

Unit 4.2

User Interface Design



Background

- Interface design focuses on the following
 - The design of interfaces between software components
 - The design of interfaces between the software and other nonhuman producers and consumers of information
 - The design of the interface between a human and the computer
- Graphical user interfaces (GUIs) have helped to eliminate many of the most horrific interface problems
- User interface analysis and design has to do with the study of people and how they relate to technology

A Spiral Process

- User interface development follows a spiral process
 - **Interface analysis (user, task, and environment analysis)**
 - Focuses on the profile of the users who will interact with the system
 - Concentrates on users, tasks, content and work environment
 - Studies different models of system function (as perceived from the outside)
 - Delineates the human- and computer-oriented tasks that are required to achieve system function
 - **Interface design**
 - Defines a set of interface objects and actions (and their screen representations) that enable a user to perform all defined tasks in a manner that meets every usability goal defined for the system

A Spiral Process

- **Interface construction**

- Begins with a prototype that enables usage scenarios to be evaluated
- Continues with development tools to complete the construction

- **Interface validation, focuses on**

- The ability of the interface to implement every user task correctly, to accommodate all task variations, and to achieve all general user requirements
- The degree to which the interface is easy to use and easy to learn
- The users' acceptance of the interface as a useful tool in their work

User Interface Analysis and Design Models

- **User profile model** – Established by a software engineer
 - Establishes the profile of the end-users of the system
 - Based on age, gender, physical abilities, education, cultural or ethnic background, motivation, goals, and personality
 - Considers syntactic knowledge of the user
 - The mechanics of interaction that are required to use the interface effectively
 - Considers semantic knowledge of the user (Logic)
 - The underlying sense of the application; an understanding of the functions that are performed, the meaning of input and output, and the objectives of the system
 - Categorizes users as
 - Novices
 - No syntactic knowledge of the system, little semantic knowledge of the application, only general computer usage
 - Knowledgeable, intermittent users
 - Reasonable semantic knowledge of the system, low recall of syntactic information to use the interface
 - Knowledgeable, frequent users
 - Good semantic and syntactic knowledge (i.e., power user), look for shortcuts and abbreviated modes of operation

User Interface Analysis and Design Models

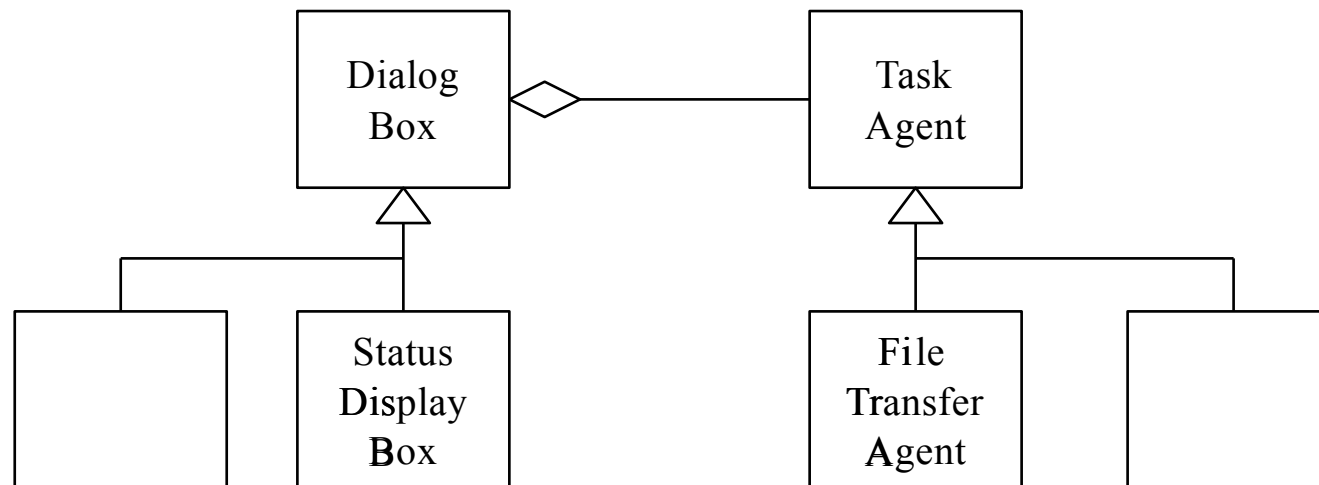
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Design model – Created by a software engineer

User Interface Analysis and Design Models

Design model – Created by a software engineer

Derived from the analysis model of the requirements

- Incorporates data, architectural, interface, and procedural representations of the software
- Constrained by information in the requirements specification that helps define the user of the system
- Normally is incidental to other parts of the design model
 - But in many cases it is as important as the other parts



User Interface Analysis and Design Models

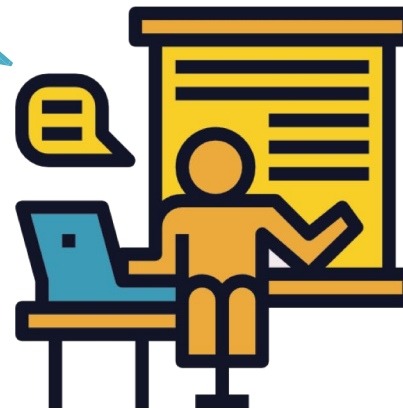
□ **Implementation model** – Created by the software implementers

- Consists of the look and feel of the interface combined with all supporting information (books, videos, help files) that describe system syntax and semantics
- Strives to agree with the user's mental model; users then feel comfortable with the software and use it effectively
- Serves as a translation of the design model by providing a realization of the information contained in the user profile model and the user's mental model

User Interface Analysis and Design Models

- **User's mental model** – Developed by the user when interacting with the application
 - Often called the user's system perception.
 - Consists of the image of the system; that users carry in their heads.

The **role of the interface designer** is to merge these differences and derive a consistent representation of the interface.





User Interface Analysis

Elements of the User Interface

- To perform user interface analysis, the practitioner needs to study and understand four elements
 - The users who will interact with the system through the interface
 - The tasks that end users must perform to do their work
 - The content that is presented as part of the interface
 - The work environment in which these tasks will be conducted

User Analysis

- The analyst strives to get the end user's mental model and the design model to converge by understanding
 - The users themselves
 - How these people use the system
- Information can be obtained from
 - User interviews with the end users
 - Sales input from the sales people who interact with customers and users on a regular basis
 - Marketing input based on a market analysis to understand how different population segments might use the software
 - Support input from the support staff who are aware of what works and what doesn't, what users like and dislike, what features generate questions, and what features are easy to use
- A set of questions should be answered during user analysis (see next slide)

User Analysis Questions

- 1) Are the users trained professionals, technicians, clerical or manufacturing workers?
- 2) What level of formal education does the average user have?
- 3) Are the users capable of learning on their own from written materials or have they expressed a desire for classroom training?
- 4) Are the users expert typists or are they keyboard phobic?
- 5) What is the age range of the user community?
- 6) Will the users be represented predominately by one gender?
- 7) How are users compensated for the work they perform or are they volunteers?
- 8) Do users work normal office hours, or do they work whenever the job is required?
- 9) Is the software to be an integral part of the work users do, or will it be used only occasionally?
- 10) What is the primary spoken language among users?
- 11) What are the consequences if a user makes a mistake using the system?
- 12) Are users experts in the subject matter that is addressed by the system?
- 13) Do users want to know about the technology that sits behind the interface?

Task Analysis and Modeling

- Task analysis strives to know and understand
 - The work the user performs in specific circumstances
 - The tasks and subtasks that will be performed as the user does the work
 - The specific problem domain objects that the user manipulates as work is performed
 - The sequence of work tasks (i.e., the workflow)
 - The hierarchy of tasks
- Use cases
 - Show how an end user performs some specific work-related task
 - Enable the software engineer to extract tasks, objects, and overall workflow of the interaction
 - Helps the software engineer to identify additional helpful features

Content Analysis

- The display content may range from character-based reports, to graphical displays, to multimedia information
- Display content may be
 - Generated by components in other parts of the application
 - Acquired from data stored in a database that is accessible from the application
 - Transmitted from systems external to the application in question
- The format and aesthetics of the content (as it is displayed by the interface) needs to be considered
- A set of questions should be answered during content analysis (see next slide)

Content Analysis Guidelines

- 1) Are various types of data assigned to consistent locations on the screen (e.g., photos always in upper right corner)?
- 2) Are users able to customize the screen location for content?
- 3) Is proper on-screen identification assigned to all content?
- 4) Can large reports be partitioned for ease of understanding?
- 5) Are mechanisms available for moving directly to summary information for large collections of data?
- 6) Is graphical output scaled to fit within the bounds of the display device that is used?
- 7) How is color used to enhance understanding?
- 8) How are error messages and warnings presented in order to make them quick and easy to see and understand?

Work Environment Analysis

- Software products need to be designed to fit into the work environment, otherwise they may be difficult or frustrating to use
- Factors to consider include
 - Type of lighting
 - Display size and height
 - Keyboard size, height and ease of use
 - Mouse type and ease of use
 - Surrounding noise
 - Space limitations for computer and/or user
 - Weather or other atmospheric conditions
 - Temperature or pressure restrictions
 - Time restrictions (when, how fast, and for how long)