



Umm Al-Qura University



# 6001333-3 Human Computer Interaction

Lecture 8 (Week 6)  
Accessibility and Risks

Email: [arzahrani@uqu.edu.sa](mailto:arzahrani@uqu.edu.sa)

Human error

## Human error

- Human error is an inappropriate or undesirable human decision or behavior that reduces or has the potential for reducing the
  - ✓ effectiveness
  - ✓ safety
  - ✓ system performance

## Human error

- ✓ Tendency to view error at the operator level
- ✓ Other people involved in the design and operation of the system can make errors
- ✓ Should therefore consider the entire system
- 1st blame only the individual

## Human error

- 2nd identify other factors. Eg:
  - badly designed or faulty equipment
  - poor management practices
  - inaccurate or incomplete procedures
  - inadequate or inappropriate training

## Human error - classification

### 1. Discrete Action classification:

- One of the simplest (Swain & Guttman 1983)
- **Omission:** Forgetting to do something, or just deliberately ignoring it.
- **Commission:** Performing an act incorrectly.
- **Sequence:** Right action, wrong order.
- **Timing / Rate:** Too fast or too slow.

## Human error - classification

### 2. Information Processing classification:

- Rouse & Rouse (1983) propose one scheme.
- This scheme follows the information processing *assumed* to occur when humans operate and control systems such as:
  - - an aircraft
  - - a ship
  - - a power plant

## classification - Human error

### Information Processing classification (scheme):

- Operator observes the state of the system
- Formulates a hypothesis
- Chooses a goal
- Selects a procedure to achieve desired goal
- Executes the procedure
- Specific categories of errors can occur at each stage - eg  
incorrect interpretation of state of the system

## Human error - classification

### 3. Alternative classification :

- Rasmussen (1982) identifies 3 types of error
- Errors depend on the type of behavior involved
- ✓ skill based
  - ✓ rule based
  - ✓ knowledge-based

## Human error - classification

### ➤ *Skill based:*

- controlled by sub-conscious behavior and stored patterns of behavior.
- errors usually errors of execution.

## -Human error classification

### ➤ *Rule based:*

- applies to familiar situations - stored rules are applied.
- errors involve recognizing the salient features of the situation.

### ➤ *Knowledge based :*

- occur in unique & unfamiliar situations.
- errors result from inadequate analysis or decision making.

## Dealing with Human error

- Human error is inevitable.
- Consequences and likelihood can be reduced by:
  - ✓ better recruitment & selection
  - ✓ training
  - ✓ better design of equipment procedures & work environment

## Dealing with Human error

Three generic design approaches for dealing with human error:

- ✓ **Exclusion designs:** Particular errors made impossible to commit
- ✓ **Prevention designs:** Particular errors made difficult to commit (but not impossible)
- ✓ **Fail-safe designs:** Consequences of errors reduced in severity

Designing to reduce error is often the most cost effective

## Designing for Errors

- Everyone makes errors.
- Designers make the mistake of not taking errors into account. Understand the causes of error and design to minimize those causes
- Make it possible to reverse actions - to "undo" them
- Make it easier to discover the errors that do occur
- Change the attitude towards errors

## Human error and accidents

- A key objective of HF is to reduce accidents and improve safety
- Difficult to define 'accident'
  - without apparent reason
  - mishap
  - unexpected
  - chance
  - 'act of God'

## Human error and accidents

### Study of 248 Accidents

- Inadequate SOP: 19%
- Error in Recognition: 15%
- Error in judgment: 14%
- Poor inspection: 12%
- Inadequate directives: 10%
- Inadequate communications: 10%
- Ops error, unskilled Op, other (20%)



## **Automation**

- Machines, especially computers, are now capable of carrying out many functions that, at one time, could only be performed by humans.
- Machine execution of such functions—or automation—has also been extended to functions that humans do not wish to perform, or cannot perform as accurately or reliably as machines

## **Integrating Automation while Preserving User Control**

- Automation
  - Increases familiarity
  - Increases over time
  - Improves speed
  - Reduces error
- Why have humans if we can automate tasks?
  - Real world is an open system
  - Computers are a closed system
- Humans are there for
 

-Unexpected situations	-Preserve safety
-Avoid failures	-Increase product quality

## **Degrees of Automation**

1. The computer offers no assistance: the human must do it all
2. The computer suggests alternative ways to do the task
3. The computer suggests one way to do the task, and
4. ... executes the suggestion if the human approves
5. ... allows the human a restricted time to veto before automatic execution
6. ... executes automatically, then necessarily informs the human
7. ... executes automatically, and informs the human only if asked
8. The computer selects and executes the task, ignoring the human

## **Andre's Taxonomy of Software Automation**

- Remembers and recalls information for users based on previous actions
  - E.g., browser history of websites visited
- Completes all or part of user's input
  - E.g., Auto-complete in search fields
- Selects format based on preceding actions
  - E.g., Phone number format

## **Andre's Taxonomy of Software Automation**

- **Makes decisions based on time lapse**
  - E.g., auto logout during on-line banking
- **Adds new programs based on new hardware installation**
  - E.g., XP plug and play for new printer, etc.
- **Initiates software based on files being added**
  - E.g., Virus scanning when email attachments added

## **Ten considerations of human-centered automation:**

1. Allocate to the human the tasks best suited to the human, allocate to the automation the tasks suited to it
2. Make the operator a supervisor of subordinate automatic control systems
3. Keep the human in the decision and control loop
4. Maintain the human operator as the final authority over the automation
5. Make the human operator's job easier, more enjoyable, or more satisfying through friendly automation

## **Ten considerations of human-centered automation:**

6. Empower the human operator to the greatest extent possible through flexibility of interface or through automation
7. Support trust by the human operator
8. Give the operator information about everything he or she should want to know
9. Engineer the automation to minimize human error and response variability
10. Achieve the best combination of human and automatic control, where best is defined by explicit objectives