User Interface Evaluation

Heuristic Evaluation

Lecture #17

Agenda

- Evaluation through Expert Analysis
  - Cognitive walkthrough
  - Heuristic evaluation
  - Model-based evaluation
  - Cognitive dimension of notations

Heuristic Evaluation

- Nielsen et al. [1994] devised a method and treated as the most efficient usability inspection method

References:

1. Heuristic Evaluation by Jacob Nielsen in Usability Inspection Methods edited by J. Nielsen, R. L. Mack, John Wiley, New York, 1994

2. Jacob Nielsen's website:

   http://www.useit.com/

Heuristic Evaluation

- The method is cost-effective, fast, relatively simple, and flexible approach
  - Can be performed on a design specification, that is, it can be used for evaluation at an early design
  - It can also be used on prototypes, short-boards and fully functioning systems

HE: Basic Concept

- Several evaluators evaluate the interface and come up with the potential usability problems
- It is important that the evaluation be done independently
- To aid the evaluators in discovering usability problems, Nielsen proposed 10 usability heuristics
  - A number of these are recognizably derived from the principles of Direct Manipulation by Ben Shneiderman, although they apply to a wide range of different interaction styles
  - They are called heuristic because they are more in the nature of rules of thumb than specific usability guidelines

HE: 10 Usability Heuristics

1. **Visibility of system status**
   - The system should always keep users informed about what is going on, through appropriate feedback within reasonable time

2. **Match between system and the real world**
   - The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order

3. **User control and freedom**
   - Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo

HE: 10 Usability Heuristics

4. **Consistency and standards**
   - Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions

5. **Error prevention**
   - Even better than good error messages is a careful design which prevents a problem from occurring in the first place

6. **Recognition rather than recall**
   - Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate

HE: 10 Usability Heuristics

7. **Flexibility and efficiency of use**
   - Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions

8. **Aesthetic and minimalist design**
   - Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility

9. **Help users recognize, diagnose, and recover from errors**
   - Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution

HE: 10 Usability Heuristics

10. Help and documentation

- Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large

- Jacob Nielsen originally developed the heuristics for heuristic evaluation in collaboration with Rolf Molich in 1990. Nielsen since refined the heuristics based on a factor analysis of 249 usability problems to derive a set of heuristics with maximum explanatory power, resulting in this revised set of heuristics

HE: Evaluation Procedure

- Each evaluator assesses the system and notes violations of any of theses usability heuristic that would indicate any potential usability problem

- The evaluator also assesses the severity of each usability problem based on four factors

1. How common is the problem
2. How easy is it for the user to overcome
3. Will be a one-off problem or persistent problem
4. How seriously will the problem be perceived

HE: Evaluation Procedure

- All these factors can be combined into an overall severity rating on a scale of 0-4 (Nielsen)

0 = I don't agree that this is a usability problem at all

1 = Cosmetic problem only; need not be fixed unless extra time is available on project

2 = Minor usability problem; fixing this should be given low priority

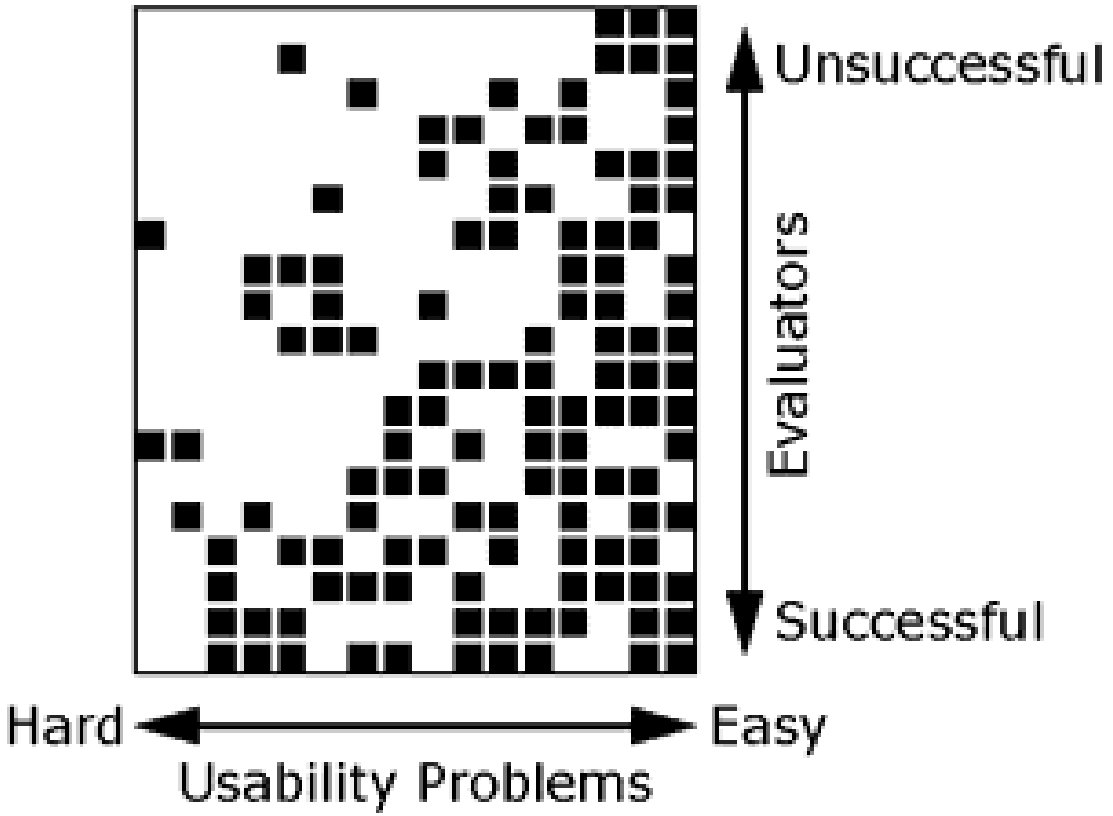
3 = Major usability problem; important to fix, so should be given high priority

4 = Usability catastrophe; imperative to fix this before product can be released

HE: Number of Evaluators

- It is obvious that Nielsen's 10 usability heuristics are important features in HE
- In addition to this, Nielsen argued that number of evaluators required in a HE is another important issue
  - In general, HE is difficult for a single individual to do because one person will never be able to find all the usability problems in an interface
  - Research reveals that different people find different usability problems

HE: Number of Evaluators



HE: Number of Evaluators

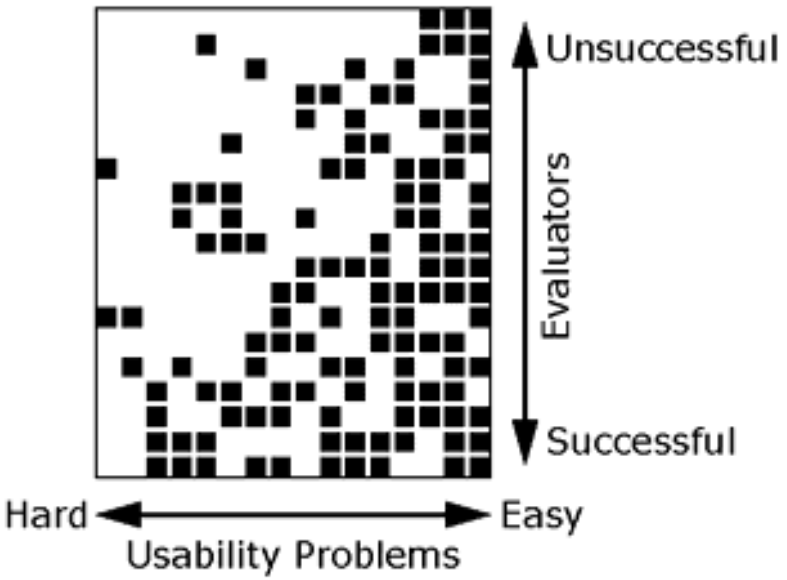
- Experiment by Nielsen

  A case study where 19 evaluators were used to find 16 usability problems

  Each row represents one of the 19 evaluators and each column represents one of the 16 usability problems

  Each square represents whether the problem was detected (black) or not (white)

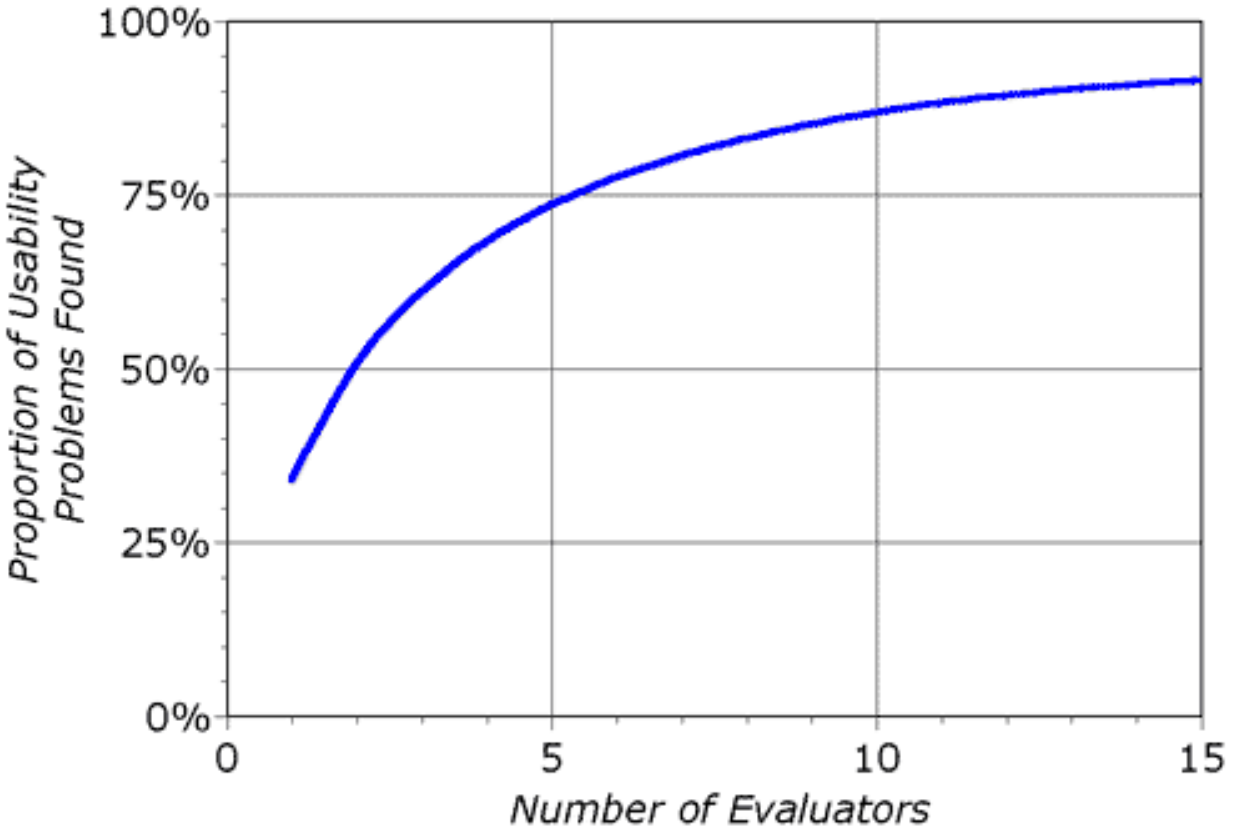
  The rows and columns are presented in sorted fashion



HE: Number of Evaluators

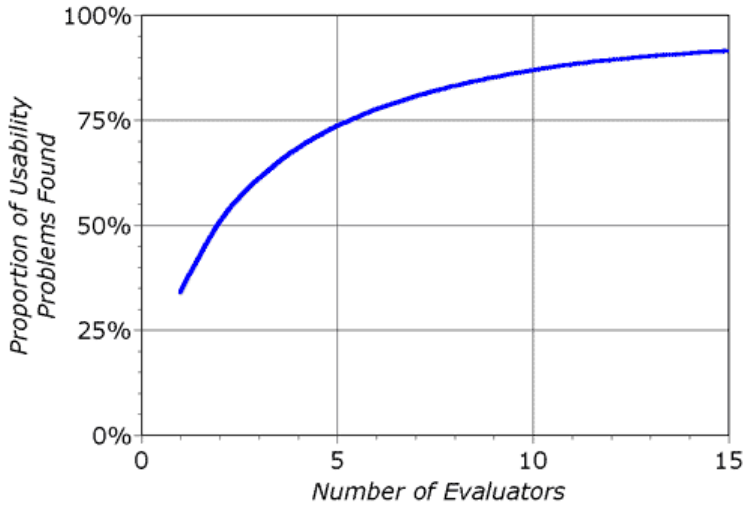
- Observation
  - It is therefore essential that HE involves multiple evaluators (preferably with different background) in order to consider the system from different perspective

HE: Number of Evaluators



HE: Number of Evaluators

- Experiment by Nielsen
  - Number of usability problems in 6 case studies varies from 16 to 50
  - Single evaluator found only 35% of the usability problems in the interface
  - More evaluators used (up to 15) the higher the proportion of usability problems detected
  - On average, just five evaluators detects almost 75% of the usability problems



HE: Number of Evaluators

- **Conclusion**
  - Normally to use **three** **to** **five** evaluators
  - The exact number of evaluators to use would depend on a cost-benefit analysis
  - More evaluators should obviously be used in cases where usability is critical or
  - when large payoffs can be expected due to extensive mission-critical use of a system

HE: Nielsen & Landaus Model

- Quantitative model on the number of usability problem detectable in heuristic evaluation by Nielsen & Landaus [1993]

$$\text{ProblemsFound(i)} = N(1-(1-K)^{i})$$

Where

ProblemsFound(i) = the number of problems found by aggregating reports for i independent evaluators

N = the total number of usability problems in the interface

K = the proportion of all usability problems found by a single evaluators (in some case studies value of K ranged from 19% to 51% with a mean of 34%)

Recommended Materials

- See the course web page

  http://www.iitkgp.ac.in/course/it60110/

  (For the presentation slides of the current lecture and other materials)

- Book

  Human-Computer Interaction by Alan Dix et al. Pearson-Education,

  Chapter 9