**Work Study**

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.
Method Study

Method study examines the way a task (changing the clutch on a car, preparing a flower bed for planting, cleaning a hotel room) is done. The industrial engineer has an eye on operational efficiencies and costs, quality of processes, service reliability, staff safety etc. Method study techniques are applicable from factory/workshop manufacturing to cabin crew activities on an international flight and office clerical work.

The Human Factor in The Application of Work Study

Management

Work Study Specialist

Supervisor

Workers
Work study and the Management

- Importance of management.

- How to gain the management support:
  - Make them feel that it is not their fault.
  - Make them understand the purpose and techniques of work study.
Work Study and the Supervisor

The importance of the supervisor:

- Mostly affected by work study.
- A personal challenge.
- Responsibilities are taken away.

Work Study and the Supervisor

Do’s and Don’ts

- Never give a direct order to a worker.
- Always refer worker’s questions to the supervisor.
- Never express opinions to workers.
- Don’t allow worker’s to get you to alter decisions made by the supervisor.
- Seek the supervisor advice whenever possible.
- Always be introduced to workers by the supervisor.
Work Study and the Worker

- Work study improves industrial relations:
  - Workers feel that the management cares for them.
  - Workers discover that there are managers who highly understand their job.
  - Improving the feeling of confidence.
  - Workers are more able to carry out their jobs.

Work study and the Worker

- Why workers resist the work study:
  - It will change their familiar work methods.
  - Many workers resent being timed.
  - Fear of being fired.
Problem Solving

- Problem definition
  - statement of purpose, goal, objective
  - criteria of judging successful solution
  - output requirements
  - completion date

- Analysis of problem
  - constraints or specifications
  - description of the present method
  - review problem definition and criteria

- Search for possible solutions
  - identify the basic cause that creates problem;
  - eliminate all unnecessary work
  - combine operations or elements
  - change sequence of operations
  - simplify the necessary operations

- Evaluation of alternatives
  - in terms of criteria and original specification
Problem Solving

- Recommendation for action
  - written reports to senior managers
  - presentations to senior managers and shop floor employees
  - development of soft skills, listening, negotiating,
- Marketing recommendations
  - target relevant groups

How do we measure performance?

- Profit
- Financial measures
- Productivity – output/input ratios
- Cycle time
Possible Performance Measures

- **Quality** expressed as % scrap value, % returns, % downtime
- **Costs** expressed as inventory turnover, value added to incoming material
- **Delivery** expressed as % on time delivery, cycle time
- **Flexibility** as Average number of setups /day, % of common parts/product
- **Innovation** as % sales from products introduced in last 3 years

**Method Study**

To Simplify the job and develop more economical methods of doing it

- **Select** the job to be studied
- **Record** by collecting data or by direct observation
- **Examine** by Challenging purpose, place, sequence, and method of work
- **Develop** new methods drawing on contributions of those concerned
- **Evaluate** results of different alternative solutions
- **Define** new method and present it
- **Install** new method and **train** persons in applying it
- **Maintain** and establish control procedures
Select – Where to Look

- Poor use of resources
- Bad layout
- Bottlenecks
- Inconsistent quality
- High fatiguing work
- Excessive overtime
- Employee’s complaints

Select – Economic Considerations

Will it pay to begin, or continue, a method study of this job?

- Key profit-generating operations
- Key costly operations
- Repetitive work
- Long travels
- Excessive overtime
Select – Technical Considerations

Desire to acquire more advanced technology

- Extensive paperwork
- Repetitive work (automation)
- Hazardous work
- Inconsistent quality

Select – Human Considerations

Workers satisfaction/resentment

- Satisfaction level
- Start with non-controversial jobs
- HSE
Select – Limiting the Scope

Setting boundaries and determining content

- One operation or a sequence
- The whole operation or part
- Which aspect: worker, materials, equipment, … etc.

Select – Possible Results

- Increased production rate
- Reduced cost
- Less labor, materials, or equipment
- Improved quality
- Improved safety
- Reduced scrap
- Improved standards of cleanliness
Select – Pareto Analysis

Pareto Chart

<table>
<thead>
<tr>
<th>Cause</th>
<th>Total Hours</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>3000</td>
<td>45.4</td>
<td>45.4</td>
</tr>
<tr>
<td>Tool</td>
<td>2000</td>
<td>30.3</td>
<td>75.7</td>
</tr>
<tr>
<td>Set Up</td>
<td>900</td>
<td>13.6</td>
<td>89.4</td>
</tr>
<tr>
<td>Machine Set Up</td>
<td>500</td>
<td>7.6</td>
<td>97.0</td>
</tr>
<tr>
<td>Machine</td>
<td>100</td>
<td>1.5</td>
<td>98.5</td>
</tr>
<tr>
<td>Other</td>
<td>1000</td>
<td>1.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Record- Symbols

- Operation (Make ready, Do, Put away)
- Inspection
- Transport
- Delay
- Storage
Record- Symbols

Operation (Make ready, Do, Put away)

- Select
- Record
- Examine
- Develop
- Evaluate
- Define
- Install
- Maintain

TRANSPORT

An arrow indicates transport, such as

- Move material by track
- Move material by hoist or elevator
- Move material by carrying (messenger)
Record- Symbols

Select
Record
Examine
Develop
Evaluate
Define
Install
Maintain

INSPECTION
A square indicates an inspection, such as
Examine material for quality or quantity
Read steam gauge on boiler
Examine printed form for information

Select
Record
Examine
Develop
Evaluate
Define
Install
Maintain

Delay
The letter D indicates a delay, such as
Material in truck or on floor at bench waiting to be processed
Employee waiting for elevator
Papers waiting to be filed

Select
Record
Examine
Develop
Evaluate
Define
Install
Maintain
Record- Symbols

Record- Charts and Diagrams

Outline Process Chart
Flow Process Chart (Worker, Material, Equipment)
Two-Handed Process Chart
Procedure Chart
Simultaneous motion Cycle Chart
Multiple Activity Chart

Flow Diagram
String Diagram
Cyclegraph
Chronocyclegraph
Travel Chart
Outline Process Chart

Task: Manufacture and assembly of rocker arm (present method).
Chart begins: Raw material for each component
Chart ends: Completed assembly inspected

Outline Chart

Flow Process Chart—"Material" Type

Job: Inspection, stencilling and filling 5-oz drum (present method).
Chart begins: Empty 5-oz drum in stock.
Chart ends: Filled 5-oz drum in stock.
1 Empty 5-oz drum:

- In empty-drum stock
- Rolled to inspection point
- Waiting inspection
- Body drum removed
- Inspected internally
- Body drum replaced

28 ft:
- Rolled to stencilling point
- Stencilled
- Waiting labelling
- Labelled
- Waiting inspection
- End drum inspected and tightened
- Waiting filing

22 ft:
- Rolled on to scale-platform
- Positioned for filling
- Body drum removed
- Tared
- Filled
- Body drum replaced
- Rolled to filled-drum stock
- In filled-drum stock

Summary

- Operations 10
- Inspections 2
- Transports 4
- Storages 2
- Delays 5

Fig. 8.8 Flow Process Chart showing progress of 'Material' through a Program.
Record- Example Flow Chart

Chart begins: Typist in own office awaiting dictation.
Chart ends: Typist puts letter in "out" tray.

Man
(Typist)

1. To author’s office
2. Take dictation
3. To own office
4. Prepare typing set
5. Typist types letter and copy
6. From m/c and separate copies
7. Check
8. Place in book for signature
9. To author’s office
10. During checking and signing
11. To own office
12. Type envelope
13. Letter to envelope
14. Letter and copy aside to "out" tray

Record- Example Flow Chart

FLOW PROCESS CHART (AMPLIFIED)—"MAN" TYPE

Job: Writing a letter using a shorthand-typist (present method).
Chart begins: Typist in own office awaiting dictation.
Chart ends: Typist puts letter and copy in out tray.

Tyest’s Office
To author’s office

Prepare typing set
Type letter and copy
From m/c and separate copies
Check
Place in book for signature

Author’s Office
Take dictation
To own office

During checking and signature

To own office

Type envelope
Letter to envelope
Letter and copy aside to "out" tray

Fig. 8.11 Man’s Type Flow Process Chart from Fig. 8.10, amplified to Emphasize Distances Traveled
Record- Example

Flow Chart

Chart begins: Contents awaiting dictation by author,
Chart ends: Contents of letter to "out" tray.

Material
(Contents of Letter)
1. Wait arrival of typist
2. Taken down in shorthand
3. To typist’s office
4. Typist prepares to type
5. Typed in letter form
6. Typist separates copies
7. Checked
8. Placed in book for signature
9. To author’s office
10. Checked
11. Signed
12. To typist’s office
13. Delay while envelope typed
14. Inserted in envelope
15. Aside to “out” tray

Select
Record
Examine
Develop
Evaluate
Define
Install
Maintain

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FLOW PROCESS CHARTS—"MAN" TYPE
AND "MATERIAL" TYPE

Job: Writing a letter using a shorthand typist (present method).

Chart begins: Typist in own office awaiting dictation.
Chart ends: Typist puts letter in "out" tray.

Man
(Typist)
1. To author’s office
2. Take dictation
3. To own office
4. Prepare typing set
5. Typist types letter and copy
6. From mime and separate copies
7. Check
8. Place in book for signature
9. To author’s office
10. During checking and signing
11. To own office
12. Type envelope
13. Letter to envelope
14. Letter and copy aside to “out” tray

Figure 8.10 Flow Process Charts, 'Man and Material' for the same job.

Record- Example

Flow Chart

Chart begins: Contents awaiting dictation by author,
Chart ends: Contents of letter to "out" tray.

Material
(Contents of Letter)
1. Wait arrival of typist
2. Taken down in shorthand
3. To typist’s office
4. Typist prepares to type
5. Typed in letter form
6. Typist separates copies
7. Checked
8. Placed in book for signature
9. To author’s office
10. Checked
11. Signed
12. To typist’s office
13. Delay while envelope typed
14. Inserted in envelope
15. Aside to “out” tray

Select
Record
Examine
Develop
Evaluate
Define
Install
Maintain

October 03
Multiple activity Chart

String Diagram

Record- Example

Select
Record
Examine
Develop
Evaluate
Define
Install
Maintain

Figure 39. Multiple activity chart: Inspection of catalyst in a converter (original method)

Figure 33. A string diagram
Record- Example
String Diagram

Figure 34. A simple movement study sheet:

![String Diagram](image)

Record- Example
Travel Chart

Figure 40. Travel chart: Movements of messenger in office

![Travel Chart](image)
Examine - The Questions

Purpose: What is actually done?
   Why is it necessary?
Place: Where? Why?
Sequence: When? Why?
Person: Who? Why?
Means: How? Why?

With a view to:
   Eliminate
   Combine or Rearrange
   Simplify
Examine- Secondary Questions

Purpose:

What is done?
Why is it done?
What else might be done?
What should be done?

With a view to:
Eliminate
Simplify

Examine- Secondary Questions

Place:

Where is it done?
Why is it done there?
where else might it be done?
Where should it be done?

With a view to:
Combine or Rearrange
Examine- Secondary Questions

Sequence:  **When** is it done?
Why is it done **then**?
when **might** it be done?
When **should** it be done?

With a view to:
Combine or Rearrange

Examine- Secondary Questions

Person:  **Who** does it?
Why does **that** person do it?
Who **else** might do it?
Who **should** do it?

With a view to:
Combine or Rearrange
Examine - Secondary Questions

Means: **How** is it done?

Why is it done **that** way?

How **else** might it be done?

How **should** it be done?

With a view to:

Simplify

Develop

New Designs

Multidisciplinary Teams

Worker Involvement

Quality Circles

Simple Ideas (Spring Loaded Table)
Evaluate

Multiple Improvement Ideas
Consider costs, benefits, and drawbacks
Report (ABC, Accurate, Brief, and Clear)
Example

Define

The written standard practice
Prepare a written standard practice, also known as an "operative instruction sheet". This serves several purposes
1. It records the improved method for future reference.
2. It can be used to explain the new method to management, supervisors and operatives. It also advises all concerned, including the works engineers, of any new equipment required or of changes needed in the layout of machines or workplaces.
3. It is an aid to training or retraining operatives.
4. It forms the basis on which time studies.
Define

The written standard practice outlines in simple terms the methods to be used by the operative. Three sorts of information will normally be required:

(1) The tools and equipment to be used and the general operating conditions.

(2) A description of the method. The amount of detail required will depend on the nature of the job and the probable volume of production. For a job which will occupy several operatives for several months, the written standard practice may have to be very detailed, going into finger movements.

(3) A diagram of the workplace layout and, possibly, sketches of special tools, jigs or fixtures.
Install

Installation can be divided into five stages, namely:

(1) Gaining acceptance of the change by management.

(2) Gaining acceptance of the change by the departmental supervision.

*There is no point in trying to go any further if this approval and acceptance have not been obtained.*

(3) Gaining acceptance of the change by the workers and their representatives.

(4) Preparing to make the changes.

(5) Controlling the changeover.

Install

Training

May use films to demonstrate the old and the new methods. Films are particularly valuable when retraining.

Develop the habit of doing the job in the correct way.

Train to follow a numbered sequence illustrated on a chart.

Learning curves

In the first stages of learning, rests between periods of practice should be longer than the periods of practice themselves.

When the operative has begun to grasp the new method and to pick up speed, rest periods can be very much shorter.

Nursing the new method.
Maintain

workers should not be permitted to slip back into old methods, or introduce elements not allowed for, unless there is very good reason for doing so.

To be maintained, a method must first be very clearly defined and specified.

Assign a specialists permanently.

Formal review.
Method Study in the Office

Offices use resources, must be used efficiently. Percentage of workers in offices continues to increase. Administrative costs (overheads) must be controlled. Introduction of advanced technology (machinery). In most offices, most of the work is routine. Look for areas or activities that:

- Account for a significant proportion of office labor costs.
- Are producing large numbers of errors or serious errors.
- Are creating high levels of dissatisfaction.
- Need to change in response to some external change.

Quality circle.

Most office work can be placed on a hierarchy which includes systems, procedures, activities and methods.

Figure 58. The hierarchy of office systems, procedures and methods
Method Study in the Office

Use the columnar chart form in which each column represents one department or section of the organization (figure 60).

![Columnar chart form](image)

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Method Study in the Office

Design of forms

Naturally, a document or form should be examined together with the procedure in which it is used. Changing a system or procedure may have automatic implications for forms used. Forms themselves should be examined when the procedure itself has been examined and improved or validated. Examination of a form follows the basic critical examination process, asking:

Why is the form necessary?
What information does it convey? Who uses it?
When do they use it? Where is it used?
How is it used? (Is the form produced by a computer, are entries typed on to the form, is it filled in manually, etc.?)

Then examining and evaluating alternatives.
Method Study in the Office

Design of forms

When designing forms we are trying to make the form:
- compatible with its intended use
- easy to complete
- easy to use

Consideration must be given to: paper size; paper weight;
- shape;
- color;
- maintaining any house style or corporate identity;
- and balancing these with the cost involved.

Method Study in the Office

Details that affect design are:
- the filing/retrieval process;
- the routing of the form throughout the organization;
- the degree to which additional entries are made on the form at subsequent stages;
- the nature of data entered on the form and the degree to which they can be grouped.
Method Study in the Office

Control of forms

The most important part of controlling forms is to undertake regular audits to discover if each form is still necessary to serve a particular business function (MAINTAIN).

Where the purpose of the form is still valid, questions must be asked about the environment in which the form operates and whether changes here, for example, in technology or filing methods require changes to be made to the form.

Method Study in the Office

Control of forms

Other items to be considered are:

The production method:

How is the form produced and are there now better or cheaper ways?

How much stock of each form is held, and where is it held? Is this appropriate to the use of the form?

How are supplies to users reordered?

How is stock issued to users?

How is issued stock tracked?
Method Study in the Office

Control of forms

What is the useful life of information on the form? Are there any legal constraints on disposal?

How do we ensure that forms are disposed of, after their useful life is ended (to release valuable space)?

Are there security restrictions on disposal (should forms be shredded or burnt)?

Office Layout

Office layout study should consist of the following steps:

Record details of the major systems in use in the office.

Record details of the clerical procedures that support those systems.

Examine the working methods of those procedures and carry out a basic method study of each one.

Carry out a capacity assessment of each part of the procedure.

Analyze volumes of output and question the senior managers to discover likely future trends.

Identify communication and contact paths and frequencies.

Design individual workstations (ergonomics).

From volume and capacity data, calculate total workstation requirements.

Decide on basic type of layout.

Identify any “external” constraints.

Draw up a schematic layout.

Investigate available hardware solutions.

Discuss the provisional layout with both the users.

Modify the layout in accordance with the results of discussions and prepare the proposed layout.