

# A Review on Improvement of Workflow and Productivity through Application of Time and Motion Study Technique

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**Abstract**— Work study is most effective tool for any enterprise to determine standard time and increase the productivity. This method is useful for simplify the operation and reduction of operation whenever possible. Automation is suitable for mass production but medium size enterprise it is not preferable. So Time and motion study technique is useful for investigation of the process. And by this method we can categorize needless activity and decrease them. This method leads to modify in process layout for effective utilization of machinery and manpower for improving productivity.

**Key words:** Work study, productivity, motion study, standard time

- To improve the design of work place layout.
- Effective utilization of materials, machines and men's.
- To find a best way of doing a job.
- Efficient and fast material handling.
- Neat and clean environments and working conditions.
- To reduce fatigue and boredom of work by avoiding unnecessary movements.
- To eliminate wastage of time.
- Reduce health hazards.
- Improving working processes and the standardization of the procedures.
- To improve operational efficiency.

## I. INTRODUCTION

Work study is the systematic examination of the methods of carrying on activities so as to improve the effective use of resources and to set up standards of performance for the activities being carried out. Work study succeeds because it is systematic both in the investigation of the problem being considered and in the development of its solution. Work study is one of the most powerful tools to improving productivity. Techniques of work study are method study and work measurement. [1]

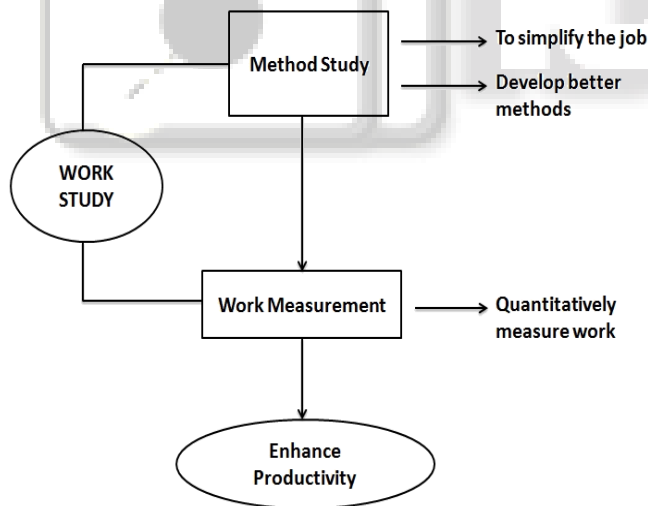


Fig. 1: Work study technique

- 1) Method study: It is the systematic recording and critical examination of ways of doing things in order to make improvements. [3]
- 2) Work measurement: It is the application of techniques designed to establish the time for a qualified worker to carry out a task at a defined rate of working. [4]

## II. OBJECTIVE

The main objective of time and motion study methods is given below. [14]

## III. HISTORY

### A. Motion Study:

Frank Bunker Gilbreth (1869-1924), along with his wife Lillian, developed the principles of Motion Study. Motion study has the best potential for economy. Frank and Lillian Gilbreth are known as the parents of motion study. Gilbreth is starting research to find the “best way” of performing a given task by analyzing the motion in which his workmen were involved. He attempt to make development by removing all preventable motion. The removal of these preventable motions is known as work simplification. [6]

### B. Time Study:

Frederick Winslow Taylor evolved the principles of time study. Taylor was the first individual who used the stop watch time study to appraise the work content his purpose was to define “a fair day’s work.” Amongst his learning “Taylor Shoveling Experiment” which he studied between 400 and 600 men that using their own scoop from home to moving material from stack of coal, coke and iron in around two mile stretched yard. Taylor goal was to classify which scoop was the most efficient among all dissimilar size of scoop. He together all the information with the help of stop watches and analyzed it. The results were unbelievable which reduction of time and saving of number of labours for every year. [12]

## IV. PROCEDURE

### A. Method Study Procedure:

The basic approach to method study consists of the following eight steps: [9]

#### 1) Select:

Select the work to be studied.

- The job should be selected for the method study based upon the following considerations:
- Economical aspect
- Technical aspect
- Human aspect

2) *Record:*

Record the relevant facts about the job by direct observation.

- Recording techniques used for method study are charts and diagrams.

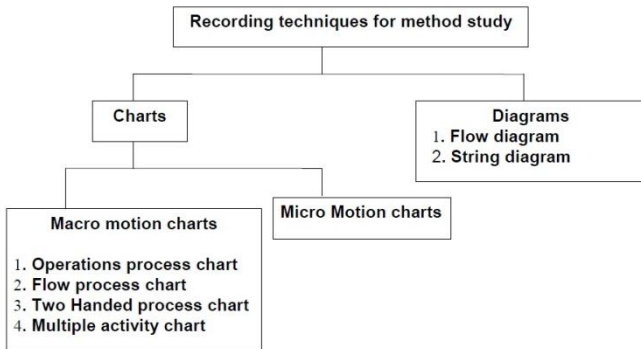


Fig. 2: Recording Techniques

Standard Symbol	Name of Activity
○	Operation
⇒	Transportation/Movement
□	Inspection
⊔	Delay/ Temporary storage
▽	Storage
□⇒	Combined Activity

Fig. 3: Recording Symbols

3) *Examine:*

Examine the way the job is being performed and test its purpose, place, sequence and method of performance.

- This examination is carried out with a view to eliminate, combine, rearrange or simplify the activities.

4) *Develop:*

Develop the most practical, economical, and effective method.

- After critical examination of records is complete, it is necessary to transform the learning's into the development of new methods.

5) *Evaluate:*

Evaluate different alternatives to develop a new improved method, and comparing the cost-effectiveness of the selected new method with the current method of performance.

6) *Define:*

Define the new method in a clear manner and present it to those concerned, i.e., management, supervisors and worker.

7) *Install:*

Install the new method as a standard practice and train the persons involved in applying it.

8) *Maintain:*

Maintain the new method and introduce control procedures to prevent a drifting back to the previous method of work.

[8]

B. *Time Study Procedure:*

This method is carried out by following steps: [5]

- (1) Select the work to be study.
- (2) Breakdown the operation into elements.
- (3) Measure the time by means of a stop watch taken by the operator to perform each element of operation. Either continuous method or snap back method of timing could be used.
- (4) At the same time assess the operator's effective speed of work relative to the observer's concept of normal speed. This is called performance rating.
- (5) Adjust the observed time by rating factor to obtain normal time for each element.
  - Normal time is calculated by below formula.

$$\text{Normal time} = \text{Observed time} * \text{Performance rating} \quad - (1)$$

- Sum the normal times for each element to develop a total normal time for the task.

- (6) Determining the allowances to be made over and above the normal time for operation. Allowance is personal time allowance, fatigue allowance, delay allowance or any other allowance.

Determining the standard time for the operation. Determining the standard time is,

- (7) Standard time = Normal time / (1 - Allowance fraction) - (2)

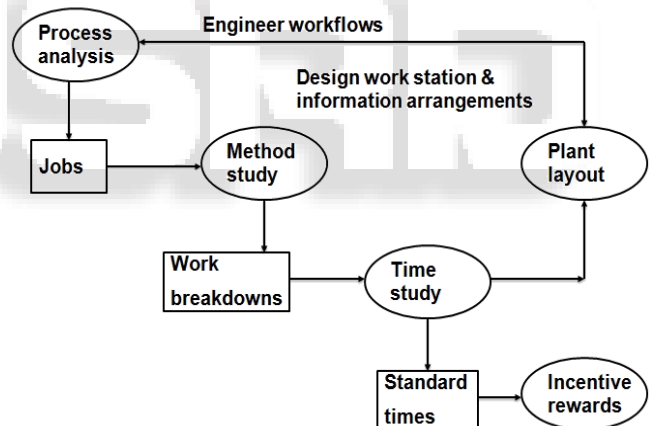


Fig. 4: System relationship

This figure shows the relationship between workflow, workstation and time-motion study method.

V. CONCLUSION

There are number of factor affecting the productivity. Mainly the factor is improper workflow, unnecessary operations, poor workmanship, improper material handling. By use of this work study method we can identify the area of improvement in the process, to find out the standard time of doing the operation and standard sequence of operation. Also improve the material handling, worker satisfaction, reducing lead time, and speed up the process thus improving the productivity. It is possible with making simple change in the process.

VI. REVIEW OF PAPERS

S R N O	TITLE	AUTHOR	PUBLISHED	AREA OF WORK	REMARK
1	Productivity improvement of a motor vehicle inspection station using motion and time study techniques	Khalid S. Al-Saleh	2011, Journal of King Saud University	Automobile vehicle testing and flow of inspection line	Reduced inspection time with the help of time and motion study and ARENA software
2	Process Flow Analysis of Diesel Engine Crankshaft Machining Line Layout	Mahesh R Kale, Prof. V.S. Jadhav	2014, International Journal of Innovative Research in Science, Engineering and Technology	Diesel engine crankshaft, flow of the process and layout	productivity improve through the changing of layout, operation distance material flow
3	Redesigning of Horn Assembly Line Using Ecrs Principles	Sindhuj a D, Mohandas Gandhi N, Madhumathi P	2012, International Journal of Engineering and Innovative Technology	Change in the movement and assembly line	By the use of this principle we can simplify the operation and eliminate unnecessary operations
4	Productivity Improvement by Applying Cellular Manufacturing Techniques in an Axle	Gyanendra Prasad Bagri, Rahul	2014, International Journal of Applied Engineering Research	Cellular manufacturing, group technology, plant layout	Improved productivity through the application of group technology

5	A Review of Various Tools and Techniques for Lead Time Reduction	Afzal H. Alad, Vivek A. Deshpande	2014, International Journal of Engineering Development and Research	Lean tool, design structure matrix, design for production	Estimate the manufacturing time and redesigning the product or modifying the production system
6	Optimization of Assembly of Rear Axle Carrier (Transmission System) Through Ergonomic Consideration: An Overview	Mr. Kaustubh N. Kalasurkar, Jayant P. Giri, S. G. Mahakar	2013, International Journal of Engineering Science and Technology	Predetermined motion time study, various charts, method time measurement	the use of time and motion study and ergonomics principle of workstation design to improve effectiveness
7	Work Study Architecture for Lean Waste Analysis to Achieve Optimum Man-Machine Configuration	Rohana Abdullah, Md Nizam Abd Rahman	International Journal of Basic & Applied Sciences	lean concept, design of workstation	By using this concept reduced the time of performing operation, eliminate human error and improved the accuracy of data

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