

Time and Motion study



D. S. S. C. P. Subasinghe
E/04/288
Department of Mechanical Engineering
Faculty of Engineering
University of Peradeniya

Time and Motion study

- What is time and motion study?
This is a business efficiency technique.
 - Time study
Frederick W. Taylor and his followers developed and refined the Time Study.
 - Motion study
Frank B. Gilbreth and his wife Lillian developed and refined the Motion Study.

Historically the two studies are discussed individually, today they generally are discussed as one

Time and Motion Study Definitions

- **Business Definition**
The measurement and analysis of the motions or steps involved in a particular task and the time taken to complete each one.
- An analysis of the motions used in an industrial process with an aim to improve efficiency and productivity.
- A method to establish "the one best way to perform a task" ..

Time and Motion Study purposes

- To eliminate unnecessary motions at work.
- Identify the best sequence of motions for maximum efficiency and productivity.
- standardization of work.

Time and Motion Study in a organization

- Historically
Used in the manufacturing industry to evolve pay scales.
- Presently
performance evaluations.
predict the level of output that may be achieved.
used to uncover problems and create solutions.
used for time cost analysis.

Time and Motion Study Methods-time Measurement

- A system of standard times for movements made by people in the performance of work tasks.
 $\text{Standard time} = (\text{Observed time}) (\text{rating factor}) + (\text{Observed time}) (\text{rating factor}) (\text{PED allowance})$
- Predetermined motion-time systems

Used to set labour rates in industry by quantifying the amount of time required to perform specific task.

Ex: MTM -1965
MOST-1972
MODAPTS Technique



Time and Motion Study Methods-work Measurement

- Determination of the length of time it should take to complete a job.

Stages of a basic work measurements system

1. Analysis
2. Data collection & measurement
3. Synthesis

Time and Motion Study Methods-work Measurement

Methods

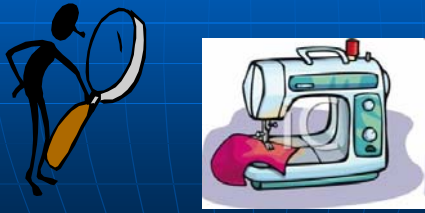
- Stopwatch time study
- Historical times
- Predetermined data
- Work sampling

Time and Motion Study How it works.....?

- Establish the standard job method.
- Break down the job into elements.
- Study the job.
- Rate the worker's performance.
- Compute the average time.
- Compute the normal time
 - $Nt=(t) (RF)$ or
 - Normal Time=(elemental average time) (rating factor)
- Compute the standard time
 - Standard time=(Observed time) (rating factor)+
 - (Observed time) (rating factor) (PFD allowance)

Time and Motion Study Implementation.....

- How the workers of a garment spend their time when sewing a garment...?



Time and Motion Study Implementation.....

- The given task separate into number of operations, 12 in total
- The exact time durations need to be measured. (cycle times)

Operations	Time/(min)	Rating Fac:
Collar	1.5	1.10
Back & front panels attachment	1	1.15
First side seam	2	1.01
Second side seam	2	0.95
Hand	3.25	1.21
Hand attachment 1	2.75	1.20
Hand attachment 2	2.75	1.05
Seams of panels	4	1.05
Button attach	4.25	1.10
Bar tag operation	0.30	1.10
Label attach	0.15	1.00
Trimming & Quality	1.5	1.2

Operations	Nt/(min)
Collar	1.65
Back & front panels attachment	1.15
First side seam	2.02
Second side seam	1.9
Hand	3.93
Hand attachment 1	3.3
Hand attachment 2	2.89
Seams of panels	4.20
Button attach	4.68
Bar tag operation	0.33
Label attach	0.15
Trimming & Quality	1.8

Time and Motion Study Implementation.....

- Measured cycle time for 1 garment = 27.97 min
- To compute the standard time use the 20% of PFD allowance factor

$$\begin{aligned}
 ST &= Nt(1 + \text{PFD Allowance}) \\
 &= 27.97(1 + 0.2) \\
 &= \underline{33.56 \text{ min}}
 \end{aligned}$$

Time and Motion Study With lean manufacturing...

- Lean manufacturing or lean production is the process in a more basic way "More value with less work".

Toyota Production System (TPS)
MAS Operating System (MOS)



Time and Motion Study With Six sigma.....

- Six Sigma is a business management strategy.

Motorola



Time and Motion Study Problems.....

- Observers are not always competent.
- Those conducting the study are not always proficient in the job being observed.
- The actions observed are not always reflective of the group as a whole.

Time and Motion Study Problems.....

Workers may not cooperate with a time and motion study.

- They may resent the study if it is being used to determine the pay scale.
- Workers may change the rate at which they work.
- Pressure may increase mistakes made.
- Workers may alter normal work methods to disrupt the study.

Time and Motion Study References.....

- Ferguson, David S., Don't Call it "time and motion study", *IIT Solutions*, Norcross. May 1997. Vol. 29, Issue 5.
- Finkler, Steven A., *A Comparison of work-sampling and time-and-motion techniques for studies in health services research*, *Health Service Research*, Chicago. Dec 1993. Vol. 28, Issue 5.
- Koehler, Kenneth G., *Time Cost Analysis*, *CMA*, Hamilton. May 1992. Vol. 66, Issue 4.
- Russell, Roberta; Taylor, Bernard W., *Operations Management*, Prentice Hall Inc., Upper Saddle River, NJ. 2000.
- Stevens, Larry, *Time Study Prompts New HR Efficiencies*, *Personnel Journal*, Santa Monica. April 1994. Vol. 73, Issue 4.
- Stuttaford, Genevieve, *The One Best Way: Fredrick Winslow Taylor & the Enigma of Efficiency*, *Publishers Weekly*, New York. March 17, 1997. Vol. 224, Issue 11.

THANK YOU.....




THANK YOU.....



Time and Motion Study With lean manufacturing...


Seven wastages of TPS

1. Transportation (moving products that is not actually required to perform the processing)
2. Inventory (all components, work-in-progress and finished product not being processed)
3. Motion (people or equipment moving or walking more than is required to perform the processing)
4. Waiting (waiting for the next production step)
5. Overproduction (production ahead of demand)
6. Over Processing (due to poor tool or product design creating activity)
7. Defects (the effort involved in inspecting for and fixing defects)



Six Sigma asserts that

- Continuous efforts to achieve stable and predictable process results (i.e. reduce process variation) are of vital importance to business success.
- Manufacturing and business processes have characteristics that can be measured, analyzed, improved and controlled.
- Achieving sustained quality improvement requires commitment from the entire organization, particularly from top-level management.
- An increased emphasis on strong and passionate management leadership and support.
- A special infrastructure of "Champions," "Master Black Belts," "Black Belts," etc. to lead and implement the Six Sigma approach.
- A clear commitment to making decisions on the basis of verifiable data, rather than assumptions and guesswork.



Time and Motion Study

- **Standard Time**
The time required for a person to complete a task or operation at a defined rate of working.
- **Observed Time**
The time required to complete the task.
- **Rating Factor**
The pace the person is working at. 90% is working slower than normal, 110% is working faster than normal, 100% is normal. This factor is calculated by an Industrial Engineer trained to observe and determine the rating.
- **PFD Allowance**
Personal, Fatigue, and Delay Allowances. These include factors such as: Are the workers standing all day? Are they working in a cold environment? Do they have to wear safety equipment?

