ME502 Ergonomics

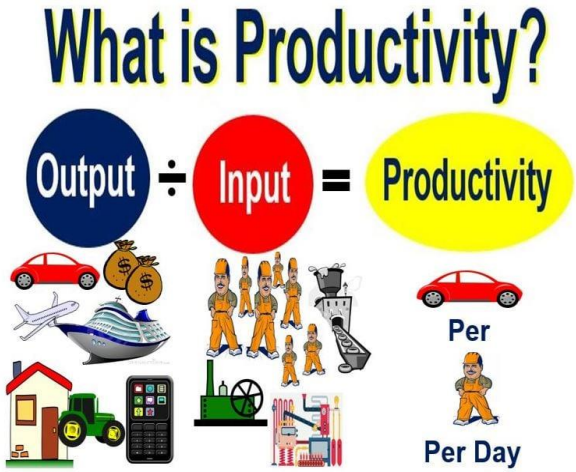
Productivity

Productivity

Productivity is generally regarded as a measure of outputs divided by inputs. All of the activities that you get done in a day may be considered your output and the time you put into them are your inputs.

Productivity is the ratio of output to input

Productivity = Output / Input

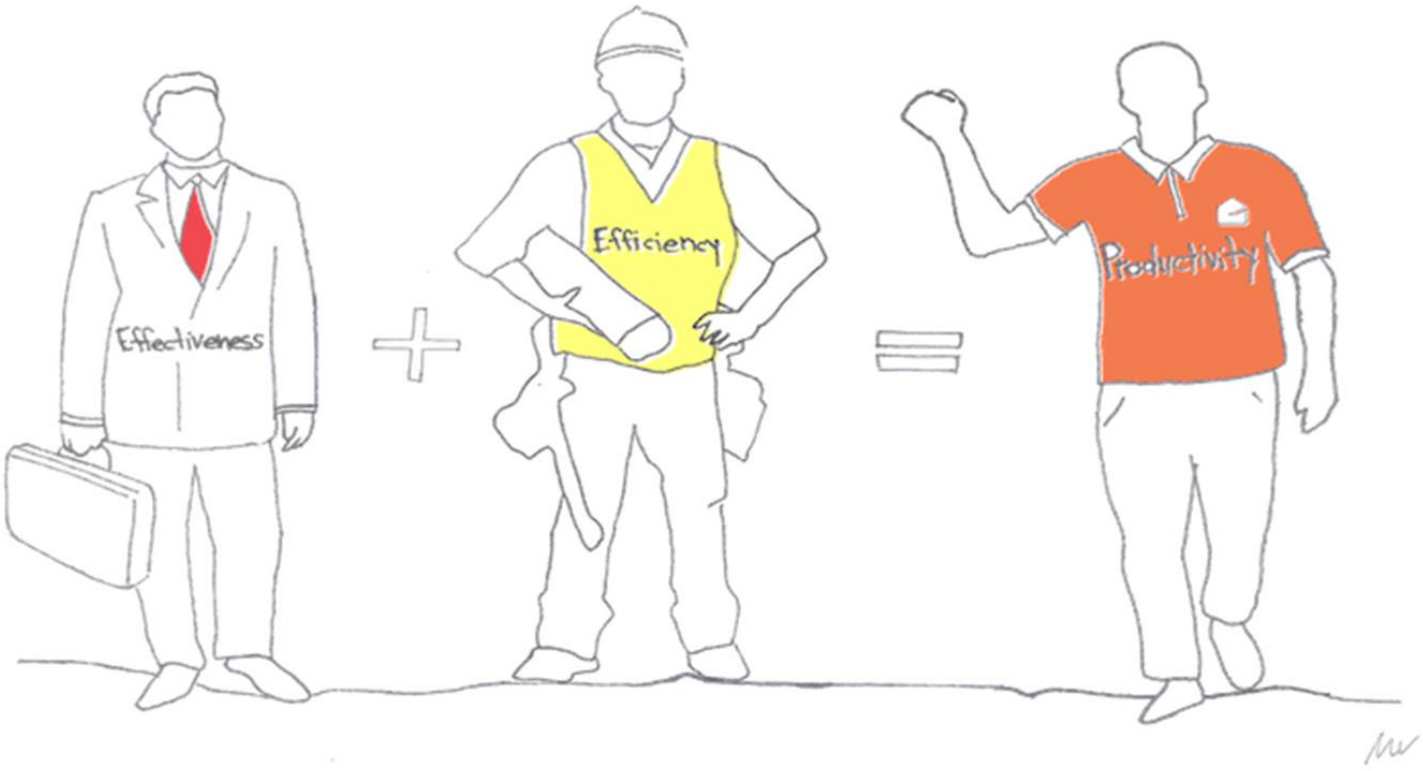


Productivity

This may apply to any activity

- OFFICE WORK
- ASSEMBLY OF AN ITEM
- RESERVATION OF HOTEL ROOMS
- PRODUCTION OF A COMPUTER
- MAINTENANCE OF A CAR

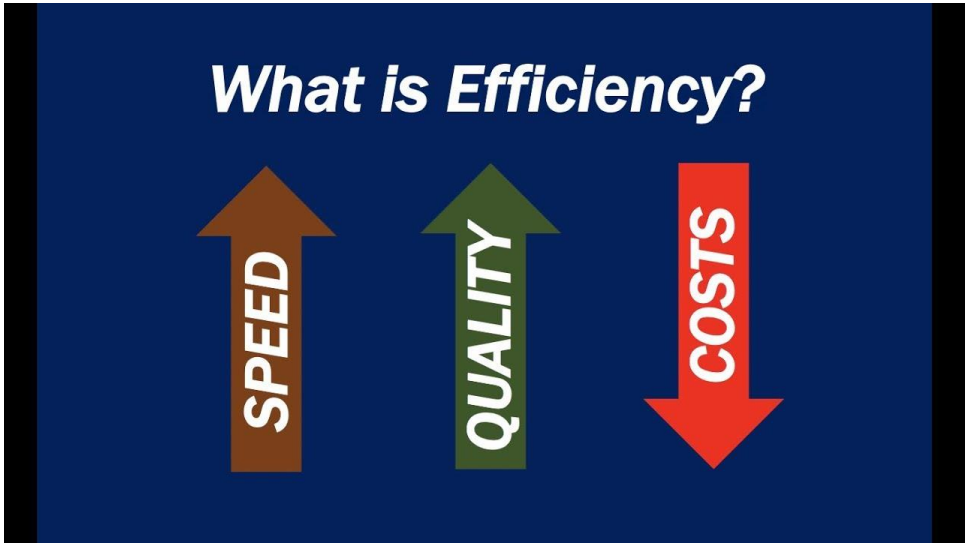
Effectiveness, efficiency, and productivity – what do they mean?



Efficiency

Efficiency is a measure of how well you do those things. If you can get more outputs from the same inputs, you are said to have increased efficiency.

- **Efficiency = Doing things right**



Effectiveness

Effectiveness is a measure of doing the "right things." Highly effective individuals and companies act in ways that move their highest priorities forward on a regular basis.

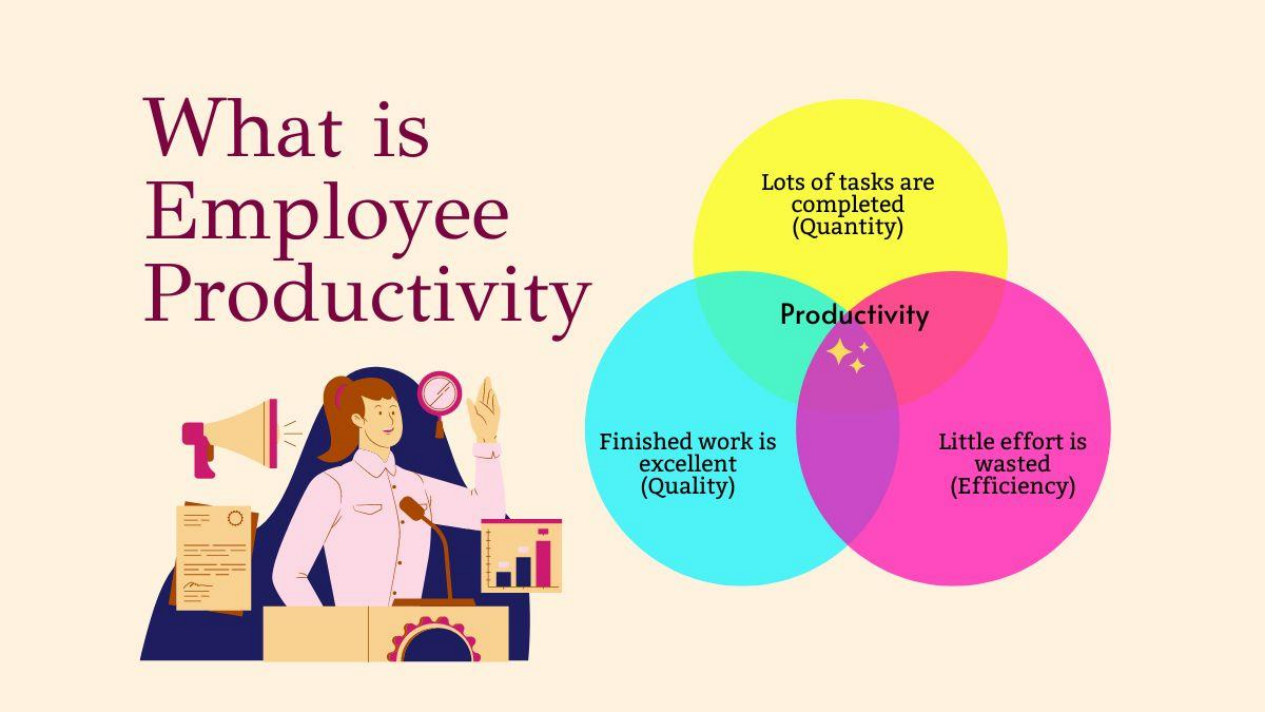
- **Effectiveness = Doing the right things**

Productivity

Productivity relates to achieving the maximum possible with the minimum resources.

The Resources are,

- ✓Manpower
- ✓Material
- ✓Equipment
- ✓Spares
- ✓Buildings
- ✓Capital
- ✓Time



Productivity

Under different circumstances, productivity is measured in different ways.

Ex. The total time required for a job is the addition of working times for,

(a) Basic work content
(b) Additional work needed due to ‘defects’ etc.
(c) Additional work due to inefficient management

Reduce time spent for (b) and (c)

Productivity

It is a keyword in the industry

Productivity is not a measure of production quantity or profitability but increasing output by using “work-study” and “method study”.

Work Study –Denotes techniques of method study and work measurement.

Method Study- How work is done and and how it can be done more efficiently.

- **AIM OF WORK STUDY IS TO**

improve productivity and not to make the work harder or produce ‘redundancy’

- **RESPONSIBILITY FOR INTRODUCTION AND APPLICATION**

lies with the management and not with the work study practitioner.

- **EXPERINCE AND KNOWLEDGE ARE NOT STATIC**

work study needs to be applied continuously to update and bring further improvements

WORK STUDY AND ERGONOMICS

(a) Measure limits of physical endurance, normal speeds of movement and optimise methods of handling controls

(b) Ascertaining the receptivity to sensory inputs and measuring the time required for perception of deviations

(c) Guaging reaction time for motor input, and the time required for perception of deviations

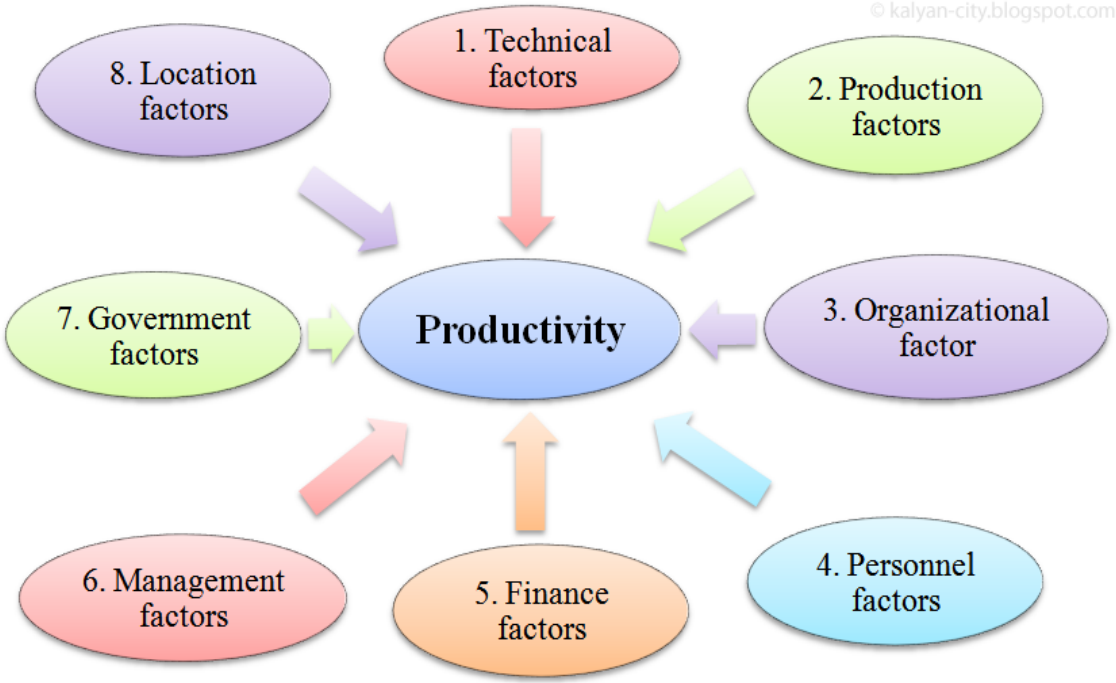
(d) Design of layout of equipment, work place and furniture to be guided by anthropometric data

(e) The effects of environmental conditions

Ergonomics for Productivity

1. **Physical Principles**

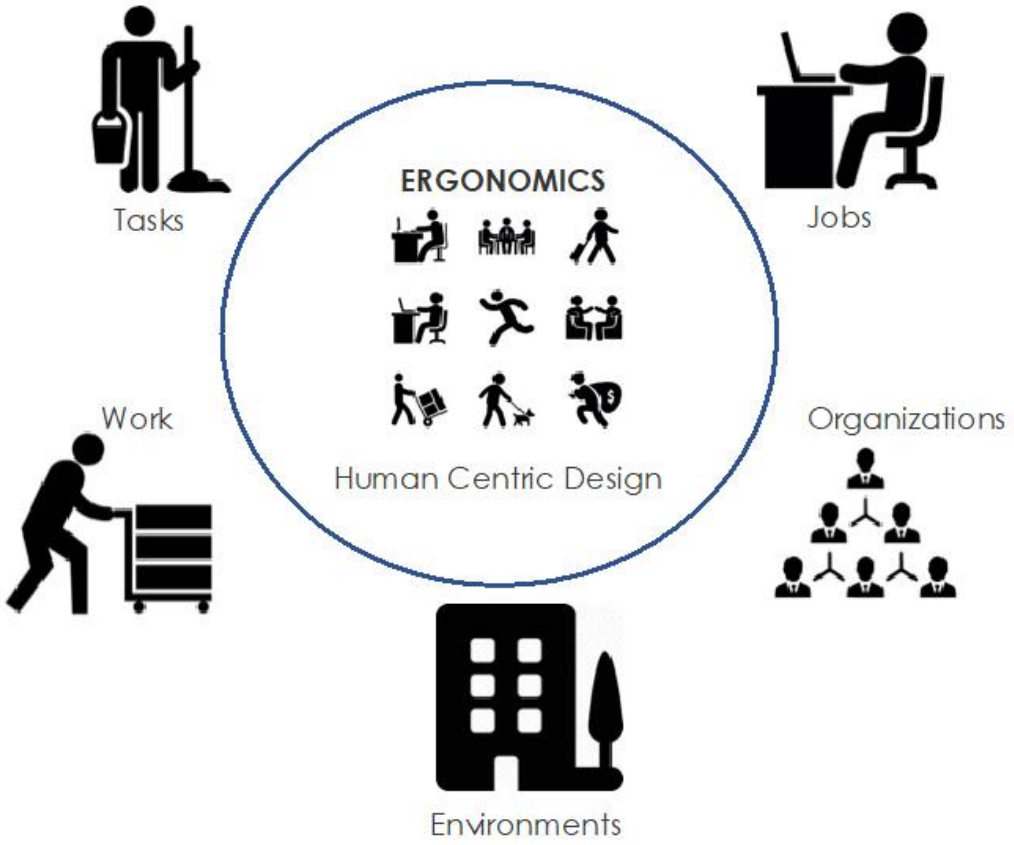
2. **Cognitive Principles**



Factors that affect or influence Productivity.

Ergonomics for Productivity

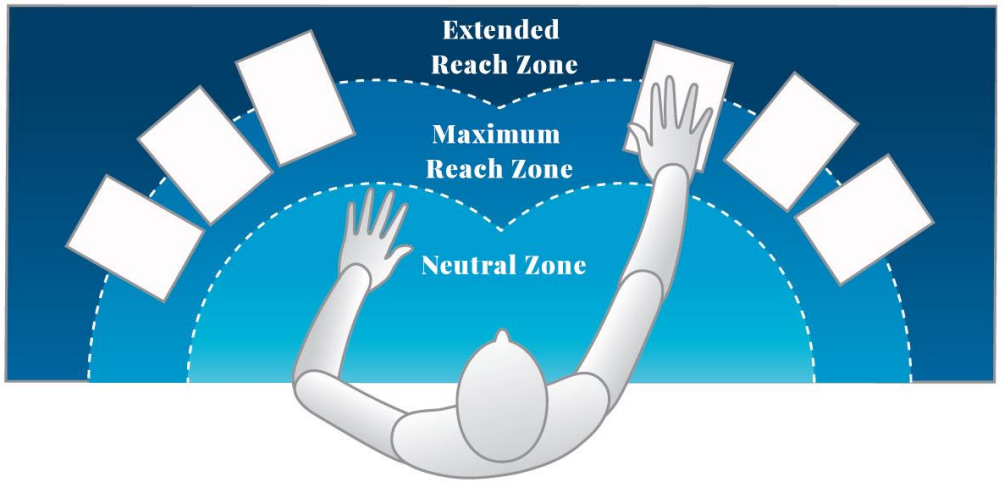
- **Physical Principles**



Keep Everything in Easy Reach

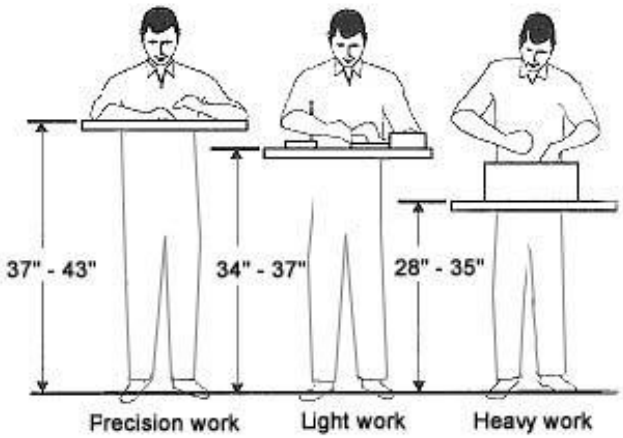
- Long reaches can strain the body and make work more difficult, plus waste time.

- An easy way to make tasks more user-friendly is to keep frequently used items such as knobs, switches, tools, and parts within easy reach. Simple as this principle may sound, it is commonly neglected.



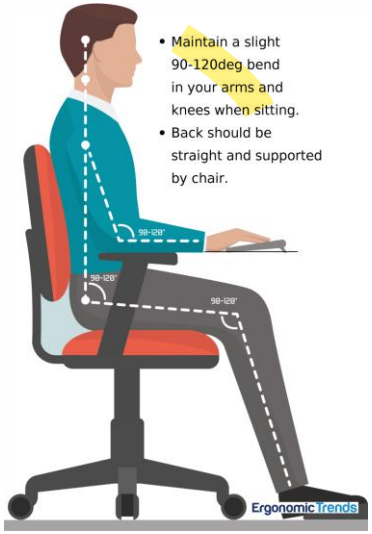
Work at Proper Heights

- A common problem is a mismatch in heights between people and the work that they are doing.
- This can entail working in awkward or contorted postures, which in turn can contribute to fatigue, discomfort, and even injury.
- Inefficiencies can also result, as people slow down to compensate for the fatigue and discomfort, or as extra work is created to overcome height differences.



Work in Good Postures

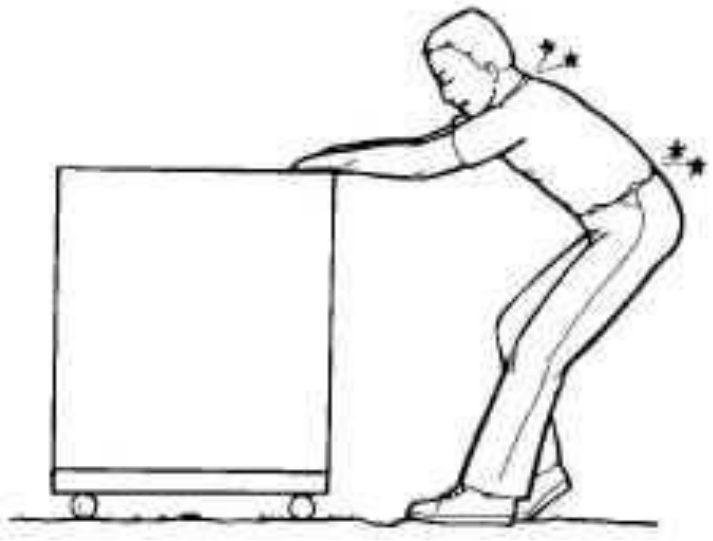
- Working in awkward and contorted postures increase physical stress on the body and often reduces strength, thereby making it more difficult to do the task.
- Tools, furniture, and task layouts that place the body in optimal postures can increase productivity and prevent costly injuries, such as lower back problems.
- The best positions in which to work are those that keep the body "in neutral." In particular, this means:
- the back with its natural "S curve" intact
- the elbows held naturally at the sides of the body
- the wrists in neutral position



Reduce Excessive Forces

- Anything that can be done to minimize the exertion required to perform a task can make it more user-friendly.

- Needlessly excessive forces load the muscles, creating fatigue and even potential for injury.

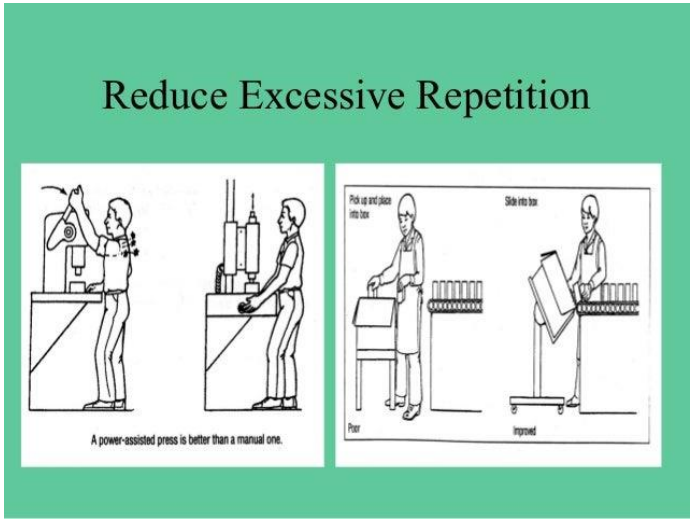


Minimize Fatigue

- Overloading a person's capabilities can contribute to injuries, accidents, poor quality, and lost productivity.
- Good task design can help prevent undesirable fatigue while maximizing efficiency.
- An especially important type of fatigue is "static load," which is continuous exertion of the same muscle group over a period of time, causing discomfort and pain.
- By maintaining the same position for a period of time – especially when combined with high force and awkward posture – muscle groups become overloaded and blood flow reduced.

Reduce Excessive Repetition

- The number of repeated motions required to perform a task has a profound impact on the wear and tear on the body.
- Excessive repetitions can create injury to sensitive tissue and joints, as well as contribute to inefficient use of time.
- Wherever feasible, repetitive motions should be reduced.



Provide Clearance and Access

- It is important that work areas be designed with enough space to both get the task done and have easy access.

- There should be no obstructions between a person and the items needed to accomplish the task.

Minimize Contact Stress

- Direct pressure or "contact stress" is an issue common to many tasks.

- In addition to being uncomfortable, it can inhibit nerve function and blood flow.

Provide Mobility and Change of Posture

- There is no single "correct" posture best for an entire workday.

- The human body needs change and mobility.

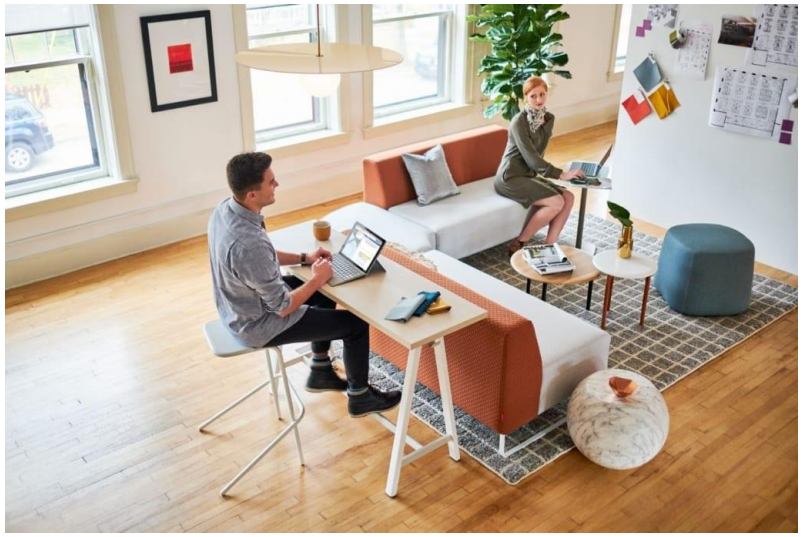
- Good ergonomic design provides opportunities to change position, move around, or alternate between sitting and standing

Maintain a Comfortable Environment

- The environment in which work is performed can directly and indirectly affect not only the comfort and health of people, but also the quality and efficiency of the work being done.

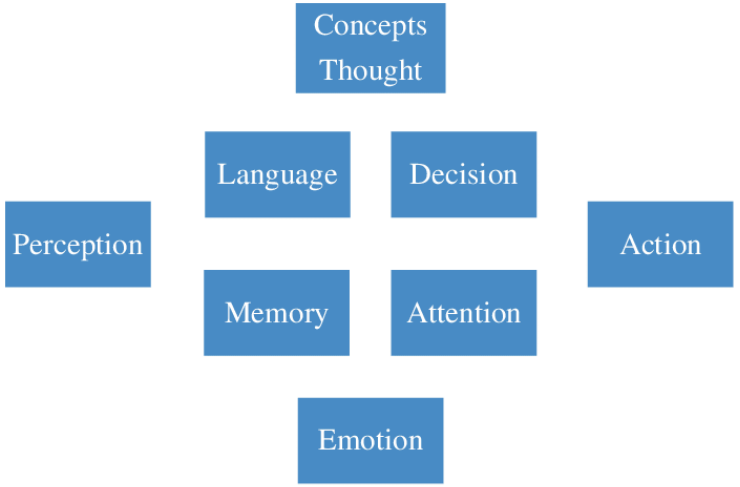
There are many issues here, but three important goals are:

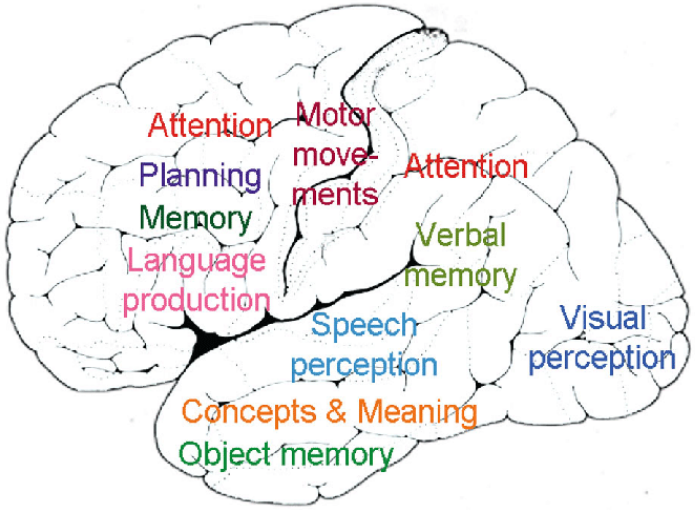
- provide appropriate lighting
- avoid temperature extremes
- isolate vibration



Ergonomics for Productivity

2. Cognitive Principles.





Standardize

- Many errors are caused because there is inconsistency in how information is displayed and how controls work.
- To prevent mistakes, a general rule is to insure that similar devices work the same way.
- Agreeing on a standard

Use Stereotypes

- A stereotype is a commonly held expectation of what people think is supposed to happen when they recognize a signal or activate a control.

Good design should take advantage of these perceptions and expectations.

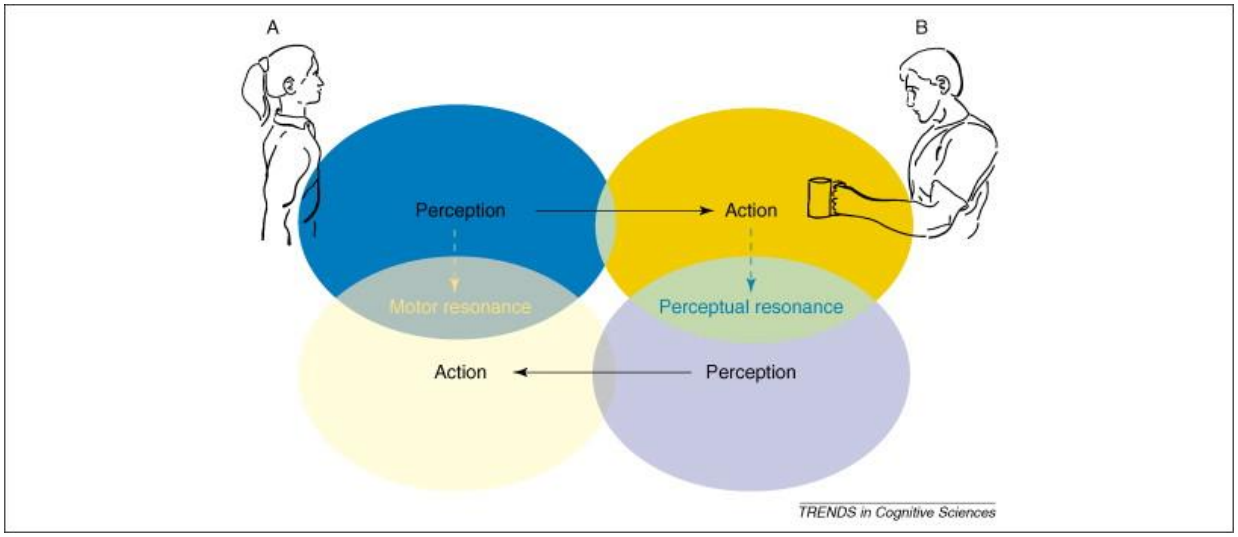
- The concept of a stereotype is closely related to that of a standard, but much less consciously determined.

Link Actions with Perceptions

- Ideally, there should be a strong relationship between the perception of the need to take an action and the action itself.

Acompatibility between a display of information and a control.

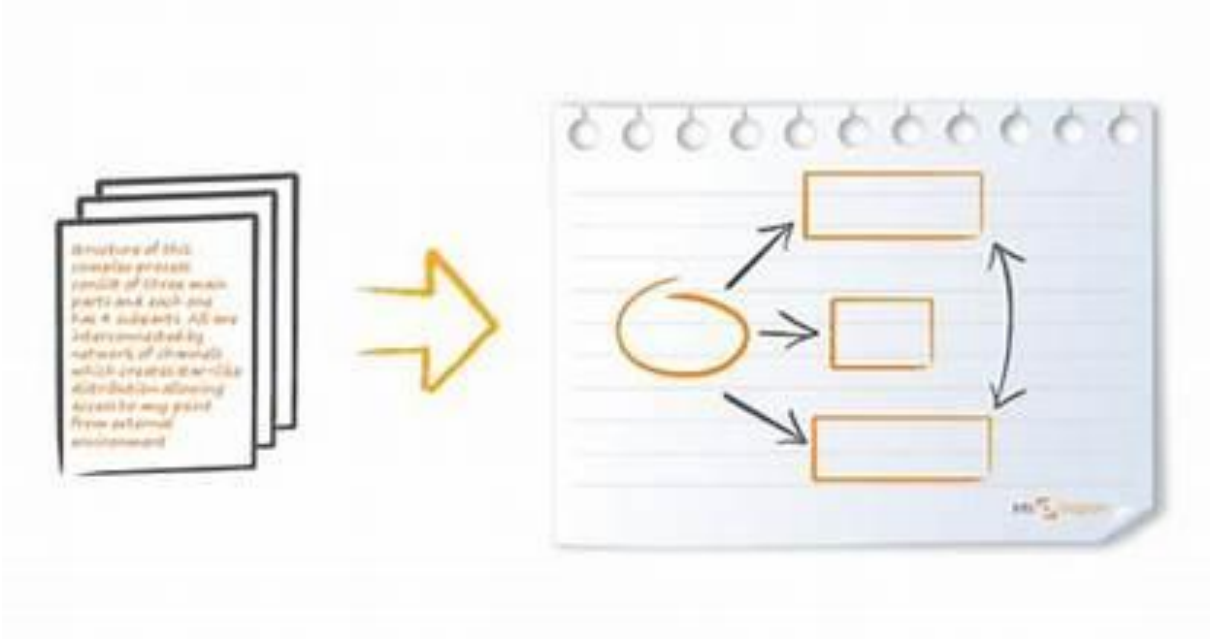
Good design means configuring things so that it is self evident what one is supposed to do.



Simplify Presentation of Information

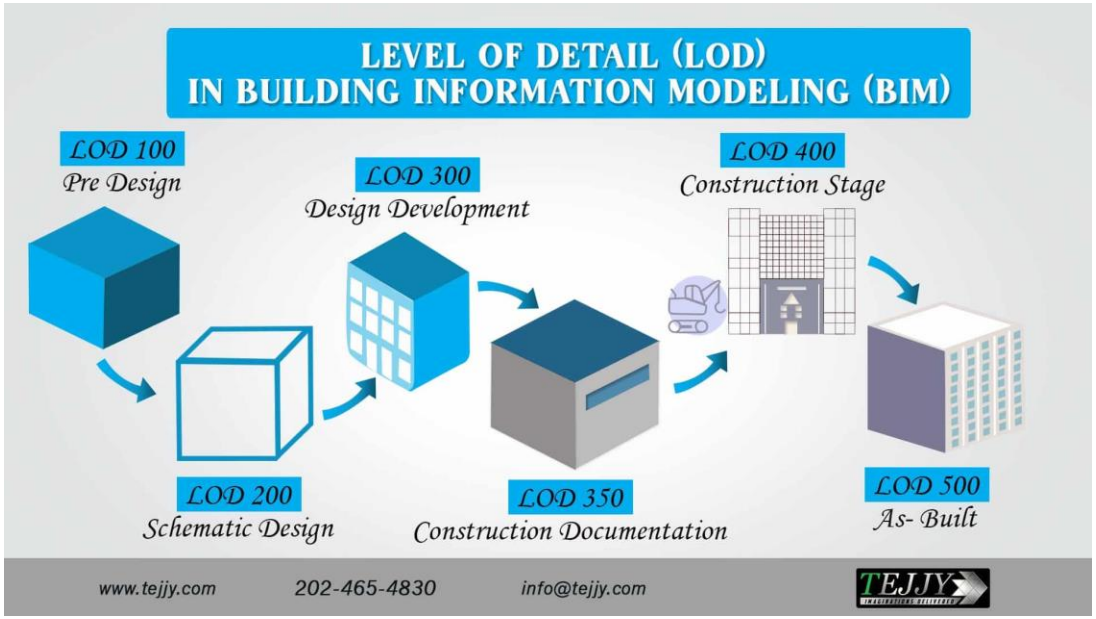
- Sometimes too much information is provided, or it is provided in too complex a fashion.

- In general, good designs provide simplified displays.



Present Information at the Appropriate Level of Detail

- Careful consideration should be given as to what information the user needs to know.
- There are many options for the level of detail of information that is presented and the choices can either enhance or hinder performances.



Present Clear Images

- Another common problem is exhibiting an image poorly, so that the user cannot distinguish or interpret the message.

- Three issues in presenting clear images are being visible, distinguishable, and interpretable.

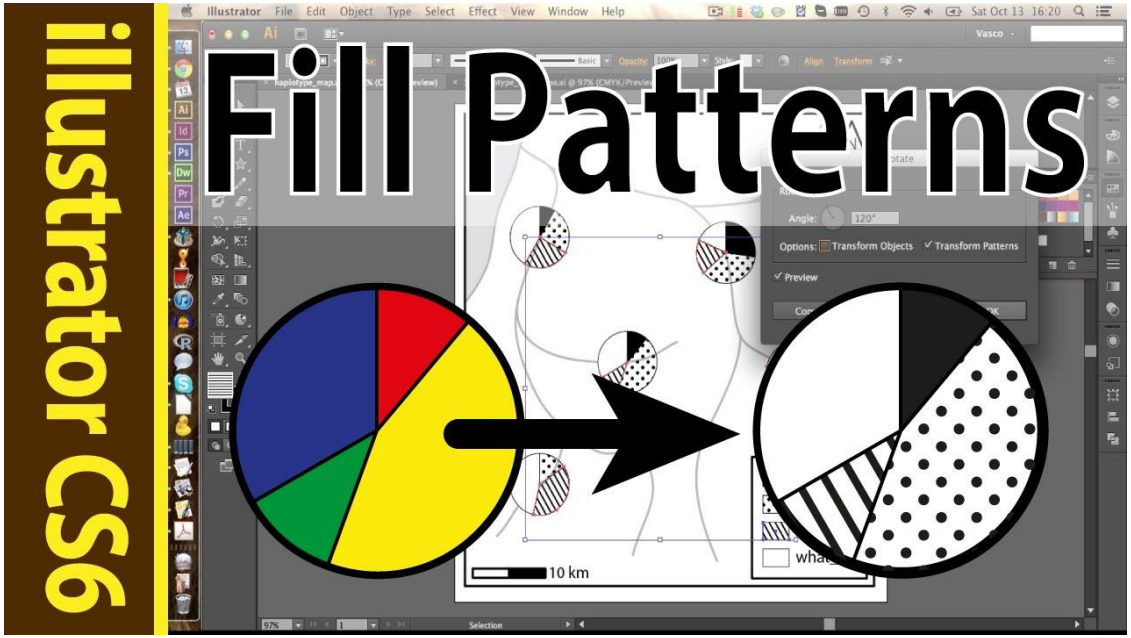
Use Redundancies

- Sometimes, one message is insufficient. Because mistakes are easy to make and humans have many limitations, it is important to provide the same information in more than one way.

Use Patterns

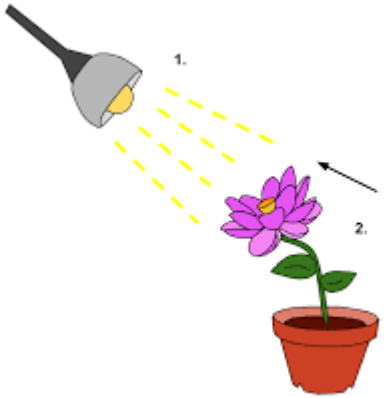
- The human eye grasps patterns well.

- Information presented as a pattern can often be understood more quickly and accurately than otherwise.



Provide Variable Stimuli

- Humans detect a novel stimuli more readily than a constant one, since our senses fatigue easily with continuous exposure.



- For example,

Flashing lights are easier to spot than unchanging lights. buzzers that sound only infrequently are noticed more than recurrent ones.

Thus, it is important to avoid excessive use of a single way of presenting information.

Provide Instantaneous Feedback

- An additional principle that helps prevent errors is to provide feedback to the user on the course of action taken.

- Furthermore, the sooner the feedback is given, the easier it is to determine if an error has been made or not.

Thank you