



Chapter 1

Usability of Interactive Systems

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Objectives

- Introduction to Usability
- Usability Requirements
- Usability Factors
- Usability Goals and Measures
- Usability Motivations
- Universal usability

What is Usability?

- **Usability** is the ease of use and learnability of a human-made object such as software application, website, book, tool, process, or anything a human interacts with.
- Allowing intended users to accomplish their tasks in the best way possible.
- How well users can use the system's functionality?

Why is usability important?

- Lack of usability can cost time and effort, and can greatly determine the success or failure of a system.
- Given a choice, people will tend to buy systems that are more user-friendly.

Why is usability important?

- From the user's perspective
 - Usability can make the difference between performing a task accurately and completely or not, and enjoying the process or being frustrated.
- From the developer's perspective
 - Usability is important because it can mean the difference between the success or failure of a system.
- From a management point of view
 - Software with poor usability can reduce the productivity of the workforce to a level of performance worse than without the system. Also increase cost and time
- In all cases, lack of usability can cost time and effort, and can greatly determine the success or failure of a system.
- Given a choice, people will tend to buy systems that are more user-friendly.

Why is usability important?

- Routine processes: tax return preparation
- Decision support: a doctor's diagnosis and treatment
- Education and training: encyclopedias, simulations
- Leisure: music and sports information
- User generated content: social networking web sites, photo and video share sites, user communities
- Business use: financial planning
- Industries and professions: web resources for journals, and career opportunities
- Family use: entertainment, games and communication
- Globalization: language and culture

Usability Requirements

- Every designer wants to build high-quality interfaces
 - Quality means features such as usability, usefulness, no errors and universality (can be used by different users from different cultures)

- Everyone want “user-friendly” interfaces, but what do they mean?
 - Synonyms for “user-friendly” in Microsoft Word:
 - *easy to use; accessible; comprehensible; intelligible; available; and ready*
 - These measures are still subjective and vague, so a systematic and measurable process is necessary to develop usable systems for specific users in a specific context
 - For example - No of times user asks for help

Usability Requirements

- Managers can promote attention to user-interface design by careful planning the whole design process
- Designers propose multiple design alternatives for consideration. This will help to chose the best design which is user friendly
- User-interface building tools enable rapid implementation
- Evaluation of user-interface designs can identify gaps in the design and can assist in improving their usability

► Usability Requirements

- Usability requires project management and careful attention to requirements analysis and testing for clearly defined objectives
- Goals for requirements analysis
 1. Ascertain (to identify) the users' needs.
 2. Ensure proper reliability.
 3. Promote appropriate standardization, integration, consistency, and portability.
 4. Complete projects on schedule and within budget.

Goals for Requirements Analysis

■ **Ascertain the user's needs**

- Determine what tasks and subtasks must be carried out
- Include tasks which are only performed occasionally. Common tasks are easy to identify.
- Functionality must match need or else users will reject or underutilize the product
- Providing excessive functionality is also a danger because the complexity make implementation, learning and usage more difficult.

► Goals for Requirements Analysis

■ Ensure reliability

- ☐ Actions must function as specified
- ☐ Database data displayed must reflect the actual database
- ☐ The system should be available as often as possible
- ☐ The system must not introduce errors
- ☐ Ensure the user's privacy and data security by protecting against unwarranted access and destruction of data

► Goals for Requirements Analysis

- Promote standardization, integration, consistency, and portability
 - *Standardization*: use pre-existing industry standards where they exist to aid learning and avoid errors
 - e.g. Apple, and Windows interface standards
 - *Integration*: the product should work with different software tools and packages
 - *Consistency*:
 - use common action sequences, terms, units, colors, etc. within the program
 - compatibility across different product versions
 - *Portability*: allow for the user to convert data and to share user interfaces across multiple software and hardware environments

► Goals for Requirements Analysis

- Complete projects on time and within budget
 - Late or over budget products can create serious pressure within a company and potentially mean dissatisfied customers and loss of business to competitors

► Goals for Requirements Analysis

- Complete projects on time and within budget
 - It has been reported that on average the percentage of software projects completed on-time and within budget improved from 16.2% in 1995 (Standish-Group, 1995) to 34% in 2003 (Standish-Group, 2003).
 - Despite this improvement, nearly two-thirds of projects were still not successful in 2003.

► Goals for Requirements Analysis

- Complete projects on time and within budget
 - A study conducted by a group of Fellows of the Royal Academy of Engineering and British Computer Society, shows that despite spending 22.6 billions pounds on IT projects in UK during 2003/2004, significant numbers of projects still fail to deliver key benefits on time and to target cost and specification

► Usability Factors

■ There are six factors

1. **Fit for Use** (support tasks what user wants)
2. **Ease of learning** (learn for various groups of users)
3. **Task Efficiency** (Quick tasks for frequent users)
4. **Ease of Remembering** (remember tasks for occasional users)
5. **Subjective Satisfaction** (how user will satisfy overall?)
6. **Understandability** (understand what system or each individual module does?)

► Class Task

- Suppose you are developing a software system for the hospital. How will you implement the factors:
 - **Fit for Use** (support tasks what user wants)
 - **Task Efficiency** (Quick tasks for frequent users)
- Lets have some discussions

► Usability Measures

- The following usability measures lead more directly to practical evaluation:
 1. *Time to learn*
How long does it take for typical members of the community to learn actions relevant to a set of tasks?
 2. *Speed of performance*
How long does it take to carry out the benchmark tasks?
 3. *Rate of errors by users*
How many and what kinds of errors are made during benchmark tasks?
 4. *Retention over time*
How well do users maintain their knowledge after an hour, a day, or a week? Frequency of use and ease of learning help make for better user retention
 5. *Subjective satisfaction*
How much did users like using various aspects of the interface?
The answer can be ascertained by interviews, free-form comments and satisfaction scales

► Usability Measures

- Trade-offs (an exchange that occurs as a compromise) in design options frequently occur. Changes to the interface in a new version may create consistency problems with the previous version, but the changes may improve the interface in other ways or introduce new needed functionality.
- Design alternatives can be evaluated by designers and users via mockups or high-fidelity (quality) prototypes.
- In some applications, subjective satisfaction may be the key determinant of success; in others, short learning time may be important.
- The user manuals and the online help can be written before the implementation to provide another review on the design.

Usability Motivations

- The interest in interface usability arises by looking at the poorly designed interfaces and the benefits of elegant interfaces. Interfaces can be seen in different domains:
- Life-critical systems
 - Air traffic control, nuclear reactors, police & fire dispatch systems, military operations, and medical instruments
 - High costs, reliability and effectiveness are expected
 - Lengthy training periods are acceptable despite the financial cost to provide error-free performance
 - Subjective satisfaction is less an issue due to well motivated users

► Usability Motivations

■ Industrial and commercial uses

- ☐ Banking, insurance, order entry, inventory management, reservation, billing, and point-of-sales systems
- ☐ Ease of learning is important to reduce training costs
- ☐ Speed of performance is important because of the number of transactions
- ☐ Subjective satisfaction is fairly important
- ☐ Retention is obtained by frequent use

► Usability Motivations

■ Office, home, and entertainment applications

- Word processing, electronic mail, computer conferencing and video game systems, educational packages, search engines, mobile devices, etc.
- Ease of learning, low error rates, and subjective satisfaction are very important because use is often discretionary and competition is intense
- Infrequent use of some applications means interfaces must be intuitive (natural), and comprehensible online help is important
- Choosing functionality is difficult because the population has a wide range of both novice and expert users
 - A level-structured design is one approach (e.g., search engines)
- Competition cause the need for low cost

► Usability Motivations

- Exploratory, creative, and cooperative systems
 - Exploratory: Web browsing, search engines, simulation and business decision making
 - Creative: Artist toolkits, architectural design, software development, music composition, and scientific modeling systems
 - Collaborative: enable two or more people to work together, even if they are separated by time and space
 - These systems are difficult to design and evaluate because:
 - users may be knowledgeable in task domain but novices in the underlying computer concepts.
 - The computer should "vanish" so that the user can be absorbed in their task domain

► Usability Motivations

■ Socio-technical systems

- Voting, health support, identity verification, crime reporting
- Trust, privacy, and security are issues
- Ease of learning for novices and feedback to build trust
- Administrators need tools to detect unusual patterns of usage and review procedures at different levels

Universal Usability

- The diversity of human abilities, background, motivations, personalities, cultures, and work styles challenges interface designers.
- Understanding the physical, intellectual and personality differences between users is vital for getting participation by broadest set of users
- Sometimes accommodating the needs of one group benefits other groups as well.

► Universal Usability

■ Cultural and international diversity

- Accommodating cultural and international differences will increase the market share of interactive products.
 - Left-to-right versus right-to-left versus vertical input and reading
 - Date and time formats
 - Numeric and currency formats
 - Weights and measures
 - Telephone numbers and addresses
 - Social-security, national identification, and passport numbers
 - Capitalization and punctuation
 - Sorting sequences
 - Icons, buttons, colors
 - Etiquette (rules for correct or polite behaviour between people), policies, tone, formality

► Universal Usability



Cross-cultural Communication

An Example of Different Meanings of the Same Gesture

UK & USA = O.K.

JAPAN = MONEY



RUSSIA = ZERO

BRAZIL = INSULT

► Universal Usability

■ Users with disabilities

- Designers must plan early to accommodate users with disabilities
 - Vision-impaired
 - hearing-impaired
 - mobility-impaired

■ Elderly Users

- Including the elderly is fairly easy; designers should allow for variability within their applications via settings for sound, color, brightness, font sizes, etc.
- If elder people can use the technology easily, we have more opportunities of knowing about their experiences

► Universal Usability

■ Children

- ☐ Designers need attention to their limitations.
- ☐ They may not always do mouse-dragging, double-clicking or pointing on small targets.
- ☐ Usual instructions and error messages might not be effective
- ☐ Parental control over dangerous content

■ Accommodating hardware/software diversity

- ☐ Internet interaction on high-speed (broadband) and slower (dial-up) connections
- ☐ Access to web services from large displays and small mobile devices
- ☐ Easy or automatic conversion to multiple languages

Summary

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- Usability Requirements
- Usability Factors
- Usability Goals and Measures
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► Class activity

- Promote standardization, integration, consistency, and portability
 - *Standardization*: use pre-existing industry standards where they exist to aid learning and avoid errors
 - e.g. Apple, and Windows interface standards
 - *Generate your own standard*

- Suppose you are developing a software system for the hospital. Design standards for the following (discussion):
 - *Use of colour*
 - *Getting user attention*
 - *Readability of page*