

## Human Factors

A field concerned with analyzing information about human behavior, abilities, characteristics, and physical limits.

### Main goal of Human Factors

Ensures that final product can be effectively used by the end user, without exceeding their capabilities.

### Aims of Human Factors

Optimizes efficiency, health, safety, and comfort of people.

### Importance of Human Factors Design

- Improves: Productivity, safety, comfort, and satisfaction
- Reduces: errors, fatigue, and learning curve
- Meet user's needs and wants
- Positive perception of product

## Challenges of Human Factors

- Humans are flexible and adaptable
- Large Individual differences:

1. Obvious differences: Physical size & strength
2. Non-obvious differences: Culture, styles & skill

### Forms of Human Factors

1. Anthropometric (body dimensions): Human Interaction in static sense
2. Ergonomics (Repeated tasks): Human interaction in dynamic sense
3. Physiological: Human interaction with body characteristics.
4. Psychological: Human interaction with mental activities

### 1. Anthropometric Factors

Focus on physical size of humans.

Must design for all/adjustability;  
Designing for average or extremes exclude ~50% of population

### Example of Anthropometric Factors

Ex: Being able to see an obstacle of height  $h$  at a minimum distance  $L$  from the front of the car

## 2. Ergonomic Factors

Ergon=work,  
nomikos=law  
Focuses on human-machine dynamic interaction

### Aspects of Ergonomic Factors

Safety, comfort, and efficiency

### Importance of Ergonomic Factors

Effective operation of a machine over long periods of time will depend upon the matching of requirements to human capability

## Capabilities Considered in Ergonomic Factors

- Physical ability of operator
- Position of operator
- Range of movement
- Speed of movement
- Duration of activity
- Environmental conditions

## Relative Value of Functions in Ergonomics

Product of the importance of the particular event by the frequency of occurrence, was used in airplane display design.

## 3. Physiological Factors

Concerned with human sensations & systems

### Body Inputs Considered in Physiological Factors

- Visual - Auditory
- Tactile (Touch) – Kinesthetic (Body

Position)

- Taste - Environment

### Examples of Physiological Factors

- Vision (Lights & colors)
- Hearing (Noise & speech)
- Weather (Temp & humidity)
- Touch (Braille & comfort)

### Importance of Physiological Factors

- Achieves satisfactory intensity, color discrimination, and resolution.
- Needed for design of lighting systems & materials and colors selection.
- Consideration of sounds frequency analysis
- Controlling noise at source
- Incorporates sense of touch in devices (Braille)
- Consideration of atmospheric environments, may

affect efficiency and accuracy.

## 4. Psychological Factors

Concerned with mental activities during use of product.

### Focus of Psychological Factors

- Interpretation of info - Motivation & fatigue
- Decision making - Aesthetics

### Implementations of Psychological Factors

- Using Presentations → Minimize error of interpretation
- Retaining usual methods of operation (Levers)
- Digital indicators for precise numerical values
- Color coding on dials (green, yellow, red)
- Arrange control movement in logical manner.