"Beyond Perceivability": Critical Requirements for Universal Design of Information

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"Beyond Perceivability"

- Information may be judged to be accessible when it appears to be easily perceivable by the user
- However, its content should not be judged to be accessed unless it is understood by the user

- Accessibility of information should be evaluated
  - not only for its percievability
  - but also for its understandability

The Cognitive Walkthrough (CW) Method

- A usability inspection method
  - Aimed at evaluating the ease of learning user interfaces
- Analysts are asked to answer questions as to whether the user will successfully perform the required action
  - Yes/No answers and their reasons

- In the current 3rd version (CW3)
  - The number of questions was reduced to 4 (Wharton et al., 1994)

Four Questions in CW3

- (Q1) Will the user be trying to achieve the right effect?
- (Q2) Will the use know that the correct action is available?
- (Q3) Will the user know that the correct action will achieve the desired effect?
- (Q4) If the correct action is taken, will the user see that things are going OK?

The Modified CW (MCW) Method

- ❑ Approaches
  - ■ Clarify the intent of CW questions using HCI model
  - ■ Determine CW questions of optimal grain levels based on HCI model
- ❑ Extended HCI model
  - ■ The Seven Stages of Action model (Norman, 1986) was extended
  - ■ Distinguish between
    - ❑ specifying "object" and "action"
    - ❑ "perceiving" and "understanding"

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Extended HCI Model

Distinguish between specifying object and action

Distinguish between perceiving and understanding
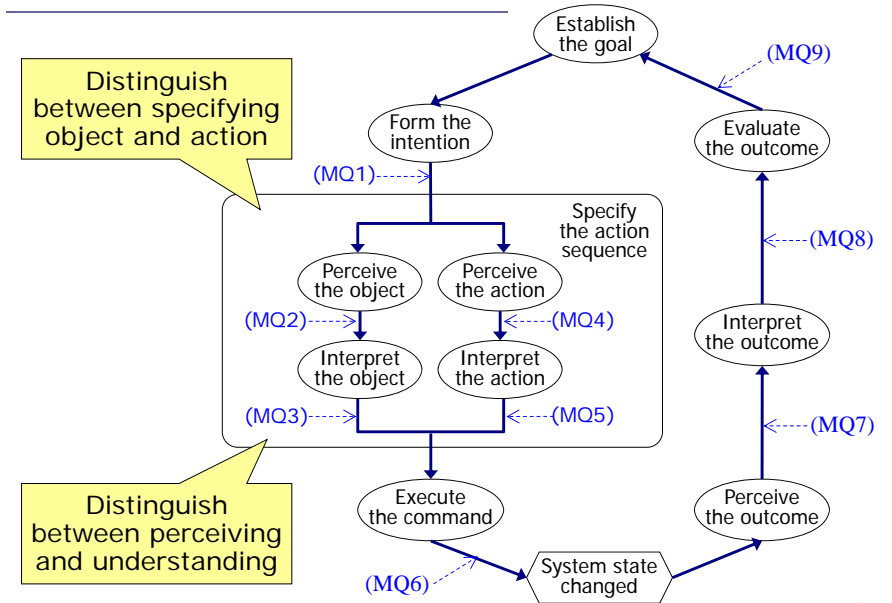
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New Set of Questions in MCW

(MQ1)	Will the user intend to achieve the right effect?
(MQ2)	Will the user notice that the correct object is available?
(MQ3)	Will the user know what the correct object refers to?
(MQ4)	Will the user notice that the correct action is available?
(MQ5)	Will the user know that the correct action should be applied to the correct object?
(MQ6)	Will the user be able to apply the correct action to the correct object without fail or difficulty?
(MQ7)	When the correct action is taken, will the user notice the physical change in the system state?
(MQ8)	Will the user know what exactly has happened to the system state?
(MQ9)	Will the user know the current system state is nearer to the completion of the task?

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Comparative Evaluation: Objective

- ❑ Compare the third version (CW3) and the modified version (MCW)
  - ■ In terms of effectiveness and efficiency in identifying Web design problems

- ❑ Effectiveness
  - ■ Measured by the proportions of problems identified by the participants
- ❑ Efficiency
  - ■ Indexed by the time spent by the participants for answering the CW questions

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Method

- 48 undergraduates without prior experience of using the CW methods
  - Randomly divided into two groups of 24 participants each
  - One group for CW3, and the other for MCW

- Participants in each group were asked to inspect possible problems in two fictitious Web sites
  - Online shopping site and university web site
  - The order of inspecting these two Web sites was counterbalanced across participants within each group

Results: Effectiveness

- Proportions of correct data was analyzed by a two-way ANOVA
  - 2 (CW3 vs. MCW) x 2 (types of Web sites)

- The main effect of the methods was significant ($F(1,46)=10.39$, $p<.005$)
- MCW had a higher mean (.58) than CW3 (.42)

Results: Efficiency

- Task completion time was analyzed by the same two-way ANOVA
- When all the 9 questions were included for the MCW, the MCW [2140 sec.] took significantly longer than the CW3 [1709 sec.] ($F(1,46)=7.77$, $p<.01$)

- MQ4 & MQ5 were about well-learned actions (e.g., mouse click)
- When MQ4 & MQ5 were excluded from the MCW, there was no significance difference between MCW [1748 sec.] and CW3 [1709 sec.] ($F<1$)

Conclusions

- The MCW was more effective than the CW3 in identifying possible Web design problems
- The MCW was comparable with the CW3 in the task completion time, when the trouble-free questions (i.e., MQ4, MQ5) were removed from the MCW
  - "Trouble-freeness" depends on the intended user group

- The finer-grained questions in the MCW allow effective and flexible evaluation of accessibility and usability
  - Design problems are more easily revealed by the explicit distinctions of identifying correct objects/actions and of perceiving/understanding
  - The question set may be customized by removing non-informative questions that will never be answered "No" with respect to the intended user group