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Impact of Equipment Downtime on Construction Projects

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Abstract: ***The construction industry is the foundation of every country's economy. India is the second largest industry in terms of contribute the maximum percentage to GDP growth. The progress of building operation now depends for a some few days on the supply of tools, system of use, greater breakdown recovery, preparation and management. Invariably, system downtime is regarded as one of the most important concerns facing highway contractors and plant managers. Owing to the complex behavior of equipment maintenance activities and downtime, efforts to minimize downtime frequently result in dismay.***
A questionnaire survey had to be collect primary data regarding the equipment downtime in the construction industry. The questionnaire is intended to determine the cause of equipment downtime on construction industry with the help of professional opinions about the same. The questionnaire was developed by using extensive literature review. Relative Importance Index (RII) was calculated to rank causes of equipment downtime. This research describe varies types of construction equipment depending on their applications. Also important for site management to possess proper knowledge about equipment in terms of its capacity, complexity and technical suitability to be used under the given conditions. This research study will help construction industry stakeholders to understand barriers, which cause the equipment downtime in construction projects.
Keywords: Relative Importance Index (RII), GDP,

I. INTRODUCTION

In today's fast paced world, we live and work in buildings that are made of modern materials and use modern utilities to make our routines easier. These utilities include highways, metros, hospitals, airports and seaports. These present and future developments necessitateconstruction industries to import the necessary resources, one of the most important being Construction Equipment. This equipment constitutes a major resource in the construction process of various projects. This equipment is very expensive and comprises a major component of a contractor's assets and the country's resources. At the macro level, equipment owned by contractors and dealers represents a good portion of the countries assets. At the micro level, equipment represents a major component of a contractor's or dealer's assets (Mali Pritam A., M.R.Apte, 2015).

Good project management in construction must vigorously pursue the efficient utilization of labour, material and equipment . Improvement of labour productivity should be a major and continual concern of those who are responsible for cost control of constructed facilities. Material handling, which includes procurement, inventory, shop fabrication and field servicing, requires special attention for cost reduction. The use of new equipment and innovative methods has made possible wholesale changes in construction technologies in recent decades. Organizations which is do not recognize the impact of various innovations and not adapted to changing environments have justifiably been forced out of the mainstream of construction activities. All the machines that are usually used to carry out these construction operations are referred to as construction equipment. The basic operations involved in the construction of any project are excavation, digging of small or large quantities of earth and moving them to fairly long distances, placement, compacting, leveling, dozing, grading, hauling, etc. In most cases, they are called heavy equipment especially in road constructions.

Construction firms are often face with problems related to high rate of equipment failure or breakdown and accident resulting from unskilled operator's abuse. Poor training of equipment operators is often claimed as a major cause of equipment related In 1983, Agbo state that the cost of equipment repair, fixed and variable operating cost wasted during the equipment downtime and a myriad of consequential costs that reverberate and surge through the construction business are enormous. The only way to avoid this huge amount of loss that usually lead to accompanies equipment breakdown or failure is to adopting proper equipment maintenance management strategy.

This will keep construction equipment fit at all times and allow timely completion of construction project, thereby increasing construction project profitability. Thus, to understand effective construction equipment management, one must also understand effective construction equipment maintenance.

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II. REVIEW OF LITERATURE

The journals for conducting the research study have been sourced from ASCE library, Research gate and Science direct. The summary of all the journals studied have been arranged in reverse chronological order beginning 2019 and ending 1983.

K. Prasanth Kumar, T. Chandra Mouli (July 2019) studied 'Impact of Construction Equipment Downtime in Indian Construction Sector' and this paper states that as sites are becoming more and more equipment intensive, it is necessary to have an equipment management policy which keeps the equipment in acceptable condition. Breakdown of equipment can cause huge cost to the contractors and delay the schedule. Concreting process at residential tower site was observed to understand the working of equipment. Batching plantand Concrete pump were identified as two of the critical equipment at site.

Bhushan B. Malusare, Prof. Hemant Salunkhe [2019] studied 'Implementing a systematic approach towards downtime cost' and the purpose of this paper is to present a sample of how Indian manufacturing companies deal with equipment downtime cost, and further how they analyze its reduction. The study was performed by conducting a web-based survey within Indian firms that have at least 50 employees. The main results obtained from the investigationshow that the estimated downtime costs constitute about 23.00 – 30.00 % from the total manufacturing cost ratio, and 13.00 – 15.00 % from planned production time. Additionally, the hourly cost of downtime, whether planned or unplanned, is relatively high.

Sujit Shivaji Jadhav, Rohit Salgude (2019) studied "Downtime Cost of Construction Equipment", Generally during planning, cost of equipment is calculated as Total cost= operating cost + owning cost but in actual field, downtime cost occurs due to breakdown of equipment, so thorough study of downtime and its cost calculation is necessary.

M. Manikandan, Prof. M. Adhiyaman, Dr. K.C. Pazhani [2018] studied 'Analysis of construction equipment management used in construction projects for improving productivity' and this paper elevated on the benefits of implementing total productivity while purchasing, leasing or renting the equipment, and guide in optimizing the profitability. Methods of life cycle cost estimating and decision methods were researched and compared

Kalpana Gangane, Dipak Prakash Patil(April 2018) studied 'A Survey on Downtime Cost of Equipment Used In a Construction Industry' and the fundamental outcomes acquired from the examination demonstrate that the evaluated downtime cost constitutes around 23.9 % from the aggregate assembling cost proportion, and 13.3 % from arranged creation time system. Focusing, the hourly cost of downtime, regardless of whether it might arrange or spontaneous exercises, is generally high. Be that as it may, there is a deficiency of efficient models that able to follow the individual cost forced by downtime situations. This need was indicated clearly while 83 % of reviewed organizations they don't have any entire investigation adjusted for evaluating their downtime costs procedure

Prasannasangeetha.A, Alan.S (2015) studied "Equipment Management In Construction Sector", The study reveals that the types of machines used in the construction industry have a significant influence in the construction industry. As the cost of the equipment plays a major role, the construction industry based on the size of the projects (i.e.) small, medium or large scale projects utilize the types of equipment based on their need. However optimism among construction equipment distributers remains high. Rental fleet growth is anticipated to play anincreasingly important role in the business model of distributers who can't afford to own equipment.

M. Waris , Mohd. Shahir Liew, Mohd. Faris Khamidi, Arazi Idrus (2014) studied "Criteriafor the selection of sustainable onsite construction equipment" and this study helps in determining a selection criteria based on the fundamental concept of sustainability and provides an assessment framework. A questionnaire survey was conducted among a classifiedgroup of Malaysian contractors to elicit information pertaining to the sustainable selection of onsite machineries. The findings of this study helped the decision makers to appraise the selection process of construction equipment on the triple bottom line of sustainability. Based on the qualitative and quantitative findings, the study has established criteria for the selection of sustainable construction equipment for onsite mechanization.

Luis F. Alarcón, Andrés Rodríguez, Claudio Mourgues [2012] studied 'Impact of machine failure costs on equipment replacement policies: Tunneling company case study'. It was inferred that, for those construction companies engaged in projects where production is controlled by equipment availability, with tunneling as maybe the most extreme example, equipment replacement policies affect not just the cost of a machine but have a decisiveeffect on overall project cost and achieved profit. This work describes a case study that used simulation to quantify the consequential costs of equipment availability for a company engaged in tunnel-construction. The study includes the simulation of activities of the drill- and-blast method for five tunnel types.

Thanapun Prasertrungruang and B. H. W. Hadikusumo (2009) studies "Modelling dynamics of heavy equipment management practices and downtime in large highway contractors", they have studied in detail on, Research concerned with optimization theme has tended to focus on operational analysis regarding the use of the appropriate feet selection for a specific construction method,

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time and cost constraints. Regarding maintenance/downtime theme, condition monitoring helps to accurately assess the performance and operating condition of critical equipment. Concerning the theme of productivity, research included the integration oftelematics for tracking machine location, fuel consumption, availability and idle time. Future research efforts are directed in utilizing state-of-the-art technology to provide real time spatial and performance data to support even more effective equipment management. Researchconcerned with the theme of operator's competence, emphasis is given on the use of simulators and game technologies to safely train them and consequently advance their skills and enhance their levels of proficiency in a cost-effective way.

III. CONCLUSION

Brief summery over the results obtained by the current study leads to the below conclusions:

A. Construction equipment plays a very important role in construction projects. It helps the project to be completed on time, and with certain quality.

B. As construction sites are becoming equipment intensive, breakdown of equipment can cause a huge impact on the site's progress.The impact of equipment downtime on construction projects is considerably huge.

C. From our research, we also have found out that, lack of proper skill in operators, their past experience, working hours and site conditions, their psychological state, the complexity of the machine, and other factors impact downtime considerably.

D. It was also observed that downtime delays the project at 10%, also impacting the frequency of accidents at site.

E. Project performance is affected due to equipment downtime, Leading to time and cost overruns at a nominal scale. Quality of the project is likely to be affected by equipment downtime.

F. This study is an attempt to identify the various factors causing construction equipment downtime by studying various literature and then to assess their relative importance by using the RII analysis.

G. This work will serve as a framework for further study. Future studies can be carried out to develop a downtime model in relation to the Indian construction scenario.

H. Studies could also incorporate the project duration for each category of equipment and will help in the assessment of the relative impacts of downtime.

I. Study could also be expanded to address the dynamics of downtime by using new models and improvising them to suit specific.

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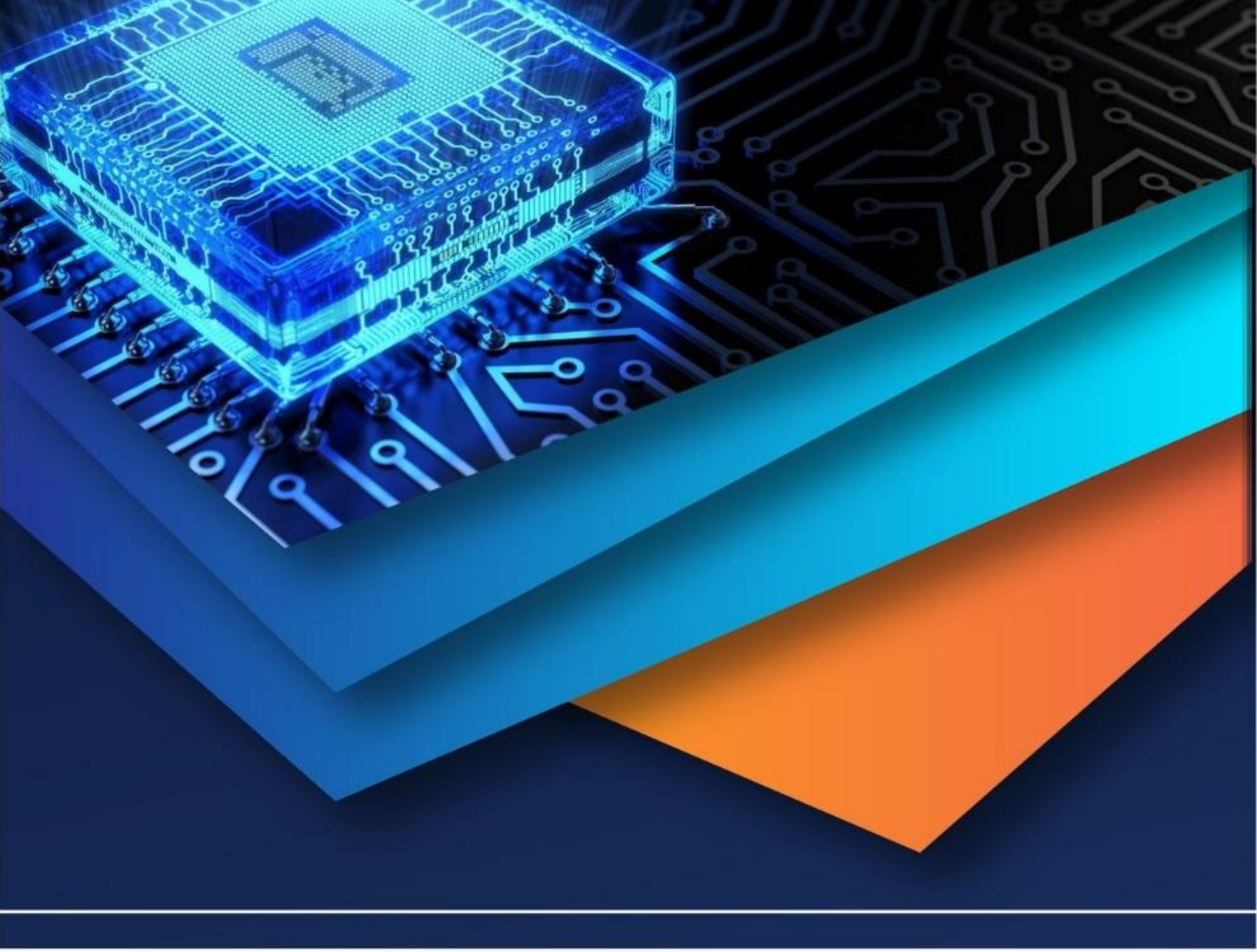

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