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Optimum Utilization of Construction Resources: A Review

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Abstract - *Construction management is one of the vital parts of project management for handling construction projects on time, with the best quality and economically. As many of the project management industries attempted to find out new methods and avoid or minimize the conventional methods for fulfilling today's demand. Construction management consists more processes and knowledge areas for managing construction projects started from initial process group up to closing process group, with all relevant segments of construction management, the Resources utilization in construction projects are one of the difficult tasks to use it optimally. Researchers have been tried distinctive methods for resource utilization, but one of the effective approaches is bringing the methods that have been used in manufacture companies to the construction industry like Just in Time method, Kanban system, .et. the main aim of this review is Optimal utilization of resources and lean construction principles to minimize the wastages in the construction project, it means to use the material, equipment, labor, and other resources in an effective way. With the help of these new methods we can to increase productivity, quality, profit and handle the project on time.*

Key Words**:** Optimum utilization; Construction resources; Lean Construction principles; Management; Wastages control.

1.INTRODUCTION

Construction management is a framework for managing construction projects with relevant aspects, challenges, and opportunities. Construction management is going parallel along with project management, so it can apply all processes of project management to construction management. The PMBOK 2017 6th edition provided an updated framework for project management as follows:

- Five Process Groups: Initiating, Planning, Executing, Monitoring, and Controlling, Closing
- Ten knowledge areas: Project integration management, project scope management, project schedule management, project cost management, project quality management, project resource management, project communication management, project risk management, project procurement management, and project stakeholder management[1].
- Forty-nine processes: the processes a middle point among process group and knowledge area, there are various processes for each step, but our focus is on resource management which has the following processes with process group and knowledge area:

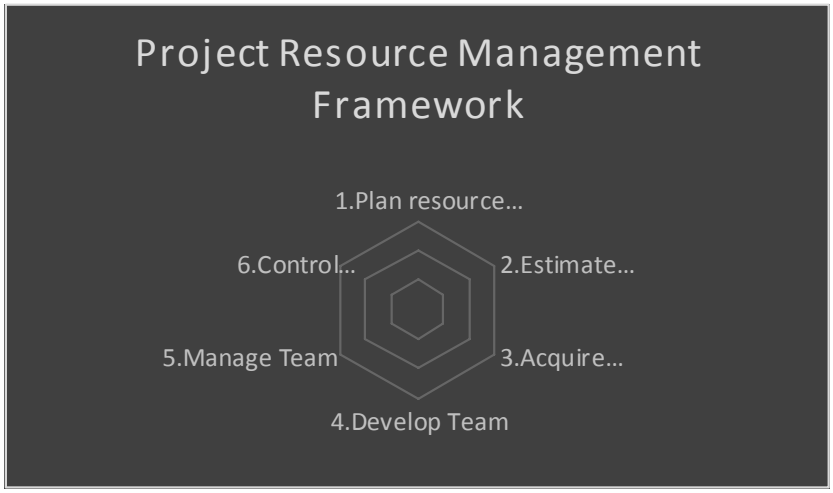

Fig: 1.1 Framework for the management of project resource

Resource utilization optimally conducted on the basis of methods that have been used in manufacture industries, on the other hand, researchers have been recommended the lean construction principles to minimize or eliminate the wastages of

resources. Using resources via lean methodology could increase productivity as well, so this review giving a picture of an optimal framework for resource utilization which is more effective for construction industries. This review paper also conducted research about time and money which are also a type of resources for a construction project, time and money are the initial provisions for each project, so the utilization and management of these two aspects are more necessary to utilize in effective ways and avoid the wastages. The researchers have conducted research on this related, it has combined in the literature review part.

2. LITERATURE REVIEW

Arulselvan-et-al (2016) studied labor productivity impacts to other resources like equipment, material, capital, the researcher has done survey for project in India, and project cost has provided with coming percentage, labor 30%, material 35%, equipment 15%, profit 10%, indirect cost 05%, overhead 05%. The researcher has suggested the following factors for improving labor productivity, 1. The practice of modernized management methods. 2. Appropriate planning3. Contribute skills guidance 4. Sufficient equipment and devices in working. 5. Encouragement with impulse and other curriculem.6. Useful conveniences to contribute .7. Excellent oversight.8. Safety plan.9. Administrative labor force.10. Governments should be in the picture[2]. Sobotka-et-al (2016) have done research about waste management scenario for construction projects, the researcher has done case study and analyzing the wastages, the result has shown that the effective management for construction processes, effective logistics chain for waste recovery and applying the ecological concept for increasing the system efficiency of waste minimization.[3]. Nowotarski-et-al (2016) has studied the impacts of the total cost of storage in the construction project, a case study was done in three elements of work i.e. concrete work of columns, storage area management, and scaffolding ordering, the result obtained to implement the lean principles and through lean management methodologies[4]. Jogi & Asadi (2017), has done research about optimization of resources via wastages control and minimization, the researcher has an emphasis on nature of wastage to identify and result shown that the wastages decrease with excellent management of machinery and labor, it means to utilize the machinery further for activities[5]. Kumar & Anil (2017) studied key factors and plan for productivity improvement of construction resources i.e. material, equipment and labors, the obtained result shown to utilize machines optimally and raise labors for increasing productivity[6]. Fapohunda-et-al (2010), studied optimum utilization of resources-reflection to site manager's attributes, the researcher has done case study in the UK construction industry concern to site managers involving and his impacts to execute the project via optimum utilization of resources, the result shown the following principles roles of site managers for increasing efficiency, 1. Squad or team combination 2. Team framework 3. Good procuring structure 4. Professional 5. Error identifications6. Presentation of effective alternative methods for construction production process.7. Planning towards resources wastes' minimization and/or avoidance.8. Effective and efficient communication and information dissemination[7]. Chandrasekar-et-al (2014), has studied effective utilization of lean management in construction industry through lean principles which raise quality and decrease wastages of material, moreover researcher scoped just in time of JIT in construction, delivery system, enhance quality, recognition of waste in construction process, and also provided the following recommendation of obtaining the effective utilization of lean management, orientation program for subcontractors, weekly meeting, training for employees, utilization of local material, participants involvement and relationship between production and management[8]. Kaiafa-et-al (2015) has done research concern optimization of multi-objective resource with limited scheduling system. genetic algorithm employed for the optimization, the result has been evaluated through Microsoft project. The result shown that the algorithm can provide sufficient solution for obtaining the optimization of resource[9]. Jamil-et-al (2016) studied to integrate the sustainable construction (SC) and lean construction (LC) and provided the simulation of both concept, created the model as sustainable lean construction (SLC), researcher concluded that the building information modeling(BIM) and Industrialized Building System (IBS) are the tools that can act as catalyst for creating the conceptual framework[10]. Cheng-et-al (2017) studied an innovative audio-based system for activity analysis and tracking of construction heavy equipment, this system has the coming steps to provide activity signal of equipment, filtering the audio signals, converting them into time-frequency representations, classifying these representations using machine learning techniques, the researcher said that the system has implemented and the result was efficient[11]. Atan-et-al (2018) has studied resource leveling with a fixed duration, provided a greedy heuristic to be used with mixed-integer linear models for several leveling objectives including the Release and Rehire metric[12]. Zhao-et-al (2019) studied about collecting data for production control in construction projects, through real-time tracking system, the researcher introduced Bluetooth Low Energy (BLE) technology for tracking the labors in three case study projects and said that this technology is ready for implementation, so it increases the management system and eliminate the waste in construction site[13]. Alavipour-et-al (2019) studied the integrated system of genetic algorithms (GA) and linear programming (LP) for financing optimization. A hybrid GALP algorithm is introduced to solve the optimization. The researchers have considered the early start and early finish times of activities. the start times of activities may reduce the financing cost[14].

3. CONCLUSIONS

- Optimum utilization of resources has an efficient result for quality, time and profit.
- Elimination and minimization of wastages through lean construction principles are an excellent choice in the construction process.
- The Just in Time and other methods that have been used in manufacture industries obtained the requirements of resource optimization and should transfer to construction for increasing efficiency.
- Utilization of technology as a real-time tracking system for productivity tracking is an efficient method.
- the construction industry is seeking a framework to utilize the resources as optimally.
- The use of a specific method for the utilization of resources as individually is required for construction projects.
- Lean principles can decrease the wastages of T.I.M.E.D.O.W.N in each type of construction project.

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