

Unit IV.

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Work methods

the physical actions employed to perform a task.

Evaluating and modifying work methods to prevent discomfort and injury is effective ergonomics.

Physical Demands Analysis (PDA) or Physical Demand Profile or work demand profile or work demand analysis indicates an evaluation conducted to determine the physical requirements of a specific job or category. focuses on physical motions / positions that are required to do a job.

Work

→ 1) Reactionary work

2) planning work

3) Procedural work

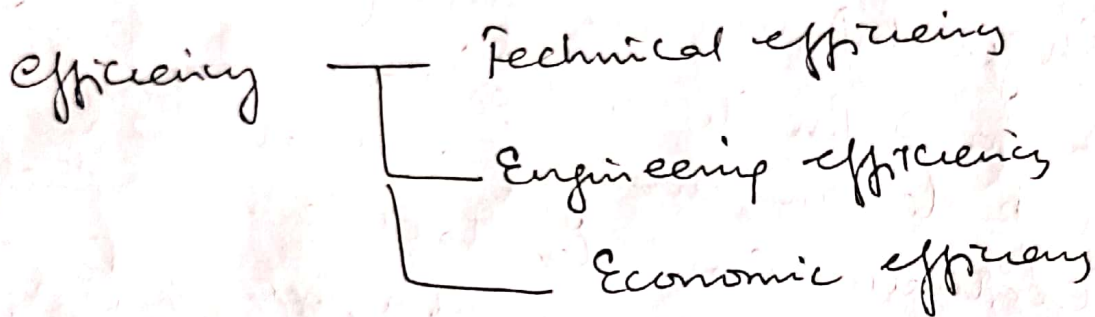
4) Insecurity work

5) Problem solving work

Concept of efficiency

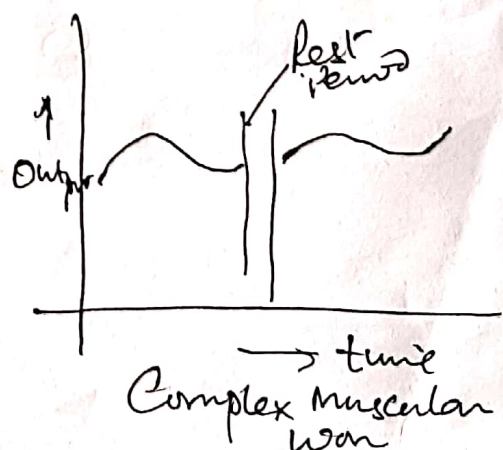
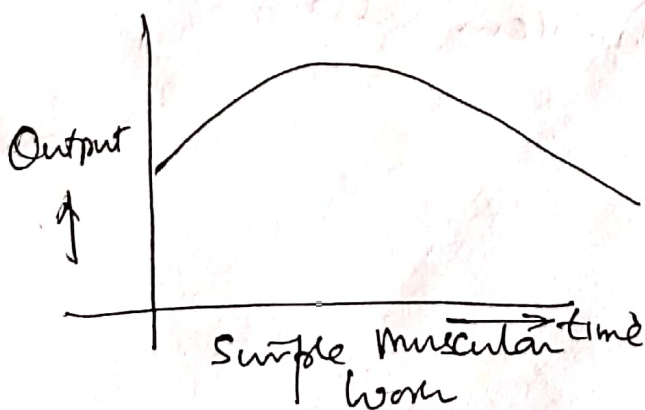
Ability to avoid wastage materials, energy, effort, money and time in doing some thing or in producing a desired result.

It is measurable, quantitatively defined by $\frac{\text{Output}}{\text{Input}}$.



"Efficiency is doing things right
Effectiveness is doing the right things"

Work Curve — 1) Simple muscular work
2) Complex muscular work
3) Mental work



hours of work →

8 hours, break for meals → 45 min.

If you work
5 days or less
per week

Contractual work hours

9 hours per day or 44 hours
per week

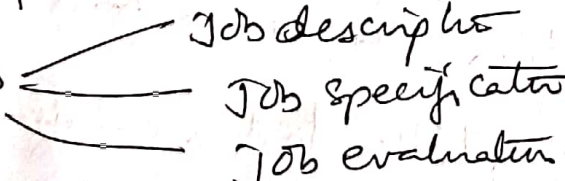
More than 5
days a week

8 hours per day
or 44 hours per week

Nature of work or job description

Job analysis

"the process of determining by observation and study of the tasks, which comprise of the job methods, equipment used, skills, attitudes required for successful performance of the job"

Job analysis 

Purposes

- 1) Determine best way to do the job
- 2) Prepare job specification for selection of employees
- 3) to determine duties & responsibilities
- 4) to establish wages
- 5) To prevent accidents
- 6) To establish relationship with other jobs

Uses

Manpower planning
Recruitment & selection
Training & development
Performance appraisal
Job evaluation

Mental work



Work method → to improve performance
at work —

- 1) Organize & prioritize
- 2) Avoid multitasking
- 3) Avoid distraction
- 4) Manage interruptions
- 5) Set milestones
- 6) Think like a boss — "wear boss's shoes"
- 7) Get a mentor
- 8) Listen
- 9) Aim for clarity
- 10) Research
- 11) Write a letter to your future self.
- 12) Identify blind spots. — areas unaware of
- 13) Simplify — something
- 14) Ask questions
- 15) Know your competitor
- 16) Acknowledge others
- 17) Read
- 19) Give yourself a vacation
- 20) Be humble.

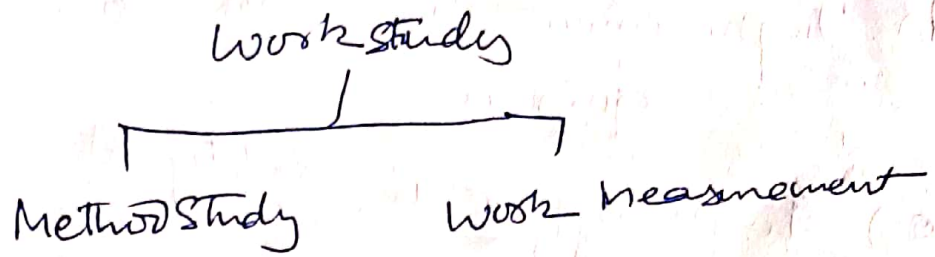
Job description an abstract of information received from job analysis, giving roles & responsibilities

Job specification - Statement of min-acceptable human qualities required for the proper performance of the job.

Job design process of designing on the contents of the job, in terms of duties, responsibilities, methods used, techniques adopted, and the relationship between jobholder, superiors & subordinates.

Some approaches →
Task fragmentation, Standardization, Training after selection, ~~and~~ incentivization.

Method of job design → Job Rotation, Job enlargement
Job enrichment



Work study is defined as — "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 is the systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more efficient methods to reduce costs. Different techniques are used to do so.

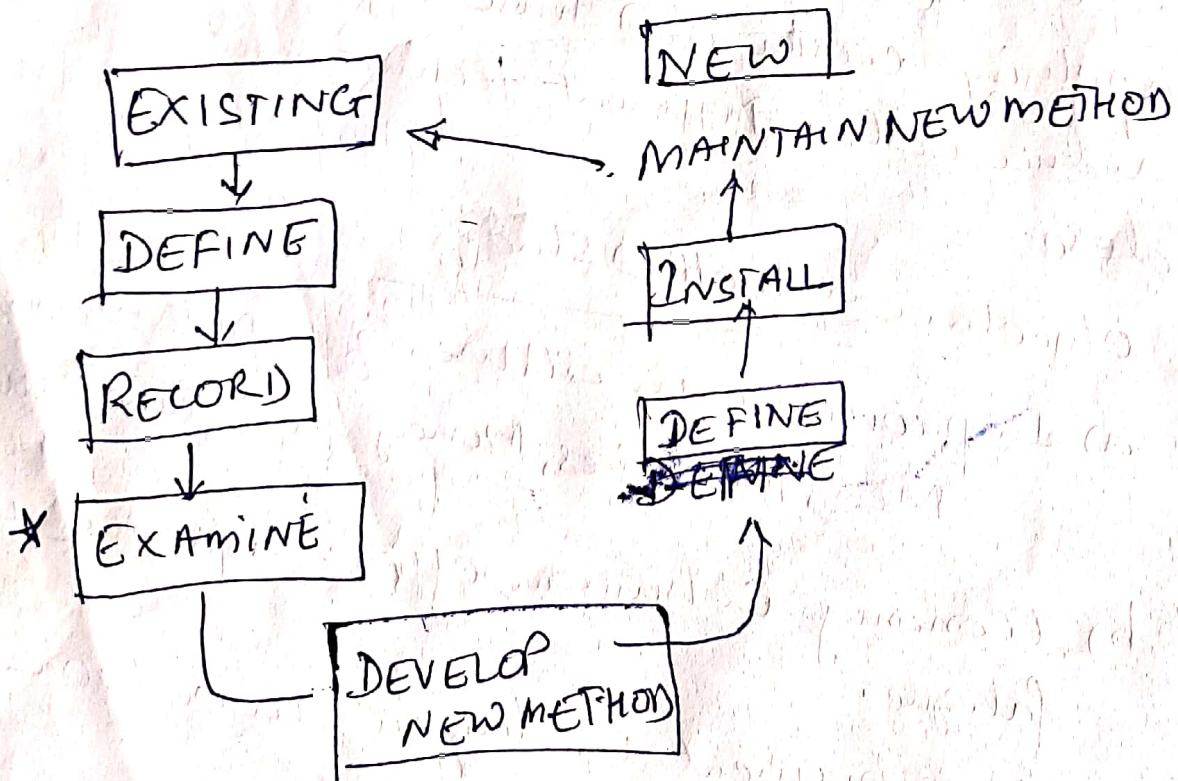
Objectives of method study

- a) Improvement in all uses of inputs of resources
Men, Machines, Money and Time & Information
- b) Economy in human effort to reduce unnecessary fatigue.
- c) Improvement in layout in a work environment

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- d) Improvement in design of plant and equipment
 - e) Improvement in safety standards and procedures
 - f) Overall development for a better working environment

7 Steps process

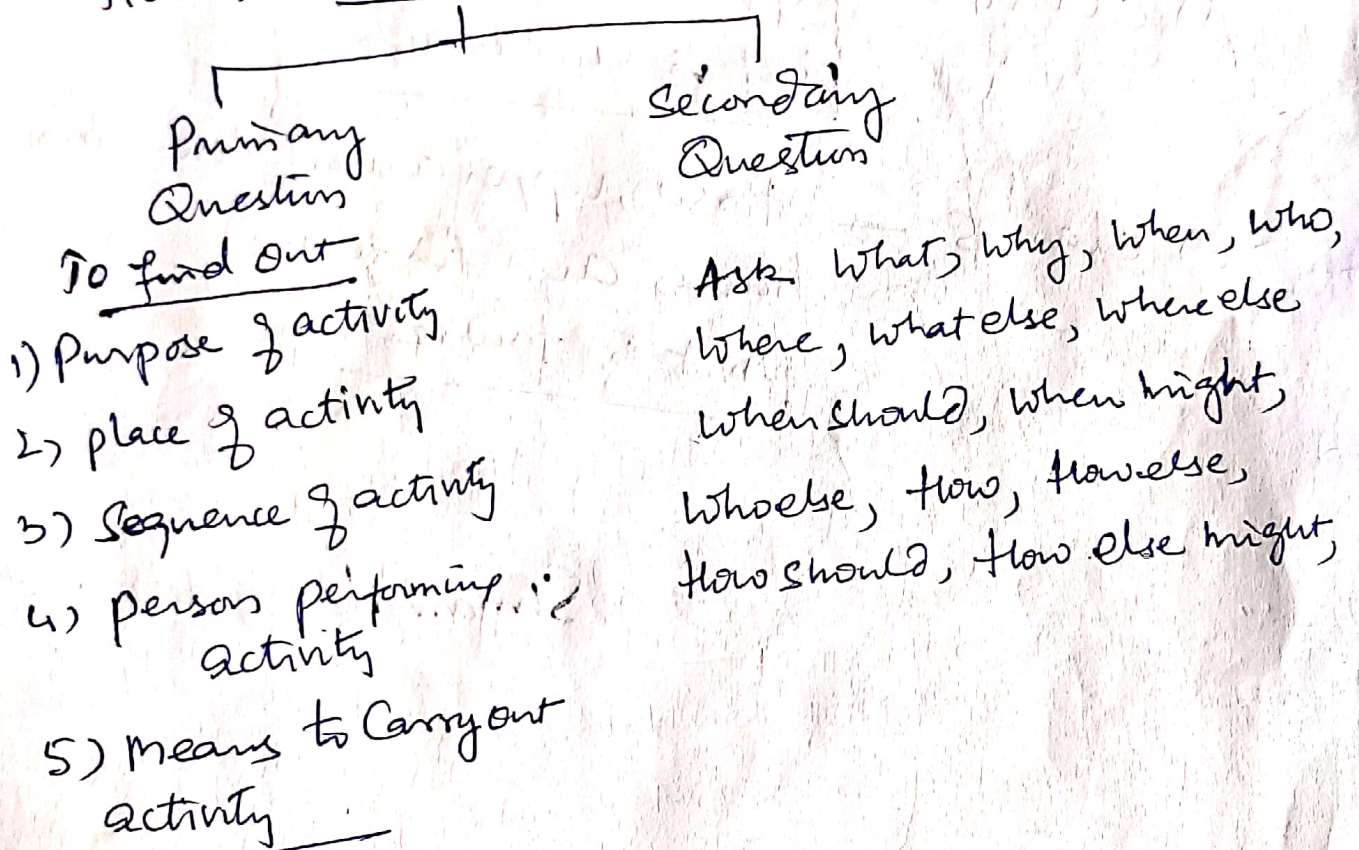
- a) Define existing method
- b) Record existing method
- c) Examine existing method
- d) Develop new method
- e) Define new method
- f) Install new method
- g) Maintain new method



Recording Techniques

- a) Outline process chart
- b) Flow process chart [Material type
Equipment type
- c) Time scale multiple activity chart
- d) Flow diagram
- e) String diagrams

How to Examine?



- ↓ FOR
- a) Eliminate
 - b) Combine
 - c) Rearrange
 - d) Simplify
- } activities

Motion Economy

Frank Gilbreth & Lillian Gilbreth

Movements of the body are classified into

- a) Class 1 → fingers, pivot is knuckle.
- b) Class 2 → Hands, fingers, pivot is wrist
- c) Class 3 → forearms, hands, fingers, pivot is elbow.
- d) Class 4 → upper arms, forearms, hands, fingers, pivot is shoulder
- e) Class 5 → torso, upper arms, forearms, hands and fingers, pivot is trunk

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Work Measurement

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Objectives

- a) finding ineffective time in an activity or process.
- b) Setting a standard for output level
- c) Evaluating workers performance.
- d) Assessing & planning manpower needs.
- e) Determine available Capacity
- f) Comparing different work methods
- g) facilitating scheduling of operations
- h) Establish wage incentive scheme.

Techniques of work measurement

- 1) Stop watch time study.
- 2) Work Sampling
- 3) Predetermined time standards.
- 4) Standard data.

Concepts req. work measurement

→ Qualified worker → One who has accepted physical attributes, required intelligence and education.

→ Standard rating → Assessment of worker based on standard pace or rate and based on observer
Concept

Standard performance (pace or rate). → rate of

Output expected to be achieved by a qualified worker, without ^{over} exertion, over the shift, provided he is motivated and applies himself to the job. The time taken by a qualified worker, to do a standard pace rate is the 'Standard time'.

Steps in work measurement — determine the Standard time

- Obtain all records of available info, worker, surroundings which are likely to effect the execution.
- Record complete description of the method and break it to elements
- Measure with a stop watch and record time taken by the worker.
- Determine allowances
- Apply allowances on basic time
- Arrive at Standard time

Micro motions

Search, Find, Select, Grasp, Hold, Position, Assemble, Use, Disassemble, Inspect, Transport—loaded, unloaded; preposition for next operation, release load, rest.

Allowances → time given as spare, to recover from fatigue and for relaxation during work

- Types →
- Relaxation allowance — fixed needs allowance 5% men, personal needs 7% women
 - Variable allowance — depends on person
 - Interference allowance → to meet legitimate and expected delays.
 - Contingency allowance
 - Policy allowance. — unexpected unavoidable delay, power breakdowns.
- ↳ as company's policy

Principles of motion Study

1) Principles relating to body movement

- a) Use momentum
- b) Use both hands
- c) equipment to be neat and in order of work
- d) rest period to remove fatigue

2) Relating to work station

- a) Clean and efficiently illuminated
- b) all work items to be near

3) Tools & equipment

- a) Both hands and legs are to be used
- b) use automation. Conveyor systems to carry output from 1 place to other
- c) all m/c to be neat and efficiently work

4) Cross transport & time saving

Accidents

Safety / health / Environment - SHE

Health Hazards

physical → noise, vibration, thermal radiation, ill lighting

chemical → dust, fumes, fibres, mist, vapour, etc

Biological →

ergonomic -

mechanical -

psychological

→ losses due to accidents → Direct & Indirect loss.

Direct loss → the employer pays for it

Indirect loss → loss of time of injured person,

→ loss of time for people who take care of injured

→ investigation & reporting

→ damage caused to machines

→ reduction in efficiency of worker after recuperation

→ loss of morale

→ Causes of accidents → due to infra, physical conditions, moving objects, unsafe acts, electrical causes

Fatigue → State of the worker, wherein the power to work is decreased and pleasure to work is reduced.

Fatigue Causes tension, increased strain, lack of sleep, loss of concentration, forgetfulness, reduced cognitive ability, depression.

Fatigue — Necessary & Unnecessary fatigue
Fatigue caused by unfavourable working conditions and methods — unnecessary fatigue

Influence of hours of work → max 7 hrs a day or 40 hrs a week

Influence of rest pauses → 5 min of rest after every 80 min of work.

Influence of illumination → excess or low illumination causes strain. Optimum is 215 lum/m^2 , (use natural + artificial) glare free, good contrast

Influence of atmospheric conditions → Temperature, humidity and air circulation affects worker.

Speed — Flywheel, gears, Coupling

Noise —

monotony of boredom — mental fatigue due to routine tasks
↳ desire to have a change

Preventive measures

a) Safe work place → Good layout, reduced noise levels, sufficient illumination, ventilation etc.
floors to be spill proof / oil proof

b) Safe material handling

c) Use of personal protective devices

→ Goggles, Helmet, Aprons, Safety shoes, belts,

→ good training to workers.

→ ~~Constant~~ Warning signs, publicity and play cards, signage.

→ prevention of electrical accidents

→ use proper insulation

→ Switch off when not in use.

Safety factors

1) equipment related

2) work related

3) Environmental

Desired values

Temp → $20-22^{\circ}\text{C}$ winter
 $21-24^{\circ}\text{C}$ summer

Humidity 25-50% RH

Noise → Conversation from a distance of 1 meter should not be possible to be heard without extra effort.

Ventilation 0.6 m^3 of air per person to remove odour

Industrial Safety

Occupational Health Hazard →

- 1) Conditions that Cause legally Compensable Illness.
- 2) Any Conditions in the work place that impair the health of an employee enough, to make them lose time from work or to work with less efficiency.

Health Hazards

- a) Physical Hazards → noise, vibration, thermal stress, poor lighting etc.
- b) Chemical Hazards → dust, fumes, gases, smoke etc.
- c) biological, ergonomic, mechanical & psychological hazards.

Safety

Accident → any incident that occurs to which interferes with orderly progress of the activity

Losses due to accident :- Direct losses / Indirect losses

Direct

- 1) loss of time for fellow workers
- 2) loss of time for conducting alternate arrangements.
- 3) loss due to damaged equipment
- 4) loss due to reduction in efficiency
- 5) loss due to lowering morale

Indirect

Safety through legislation

Factories act 1948, Indian explosives act 1884,

Mines act 1952, Indian Boilers act 1932,

Indian Electricity Act 1910, etc.

Government Safety through legislation