NUR: HCI design rules, interaction styles

heuristics, design patterns, design guidelines
Design: Heuristics, guidelines, principles

- goal is to increase usability (ISO 9241-11)
- define what should be achieved
- rarely how it can be achieved

- basic document ISO 9241
Design heuristics

SHNEIDERMAN
- Strive for consistency
- Enable frequent users to use shortcuts
- Offer informative feedback
- Design dialogs to yield closure
- Offer error prevention and simple error handling
- Permit easy reversal of actions
- Support internal locus of control
- Reduce short-term memory load

NIELSEN
- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognize, diagnose, and recover from errors
- Help and documentation
ISO 9241-10 dialogue principles

- Suitability for the task
- Self-descriptiveness
- Controllability
- Conformity with user expectations
- Error tolerance
- Suitability for individualization
- Suitability for learning
ISO 9241

- 20 Accessibility and human-system interaction
- 100 series Software ergonomics
- 200 series Human system interaction processes
- 300 series Displays and display related hardware
- 400 series Physical input devices - ergonomics principles
- 500 series Workplace ergonomics
- 600 series Environment ergonomics
- 700 series Application domains - Control rooms
- 900 series Tactile and haptic interactions
## Usability metrics

<table>
<thead>
<tr>
<th>Metrics</th>
<th>Usage indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to complete a specific task</td>
<td>Performance Time</td>
</tr>
<tr>
<td>Number of commands used</td>
<td>Performance Time</td>
</tr>
<tr>
<td>Percent of task completed per unit time</td>
<td>Performance Time</td>
</tr>
<tr>
<td>Relative time spent in physical actions</td>
<td>Performance Time</td>
</tr>
<tr>
<td>Relative time spent in mental actions</td>
<td>Performance Time</td>
</tr>
<tr>
<td>Time spent waiting for the system responds</td>
<td>Performance Time</td>
</tr>
<tr>
<td>Number of tasks that can be completed within a given time limit</td>
<td>Performance Time</td>
</tr>
<tr>
<td>Number of regressive behaviors</td>
<td>Memorability</td>
</tr>
<tr>
<td>Number of system features users can remember afterwards</td>
<td>Memorability</td>
</tr>
<tr>
<td>Time spent in errors</td>
<td>Errors</td>
</tr>
<tr>
<td>Percent of number of errors</td>
<td>Errors</td>
</tr>
<tr>
<td>Number of repetitions of failed commands</td>
<td>Errors</td>
</tr>
<tr>
<td>Number of immediately subsequent erroneous actions</td>
<td>Errors</td>
</tr>
</tbody>
</table>
# Usability metrics

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<tr>
<td>Time spent using help or documentation</td>
<td>Learnability</td>
</tr>
<tr>
<td>Frequency of help and documentation use</td>
<td>Learnability</td>
</tr>
<tr>
<td>Ration of users using effective vs. ineffective strategy</td>
<td>Learnability</td>
</tr>
<tr>
<td>Number of good and bad features recalled by users</td>
<td>Satisfaction</td>
</tr>
<tr>
<td>Percent of favorable/unfavorable user comments</td>
<td>Satisfaction</td>
</tr>
<tr>
<td>Number of users preferring your system</td>
<td>Satisfaction</td>
</tr>
<tr>
<td>Number of times user expresses frustration or satisfaction</td>
<td>Satisfaction</td>
</tr>
<tr>
<td>Number of times interface misleads the user</td>
<td>Task Completion</td>
</tr>
<tr>
<td>Percent of task completed / Ration of successes/failures</td>
<td>Task Completion</td>
</tr>
<tr>
<td>Number of available commands not invoked</td>
<td>Task Completion</td>
</tr>
<tr>
<td>Number of times users need to work around a problem</td>
<td>Task Completion</td>
</tr>
<tr>
<td>Number of times the user is disrupted from a work task</td>
<td>Task Completion</td>
</tr>
<tr>
<td>Number of times user loses control of the system</td>
<td>Task Completion</td>
</tr>
</tbody>
</table>
Design Guidelines vs. Patterns

GUIDELINES
- capture design knowledge into small pieces
- described by means of rules
- can be too simplistic or abstract to implement

PATTERNS
- capture proven design knowledge
- described in terms of problem–context–solution
- are context specific => narrow application range
Design pattern: Tabs

- alternate views within the same context
- only if user does not need to see all data simultaneously
- parallel in nature
- do not use ALL CAPS
- selected is clearly highlighted / unselected is readable

https://www.nngroup.com/articles/tabs-used-right/
Design pattern: Animation

Questions to answer

- User attention
- Goal of animation
  - attraction, continuity, relationship
- Frequency
- Mechanism
  - transition/animation
  - directly cased by user or not

https://www.nngroup.com/articles/animation-usability/
Design pattern: Sliders

- imprecise interaction
  - do not expect precise value entry
  - density of the range

- interaction with various methods
  - mouse, index finger, thumb

- steering law

https://www.nngroup.com/articles/gui-slider-controls/
Design pattern: Modal dialog

- Preventing critical errors
- Requesting critical info
- Fragment a complex workflow (Wizards)
- Interrupting important process
- Complex decision making

https://www.nngroup.com/articles/modal-nonmodal-dialog/
Interaction styles

- **Command line**
  - fast, efficient, no overview, recall, weak feedback

- **Menu**
  - user choices, hierarchy, overview, recognition

- **Form**
  - information gathering, linear approach (with possible side walks), problem with structured data

- **Questions and answers**
  - installation wizards, for beginners, not for experts, task sequence is well-defined and fixed

- **Direct manipulation**
  - intuitive handling, usage of metaphors, ad-hoc sequence of tasks, can become messy

- **Metaphors**
  - usage of objects from the real world, can be misunderstood

- **Hyperlinks**
  - better awareness of context, easier navigation in graph structures, links are labeled and placed close to related content

- **3D environments**
  - immersive, intuitive walkthrough, special devices needed

- **Zoom/Pan**
  - overview/detail problem, visual search, problem of non-isomorphic environment

- **Conversation interface**
  - intuitive navigation in complex tasks with high number of walkthroughs, reliability and privacy issues
Resources

- Nielsen Norman Group
  - https://www.nngroup.com/topic/design-patterns/
  - https://www.nngroup.com/topic/interaction-design/
  - https://www.nngroup.com/topic/heuristic-evaluation/
  - https://www.nngroup.com/topic/navigation/
  - https://www.nngroup.com/articles/gui-slider-controls/

- User focus
Example question for examination

- Describe the purpose of design patterns. How are they defined?
- Give some examples of design guidelines. How they should be applied in design process?
Thank you for attention