

HUMAN FACTORS

- Human factors is a system concerned with the relationship between human beings, machines, and the work environment.
- The diverse and complex nature of problems encountered by the human factors group in many organizations calls for an interdisciplinary approach and may require skills from a variety of professions, such as psychology, sociology, biology, physiology, and engineering.

Definitions:

- The central focus relates to the consideration of human beings in the design of the man-made objects, facilities and environments that people “use” in the various aspects of their lives.
- The objectives of human factors in the design of these man-made objects are:
 1. To enhance the functional effectiveness with which people can use them
 2. To maintain or enhance certain desirable human values in the process (e.g. Health, safety and satisfaction)
- The central approach of human factors is the systematic application of relevant information about human characteristics and behavior to the design of the man-made objects, facilitates and environments that people use.
- The worker-machine relationship is the central core of human factors. The worker and the machine may performs similar functions. Both have certain capabilities and limitations. The worker-machine system, like any system, has an objective and consists of inputs and outputs.

A person ordinarily does three things in performing a task:

- Receives information – through the sense organs: eyes, ears, touch, etc...
- Make decisions – acts on the information obtained and on the basis of his or her own knowledge
- Takes action – action resulting from the decision that has been made. The action may be purely physical, such as operating a machine or it may involve communication such as giving oral or written instructions.
- Men and machines both have sensors.
- The machine senses by mechanical, chemical or electrical means.
- Decision making or information processing by machines occurs through the use of computers, electrical circuits or mechanical means.
- The action function is the accomplishment or the output resulting from the decisions made.

- Both men and machines may store information and there is usually feedback.
- The division of work between man and machines is generally determined by economic consideration although many other factors enter the picture.

Humans are generally better in their abilities to:

1. Sense very low levels of certain kinds of stimuli: Visual, auditory, tactual, olfactory and taste.
2. Detect stimuli against high 'noise' level background.
3. Recognize patterns of complex stimuli which may vary from situation to situation, such as objects in aerial photographs and speech sounds.
4. Sense unusual and unexpected events in the environment.
5. Store large amounts of information over long periods of time (better for remembering principles and strategies than mass of detailed information).
6. Retrieve pertinent information from storage (recall), frequently retrieving many related items of information; but reliability of recall is low.
7. Draw upon varied experience in making decisions; adapt decisions to situational requirements; act in emergencies. (Does not require previous "programming" for all situations.).
8. Select alternative modes of operation, if certain mode fails.
9. Reason inductively, generalizing from observations.
10. Apply principles to solutions of varied problems.
11. Make subjective estimates and evaluations.
12. Develop entirely new solutions.
13. Concentrate on most important activities, when overload conditions require.
14. Adapt physical response (within reason) to variations in operational requirements.

Machines are generally better in their abilities to:

1. Sense stimuli that are outside man's normal range of sensitivity, such as X-rays, radar wavelengths, and ultrasonic vibrations.
2. Apply deductive reasoning, such as recognizing stimuli as belonging to a general class (but the characteristics of the class need to be specified).
3. Monitor for pre specified events, especially when infrequent.
4. Store coded information quickly and in substantial quantity (e.g. large sets of numerical values can be stored very quickly).
5. Retrieve coded information quickly and accurately when specifically requested.
6. Process quantitative information following specified programs.
7. Make rapid and consistent responses to input signals.
8. Perform repetitive activities reliably.
9. Exert considerable physical force in a highly controlled manner.
10. Maintain performance over extended periods of time (machines typically do not "fatigue" as rapidly as humans).

11. Count or measure physical quantities.
12. Perform several programmed activities simultaneously.
13. Maintain efficient operations under conditions of heavy load.
14. Maintain efficient operations under distractions.

- The number of people working in the human factors field grew rapidly during World War II. A most important contribution of this group was the solving of complex man-machine problems, such as assisting in the design of aircraft cockpits, fire-control systems, and ship and submarine control systems. In some cases, military equipments had not been designed for effective human use – failures occurred, human errors were made, and planes and ships were lost because people operating the equipment were unable to perform their functions – the designer had not taken into consideration human capabilities.
- Human factors specialists continue to be used in military and space systems design but increasingly they play an important part in business and industry.