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.

### 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”.

### Purposes

To eliminate unnecessary motions at work.

Identify the best sequence of motions for maximum efficiency and productivity.

Standardization of work.

### Methods

#### Time Measurement

- A system of standard times for movements made by people in the performance of work tasks.

  \[
  \text{Standard time} = (\text{Observed time}) \times (\text{rating factor}) + (\text{Observed time}) \times (\text{rating factor}) \times (\text{PED allowance})
  \]

- 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

#### Predetermined Motion-Time Systems

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
  \[ N_t = (t) \cdot (RF) \]
  Normal Time = (elemental average time) \cdot (rating factor)
- Compute the standard time
  \[ S_t = (O_t) \cdot (RF) + (O_t) \cdot (RF) \cdot (PFD allowance) \]

Time and Motion Study
Implementation.....

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

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

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<th>Operations</th>
<th>Time/(min)</th>
<th>Rating Fac:</th>
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<td>1.10</td>
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### 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
  \[ ST = Nt(1 + \text{PFD Allowance}) \]
  \[ = 27.97(1+0.2) \]
  \[ = 33.56 \text{ min} \]

### 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)**

### With Six sigma....

- Six Sigma is a business management strategy.

  **Motorola**

### Problems...........

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

- Workers may not cooperate with a time and motion study.
  1. They may resent the study if it is being used to determine the pay scale.
  2. Workers may change the rate at which they work.
  3. Pressure may increase mistakes made.
  4. Workers may alter normal work methods to disrupt the study.
A clear commitment to making decisions on the basis of verifiable data, rather than assumptions and guesswork.

Achieving sustained quality improvement requires continuous efforts to achieve stable and predictable results. The use of Six Sigma, for instance, has been shown to improve process efficiency and reduce defects. Six Sigma asserts that seven wastages of TPS exist:

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)

Continuous efforts to achieve stable and predictable process results (i.e. reduce process variation) are of vital importance to business success. Time and motion study is a technique for studying the elements of a task and determining the time required to perform it at a defined rate of working. Factors such as: Are the workers standing all day? Are they working in a cold environment? Do they have to wear safety equipment? And determine the rating. Normal, 110% is working faster than normal, 100% is normal. This normal, 110% is working faster than normal, 100% is normal. This normal, 110% is working faster than normal, 100% is normal. This normal, 110% is working faster than normal, 100% is normal.

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.

Standard Time

The time required for a person to complete a task or operation at a defined rate of working.

PPE Allowances

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?