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Study on Factors and Problems Governing Resource Management in Construction Industry

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ABSTRACT – *The success of any construction project highly depends on proper and effective management of construction resources flow. The management of resources is an essential task in every construction company. Effective construction resources management process is a key to success of a construction project. This study focuses on the significant factors causing problems on resource management in construction industry. Data collection was carried out through a structured questionnaire survey consisting of 70 factors identified through a comprehensive literature review. Data were analyzed with Predictive Analytic software (PASW). The factors were ranked through mean rank calculation. The opinion of respondence regarding the severity of each cause was checked by analysis of variance. Relation between pairs of variables was examined by using Spearman's rank order correlation. Case study is conducted to find the impact of problems occurred in resource management.*

Keywords: Construction Resource Management, Descriptive, analysis of variance, Spearman's rank order correlation

1. INTRODUCTION

A successful project requires careful planning, organization and controlling resources throughout to achieve the correct results to the client. Construction projects success not only depends on the quality & quantity of work, but also largely depends on adequate availability and efficient management of resources. Nowadays, successful management of construction resources has to be based on updated information and processed utilizing a well designed construction resources management process. In general, construction projects are of high value, and they employ huge resources of men, materials and machines. Major works involve heavy investments from hundreds of cores rupees to a few thousands of rupees, the use of high level technology and need an open ended model for effective management of resources.

2. LITERATURE REVIEW

Effective planning of materials becomes mandatory as timely availability of material ensure progress of the work without any delay and also make the contractors remain competitive in the field.

Leni (2006) in his study states that corrective action towards variance of the material purchasing cost is actually a preventive action.

Factors that negatively affect labour productivity are material shortage, lack of labour experience, misunderstandings between the labour and the supervisor, change in drawings and specifications during constructions (Sherif Mohamed, 2007)

Effective construction methodology and planning will result in significant saving of resources, rather than adopting the optimum design concepts according to Jayakumar (2008)

Effective use of the Enterprise Resource Planning Tool ensures proper procurement and utilization of materials. Lack of knowledge in the use of the tool or refusal to use the tool has increased the wastage of materials (Sam et. al., 2012)

It is necessary to obtain the capacity of the available work force so that the scheduling of the works can be done to ensure smooth progress of the work (Kim and Kim, 2012)

Nagaraju (2012) Materials are the essence in the construction industry. Material resource represents a substantial proportion of the total value of the project. A material management system includes the major functions needed in construction project, i.e. identifying, acquiring, storing, distributing and disposing of materials. Material planning may vary, depending on the project size, location, cash flow requirements, and procedure for purchasing and inspection. Regular supply of the material in proper quantity must be ensured. It is extremely important because late or

irregular delivery or wrong types of material delivered during construction are major factors that contribute to the delay of a project. Also the effective utilization of manpower can be greatly enhanced by ensuring proper and sufficient availability of material.

Ismail Abdul Rahman(2013) Completion of any project within the estimated cost is the basic criteria for the success of any construction project. Primary target of practitioners involved in construction projects is to complete the project within budgeted cost regardless of size and complexity of project. However, completion of any project highly depends on the construction resources. Project resources provide the means for accomplishing the work objectives. Construction resources management is the most important factor contributing to cost success.

Effective planning for resources especially in resource-constrained constructions is necessary for facilitating overlapping of construction activities (Wojciech et. al, 2014)

Equipment selection plays a significant role in deciding the total cost of a project; it also affect the activity and continuity of the project and is a strategic problem.

3. METHODOLOGY

Data was collected through a structured questionnaire survey carried out among the personnel involved in construction industry.

Table 1: IDENTIFIED FACTORS

Factor ID	Factors
MA1	Non-standard specifications
MA2	Lack of conformance to requirements
MA3	Quality of material
MA4	Availability of material
MA5	Undefined scope for materials.
MB1	Proper knowledge of supplier
MB2	Flexibility of supplier
MB3	Change in market demand
MB4	Owner's choice for selecting supplier
MB5	Service performance
MB6	Quick response time in case of emergency, problem or special request
MB7	Honesty & Integrity of supplier
MC1	Insufficient supply of materials
MC2	Material damage
MC3	Access of materials from suppliers
MC4	Late deliveries
MC5	Improper quality of material
MC6	Proper system in supply materials
MD1	Material damage on site
MD2	Improper wastage of materials
MD3	Lack of materials (due to closure)
MD4	Poor storage of materials
MD5	Lack of maintenance
MD6	Bad weather condition at site
MD7	Poor inspection
MD8	Improper finishing of works
MD9	Existence of unnecessary materials on site
MD10	Over stocking of materials
MD11	Shortage of materials during work
MD12	Storing materials away from store
LA1	Lack of labor experience
LA2	Labor personal problem
LA3	Labor dissatisfaction at site
LA4	Misunderstanding among labors
LA5	Labor disloyalty
LB1	Misunderstanding between labor and superintend
LB2	Lack of labor surveillance
LB3	Lack of periodic meeting with labor
LC1	Lack of place for eating and relaxation
LC2	Payment delays
LC3	Lack of training session
LD1	Working overtime per day
LD2	Working seven days in a week without holiday
LE1	Violation of safety precaution
LE2	Bad ventilation
LE3	Noise occurring at site
LF1	Material shortage at site
LF2	Unsuitability of material strong location
LF3	Lack of knowledge in handling the equipment
LF4	Tools/Equipment breakdown
LF5	Lack of Tools & Equipment
LF6	Inefficiency of equipment's
EA1	Availability of construction equipment in the market
EA2	The quality of construction equipment
EA3	Lifetime of the equipment
EA4	Price of the construction equipment
EA5	Size of the equipment
EA6	Proper planning & selection of equipment

EA7	Lack of space
EA8	Equipment shortage
EA9	Usage of out dated equipment
EA10	Frequent repair and rework
EA11	Lack of skilled labours to operate the equipment
EA12	Insufficient money to buy the equipment
EA13	Maintenance cost
EA14	Improper handling of equipment
EA15	Determining general long-term and short-term equipment policy of the firm
EA17	Selecting the proper equipment for the project

3.1 Reliability Test

A reliability test was performed on the collected data to determine its degree of consistency. The Cronbach's coefficient is computed for data consistency. The accepted reliability is when Cronbach's coefficient is greater than 0.5. If it is greater than 0.9, the collected data is considered as highly reliable.

3.2 Ranking

A five point Likert-scale of 1 to 5 was adopted to assess the likelihood of each of the identified factor in causing problems in resource management, where scales of 1 = very important, 2 = important, 3 = medium, 4 =less important, and 5 = very less important are adopted. The factors were ranked based on the mean rank score. Lower mean rank represents that factor is important factor.

3.3 ANOVA

Quantitative statistical analysis for questionnaire was done by using Predictive Analytic software (PASW). The opinion of respondence regarding the severity of each cause was checked by analysis of variance (ANOVA).

3.4 Correlation

The strength of associations of pairs of variables understudy was determined by correlation relationships. As data collected in this study is non-parametric and ordinal variables, the powerful method of examining the relationship between pairs of variables is by using Spearman's rank order correlation.

The correlation coefficient ranges from -1.0 to +1.0. The value of close to 1 implies there is strong positive linear relationship between the two variables while the value of close to -1 shows a strong negative linear relationship between the two variables.

4 RESULTS AND DISCUSSIONS

The survey results are illustrated in this chapter. Mainly, Reliability test, Mean value method, One Way ANOVA test and Spearman's rank order correlation test.

4.1 Reliability Test Results

Data from questionnaire were analyzed for its Cronbach's value. This was to ensure that the data collected are valid and reliable for further analysis. The alpha values are in the range of 0.644 to 0.809 for main factors. And the overall factor is 0.912. This range is considered high. Thus, the reliability of the questionnaire is assured. Certainly, this indicates that the questionnaire data are valid and reliable.

The overall reliability value is 0.912, hence the collected data is considered as highly reliable. The Table 2 describes the reliability for each group.

Table 2: Reliability for Each group

Factor ID	Factors	Cronbach
MA	Factors related to Material Identification	0.746
MB	Factors related to Vendor selection	0.768
MC	Factors related to procurement	0.783
MD	Factors related to construction on site	0.725
LA	Factors related to manpower Issues	0.644
LB	Factors related to Human resource Issues	0.658
LC	Factors related to Motivation Issue	0.689
LD	Factors related to time	0.749
LE	Factors related to safety	0.698
LF	Factors related to Material & Equipment	0.732
EA	Factors related to Equipment issue	0.809

In this Table 2 the reliability for main factors are listed. The Cronbach's Alpha ranges from 0.644 to 0.809. Hence the collected data is highly reliable

4.2 Descriptive statistics

The studied factors were ranked based on the mean rank score. The factors which are rated as Very important and Important factors are considered as critical factors. Hence

the mean value less than two are considered as important factors. The factors less than two are listed in the table 3.

Table 3: Mean value method

Factor ID	Factors	Mean
LF4	Tools/Equipment breakdown	1.57
EA3	Life time of equipment	1.68
LC2	Payment delays	1.71
EA10	Frequent repair and rework	1.75
EA6	Proper planning & selection of equipment	1.75
MA3	Quality of material	1.76
MD7	Poor inspection	1.79
LA4	Misunderstanding among labors	1.79
MD11	Shortage of materials during work	1.84
LA1	Lack of labor experience	1.84
EA13	Maintenance cost	1.85
LE1	Violation of safety precaution	1.88
LF5	Lack of tools & equipment	1.89
EA12	Insufficient supply of materials	1.91
LA5	Labor disloyalty	1.91
LF3	Lack of knowledge in handling the equipment	1.93
LF6	Inefficiency of equipment	1.95
MD1	Material damage on site	1.98
MB3	Change in market demand	1.99

The Table 3 represents the important factors. The mean value ranges from 1.57 (Tools/Equipment breakdown) to 1.99 (Change in market demand).

4.3 ANOVA Test

The significance for each factor can be calculated. The significance for each factor varying from 0 to less than 1, based on the responses received. The significance value above 0.05 are treated as important factors, they need close monitoring. The significance value less than 0.05 are treated as insignificant factors.

The Table 4 represents the insignificant factors from the respondent point of view.

Table 4: Anova Test

Factor ID	Factors	Sig.
MA3	Quality of material	0.043
MB7	Honesty & Integrity of supplier	0.042
MC2	Material damage	0.040
MD2	Improper wastage of materials	0.023
EA2	Lifetime of the equipment	0.034
EA12	Evaluating the equipment alternative economically	0.028

4.4 Correlation Test

Relation between pairs of variables was examined by using Spearman's rank order correlation. The correlation test is conducted to find the relation between each and every factors. The positive significance is shown in the below table 5. These factors are critical factors.

Table 5: Spearman's rank order correlation

Factor ID	Factors	Sig.
EA3	Lifetime of the equipment	0.689
EA6	Proper planning & selection of equipment	0.689
MD1	Material damage on site	0.709
MA3	Quality of material	0.709
MD7	Poor inspection	0.699
LA4	Misunderstanding among labors	0.699
EA13	Maintenance cost	0.632
LE1	Violation of safety precaution	0.632
MD11	Shortage of materials during work	0.588
LF5	Lack of Tools & Equipment	0.588
LA5	Labor disloyalty	0.568
LC2	Payment delays	0.568
LF3	Lack of knowledge in handling the equipment	0.658
LF5	Inefficiency of equipment's	0.658

The Table 5 Represents positive relationship between the factors. Hence these factors are critical factors.

5 CONCLUSIONS

The construction manager must develop a plan of action for directing and controlling resources of workers, machines and materials in coordinated and timely manner in order to deliver the project within the frame of limited funding and

time. Hence, aside from a technology and process focus, a resource-use focus must be adequately addressed in describing a construction method or operation in a project plan. From the study, most critical factors were identified and ranked. Case studies were done in order to analyses the resource management in the respective projects. The critical factor identified from the case studies has caused an increase in project duration and cost overruns. Hence for proper resource management, the critical factors should be taken into consideration.

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