Usability Engineering SENG 42222

Introduction

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Learning outcomes

Course Code : SENG 42222
Course Title : Usability Engineering
Prerequisites : SENG 22223

Learning outcomes:

On completion of this course unit, the student should be able to:

- Understand and discuss user centered software evaluation, development and GUI design
- Gather requirements for a user interface, using both task analysis and interview with a user and create a specification for a user interface based on requirements
- Create different prototypes at different levels of specificity from the specification.
- Implement the prototype using some GUI toolkit.

Course content:

- Evaluation with and without typical users
- Challenges to effective evaluation
- Functionality and usability requirements
- Techniques for gathering requirements
- Notations for specifying user interfaces
- Prototyping techniques and tools
- User-interface software techniques
- GUI builders
- Choosing interaction styles and interaction techniques
- Choosing the right widget for users and tasks
- HCI aspects of screen design, beyond simple screen design
- Designing for small devices
- Multi-cultural interaction and communication
- Usability of Multimedia and Multimodal Systems

Method of teaching and learning: Lectures, assignments, case studies and self-study

Assessment: End of course unit examination, mid-semester examination, in-class quizzes

Recommended reading:

- Leventhal, L. and Barnes, J. (2008), Usability Engineering: Process, Products & Examples, Pearson
- Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., Elmqvist, N. and Diakopoulos, N. (2017), Designing the User Interface: Strategies for Effective Human-Computer Interaction, Pearson
- Dix, A.J., Janet, E., Gregory, D., Abowd, G.D. and Beale, R. (2003). Human-Computer Interaction. Prentice Hall.
- Materials provided in CAL

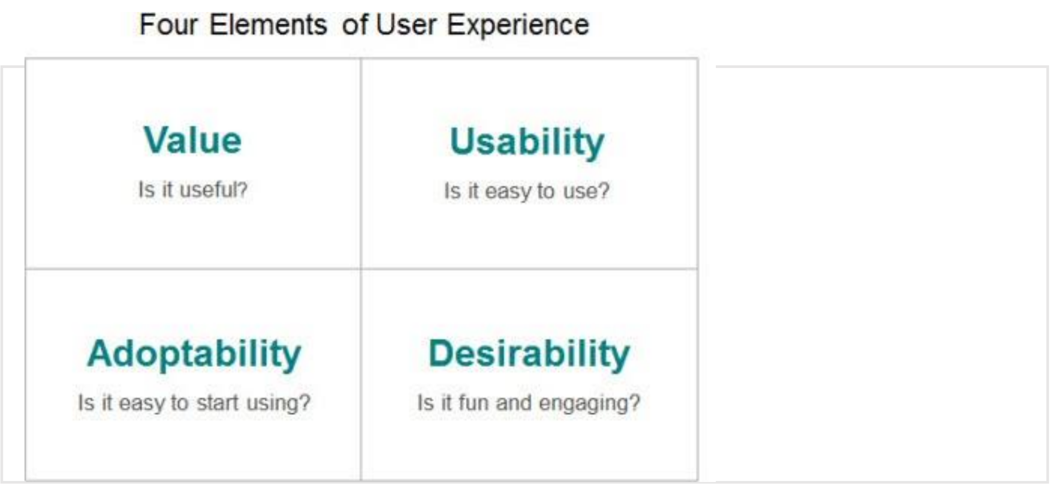
Usability can be described as the capacity of a system to provide a condition for its users to perform the tasks safely, effectively, and efficiently while enjoying the experience.

Usability is a **quality attribute** that assesses how easy user interfaces are to use. The word "usability" also refers to methods for improving ease-of-use during the design process.

~Nielsen Norman Group~

Usability vs. User Experience?

- Usability refers to how successfully a user can use a product to accomplish a specific goal.
- User experience encompasses an end user’s entire experience with a product — not just how well the product worked, but how they expected it to work, how they feel about using it, and how they feel about the company overall.



Four Elements of User Experience

Value Is it useful?	**Usability** Is it easy to use?
Adoptability Is it easy to start using?	**Desirability** Is it fun and engaging?

What is Usability?

- **Users don’t need machines to be friendly to them, they just need machines that will not stand in their way when they try to get their work.**
  - Users’ needs can be described along a single dimension by systems that are more or less friendly.
  - Reality different users has different needs, and a system that is “friendly” to one may feel tedious to another.
- **Because of these problems “user friendly”, user interface professionals have tended to use other terms.**
  - Computer-Human-Interaction
  - Human-Computer-Interaction
  - User-Centered-Design
  - Man-Machine-Interface
  - Human-Machine-Interface
  - User-Interface-Design
  - Human Factors

What is Usability?

Usability and Other Considerations

- **Usability is a narrow concern compared to the large issue of system acceptability**
  - Whether the System is good enough to satisfy all needs and requirements of the users and other potential stakeholders.

Overall acceptability for a computer system = Social acceptability + Practical acceptability

Usability and Other Considerations

Social acceptability

Ex:

- A system investigates whether people applying for unemployment benefits are currently gainfully employed and thus have submitted fraud applications.
- Thus, system might do this by asking applicants a number of questions and searching their answers for inconsistencies/ profile that indicates as cheaters.

- Some people consider this system is highly socially desirable, but others may find it offensive
    - questioning and delay benefits for people fitting certain profiles
    - not socially accepted, even practically acceptable & identifying many cheaters.

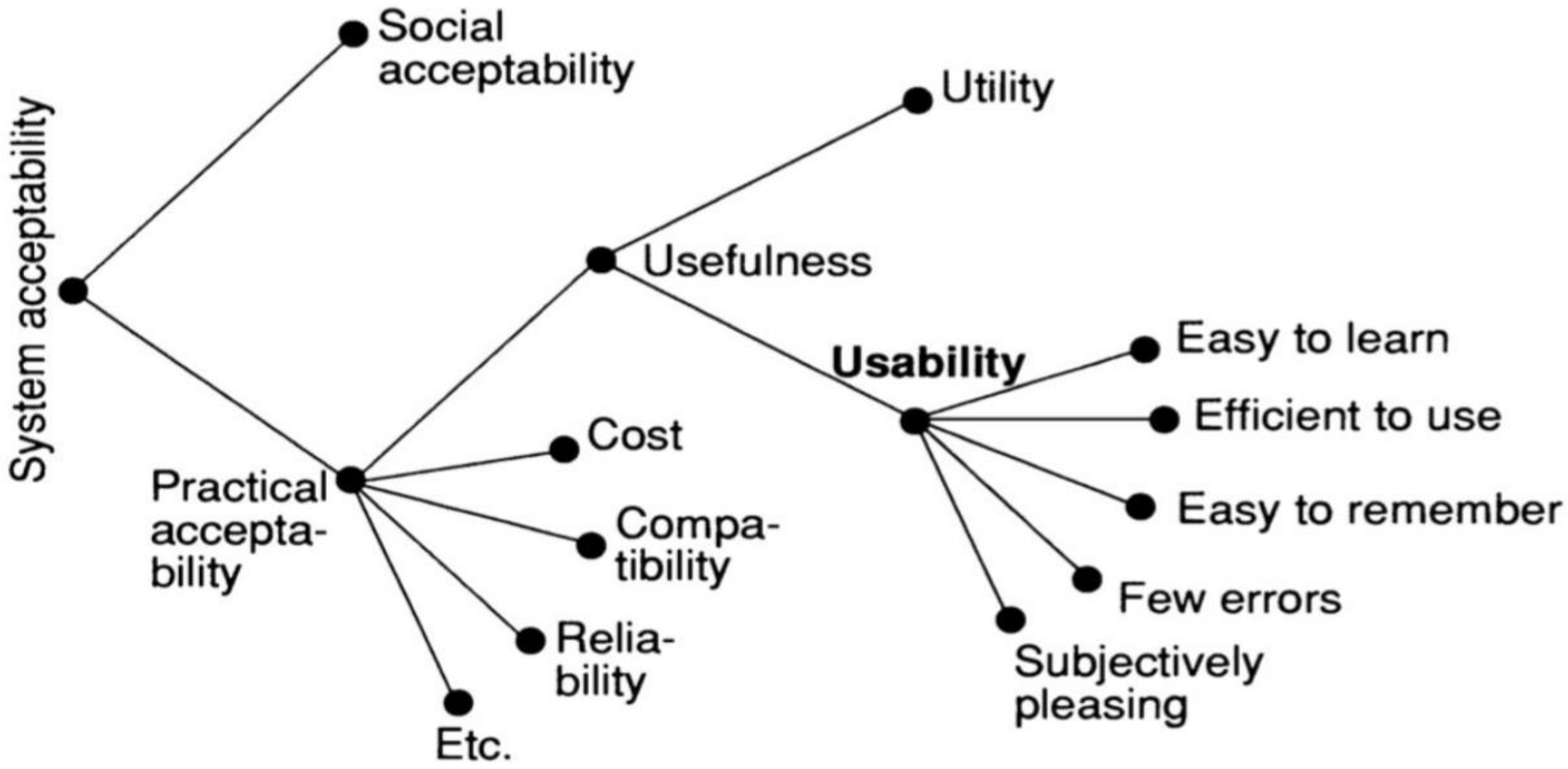
Usability and Other Considerations

Practical acceptability

- ❑ Usefulness - issue of whether the system can be used to achieve some desired goal.
    - Utility - whether the functionality of the system in principle can do what is needed.
        - Educational Softwares (coursewares) - High utility, if students learn from it
        - Entertainment Softwares - High utility, if it is fun to use
    - Usability - How well users can use that functionality
        - Applies all aspects of a system which a human might interact, including installation and maintenance procedures.

- ❑ Traditional Categories
    - Cost
    - Support
    - Reliability
    - Compatibility with existing system

Usability and Other Considerations



A model of the attributes of system acceptability

Usability

- Usability is not a single, one-dimensional property of a user interface
- Five usability attributes

1. **Learnability**
    - The system should be easy learn so that the user can rapidly start getting some work done with the system.
2. **Efficiency**
    - The system should be efficiency to use, so that once the user has learned the system, a high level of productivity is possible.
3. **Memorability**
    - The system should be easy to remember, so that the casual user is able to return to the system after some period not having used it -without having to learn everything all over again.
4. **Errors**
    - The system should have low error rate, so that the users make few errors during the use of the system, and if they do make errors, they can easily recover from them.
5. **Satisfaction**
    - The system should be pleasant to use, so that the users are subjectively satisfied when using it.

Usability

Usability is measured by having number of test users use the system to perform a prespecified set of tasks.

- Can have real users in the field whatever tasks they are doing anyway.
- To determine a systems' overall usability on the basis of a set of usability measures.

Take mean values of each attributes that have been measures and then compare with a threshold/ previously specified minimum

1. Learnability

First experience, most people have with a new system is that of learning to use it.

- Systems Trainings - overcome a **hard-to-learn** interface.
- In most cases, systems need to be easy to learn.
- Ease of Learning - novice user experience on the initial part of the learning curve.
  - ❑ Highly learnable systems
    - ○ Have a steep incline for the first part the learning curve.
    - ○ Allow users to reach a reasonable level of usage proficiency within a short time.
      - Like Museum information system - one time use with zero knowledge
- Note : Users normally do not take the time to learn complete interface fully

  before starting to use it.

2. Efficiency of Use

- Refers to the expert user’s steady state level of performance at the time when the learning curve flattens out.
- Get a representative sample of users with that expertise and measure the time it takes these users to perform some typical test tasks.

3. Memorability

- Casual users are the third major category of users beside novice and expert users.
- Casual Users - using a system intermittently rather than having fairly frequent use assumed for expert users.
- Compared novice users - Casual users have used the system before.
  - Do not need to learn the system from the scratch
  - Just need to remember how to use it based on their previous learning.
- Systems do not need to be actively able to remember what is available – system reminds when necessary.

4. Few and Non-Catastrophic Errors

- Users should make as few errors as possible when using a computer system.
- Error - action that does not accomplish the desired goal.
- System's Error Rate - counting the no of such actions made by users while performing some special tasks.
  - Error rate - thus can be measured as part of an experiment to measure other usability attributes.
- Defining Errors
  - Incorrect user actions - does not take highly varying impact of different errors.
  - Errors Corrected immediately by the user - have no other effect than slow down the user's transaction rate.
  - Catastrophic - not discovered by the user, leading to faulty product, destroy the user's work

5. Subjective Satisfaction

- Refers how pleasant it is to use the system.
- Important for systems that are used on a discretionary basis in a non work environment.
  - Home computing
  - Games
  - Interactive fiction
- Enriching experience when using above systems since they have no other goal.
- Measured by small questionnaire
- A Semantic Differential scale : list two opposite terms along some definition

Other components of usability

- Effectiveness
  - Whether users can complete their goals with a high degree of accuracy.
  - Eg: Filling a credit card field which it only accepts a valid credit card number entry.
- Engaging
  - Engagement occurs when the user finds the product pleasant and gratifying to use.
  - Looking nice and looking right.
  - Eg: Proper layouts, readable typography and ease of navigation

Usability for Novel vs. Routine Tasks

You might feel a mismatch between your personal user experience and some of the usability findings reported recently:

- On intranets, employees had an average success rate of 74%, meaning that 1/4 of the measured tasks ended in failure.
- Teenagers—those supposed masters of technology—had an average success rate of 71%, and thus failed even more often than corporate users.
- E-commerce users found what they wanted 64% of the time in their first query and only 28% of the time in more difficult searches.
- Generalizing across many recent studies, conclusion is "users are incredibly bad at finding and researching things on the web."

Why You Don't Fail As Much

- You most likely have above-average IQ and education.
- You certainly have above-average reading skills.
- You most definitely have superior knowledge of web design patterns and computer concepts.

Why Users Don't Fail As Much

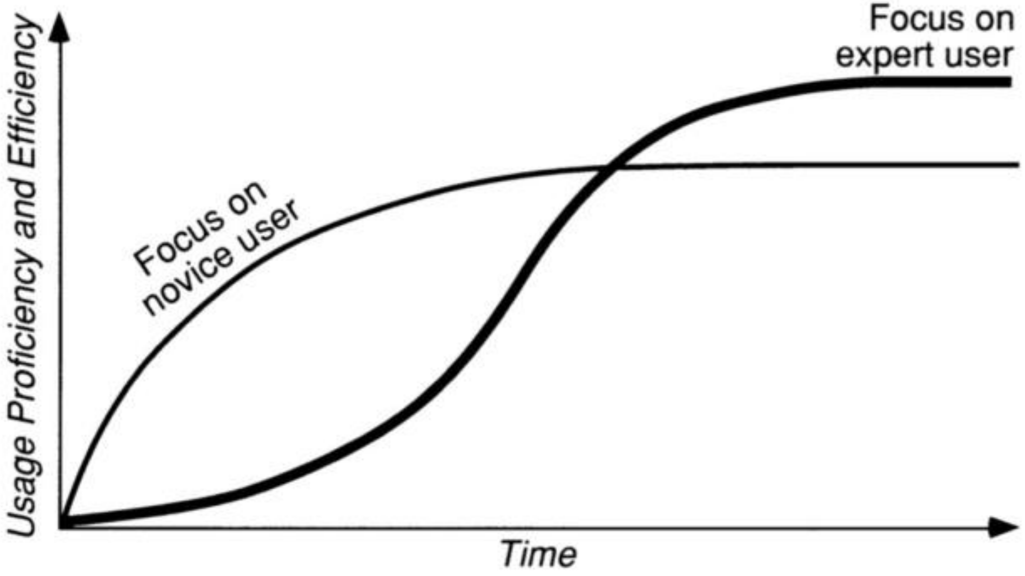
- Users spend an inordinate amount of **time on websites they already know quite well**.
- People do fairly simple things they’ve done many times before on the same site, such as checking news headlines.

So why worry about usability if the everyday user experience is so much better than what we measure in the usability lab?

People won’t become *experienced* users of a design if they fail at being *first-time* users of that design.

If a site is too difficult or frustrating to use, **people leave** and try the next site.

Usability Trade-Offs

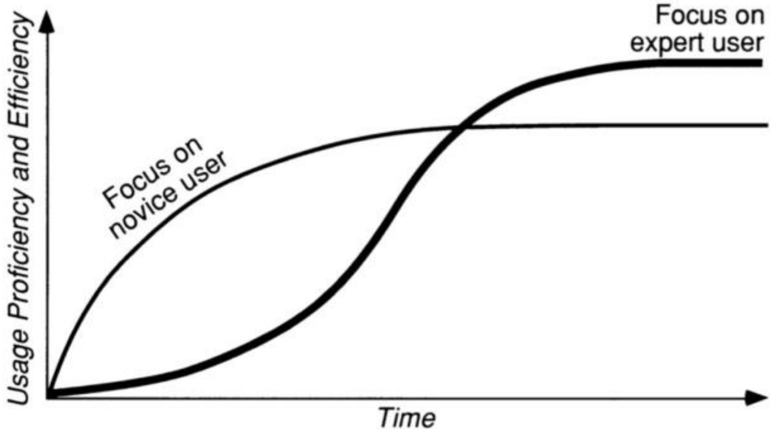


Usability Trade-Offs

- Possible to ride the best parts of both learning curves by providing a user interface with multiple interaction styles,
  - User start by learning one interaction style that is easy to learn
- Typical way to achieve this “best-of-best-worlds” effect - include accelerators in the user interface.
  - Accelerators - allow users to perform frequent tasks quickly

Changing the expert mode may suffer a small dip in performance, so the learning curve will not necessarily be continuously increasing

Increase of interface complexity - novice and expert modes can be a problem in itself.



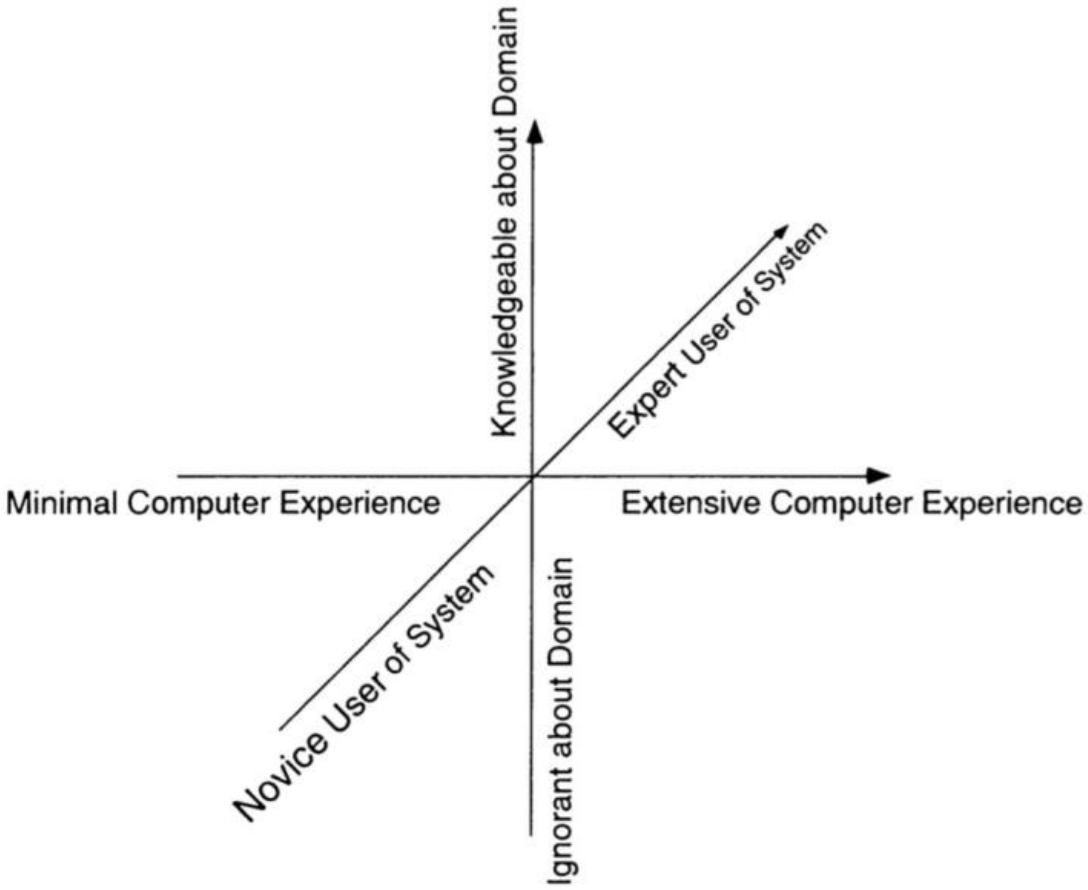
Categories of Users & Individual User Differences

- Most important issues for usability,
  - User’s task
  - Individual characteristics and differences

- User cube - three main dimensions
  - along which users’ experience differs:
    - experience with the system
    - with computer in general
    - the task domain

Categories of Users & Individual User Differences

User cube


Knowledgeable about Domain
Expert User of System
Minimal Computer Experience
Extensive Computer Experience
Novice User of System
Ignorant about Domain

- Main dimensions on which users' experience differs:
  I. Knowledge about computers in general
  II. Expertise in using the specific system
  III. Understanding of the task domain

Expertise with the System

- Users are normally considered to be either novice, expert or in between.
  - Eg: menu systems.
    - List the appropriate shortcuts for menu options as a part of the menu it self.
    - Does not hurt novice users allowing them to try alternative (short cuts) interactive technique
  - Eg: Online help systems
    - Provide hypertext links to information that is related to their specific queries.
- Some user interfaces are only intended to be used by novices (almost nobody will use them more than a few times)
  - KIOSK
  - May require a little reading of the instructions
- Common way to cater both expert and novice users is to include accelerators.
- Reality - most users do not acquire comprehensive expertise in all parts of the system, no matter how much they use it.

Expertise with Computers

- Users' general experience with computers also has impact on user interface design.
  - Mainframe administrators Vs Personal Computer Users
  - Disk defragmentation - interfaces should be very different
- Experience with other applications
  - Expects features which experienced in other applications
  - Eg: sort option in word processor as it is spread sheet.

Expertise with the Knowledge of the Task Domain

- Interfaces for users with extensive domain knowledge can use specialized terminology and density of information in the screen.
- Less domain knowledge - need to have a system explanation.
  - Eg: Financial Planning System

How to improve Usability?

There are many methods for studying usability, but the most basic and useful is user testing, which has 3 components:

1. Get hold of some representative users, such as customers for an ecommerce site or employees for an intranet.
2. Ask the users to perform representative tasks with the design.
3. Observe what the users do, where they succeed, and where they have difficulties with the user interface.

When to Work on Usability?

- Conduct a field study to see how users behave in their natural habitat.
- Test your competitors’ designs to get data on a range of alternative interface that have similar features to your own.
- Before starting new design, test the old design to identify the good parts that you should keep or emphasize, and the bad parts that give users trouble.
- Make paper prototypes of one or more new design and test them.

Q & A