INDUSTRIAL ENGINEERING

Lesson 4
Work Study

by
Dr. Gusman Nawanir
Faculty of Industrial Management, Universiti Malaysia Pahang
E-mail: gusman@ump.edu.my

Synopsis

This chapter briefs the general concepts of work study constituting methods study & work measurement to ensure the best methods of doing activities.

Expected Outcome

1. Understand the general concepts work study.
2. Explain the steps involved in work study.
3. Describe types of tasks/works.
4. Understand the role of work study in improving productivity.

What is Work Study?

"... The techniques of method study & work measurement, which are employed to ensure the best possible use of human & material resources in carrying out specified activity"

(International Labour Organization)

Objectives of Work Study

Eliminate

Combine

Rearrange

Simplify

Effectiveness & efficiency

Steps Involved in Work Study

Motion Study

Definition

Analysis of the human body motions used while performing a specific job.

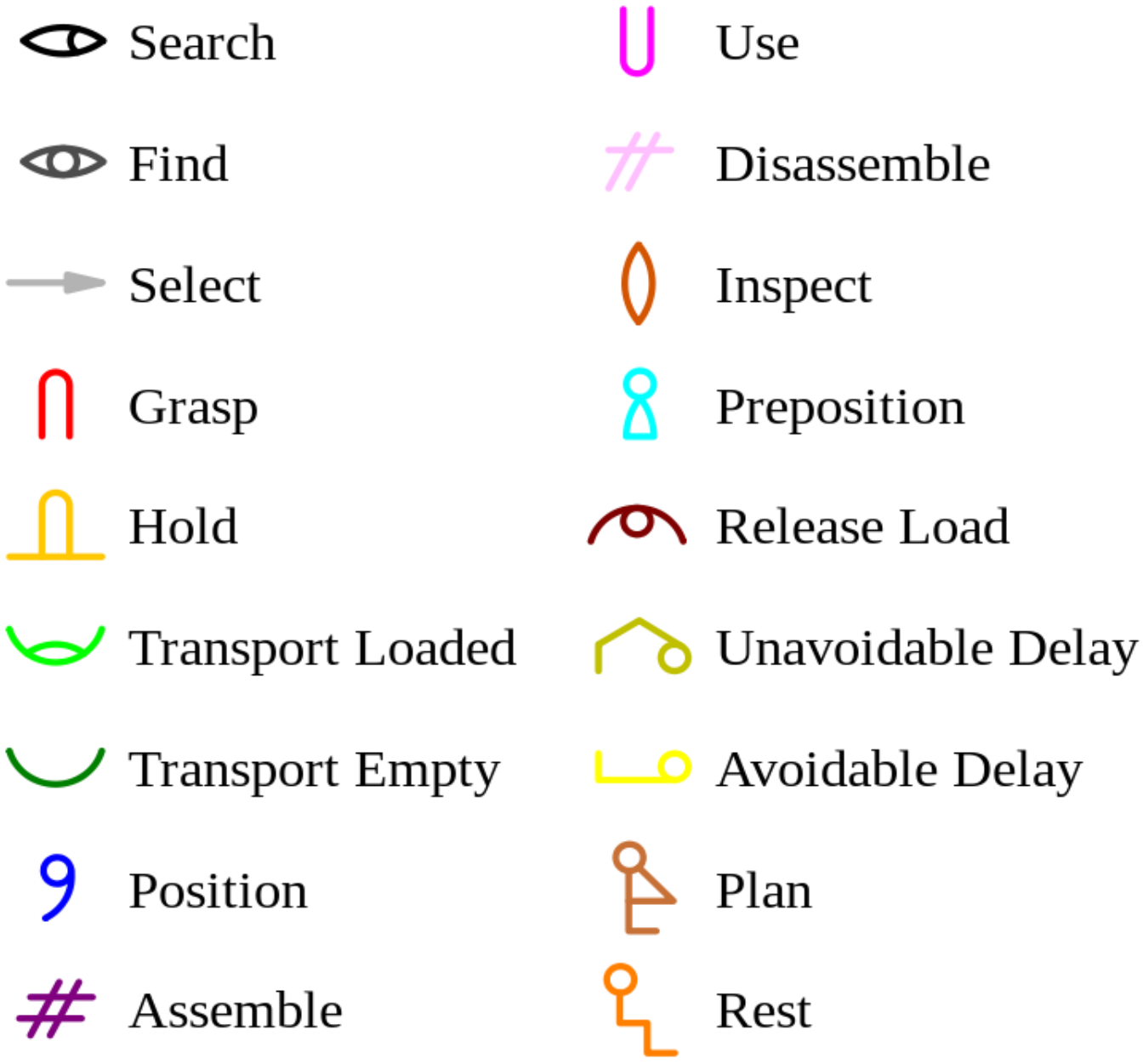
Purpose

To eliminate or reduce ineffective movements, to facilitate & speed effective movements.

Results

Job is performed more easily and safely & output rate is increased.

Therblig Elements



Source: https://en.wikipedia.org/wiki/Therblig

Therblig Elements

Element	Code	Explanation
Transport empty [unloaded]	TE	Receiving an object with an empty hand (Now called "Reach")
Grasp	G	Grasping an object with the active hand
Transport loaded	TL	Moving an object using a hand motion
Hold	H	Holding an object
Release load	RL	Releasing control of an object
Preposition	PP	Positioning and/or orienting an object for the next operation and relative to an approximation location
Position	P	Positioning and/or orienting an object in the defined location
Use	U	Manipulating a tool in the intended way during the course working
Assemble	A	Joining two parts together

Therblig Elements

Element	Code	Explanation
Disassemble	DA	Separating multiple components that were joined
Search	Sh	Attempting to find an object using the eyes and hands
Select	St	Choosing among several objects in a group
Plan	Pn	Deciding on a course of action
Inspect	I	Determining the quality or the characteristics of an object using the eyes and/or other senses
Unavoidable delay	UD	Waiting due to factors beyond the worker's control and included in the work cycle
Avoidable delay	AD	Waiting within the worker's control which causes idleness that is not included in the regular work cycle
Rest	R	Resting to overcome a fatigue, consisting of a pause in the motions of the hands and/or body during the work cycles or between them
Find	F	A momentary mental reaction at the end of the Search cycle (Seldom used)

Effective vs Ineffective Therblig

Effective	Ineffective
Transport empty	Hold
Grasp	Pre-position
Transport loaded	Position
Release load	Search
Use	Select
Assemble	Plan
Disassemble	Unavoidable delay
Inspect	Avoidable delay
Rest	

Effective Therbligs:

Contributes to the progress of work.
Must be improved.

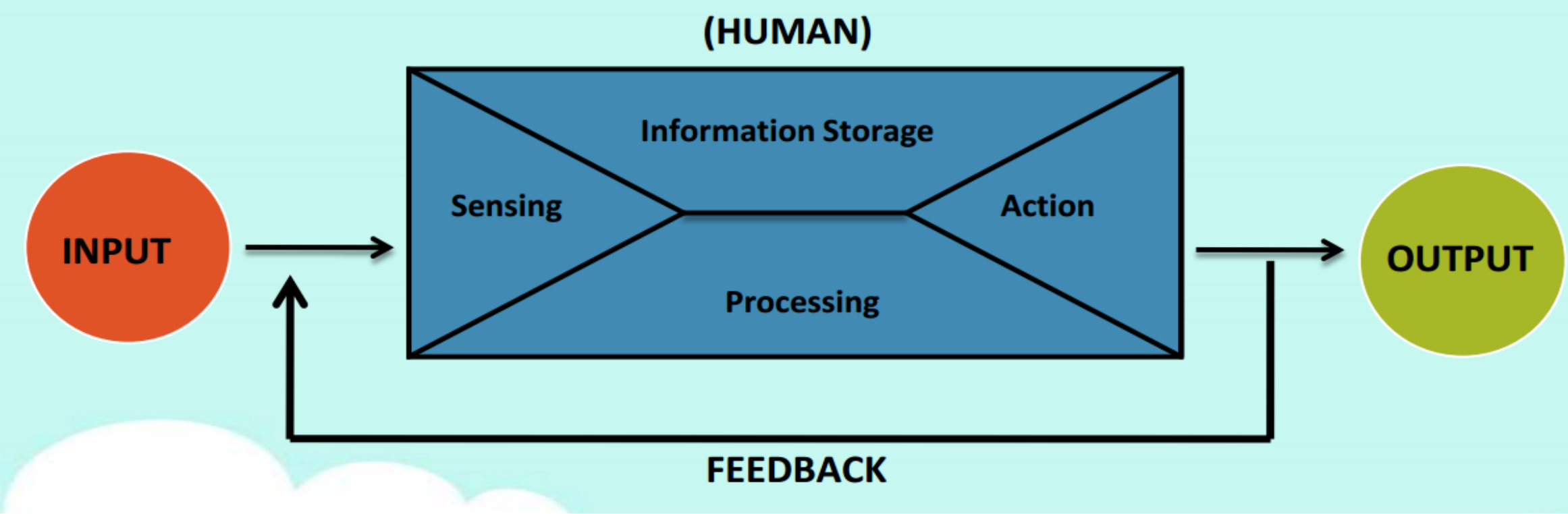
Ineffective Therbligs:

Should be minimized through operation analysis & motion study.

Types of Tasks/Works

- ✓ Manual
- ✓ Semi-automatic
- ✓ Automatic

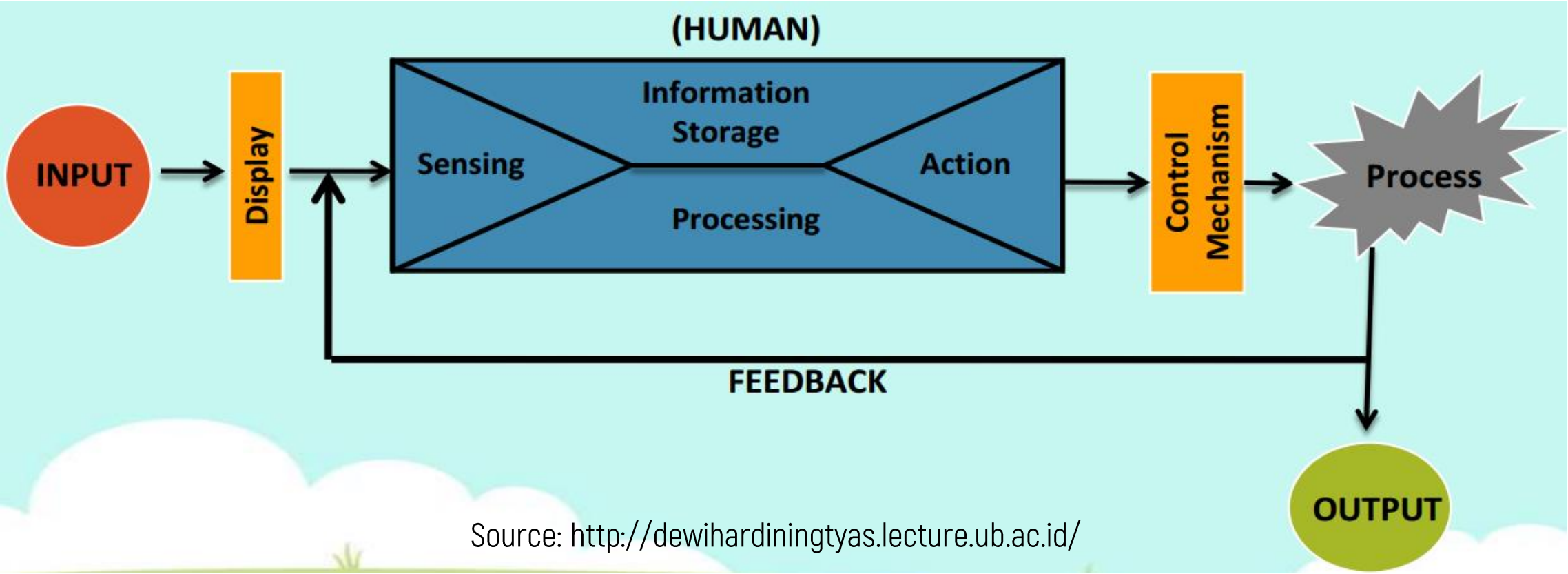
Manual Works



Source: http://dewihardiningtyas.lecture.ub.ac.id/

Physical work done by people, most especially in contrast to that done by machines

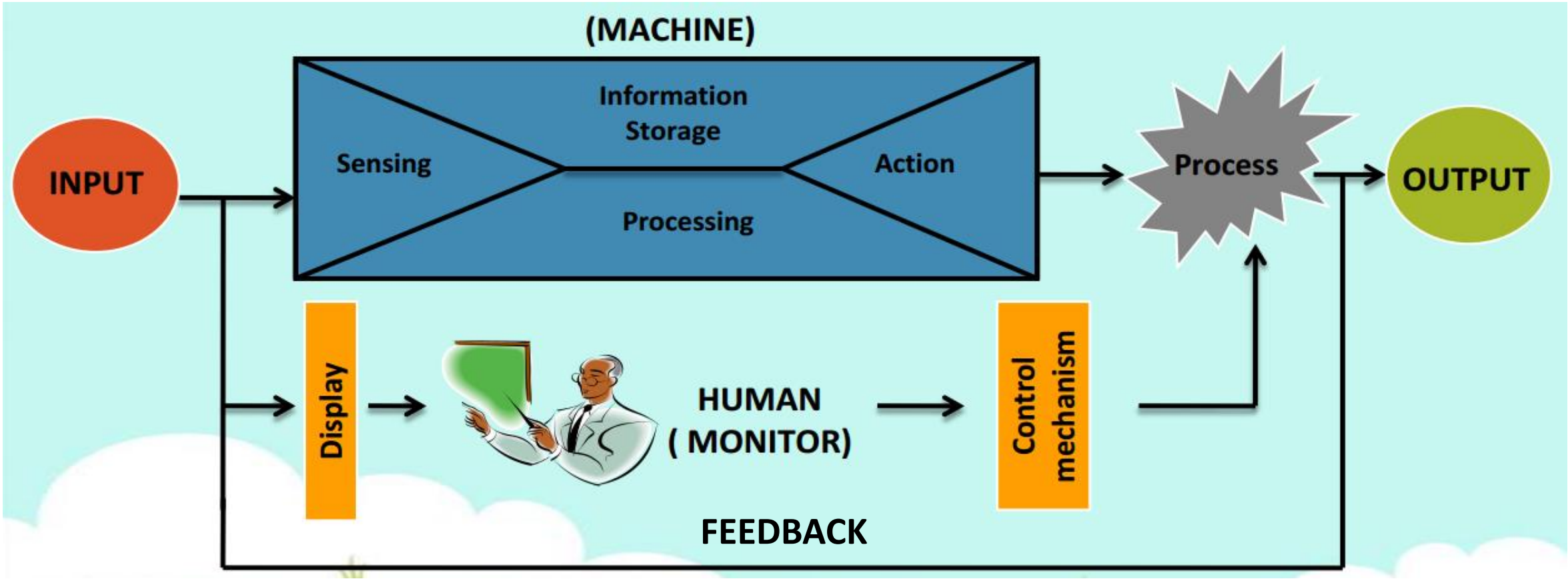
Semi-automatic Works



Source: http://dewihardiningtyas.lecture.ub.ac.id/

The work involves some manual activities done by workers

Automatic Works



Source: http://dewihardiningtyas.lecture.ub.ac.id/

The work is fully done by machine

Productivity

"The ratio of what is produced to what is required to produce"

"The relationship between outputs (e.g., goods & services produced) & inputs (e.g., labor, capital, material, & other resources)"

~Hill (1993)~

$$Productivity = \frac{Total\ Outputs}{Total\ Inputs} = \frac{Effectiveness}{Efficiency}$$

How to increase productivity?

Source: https://news.temple.edu

Work Study

Methods Study

To improve methods of production

To determine the best way to complete a repetitive task

Resulting in more effective use of material, manpower, machine & equipment

Work Measurement

To assess human effectiveness

To measure how long it takes to complete a task at a normal pace.

Making possible improved planning & control, & as a basis for a sound incentive scheme

Higher Productivity

References

Greene, J. (2013). *Industrial Engineering: Theory, Practice & Application: Business and Production Management, Productivity and Capacity*. South Caroline, USA: Jackson Productivity Research Inc.

Salvendy, G. (2001). *Handbook of industrial engineering: technology and operations management*. Canada: John Wiley & Sons.

Turner, W. C., Mize, J. H., Case, K. E., & Nazemtz, J. W. (1993). *Introduction to Industrial and Systems Engineering*. New Jersey: Prentice Hall.

Universiti Malaysia PAHANG
Engineering • Technology • Creativity

Thank You