and qualitative techniques were used as data collecting tools. MS Excel tool was used to analyse the data. From the study, it is found that manual record keeping system was used for MMS. About 71.43 % of projects did not use automatic loading/unloading system and did not give priority to the quality of materials for MMS. Nearly 75 % of projects have implemented well managed store house in site as per material type and also focused on centralized storing system. None of the projects used any new technology of MMS in Building Construction Projects. It leads to the cost overrun on Building Construction Projects.

Keywords: Material Management Systems (MMS), Key Informant Interviews (KII), Information and Communication Technology (ICT)

I. INTRODUCTION

The materials which are used for the construction of building, road, dam, and tunnel are called construction materials. Construction materials cover about 30-70 % of total cost in construction projects [4]. The total cost of the project can be controlled by taking corrective actions towards the cost variance occurred in the project by material control. Materials management is an important function in order to

improve productivity in construction projects. Materials management functions include "material requirement planning and material take off, vendor evaluation and selection, purchasing expenditure, shipping, material receiving, warehousing and inventory, and material distribution". This is concerned with the planning and controlling process to ensure that the right quality and quantity of materials and equipment are appropriately specified in a timely manner, obtained at reasonable cost and are available when needed.

II. LITERATURE REVIEW

A. Construction Material

A good construction project is characterized by having right people with right skills and equipment, which are able to complete the project on time and on expected budget. Right materials in right place and at right time are important. The cash and capital flow to procure the labors and materials are also important. The materials cost on a project can vary from 30 % to 70 % of the total cost of the project, but, materials management has not received attention [5]. Construction materials can be classified into five different categories depending on their fabrication and storage system on site [6].

B. Construction Material Management

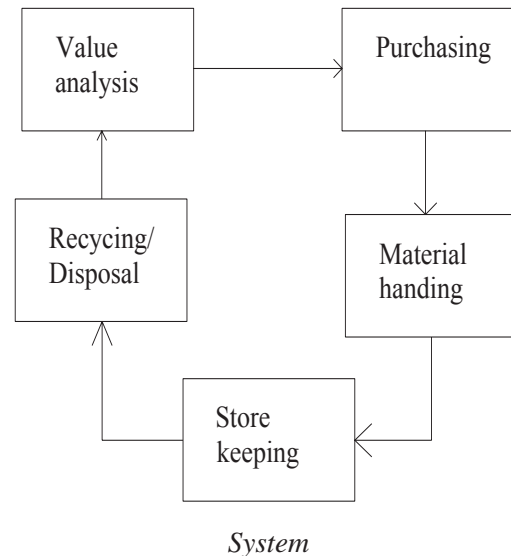
Construction project management process includes planning, organizing, executing, monitoring, and controlling. During any construction projects, three inter-related factors, time, cost and quality need to be controlled and managed. Successful completion of project requires all resources to be effectively used. Materials management is considered as a mean to achieve better productivity, which should be turned into cost reduction [1].

Survey of construction industries determined various format for construction material management, discussed the tracking system of material management and software technology developed for the process of material managements [3].

Nine different small, large & medium firms surveyed and followed five basic components of material management [2]. These components are

- Value analysis
- Purchasing
- Material handling
- Store keeping
- Recycling/Disposal

Figure 1. Components of Material Managements



Material management is a system which guides the way of material handling in construction industries. Vendor selection system, delivery system, storing system, and handling system are covered in material management in construction industries. Well defined material management system does not fit directly on a particular construction industry. So, material management is the critical and important task for construction projects [1].

III. METHODOLOGY

A. Research Design

This includes the research design, the research method, the population under study, the sampling procedure and the methods that were used to collect data. The reliability and validity of the research instrument were addressed by hypothesis test.

B. Study Area

This research was conducted in Kathmandu valley. Fifty governments owned building construction projects were selected as population. Out of them, only sixteen projects were selected as samples mainly based on accessibility, co-operation and co-ordination, and as required by research.

C. Data Collection Technique

1. Primary Data Collection

i. Questionnaire Survey

The questionnaires were distributed to the respondents of client/consultant (project managers/engineers) and contractors (Store manager project manager/engineers) for survey. All the questionnaires were distributed by visiting them on construction site.

ii. Key Informants Interview (KII)

For cross reference of data obtained from questionnaire survey, the KII was conducted with the project managers (clients) of selected building projects.

IV. RESULTS AND DISCUSSION

A. Existing Practice as Per Contractors View on MMS

Table 1 shows the contractors’ opinion towards existing MMS practice. Out of 16 respondents 81.25% did not use any modern technique and automatic loading /unloading system for MMS. 75% respondents said that they did not give priority towards MMS, 62.5% respondents had problem on transportation on site for MMS, and 50% respondents said procurement system is good as per PPMO (public procurements monitoring office), material delivery system and professionalism on MMS. 75% respondents said that they used well store house on site, 68.75% respondents said they focused on quality of material, and 56.25% respondents have satisfaction on works due to MMS.

So, as per contractors’ opinion by questionnaire, effective and efficient material managements were not practiced on building construction projects. Material managements are much effective by using information communication technology (ICT), but, in our scenario, paper based and manually handled material management systems are practiced.

TABLE 1.Existing Practice of MMS as per Contractors

S.N.	Description	Yes (%)	No (%)
1	Use any material management system (MMS) Technology	18.75	81.25
2	Give priority /importance towards MMS	25	75
3	Well Storage system/Store house on site	75	25
4	Use material procurements as per PPMO	50	50
5	Material delivery automatically as per schedule	50	50
6	Have professionalism in MMS	50	50
7	Transportation problem on MMS	37.5	62.5
8	Automatic Loading /Unloading system for MMS	18.75	81.25
9	MMS give satisfaction on works	56.25	43.75
10	Focus towards quality of material by MMS	68.75	31.5
11	MMS include safety provision	62.5	37.5
12	Centralized store system	25	75

B. Existing Practice as Per Consultants View on MMS

Table 2 shows the existing practice as per consultant's opinion for MMS. Out of 16 numbers on going building construction projects, all 100% respondents said that there is no any modern technique used for MMS. 85.71% respondents did not give priority towards MMS, did not deliver material automatically as per schedule and have not professionalism in MMS.71.43% respondents face the transportation problem, did not use automatic loading /unloading system and decentralized store system used for MMS.57.14% respondents said that they did not focus towards quality of material and did not include safety provision on MMS.85.71 % respondents said that they use well storage system/store house on site. 57.14% respondents said that they use material procurements as per PPMO and MMS give satisfaction on works.

So, opinions of consultants towards MMS were similar to contractors on some points, but, they said even more problem for practice of MMS on

building construction project in Kathmandu valley. Use of ICT is required for proper use of MMS on construction projects, but, as per consultant's opinion, practice towards MMS on construction site is fully based on paper based technology [3].

TABLE 2. Existing Practice of MMS as Per Consultants

SN	Description	Yes (%)	No (%)
1	Use any material management system (MMS) Technology	0	100
2	Give priority /importance towards MMS	14.29	85.71
3	Well Storage system/Store house on site	85.71	14.29
4	Use material procurements as per PPMO	57.14	42.86
5	Material delivery automatically as per schedule	14.29	85.71
6	Have professionalism in MMS	14.29	85.71
7	Transportation problem on MMS	28.57	71.43
8	Automatic Loading / Unloading system for MMS	28.57	71.43
9	MMS give satisfaction on works	57.14	42.86
10	Focus towards quality of material by MMS	42.86	57.14
11	MMS include safety provision	42.86	57.14
12	Centralized store system	28.57	71.43

C. Hypothesis Testing for Existing Material Managements System

Hypothesis test is conducted for correlation between clients or consultants and contractors' opinion.

Null hypothesis: There is no relation between the clients or consultants and contractors i.e. $H_0 = 0$.

Alternative hypothesis: There is relation between the clients and contractors i.e. $H_1 \neq 0$.

The observed standard deviation(ρ) = 0.154 (less than critical value of ρ i.e. 0.591) and it comes

in the acceptance region, therefore, not reject the null hypothesis at 10 % level of significance and reject the alternative hypothesis. Hence, it is concluded that there is significant difference between the opinion of the clients or consultants and contractors.

For the validation of these results, out of 20 projects, key informant interview (KII) was conducted on 5 selected projects. From this KII, it is understood that the perception of contractors and consultants was found significantly different regarding the importance and knowledge of MMS in construction projects.

V. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusion

Existing practice of material management systems (MMS) depends on the manual record keeping system. More than 81 % respondents did not adopt the modern technique (MMS related software) of MMS. Respondents (75 %) did not give priority to MMS. Respondents, 71.43 %, did not adopt automatic loading/ unloading systems. Seventy five percent respondents said that there is well managed storage system. About 68.75 % respondents said that they focused on quality on material and 56.25 % respondents have satisfaction on works due to MMS. Above conclusion are contractor's opinion, but, as per consultant's opinion 100 % respondents did not adopt modern technique of MMS. Respondents, 85.7 %, gave priority towards MMS. So, from the findings, it is concluded that most of the government's building construction projects in Kathmandu valley did not use ICT technology, did not give importance towards MMS, did not adopt automatic loading/unloading system, proper store house is used as per material types and focused on quality of material. These conclusions were validated by KII study on selected projects, but, none of the building construction projects used automatic MMS system, which leads to the cost and time overrun on Building Construction Projects.

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