

User Interface Design



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- Interface design focuses on three areas of concern:
 - ▶ The design of interfaces between software components;
 - ▶ The design of interfaces between the software and other nonhuman producers and consumers of information (i.e., other external entities); and
 - ▶ The design of the interface between a human (i.e., the user) and the computer.

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 - ▶ The design of the interface between a human (i.e., the user) and the computer.
- **UI Design Principles:** Theo Mandel coined three “golden rules” for user interface design:
 - ▶ Place the user in control.
 - ▶ Reduce the user’s memory load.
 - ▶ Make the interface consistent.

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 - ▶ Define interaction modes in a way that does not force a user into unnecessary or undesired actions.
 - ▶ Provide for flexible interaction.
 - ▶ Allow user interaction to be interruptible and undoable.
 - ▶ Streamline interaction as skill levels advance and allow the interaction to be customized.
 - ▶ Hide technical internals from the casual user.
 - ▶ Design for direct interaction with objects that appear on the screen.

- Reduce the user's memory load:

- ▶ The more a user has to remember, the more error-prone will be the interaction with the system.
- ▶ It is for this reason that a well-designed user interface does not tax the user's memory.
- ▶ Whenever possible, the system should “remember” pertinent information and assist the user with an interaction scenario that assists recall.

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- ▶ Whenever possible, the system should “remember” pertinent information and assist the user with an interaction scenario that assists recall.
- ▶ Mandel defines design principles that enable an interface to reduce the user's memory load:
 - Reduce demand on short-term memory.
 - Establish meaningful defaults.
 - Define shortcuts that are intuitive.
 - The visual layout of the interface should be based on a real world metaphor.
 - Disclose information in a progressive fashion.

- **Make the interface consistent:**

- ▶ The interface should present and acquire information in a consistent fashion. This implies that
 - All visual information is organized according to a design standard that is maintained throughout all screen displays;
 - Input mechanisms are constrained to a limited set that are used consistently throughout the application; and
 - Mechanisms for navigating from task to task are consistently defined and implemented.

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- ▶ Mandel defines a set of design principles that help make the interface consistent:

- Allow the user to put the current task into a meaningful context.
- Maintain consistency across a family of applications.
- If past interactive models have created user expectations, do not make changes unless there is a compelling reason to do so.

- The design process for user interfaces is iterative and can be represented using a spiral model.
- The user interface design process encompasses four distinct framework activities:
 - ▶ User, task, and environment analysis and modeling
 - ▶ Interface design
 - ▶ Interface construction
 - ▶ Interface validation
- The spiral implies that each of these tasks will occur more than once, with each pass around the spiral representing additional elaboration of requirements and the resultant design.
- In most cases, the implementation activity involves prototyping—the only practical way to validate what has been designed.

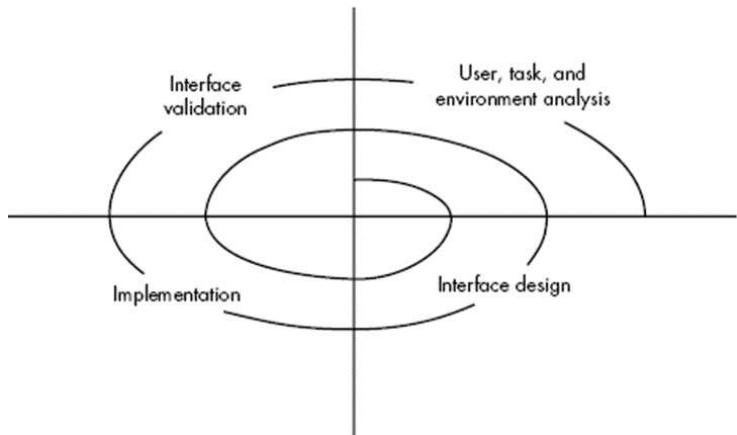


Figure 1: UI Design Process

- The initial analysis activity focuses on the profile of the users who will interact with the system.
- Skill level, business understanding, and general receptiveness to the new system are recorded; and different user categories are defined.
- For each user category, requirements are elicited.
- In essence, the software engineer attempts to understand the system perception for each class of users.
- Once general requirements have been defined, a more detailed task analysis is conducted.
- Those tasks that the user performs to accomplish the goals of the system are identified, described, and elaborated (over a number of iterative passes through the spiral).
- Among the questions to be asked are:
 - ▶ Where will the interface be located physically?
 - ▶ Will the user be sitting, standing, or performing other tasks unrelated to the interface?
 - ▶ Does the interface hardware accommodate space, light, or noise constraints?
 - ▶ Are there special human factors considerations driven by environmental factors?

- The information gathered as part of the analysis activity is used to create an analysis model for the interface.
- Using this model as a basis, the design activity commences.
- The goal of interface design is to define 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.

- The implementation activity normally begins with the creation of a prototype that enables usage scenarios to be evaluated.
- As the iterative design process continues, a user interface tool kit may be used to complete the construction of the 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; and
- ▶ The users' acceptance of the interface as a useful tool in their work.

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- **Milestones**
 - ▶ These are a set of occasions in project design where the proper progress of the project can be assessed in such a way that corrective measures could be taken if necessary.
 - ▶ The two major milestones are:
 - **Preliminary Design Review (PDR):** Its normally held near the end of architectural design and prior to detailed design
 - **Critical design Review (CDR):** Its normally held at the end of detailed design and prior to implementation.
 - ▶ The major goal of PDR is to demonstrate the externally observable characteristics and architectural structure of the product which would satisfy the customer's requirements. Functional characteristics, performance attributes, external interface, user dialogs, report formats, exception conditions and exception handling and future enhancements are reviewed during PDR.
 - ▶ The CDR provides a final management decision point, to build or cancel the system.

• Walkthroughs

- ▶ A structured walkthrough is an in-depth, technical review of some aspects of a software system. Walkthroughs can be anytime, during any phase of a software project.
- ▶ A walkthrough team consists of 4 to 6 people.
- ▶ The person whose material is being reviewed is responsible for providing copies of the review materials to the members of the walkthrough group in advance of the walkthrough session and the team members are responsible for understanding the reviewing material before the session.
- ▶ During the walkthrough the reviewed “walks through” the material while the reviewers look for errors, request clarification and explore problem areas in the material under review.
- ▶ High-level managers should not attend walkthrough sessions as the aim of walkthroughs is error detection not corrective action.
- ▶ Its important to note that the material is reviewed not the person whose material is being reviewed.

• Inspections

- ▶ Design inspections are conducted by teams of trained inspectors who have a check list of items to be examined.
- ▶ Special forms are used to record problems encountered.
- ▶ A typical inspection team consists of a Moderator or Secretary, a Designer, an Implementer and a Tester.
- ▶ The Designer, Implementer and Tester may or may not be the people responsible for the actual design, implementation and testing of the product being inspected.
- ▶ The team members are trained for their specific roles and typically conduct a dual 2 hour sessions per day.