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Improving the Labour Productivity through Applications of Work Study Principles

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Abstract – Civil is a basic branch of engineering and hence construction industry is one of the largest industry in economy. Because of its large presence, it contributes to the national economy and provides employment to the large no of people. Large amount of investment is made in the constructing ports, roads, urban infrastructural development, telecommunication sectors, power plants, and rural development etc. Various studies are performed by different researchers to improve the efficiency and effectiveness of construction process, implementation various techniques to reduce re-work and improve the productivity. Labour productivity is a very important factor in the construction industry that affects the overall quality of construction. Different labors have their own capacity of working and they show different level of productivity and affect the time and quality of the construction.

Case studies and work measurement can improve the planning of human effectiveness. Using this study we can improve the efficiency and economy of the construction industry. Purpose of this work, focuses the benefits of time and method study employed in construction sectors. Method study and work measurement and work sampling has been used to measure the productivity of the various construction activities. It is expected that this concept will help to improve the further quality of the product and reduce risks.

In essence, the focus is to apply method study and work measurement and statistical analysis to various construction activities to the observation data sets generated for different construction processes on site and determines their productivity processes and establish regression equation using statistical analysis.

Keywords: Time and Motion Study, Productivity, Works Sampling, Statistical Analysis.

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INTRODUCTION

Work Study is a step by step examination of the method to carry out the activities. Work study is used to improve the effective use of the resources and also used to set up the standards of the performance for which the activities are carried out. In work study the word “Efficiency” began in the 19th to 20th century. The work measurement i.e. the time and method study i.e. the motion is two principle activities of work study. These two studies are originated in the work of T.W. Taylor. T.W. Taylor is called as the father of scientific management. Method study is used to achieve the economy of project.

The goal of this project is to understand the skills required to perform a work and to provide the correct training. The work study concept is used to increase the output and quality of the labour productivity. Time study is a direct and homogeneous observation of task, using a timekeeping device e.g. decimal stopwatch, electronic stopwatch and videotape camera are used to record the task to have time taken for completing that particular job and most of this device is used for the repetitive cycles for short to long durations. Workers observation must be competent; find out the difficulty in the job and decide what best solution is. Problem statement for work study increases the output in mind because; worker is under impression that he has made a mistake. Basic purpose of this project is to improve the quality of labour productivity and ultimately quality of production.

LITERATURE REVIEW

1. The origin of scientific management

An American, Frederick Winslow Taylor (1856-1915) is the founder of scientific management, in his famous book, "Principle of Scientific Management" in 1911; he suggested new principles of industrial organization and stressed the advantages of an extreme division of labour and mechanization in the workplace. The principles of scientific management were developed at a time when American industry and economy entered the stage that characterized modern industries in the country. Taylors view was that the objective of management should be maximized so that there is prosperity of both employers and employees. As Taylors principles of scientific management were adopted complimenting tools, techniques were developed including time and motion study. Frank Bunker Gilbert Sr (July 7, 1868-June, 14, 1924) was an advocate of scientific management; Frank Gillbreth and his wife Lillian Moller Gillbreth are known as the parents of motion study.

2. Labour productivity and work sampling: The bottom line by H. Randolph Thomas

This paper describes the relationship between labour productivity and direct work. They compare 30 projects that show, direct work is better in winter than the rest of the year. According to this result it's illogical and this can be found by using linear regression model. This paper shows that direct work is not related to productivity.

In that the conclusion is based on the three assumptions. First one is wait time is inversely proportional to the direct work time. The second is, direct work is directly proportional to the better productivity. Third one is better productivity depend on the less time spent waiting. In this paper author says, the labour productivity is increased when we spend more time on the direct work activity. Most of the data collected from the nuclear power plant construction project; because work sampling studies have not been widely conducted in other sectors of the construction industries. This paper mention about the various factors that affect the labour productivity. The major factors are type, scope, layout and complexity, time frame, construction method, weather, skill of the work force, work practices, length of workdays etc.

3. Causes of variation in construction project task starting times and duration by Brad W. Wambeke, Simon M. Hsiang

In this paper author gives us definition for 'variation'. It is the difference between time that was planned and what actually happened during the task. Variation in the task is important because the same way causes same result, that's why we are not improving the productivity performance.

A construction project consists of a large no of interdependent tasks, where starting time of various activities affects indirectly all activities. Delay in any of the activities affects the schedule planned and ultimately decreasing the productivity.

4. Enhance comparative study of motion based on modeling and classification of harmful actions in construction

In this paper author gives us the action recognitions for analysis of safety, analysis of health and also the analysis of operation. The most important factor in this paper is health and safety. The classification of unsafe actions are decided by monitoring workers behavior due to which workers get injured that is detected from the monitoring by recording video, taking pictures using camera etc. These unsafe actions are improved by their feedback and behavior, for finding such problems. Author uses the data from various captured data, from that recognition of unsafe actions, focusing on rotation angles, joints angles, position vectors and movement direction that four factors will be used as features for classification and indicating this author used the (RGB-D)i.e. red, green, blue plus depth sensor.

5. Effects of Design-Integrated process planning on productivity in Rebar placement

In this paper author gives the planning process on productivity in Rebar placement. Rebar that is the reinforcement bars is a major portion of today's construction and the rebar is a main constitute of this type of construction. In this paper, author gives us idea about planning process and thus improving the productivity. Author gives us three different techniques for placement of rebar 1) productivity rating. 2) five-minute rating, and 3) continuous time study and finally the productivity result is based on the comparison and it will be show whether planning process has significantly reduced non-productive time.

6. Factors affecting labour productivity in building project in the Gaza strip

In this paper, author gives us factors affecting the labour productivity. The productivity is a dominant issue in the constructor field. Productivity depends on time and motion. It is an issue in both the developing and developed countries. The developed countries are recognized with the factors that we have to increase and which will be used to improve productivity. In this paper author gives the factors that are affected, the material shortage, lack of labour experience, lack of labour surveillance, misunderstanding between labour and

superintendent and drawing and specification alteration during execution.

7. Construction labour productivity and its improvement

Author says that productivity is a dominant issue in the construction sector and the most important challenge is its improvement. Many researchers have been doing this in the past, still they need to improve the labour productivity hence its proved that there is no standard definition for productivity. This paper is on the basis of questionnaires. In this data is collected and analyzed and also gives the steps for improvement of labour productivity.

8. Introduction to work study; George Kanawaty, 199 2, International Labour office Geneva

The original author of this book was late C.R. Wynne-Roborts, who mainly intended as a training manual, who attended course in work study at management development and productivity. The second revised edition was published ten years later and this edition was prepared by R.L. Mitchell and last edition that is the fourth edition was prepared by George Kanawaty. While updating he wrote many chapters of the new material. In this book he introduced six parts. In that first one is the productivity, work study and human factor, gives us the definition of the productivity. Productivity is calculated as the ratio of output to input. In this output is particularly defined as a product. Output depends on the input like land and building in a convenient location, material, energy, machines and equipment and human recourse. Task of management is to improve productivity without changing other recourse or balancing against another. Aim of work study is to examine the way an activity is carried out, and simplify or modify to reduce the unnecessary or excess work and reduce re-work.

The second part of this book is the method study. In that they define method as a systematic recording of a selected job, examine the way of work in order to make improvement. Method study consist eight steps; select, record, examine, develop, evaluate, define, install and maintain. With the help of these steps improve the same amount of productivity.

The third part of this book is the selected production management technique. Production cost depends on the way a product is designed. The fourth part is the work measurement. The work measurement is the second complementary technique of work study. Work measurement is the time required for that particular activity. It depends on the poorly designed process and specification. This chapter gives us steps for reducing waste of time by eliminate unnecessary movement to improve the productivity.

The second last part is that; how work study has become an effective tool in improving productivity. The overall book of introduction to work study is very effective. With the help of this we can improve the productivity.

9. Study of various factors affecting labour productivity and methods to improve it - Mr. A. A. Attar, Prof. A. K. Guptam Prof. D. B. Desai

In this paper, author gives the various factors that affect the production which includes lack of material, bad weather, proper guidelines, design specification, financial problem to owner etc. For improving such type of problems he gives guidelines as below:-

- Proper training to the laborers.
- Motivating the workers toward project completion.
- Store the required material in stock.
- Pre planning of activity.
- Maintain work discipline.
- Time to time remuneration to workers.

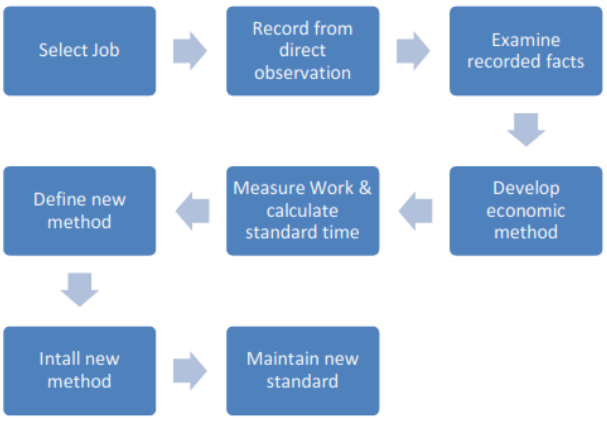
In this paper author try to find the factors that affect the productivity and also gives the guidelines to improve it.

10. Productivity improvement technique and its relationship with work study

In this chapter author gives us the productivity improvement technique which is useful for the individual and organization growth in productivity. In this chapter the aim is to introduce and understand productivity improvement, work study and its relation with productivity improvement.

Work study procedure consist eight steps as shown in fig-

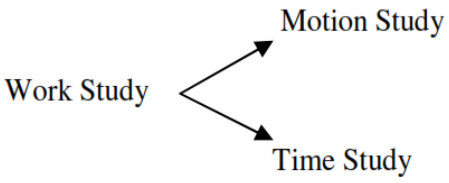
Work Study Procedure



Symbols for Method Study consists the following symbols:-

Operation	Denoted by	○
Transportation	Denoted by	T
Storage	Denoted by	▽
Inspection	Denoted by	I
Delay	Denoted by	D

Flow chart for work study includes motion study and the time study as given by the author. It is very useful for finding the work study as below;



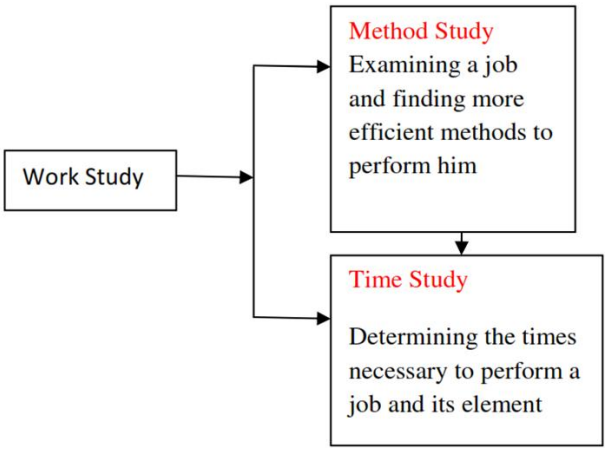
Work measurement-

How to find the work measurement? There are 6 basic steps namely selection, recording, examining, measuring, compiling and precisely defining method. Flow chart for work measurement is as follows;

Relationship between method study and work study:-

In work study give us two parts that is the method study and the time study. In method study first examine the job and finding the alternative more efficient method to perform him. In time study calculate how time required for that activity and determine necessary time to perform a job. Following work study principles in any construction industry we can improve the productivity and also improve the planning.

Flow chart for the Work Study



CONCLUSION

Direct work percentages from work sampling studies can be used to predict labour productivity measured as the work hours per unit of output. It can decrease and control costs improve working conditions in the surrounding and motivate people. The most important thing of this project is to learn how to train the workers particularly production workers in their skills and techniques so they can become motion and time conscious.

Using the motion studies we will eliminate waste of time (Work measurement) and motion study (Method study) and work sampling has been achieved employed to measure the productivity that is output per worker hour of the various construction activities. It can be calculated individual workers performance and identifying operations that are having problems so the problems can be corrected.

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