Usability Evaluation Methods

- Usability can be evaluated by
  - Inspection
  - Testing
  - Inquiry

Inspection

- In Usability Inspection approach,
  - usability specialists and sometimes software developers, users and other professionals -- examine usability-related aspects of a user interface.

Inspection Methods

- Heuristic Evaluation
- Cognitive walkthrough
- Action Analysis

Heuristic Evaluation

- Most common informal method
- Involves usability specialist judges
  - They judge each dialogue element follows usability principles of not
  - Evaluator goes through one dialogue element several times and compare that with various usability principles
  - At the end all evaluators can communicate and share their findings.
  - Evaluators should have the proper experience otherwise heuristic evaluation will be of no use.

Heuristic Evaluation(Contd')

- Advantages
  - Application of recognized and accepted principles.
  - Intuitive(spontaneous results)
  - Usability early in the development process
  - Effective identification of major and minor problems
  - Rapidity, HE can be used throughout the development process
- Disadvantages
  - Disassociation from end users
  - Does not identify or allow for unknown users' needs
  - HE does not necessarily result in evaluating the complete design since there is no mechanism to ensure the entire design is explored.

Cognitive Walk through

- Cognitive walkthrough involves one or a **group of evaluators** inspecting a user interface by going through
  - **set of tasks** and evaluate its
  - **Understandability** and **ease of learning**.
- The user interface is often presented in the form of a
  - **paper mock-up** or a **working prototype**, it can also be a **fully developed interface**.
- As the walkthrough proceeds, the evaluators ask the following four questions:
- *Will the users try to achieve the right effect?*
  - For example, their task is to print a document, but the first thing they have to do is select a printer. Will they know that they should select a printer?
- *Will the user notice that the correct action is available?*
  - This relates to the visibility and understandability of actions in the interface.
- *Will the user associate the correct action with the effect to be achieved?*
  - Users often use the "label-following" strategy, which leads them to select an action if the label for that action matches the task description.
- *If the correct action is performed, will the user see that progress is being made toward solution of the task?*
  - This is to check the system feedback after the user executes the action.

Cognitive Walkthrough(contd')

Disadvantages of Cognitive Walkthrough

- Non-involvement of the end user
- For larger and complex tasks it can be time consuming.

Action Analysis

- Focus is on what the practitioner's do than on what they say they do
- Close inspection of the action sequences, which a user performs to complete a task
- Break the task into individual actions such as move-mouse-to-menu or type-on the-keyboard
  - calculate the times needed to perform the action..
- Advantages
  - Precise prediction of how long a task will take.
  - A deep insight into users' behaviour.
- Disadvantages
  - Time-consuming and needs high expertise

Testing

- In Usability Testing approach, representative users work on typical tasks using the system and the evaluators use the results to see how the **user interface supports the users** to do their tasks.

- Testing methods include
  - Coaching Method
  - Co-discovery Learning
  - Performance measurement
  - Question asking protocol
  - Remote Testing
  - Retrospective testing
  - Teaching Method

- Coaching Method
  - participants are allowed to ask any system-related questions of an expert coach who will answer to the best of his or her ability.
  - Aim of this technique is to discover the information needs of users, in order to provide better *training* and *documentation*, as well as possibly redesign the interface to avoid the need for the questions.
    - **Tester serves** as a coach
      - Testers can give answers to users questions
    - **Expert user** serves as a coach
      - When expert user is a coach tester can study the mental model of expert users also.

- Co-discovery Learning
  - two test users attempt to perform tasks together while being observed.
  - They are to help each other in the same manner as they would if they were working together to accomplish a common goal using the product.
    - Compared to thinking-aloud protocol, this technique makes it more natural for the test users to verbalize their thoughts during the test
      - Because when testers are talking to each other, we can get an idea, what they are thinking about.

- Performance Measurement
  - This gives quantitative data, This test must be performed in Usability Laboratory because a small distraction can lead to false results.
- Quantify these usability issues by measurements:
  - The time users take to complete a specific task.
  - The number of task of various kinds that can be completed within a give time limit.
  - The Ratio between successful interactions and errors.
  - The time spent recovering from errors.
  - The number of user errors.
  - The number of commands or other features that were never used by the user.
  - The frequency of use of the manuals and/or the help system, and the time spent using them.

- Question asking protocol
  - Users are asked direct questions about the product.
    - From response of these questions the tester finds out,
      - problems faced by the users in using the system
      - Understanding mental models of the system and tasks
- For example,
  - "How would you send the email message?"
    - Their response, either in terms of the product being tested or in other products from their past experience, will provide insights into their mental model of the product.

- Retrospective Testing
  - A videotape is made of the Usability test session.
  - Tester reviews the videotape together with participants and asking questions about their behavior.

- Teaching Method
  - Let test user interact with the system first. Let them be little expertise
    - Assign naïve user to each test user.
    - Naïve users are instructed not be give active participation in problem solving.
  - From test user mental model, we will observe how he interpreted the system.

- Thinking Aloud Protocol
  - Test users are asked to **verbalize their thoughts**, **feelings, and opinions** while interacting with the system.
  - Useful in capturing a wide range of cognitive activities.
  - **Critical response** User has to be vocal only during the execution of certain predetermined subtasks.
  - **Periodic report** Used when the task is complex and makes it difficult for users to think aloud while performing the task at the same time.
    - The length of the interval depends upon the complexity of the task. This technique is very time consuming, so it is recommended for subdivisions of a task.

Inquiry

- Field Observation
  - Go to user work places and observe them work
  - how the users are using the system to accomplish their tasks
  - what kind of mental model the users have about the system
    - This method can be used in the test and deployment stages.

- Focus Groups
  - Data collecting technique where about 6 to 9 users are brought together to discuss issues relating to the system.
  - A human factors engineer plays the role of a moderator, who needs to prepare the list of issues to be discussed.

- Interviews
  - Human factors engineers formulate questions about the product based on the kind of issues of interest.
    - Then they interview representative users to ask them these questions in order to gather information desired
  - In an evaluation interview, an interviewer reads the questions to the user, the user replies verbally, and the interviewer records those responses.
  - Interviews can be Structured & Unstructured

Contd

- Unstructured
  - During early stages of usability evaluation
  - Does not have well defined agenda, and is not concerned with specific aspect of the system
  - Obtain information on procedures adopted by users and on their expectations of the system.
- Structured
  - has a specific, predetermined agenda with specific questions to guide and direct the interview.

- Questionnaire
  - This is the method, being used from long time.

Nielsen's Heuristic Evaluation

Based on: Nielsen, J. (1993) *Usability Engineering*. Academic Press. Chapter 5, p. 115. | About question.cgi

Please evaluate the system according to Nielsen's usability heuristics.

- Try to respond to all the items.
- For items that are not applicable, use: **NA**
- Make sure these fields are filled in: **System:** **Email to:**
- Add a comment about an item by clicking on its icon, or add comment fields for all items by clicking on **Comment All**.
- To mail in your results, click on: **Mail Data**

System: **Email to:**

Optionally provide comments and your email address in the box.

Mail Data | Comment All | RETURN TO REFERRING PAGE

			1	2	3	4	5	6	7		NA
1.	Simple and Natural Dialogue	bad	○	○	○	○	○	○	○	good	○
2.	Speak the Users' Language	bad	○	○	○	○	○	○	○	good	○
3.	Minimize User Memory Load	bad	○	○	○	○	○	○	○	good	○
4.	Consistency	bad	○	○	○	○	○	○	○	good	○
5.	Feedback	bad	○	○	○	○	○	○	○	good	○
6.	Clearly Marked Exits	bad	○	○	○	○	○	○	○	good	○
7.	Shortcuts	bad	○	○	○	○	○	○	○	good	○
8.	Good Error Messages	bad	○	○	○	○	○	○	○	good	○
9.	Prevent Errors	bad	○	○	○	○	○	○	○	good	○
10.	Help and Documentation	bad	○	○	○	○	○	○	○	good	○
			1	2	3	4	5	6	7		NA

Questionnaire for User Interface

OVERALL REACTION TO THE SOFTWARE		0	1	2	3	4	5	6	7	8	9		NA
1.	terrible	○	○	○	○	○	○	○	○	○	○	wonderful	○
2.	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
3.	frustrating	○	○	○	○	○	○	○	○	○	○	satisfying	○
4.	inadequate power	○	○	○	○	○	○	○	○	○	○	adequate power	○
5.	dull	○	○	○	○	○	○	○	○	○	○	stimulating	○
6.	rigid	○	○	○	○	○	○	○	○	○	○	flexible	○
SCREEN		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
7. Reading characters on the screen	hard	○	○	○	○	○	○	○	○	○	○	easy	○
8. Highlighting simplifies task	not at all	○	○	○	○	○	○	○	○	○	○	very much	○
9. Organization of information	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
10. Sequence of screens	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
TERMINOLOGY AND SYSTEM INFORMATION		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
11. Use of terms throughout system	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
12. Terminology related to task	never	○	○	○	○	○	○	○	○	○	○	always	○
13. Position of messages on screen	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
14. Prompts for input	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
15. Computer informs about its progress	never	○	○	○	○	○	○	○	○	○	○	always	○
16. Error messages	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○
LEARNING		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
17. Learning to operate the system	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
18. Exploring new features by trial and error	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
19. Remembering names and use of commands	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
20. Performing tasks is straightforward	never	○	○	○	○	○	○	○	○	○	○	always	○
21. Help messages on the screen	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○
22. Supplemental reference materials	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
SYSTEM CAPABILITIES		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**

- Logging Actual Users
  - Computer automatically collects statistics of detailed use of the system.
  - It is useful because it is
    - Easy to automatically collect data from a large number of users working under different circumstances.
      - An interface log will contain statistics about
        - frequency with which each user has used each feature in the program and
        - frequency with which various events of interest (such as error messages) have occured.
        - frequency of use of commands and other system
        - frequently used features

Contd…

- Since the logging data only shows **what** the users did **but not why** they did it.
  - It would be better to combine logging with other methods such as interviews, where users are shown data about their own use of the system and asked to explain their activities.

- Proactive Field Study
  - This technique is used only in requirements and design stages
    - Human factors engineers go to representative users's workplace to
      - talk to them,
      - observe them work,
      - ask them questions,
      - Understand user characteristics,
      - the work flow,
      - the system features they need, etc.

Usability in Development Life-Cycle

Evaluation Methods	Stages in Software Development Life-cycle				
	Requirement	Design	Code	Test	Deployment
Proactive Field Study	*	*			
Pluralistic Walkthroughs		*			
Teaching Method		*	*	*	
Shadowing Method		*	*	*	
Co-discovery Learning		*	*	*	
Question-asking Protocol		*	*	*	
Scenario-based Checklists		*	*	*	*
Heuristic Evaluation		*	*	*	*
Thinking-aloud Protocol		*	*	*	*
Cognitive Walkthroughs		*	*	*	*
Coaching Method		*	*	*	*
Performance Measurement		*	*	*	*
Interviews		*	*	*	*
Retrospective Testing		*	*	*	*
Remote Testing		*	*	*	*
Feature Inspection			*	*	*
Focus Groups				*	*
Questionnaires				*	*
Field Observation				*	*
Loggin Actual Use				*	*

Usability Engineering

Ask Usability Advisor

Extra: find a usability expert near your!

Please specify your project requirements and constraints below and then click on the "Give Recommendation" button to get a list of methods most suitable for your project.

>> Software development stage:

○ Requirement ◉ Design ○ Code ○ Test ○ Deployment

>> Personnel Availability:

Usability experts:	Users:	Software developers:
◉ 1	○ 0-1	○ Yes
○ 2-3	◉ 2-3	◉ No
○ 4 or more	○ 4-5	
	○ 6-9	
	○ 10 or more	

>> Usability Dimensions to be Measured:

☑ Effectiveness ☐ Efficiency ☐ Satisfaction

>> Need to obtain quantitative measures:

○ Yes ◉ No

>> Need to do remote evaluation:

○ Yes ◉ No

http://www.usabilityhome.com/Advisor.html

Discussion

- You all are using mobile phones,
  - List down the usability Issues you feel with your mobile and what you suggest it to be corrected.
  - Exchange mobile phone with your friend and ask them to check the usability of your phone
    - Apply suitable Usability Evaluation method to find out how comfortable they are using your phone
    - List down your findings.

Do you think Apple has any Usability Issues?

- I pod
- I phone
- I Pad