

# User Interface Design

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# Interface Design

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**Easy to learn?**

**Easy to use?**

**Easy to understand?**



# Interface Design

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## *Typical Design Errors*

**lack of consistency**  
**too much memorization**  
**no guidance / help**  
**no context sensitivity**  
**poor response**  
**Arcane/unfriendly**



# Golden Rules

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- Place the user in control
- Reduce the user's memory load
- Make the interface consistent

# Place the User in Control

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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

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- 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

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- 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.

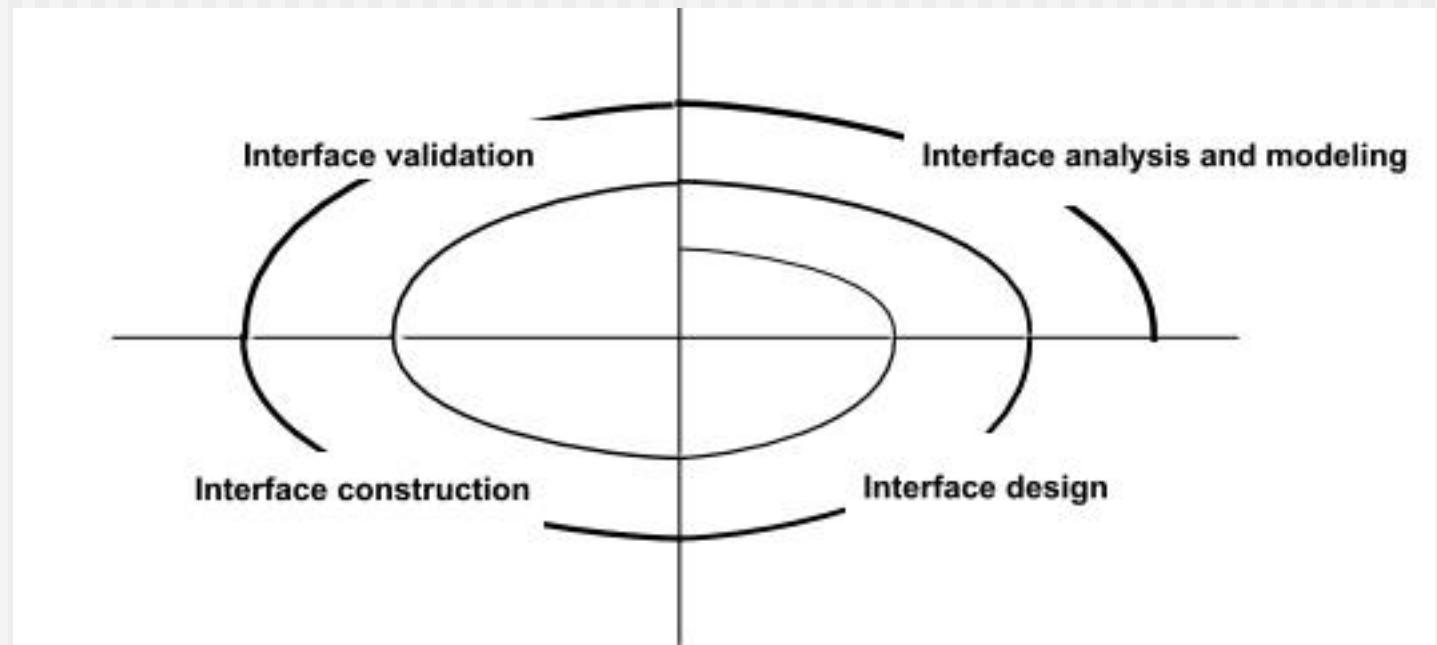
# User Interface Design Models

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- **User model** — a profile of all end users of the system
- **Design model** — a design realization of the user model
- **Mental model (system perception)** — the user's mental image of what the interface is
- **Implementation model** — the interface “look and feel” coupled with supporting information that describe interface syntax and semantics

# User Interface Design Process

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# Interface Analysis

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- Interface analysis means understanding
  - (1) the people (end-users) who will interact with the system through the interface;
  - (2) the tasks that end-users must perform to do their work,
  - (3) the content that is presented as part of the interface
  - (4) the environment in which these tasks will be conducted.

# User Analysis

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- Are users trained professionals, technician, clerical, or manufacturing workers?
- What level of formal education does the average user have?
- Are the users capable of learning from written materials or have they expressed a desire for classroom training?
- Are users expert typists or keyboard phobic?
- What is the age range of the user community?
- Will the users be represented predominately by one gender?
- How are users compensated for the work they perform?
- Do users work normal office hours or do they work until the job is done?
- Is the software to be an integral part of the work users do or will it be used only occasionally?
- What is the primary spoken language among users?
- What are the consequences if a user makes a mistake using the system?
- Are users experts in the subject matter that is addressed by the system?
- Do users want to know about the technology the sits behind the interface?

# Task Analysis and Modeling

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- Answers the following questions ...
  - What work will the user perform in specific circumstances?
  - What tasks and subtasks will be performed as the user does the work?
  - What specific problem domain objects will the user manipulate as work is performed?
  - What is the sequence of work tasks—the workflow?
  - What is the hierarchy of tasks?
- Use-cases define basic interaction
- Task elaboration refines interactive tasks
- Object elaboration identifies interface objects (classes)
- Workflow analysis defines how a work process is completed when several people (and roles) are involved

# Swimlane Diagram

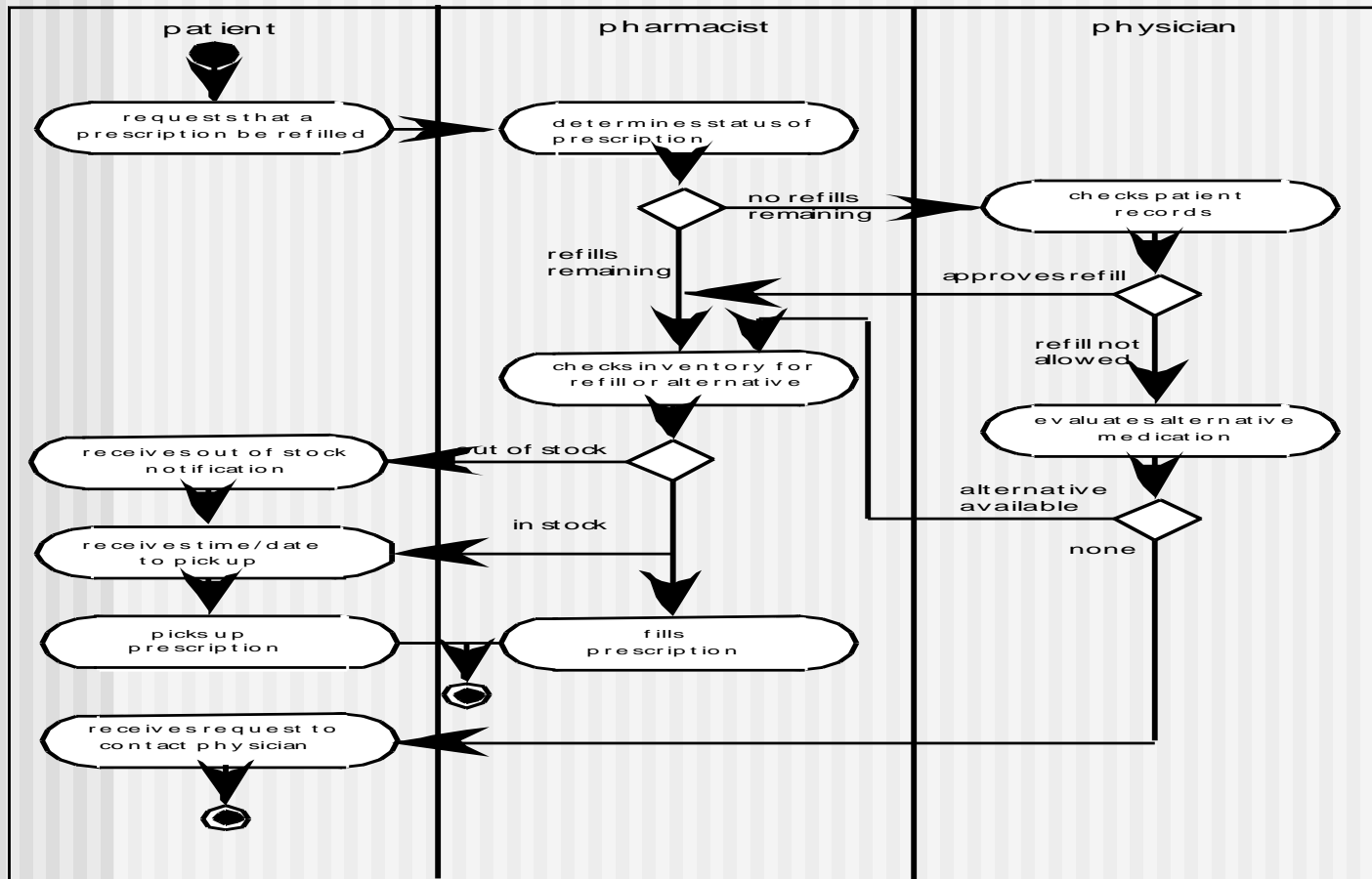


Figure 12.2 Swimlane

function

# Analysis of Display Content

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- Are different types of data assigned to consistent geographic locations on the screen (e.g., photos always appear in the upper right hand corner)?
- Can the user customize the screen location for content?
- Is proper on-screen identification assigned to all content?
- If a large report is to be presented, how should it be partitioned for ease of understanding?
- Will mechanisms be available for moving directly to summary information for large collections of data.
- Will graphical output be scaled to fit within the bounds of the display device that is used?
- How will color to be used to enhance understanding?
- How will error messages and warning be presented to the user?

# Interface Design Steps

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- Using information developed during interface analysis, **define interface objects and actions (operations)**.
- **Define events (user actions)** that will cause the state of the user interface to change. Model this behavior.
- **Depict each interface state** as it will actually look to the end-user.
- **Indicate how the user interprets the state of the system** from information provided through the interface.

# Design Issues

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- Response time
- Help facilities
- Error handling
- Menu and command labeling
- Application accessibility
- Internationalization

# WebApp Interface Design

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- *Where am I?* The interface should
  - provide an indication of the WebApp that has been accessed
  - inform the user of her location in the content hierarchy.
- *What can I do now?* The interface should always help the user understand his current options
  - what functions are available?
  - what links are live?
  - what content is relevant?
- *Where have I been, where am I going?* The interface must facilitate navigation.
  - Provide a “map” (implemented in a way that is easy to understand) of where the user has been and what paths may be taken to move elsewhere within the WebApp.

# Effective WebApp Interfaces

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- Bruce Tognozzi [TOG01] suggests...
  - **Effective interfaces are visually apparent and forgiving**, instilling in their users a sense of control. Users quickly see the breadth of their options, grasp how to achieve their goals, and do their work.
  - **Effective interfaces do not concern the user with the inner workings of the system.** Work is carefully and continuously saved, with full option for the user to undo any activity at any time.
  - **Effective applications and services perform a maximum of work**, while requiring a minimum of information from users.

# Interface Design Principles-I

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- **Anticipation**—A WebApp should be designed so that it anticipates the use's next move.
- **Communication**—The interface should communicate the status of any activity initiated by the user
- **Consistency**—The use of navigation controls, menus, icons, and aesthetics (e.g., color, shape, layout)
- **Controlled autonomy**—The interface should facilitate user movement throughout the WebApp, but it should do so in a manner that enforces navigation conventions that have been established for the application.
- **Efficiency**—The design of the WebApp and its interface should optimize the user's work efficiency, not the efficiency of the Web engineer who designs and builds it or the client-server environment that executes it.

# Interface Design Principles-II

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- **Focus**—The WebApp interface (and the content it presents) should stay focused on the user task(s) at hand.
- **Fitt's Law**—“The time to acquire a target is a function of the distance to and size of the target.”
- **Human interface objects**—A vast library of reusable human interface objects has been developed for WebApps.
- **Latency reduction**—The WebApp should use multi-tasking in a way that lets the user proceed with work as if the operation has been completed.
- **Learnability**— A WebApp interface should be designed to minimize learning time, and once learned, to minimize relearning required when the WebApp is revisited.

# Interface Design Principles-III

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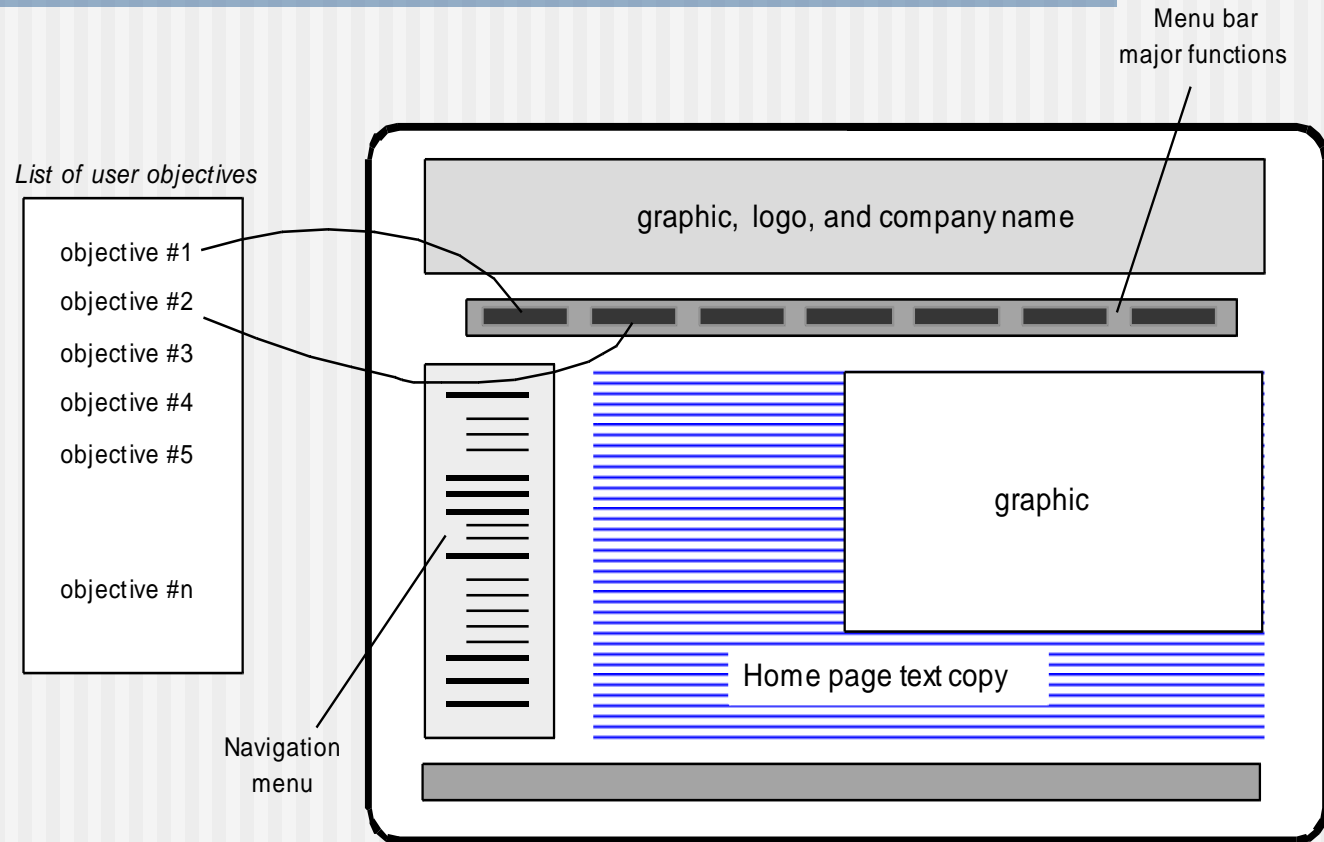
- **Maintain work product integrity**—A work product (e.g., a form completed by the user, a user specified list) must be automatically saved so that it will not be lost if an error occurs.
- **Readability**—All information presented through the interface should be readable by young and old.
- **Track state**—When appropriate, the state of the user interaction should be tracked and stored so that a user can logoff and return later to pick up where she left off.
- **Visible navigation**—A well-designed WebApp interface provides “the illusion that users are in the same place, with the work brought to them.”

# Interface Design Workflow-I

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- Review information contained in the analysis model and refine as required.
- Develop a rough sketch of the WebApp interface layout.
- Map user objectives into specific interface actions.
- Define a set of user tasks that are associated with each action.
- Storyboard screen images for each interface action.
- Refine interface layout and storyboards using input from aesthetic design.

# Mapping User Objectives



# Interface Design Workflow-II

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- Identify user interface objects that are required to implement the interface.
- Develop a procedural representation of the user's interaction with the interface.
- Develop a behavioral representation of the interface.
- Describe the interface layout for each state.
- Refine and review the interface design model.

# Aesthetic Design

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- Don't be afraid of white space.
- Emphasize content.
- Organize layout elements from top-left to bottom right.
- Group navigation, content, and function geographically within the page.
- Don't extend your real estate with the scrolling bar.
- Consider resolution and browser window size when designing layout.

# Design Evaluation Cycle

