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Identification of factors influencing equipment productivity in construction projects

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Abstract - *Creating nations have seen an increment in the development of construction projects .The selection of the appropriate sort and size of equipment regularly influences the specified amount of the time and in this way productivity. This study was made to discover the productivity and factors influencing the output of the construction tools. Responses collected through survey study from 20 organizations related with the construction of buildings have been examined using theoretical tool like relative importance index (RII) method. The strategy for consider was a quantitative survey backed by investigative subjective interviews with industry professionals, and the overview discoveries demonstrates the major factor affecting equipment productivity is lack of ability of operator due to factor like operator/human.*

Key Words: Construction equipment, relative importance index, Factors affecting construction equipment, Productivity.

1. INTRODUCTION

1.1 BACKGROUND

Scope of construction projects is wide and separated into different sections usually private buildings, industrial buildings, commercial buildings, utility construction etc.

Equipment management is the portion of project management. Authentic management of assets in projects can create noteworthy investment funds in time and cost. However, until nowadays, construction businesses are still confronting a number of issues with respect to the low efficiency, destitute security and inadequate quality.

For successful equipment management, it is essential to consider productivity of equipment. For finding out the productivity of equipment, consider of factors influencing behind them is necessary. Appropriate equipment management can increment the equipment productivity which leads to minimize the cost and time of the current project.

1.2 SIGNIFICANCE AND PURPOSE OF THE RESEARCH

Better productivity in the construction industry profits the client and worker of the venture. From the client's viewpoint, increased productivity brings down costs, abbreviates construction plans and accomplishes superior returns on investments. From the contractor's viewpoint, improved productivity leads to a more fulfilled client leads to quicker turnover and increased benefits. Other than the considered factors can serve as a list for construction consultants to give consideration to improve the equipment productivity so as to create the venture to be finished as per the plan.

1.3 OBJECTIVE OF THE STUDY

The objective of this study is to measure the productivity measurement practices within the construction industry. Understanding these factors is supportive for the construction experts in order to productively convey the venture as per the plan.

By investigating the real circumstances in construction business the following are the actual objectives of the study are listed.

1. To outline the productivity measurement practices within the construction industry.
2. Study and discuss the various factors affecting equipment productivity in the construction industry.
3. Analyze and calculate the Relative Important Index (RII) of those factors affecting equipment productivity.
4. To make recommendations to improve equipment productivity in construction.

1.4 SCOPE AND LIMITATION OF THE RESEARCH

The scope of this investigate is limited to the research of equipment productivity on construction ventures. Low equipment productivity influences all contractors of various class and category. Low equipment productivity causes cost overrun and delay for the building construction projects. Hence, this investigate studies basically the basic factors which influences equipment productivity on building

2. LITRATURE REWIEW

2.1 GENERAL

The following are the past research survey based on the distinguishing proof of factors influencing the efficiency of construction equipment.

A.A. Attar1, A.K. Gupta and D.B.Desai [1] conducted a study on project directors and skilled engineers of building ventures in pune, sangli & Kolhapur locale, where an increment in productivity is being looked for. Respondents were required to rate utilizing their skill how all factors influence productivity with regard to cost, time, and quality.

The investigation was achieved by a responses and questionnaire. The ten most important factors influencing labour proficiency for medium, small & huge firms are recognized.

Mohamed Abdelaal and Hassan Enam [8] in this paper quantitative questionnaire study was done with industry practitioners to find major factors which are impacting on equipment productivity.

It includes some of the major factors like site working time, managing site equipment, communication, work schedule, working tasks types, safety measures, quality control, managerial factors, skilled laborers, motivation, scope change, availability of material, and over planning and work methodology.

This research examines all significant factors by method of a structured survey managed in GCC countries. The ranking of factors is calculated by relative importance indices that is RII.

Shinde V. J and Dr. Hedoo M. N. [11] have used standard productivity, coefficient of variance, survey study, time study and relative importance factor as a strategy for enhancement of productivity in the construction industry. A survey of 69 questions was arranged for factors influencing construction productivity, from which extremely affecting factors will be organized and then remedies will be given to them.

3. RESEARCH METHODOLOGY

3.1 GENERAL

This investigate examines the critical factors influencing productivity of equipment in construction and their impacts on project. Understanding these factors is supportive for construction experts who work on all venture stages, particularly on the starting stage of construction planning, in order to effectively provide project plans.

3.2 RESEARCH STAGES

This investigate, passed through the following stages in figure:

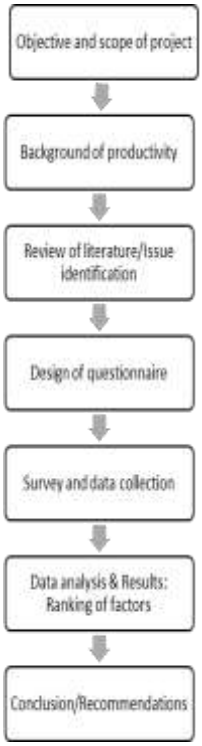

Fig 3.1Research stages

3.2.1 Objective and scope of project

The objective of this consider focuses on opinions from the construction business about different factors influencing equipment productivity, investigates factors influencing the equipment productivity affect, and recommends suitable measures that can progress impact productivity. The scope of this investigate is inadequate to the study of productivity of equipment of building construction projects.

3.2.2 Background of productivity

From the different literature studies, productivity meaning is clarified and significance of equipment productivity is discussed.

3.2.3 Review of literature

In this suggested model, the identification of different factors influence the equipment proficiency of construction equipment and their impacts on ventures basis has been developed on the origin of literature review and a successions of discourses with the academicians and instructing guide.

3.2.4 Design of questionnaire

The information collection process utilized in this investigate, had the choice of two essential strategies:

questionnaires and individual discussions. As the result of pilot overview, there are 83 factors which are recognized as major factors influencing equipment productivity and 6 types of effects. These factors are organized in the questionnaire format.

The factors influencing are categorized into 5 groups

1. Operators/ human factors

2. Resource/equipment factors

3. Technological factors

4. Management factors

5. Environmental factors

3.2.5 Survey and data collection

To successfully accomplish the objective of the study, one of the best vital stage is collection of accurate information. Data collection is a method of collecting important information records for a certain test or populace of observations. About twenty questionnaires were sent to the construction industry by mail and interviews were conducted among construction personnel specifically consultant, client, engineer, contractor, architect and labour.

3.2.6 Data analysis and results

The information collected were examined utilizing the relative importance index strategy to rank the factors influencing to equipment productivity on construction locales and their impacts on the project. The RII for each figure was computed from the investigation of the rating shown by the respondents.

$$\text{R.I.I} = \frac{5(n5)+4(n4)+3(n3)+2(n2)+1(n1)}{5(n1+n2+n3+n4+n5)} * 100$$

Where,

n5= number of respondents who has chosen the factor commitment as eminently significant.

n4= number of respondents who has chosen the factor commitment as very significant.

n3= number of respondents who has chosen the factor commitment as moderately significant.

n2= number of respondents who has chosen the factor commitment as slightly significant.

n1= number of respondents who has chosen the factor commitment as not significant.

3.2.7Conclusions and recommendation

After positioning, conclusions can be made about the factors which influence most and impact on project and at last recommendations and can be given for progressing the productivity.

3.3 FACTORS AFFECTING EQUIPMENT PRODUCTIVITY

From the different literature studies the following factors which impact the equipment productivity are recorded as below:

Group I: Operators/ Human factors

1. Lack of ability of operator
2. Lack of experience
3. Disloyalty
4. Personal problems
5. Lack of training

Group II: Resource/ equipment factors

1. Delay in placing the equipment
2. Two or more groups sharing an equipment
3. Equipment breakdown
4. Lack of proper maintenance
5. Spares not available

Group III: Technological factors

1. Rework
2. Compatibility and steady among contract records
3. Condition of haul road
4. Excess travel/ lifting
5. Obstacle on site

Group IV: Management factors

1. Lack of supervision
2. Improbable planning and expectation of labour execution
3. Communication between site administration and operator
4. Non-payment of charges/ Delay in payment
5. Interfacing of activities

Group V: Environmental factors

1. Temperature and humidity effects
2. Rain, snow, wind effects and sandstorm
3. Type of soils

4. RESULTS AND DISCUSSIONS

4.1 GENERAL

The overview evaluation was done by utilizing relative importance index strategy and found the best factors influencing equipment productivity.

4.2FACTORS AFFECTING EQUIPMENT PRODUCTIVITY:

Group	Factor	R.I.I.	RANK
Operators/ Human factors	Lack of ability of operator	71	1
Technological factors	Rework	71	1
Management factors	Lack of supervision	71	1
Management factors	Improbable planning and expectation of labour execution	71	1
Resource/ equipment factors	Delay in placing the equipment	69	2
Resource/ equipment factors	Two or more groups sharing an equipment	69	2
Management factors	Communication between site administration and operator	69	2
Resource/ equipment factors	Equipment breakdown	68	3
Resource/ equipment factors	Lack of proper maintenance	68	3
Management factors	Non- payment of charges/Delay in payment	68	3

Fig 4.1 Top 10 factors affecting equipment productivity

Lack of ability of operator is the 1st major issue that affects the productivity of equipment. This can happen due to lack of proper training or knowledge.

Rework may be a critical factor that contributes adversely to the construction process and specifically leads to client disappointment, decreases productivity and in extreme circumstances, case and other negative results.

Lack of supervision factor is the management factors that affects the equipment productivity in construction projects. Destitute supervision contributes to the destitute workmanship on construction areas.

Group	Factor	R.I.I.	Group Rank	Overall Rank
Operators/ Human factors	Lack of ability of operator	71	1	1
	Lack of experience	60	2	11
	Disloyalty	54	3	17
	Personal problems	48	4	21
	Lack of training	47	5	22
	Absenteeism	47	5	22
	Lack of support	43	6	25
	Age	42	7	26

Fig 4.2 operators/ human factors

Lack of ability of operator factor ranked 1st in group 1, that is operator/ Human factors.Lack of ability and involvement of laborer can cause disturbance within the construction operation and delay of various activities in construction.

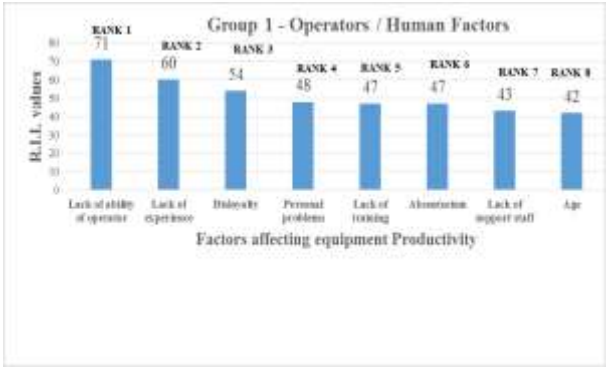

Fig 4.3 Graph for operator/human factors

Group	Factor	R.I.I.	Group rank	Overall Rank
Resource/ equipment factors	Delay in placing the equipment	69	1	2
	Two or more groups sharing an equipment	69	1	2
	Equipment breakdown	68	2	3
	Lack of proper maintenance	68	2	3
	Spares not available	66	3	5
	Lack of required development material or / and cost increment	66	3	5

Fig 4.4 resource/equipment factors

Delay in placing the equipment and two or more groups sharing an equipment are ranked 1st in group 2 that is resource/ equipment factors. For contractor, delay implies the loss of cash for additional investing on equipment and loss of time.

Group	Factor	R.I.I.	Group Rank	Overall Rank
Technological factors	Rework	71	1	1
	Compatibility and steady among contract records	67	2	4
	Condition of haul road	67	2	4
	Excess travel/ lifting	65	3	6

Fig 4.5 Technological factors

Rework factor is ranked 1st in group 3 that is technological factors which affects the productivity of equipment. Rework may be a critical factor that contributes adversely to the development process and specifically leads to client

disappointment, decreases productivity and in extreme circumstances, case and other negative results.

Group	Factor	R.I.I.	Group Rank	Overall Rank
Management factors	Lack of supervision	71	1	1
	Improbable planning and expectation of labour execution	71	1	1
	Communication between site administration and operator	69	2	2
	Non-payment of charges/ Delay in payment	68	3	3
	Interfacing of activities	68	3	3

Fig 4.6 Management factors

Lack of supervision and improbable planning and expectation of labour execution both are ranked 1st in group 4 that is management factors. Destitute supervision contributes to the destitute workmanship on construction location.

Group	Factor	R.I.I.	Group Rank	Overall Rank
Environmental factors	Temperature and humidity effects	65	1	6
	Rain, snow, wind effects and sandstorm	63	2	8
	Type of soils	44	3	24

Fig 4.7 environmental factors

Temperature and humidity effects factor is ranked 1st in group 4 that is environmental factors. Climate conditions can have a disadvantageous effect on the period and cost of building activities.

6. Conclusion and recommendations

6.1 conclusion

This investigate gives study and information of construction productivity as well as focus on factors influencing equipment productivity in building construction projects. The study considered for the views of clients, workers and contractors on the results of infrastructure projects particularly public projects that impact financial matters. This study examines all possible factors through an organized questionnaire. The overview results are subjected to investigation, and the positioning of factors is calculated utilizing relative importance indices (RII).

The study appeared that all the 3 groups-contractors, clients, and specialists of members for the most part established that out of 83 factors the best 10 impacting factors influencing equipment productivity organized in descending arrange of RII are:

- Lack of ability of operator
- Rework
- Lack of supervision
- Improbable planning and expectation of labour execution
- Delay in placing the equipment
- Two or more groups sharing an equipment
- Communication between site administration and operator
- Equipment breakdown
- Lack of proper maintenance
- Non- payment of charges/Delay in payment

The strategy for consider was a quantitative survey backed by investigative subjective interviews with industry professionals, and the overview discoveries demonstrates the major factor affecting equipment productivity is lack of ability of operator due to factor like operator/human.

6.2 Recommendation

Recommendations for improving the equipment productivity on the building projects:

- Advance equipment planning.
- Commitment to productivity advancement ought to be there at all administration levels.
- Employing modern innovations
- Motivation of laborers towards project completion.

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