
Construction of User Interfaces (SE/ComS 319)

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Iowa State University, Spring 2022

DESIGNING THE USER INTERFACES

Outline

- User interfaces
- UI Design process

User interface

- User interface: Way by which end-users will interact with your software
- Should take into consideration users' expectations, experience and skills
- Bad interface ☐ low usability



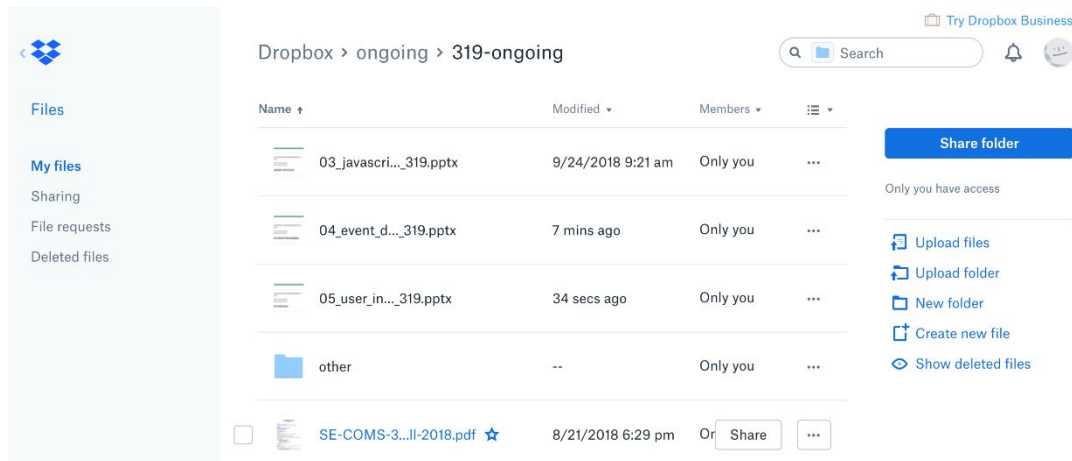
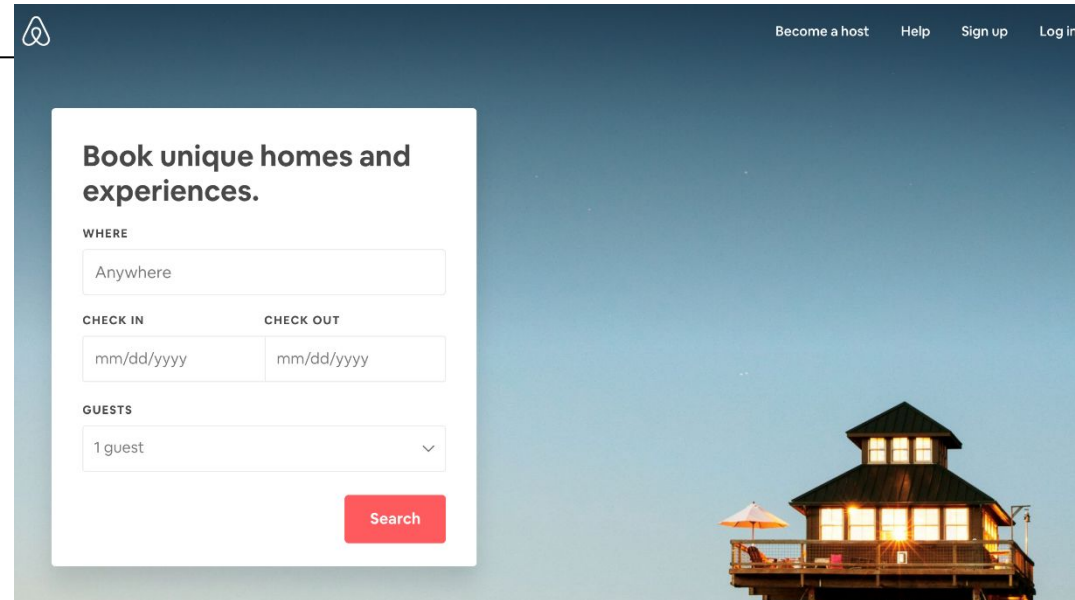
User interface

- Human errors have been correlated to the usability of user interface (J. Galliers and et al, ACM TCHI).
 - Confirmation dialog box:



User interface

- Examples of excellent UI:
 - AirBnB, DropBox, ...



User interface

- Examples of poor UI
 - IBM Lotus Notes
 - Windows 8,...



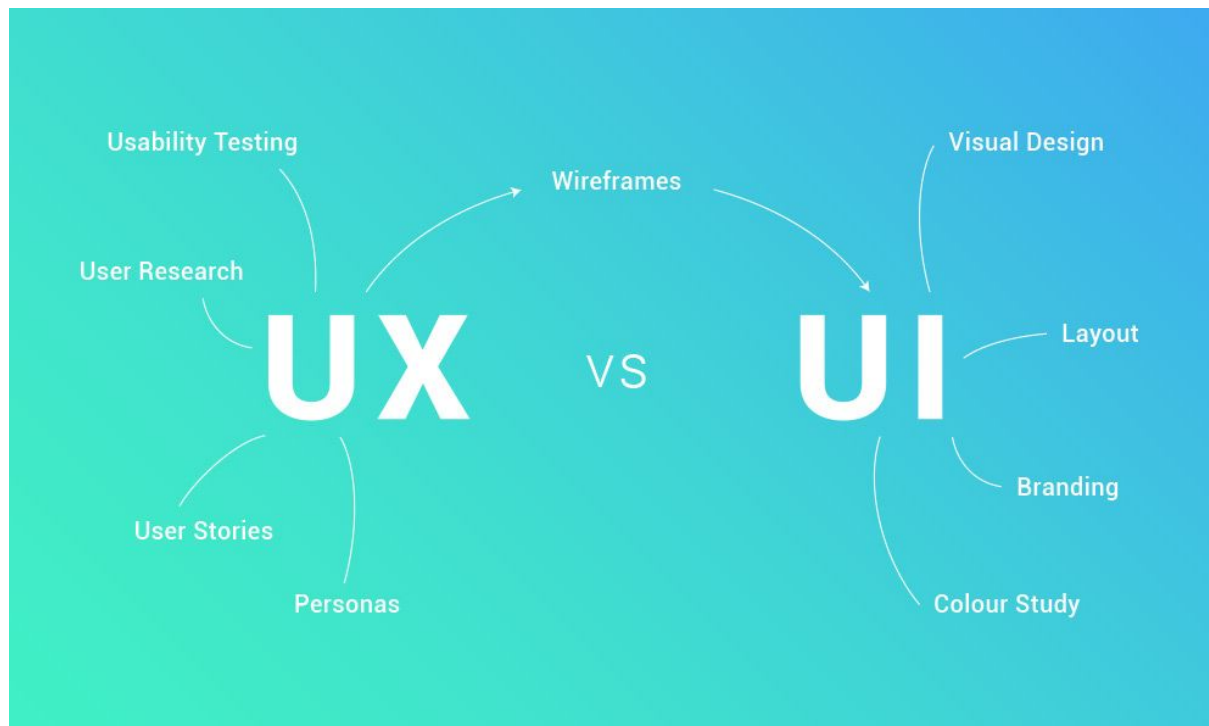
User Interface (UI) vs. User Experience (UX)

- **UI** design is all about how the product's interfaces look and function
 - The look and feel, the presentation and interactivity of a product
 - Process of **making interfaces in software** or computerized devices with a **focus on looks or style**
- **UX** design is all about the overall feel of the experience
 - Focused on the optimization of a product for **effective and enjoyable use**
 - Used to create products that provide meaningful and relevant experiences to users
 - UX design is **NOT** about visuals; it focuses on the overall feel of the experience
- Both are essential for the product's success!

UI vs. UX

- Focus of UI lies in the **visual part** of what you see on screen
- Focus of UX is on designing the **navigation experience** of the user and the product **logical flow** from one step to the next

Wireframe is a layout of a web page/app that demonstrates what interface elements will exist on key pages.



Personas are fictional but represent a selection of real users and their behaviors.

UI vs. UX (2)

Responsibilities of UX and UI designers



What UX designer does

- Creates an app concept from scratch
- Studies and analyzes the behavior of potential users.
- Elaborates scenarios and tasks flows
- Does research
- Outlines wireframes
- Makes prototypes
- Follows human-centered design



What UI designer does

- Works out a visible part of the application
- Works according to the requirements provided by a client
- Matches colors and typography
- Creates layouts
- Composes graphics
- Builds mockups
- Takes care of visual design

UI designers work very closely with UX designers!

USER INTERFACE (UI) DESIGN

Designing User Interface (UI)

UI designers:

- **Create** and design interfaces using different tools such as Sketch, Figma, Pencil, Photoshop, etc.
- Conduct user **interface testing** to ensure the product meets its specifications
- Should consider these questions:
 - Do the **colors** work well together?
 - How is **typography** used to convey meaning and hierarchy?
 - Is the app **well-designed**?
 - How can I improve the UI design of the app?
 - Would flat UI design (flat design) work here?

Visible language

- **Visible language: graphical techniques** used to communicate the message or context:
 - **Layout:** formats, proportions, grids and 2-D/3-D organization
 - **Typography:** selection of typefaces (fonts) and typesetting, including variable width and fixed width
 - Monospaced fonts are same width, opposed to variable-width fonts, where the 'w' and 'm' are wider than most letters, and the 'i' is narrower!
 - **Color and Texture:** color, texture and light that convey complex information and pictorial reality
 - **Imagery:** signs, icons and symbols, from the photographically real to the abstract

Visible language (2)

- **Visible language: graphical techniques** used to communicate the message or context:
 - **Sequencing**: the overall approach to visual storytelling
 - **Sound**: abstract, vocal, concrete, or musical cues
 - **Visual identity**: the additional, unique rules that lend overall consistency to a user interface
 - The overall decisions as to how the corporation or the product line expresses itself in visible language
 - E.g. ISU web **Red** & **gold**

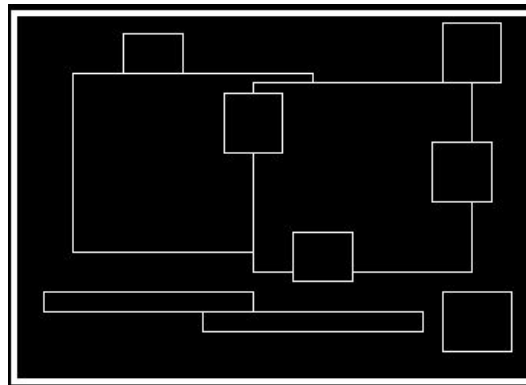
Use of a visible language – Fundamental principles

1. **Organize:** provide the user with a clear and consistent conceptual structure
 - Consistency, screen layout, relationships and navigability
2. **Economize:** do the most with the least amount of cues
 - Simplicity, clarity, distinctiveness, and emphasis
 - **Emphasis:** The most important elements should be easily perceived.
 - Non-critical elements should be de-emphasized.
3. **Communicate:** match the presentation to the capabilities of the user
 - In order to communicate successfully keep in balance legibility, readability, typography, symbolism, multiple views, and color/texture

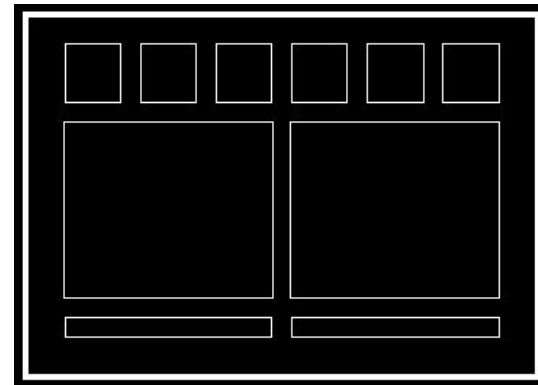
Use of a visible language – Fundamental principles (2)

1. **Organize:** provide the user with a clear and consistent conceptual structure (consistency, screen layout, relationships and navigability)

- **Layout**

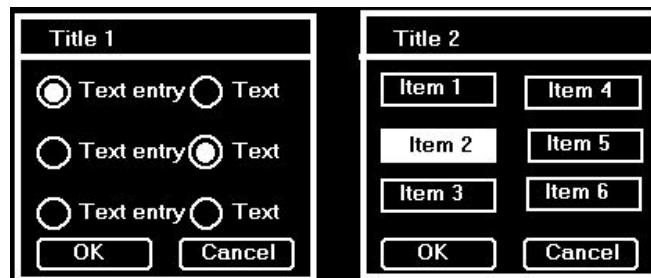


Chaotic Screen



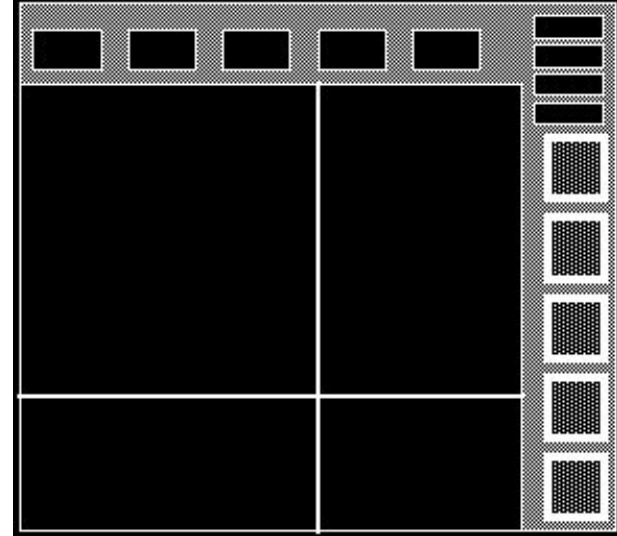
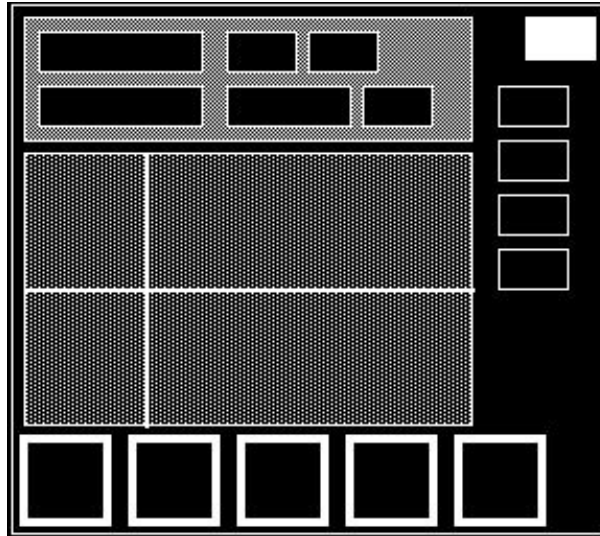
Ordered Screen

- **Consistency:** Same kinds of elements are shown in the same places



Use of a visible language – Fundamental principles (3)

1. **Organize:** provide the user with a clear and consistent conceptual structure (consistency, screen layout, relationships and navigability)
 - **Relationships:** Linking related items and disassociating unrelated items can help achieve visual organization



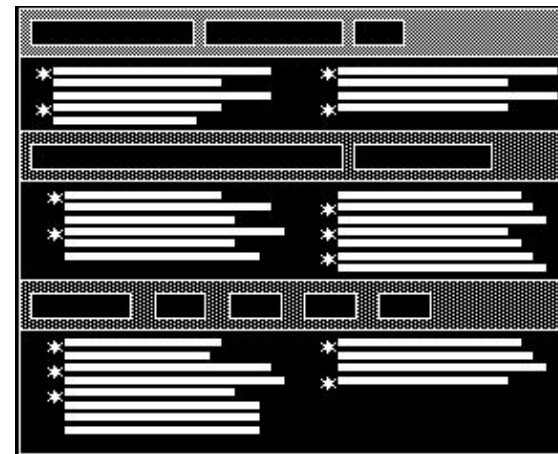
Use of a visible language – Fundamental principles (4)

1. **Organize:** provide the user with a clear and consistent conceptual structure (consistency, screen layout, relationships and navigability)

- **Navigability**



Poor design



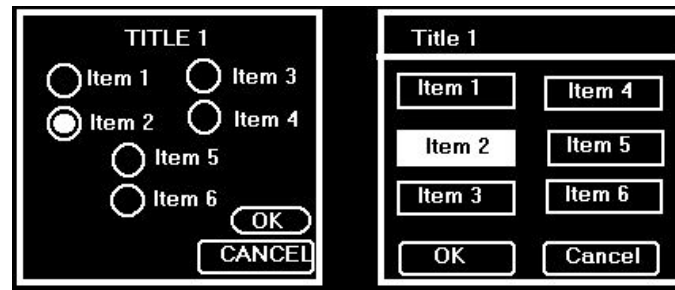
Improved design

- Spatial layout and color help focus viewer's attention to most important areas
- Bulleted items guide the viewer through the secondary contents

Use of a visible language – Fundamental principles (5)

2. **Economize**: do the most with the least amount of cues

- Simplicity, clarity, distinctiveness, and emphasis
- **Simplicity**
 - Includes only the elements that are most important for communication
 - It should also be as unobtrusive as possible



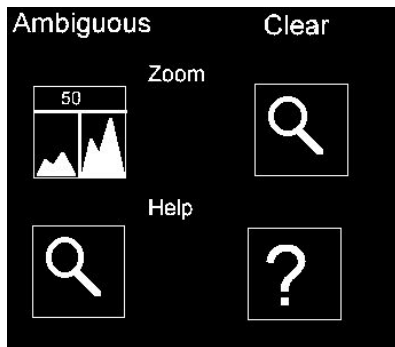
Complicated vs. Simpler Designs

- **Emphasis**: The most important elements should be easily perceived. Non-critical elements should be de-emphasized.

Use of a visible language – Fundamental principles (5)

2. **Economize**: do the most with the least amount of cues

- Simplicity, clarity, distinctiveness, and emphasis
- **Clarity**: All components should be designed so their meaning is not ambiguous



Ambiguous and Clear Icons

- **Distinctiveness**: The important properties of the necessary elements should be distinguishable

Use of a visible language – Fundamental principles (6)

3. **Communicate:** match the presentation to the capabilities of the user

- In order to communicate successfully keep in balance legibility, readability, typography, symbolism, multiple views, and color/texture



Illegible and Legible Texts

- Developing better visual (color or black-and-white) communication is an important part of making UI that communicate effectively and efficiently through graphic design

Use of a visible language – Fundamental principles (6)

3. **Communicate:** match the presentation to the capabilities of the user
- In order to communicate successfully keep in balance legibility, readability, typography, symbolism, multiple views, and color/texture
 - **Readability:** display must be easy to identify and interpret, should also be appealing and attractive

- **Example:**

Unreadable and Readable Texts:

Unreadable: Design components to be
easy to interpret and understand. Design
components to be inviting
and attractive.

Readable

Design components to be easy to
interpret and understand.

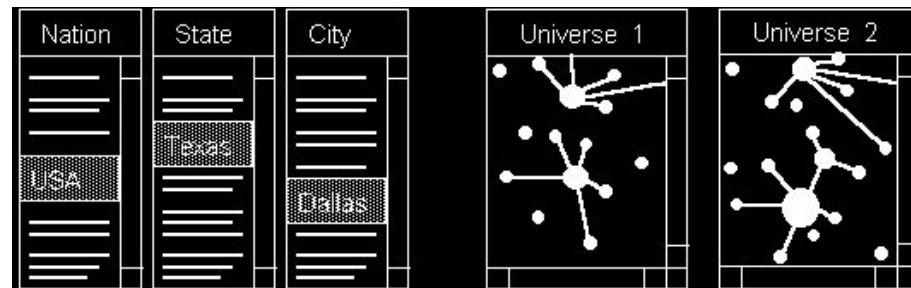
Design components to be inviting
and attractive.

Use of a visible language – Fundamental principles (6)

3. **Communicate:** match the presentation to the capabilities of the user

- In order to communicate successfully keep in balance legibility, readability, typography, symbolism, multiple views, and color/texture
- **Multiple Views:** provide multiple perspectives on the display of complex structures and processes (multiple levels of abstraction)

- Example:



Verbal and Visual Multiple Views

Design principles for user interfaces

- UI Design Issues
- UI Design Process
- UI Evaluation

UI Design Issues

- UI design issues depend on
 1. Human factors
 2. Interaction styles (to/from the user)
 - Visualization
 - Error/warnings
 - Color (visible language)
 - . . .

Human Factors

- Limited short-term memory
 - How many items of information can one remember instantaneously?
- Familiarity
 - Use terms and concepts from the domain of the application
- Consistency
 - Similar/comparable operations should be activated in the same way
- Error recovery & guidance
 - Provide meaningful, unambiguous feedback when errors occur

Interaction styles

1. Obtaining information from the user
2. Presenting information to the user
3. Obtaining information from the user
 - a. Direct Manipulation
 - b. Menu-based
 - c. Form-based
 - d. Natural language
 - e. Command language

Interaction styles – Input

a. Direct manipulation

- Advantage: Intuitive interaction
- Disadvantage: Hard to implement, requires visual metaphor
- Applications: Games, CAD

b. Menu-based

- Advantage: Avoids user error
- Disadvantage: Can be slow and/or complex
- Applications: Most systems

Interaction styles – Input

c. Form-based

- Advantage: Simple and Checkable
- Disadvantage: Can be long
- Applications: e-Commerce

d. Natural Language

- Advantage: easy and natural
- Disadvantage: Natural language processing (AI – NLP)
- Applications: Information retrieval systems, apps

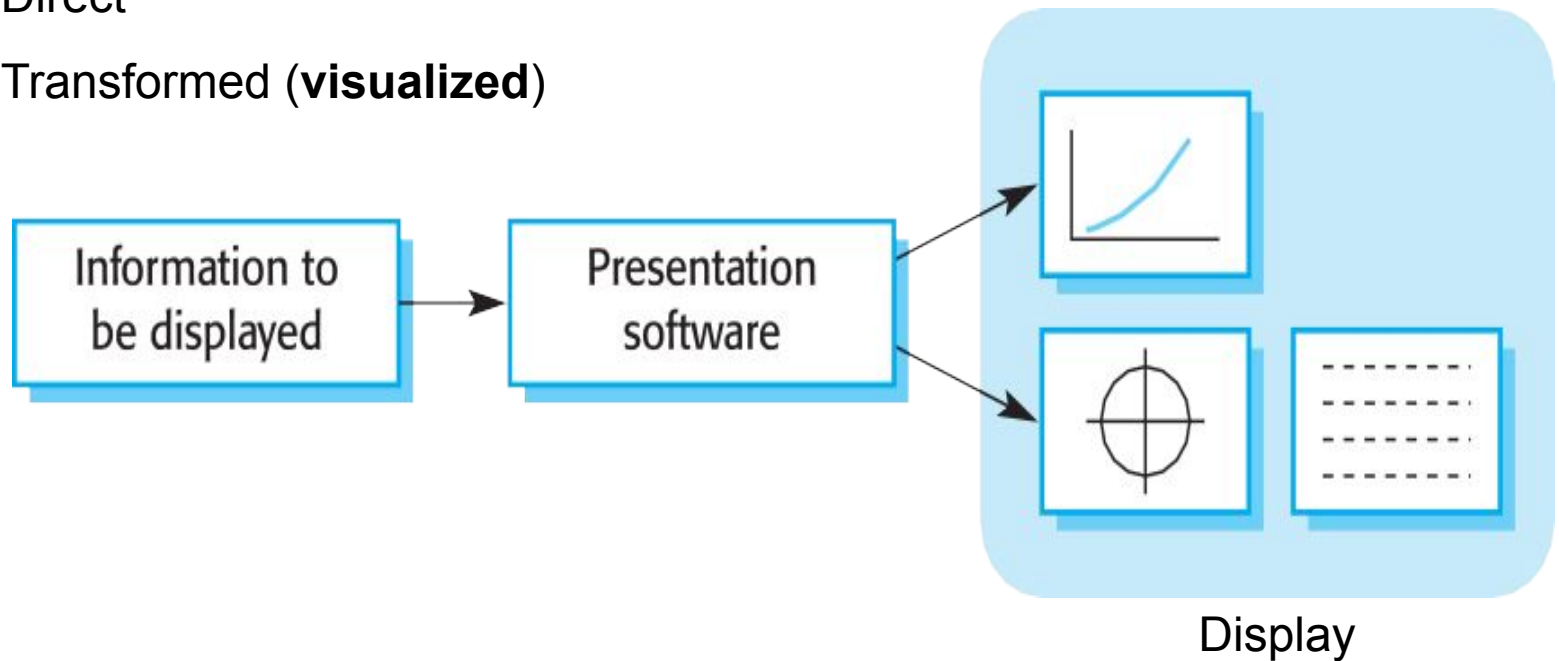
e. Command-Line Language

- Advantage: : Easy to implement
- Disadvantage: Hard to understand/remember all commands

Interaction styles – output

2. Presenting information to the user

- Direct
- Transformed (**visualized**)



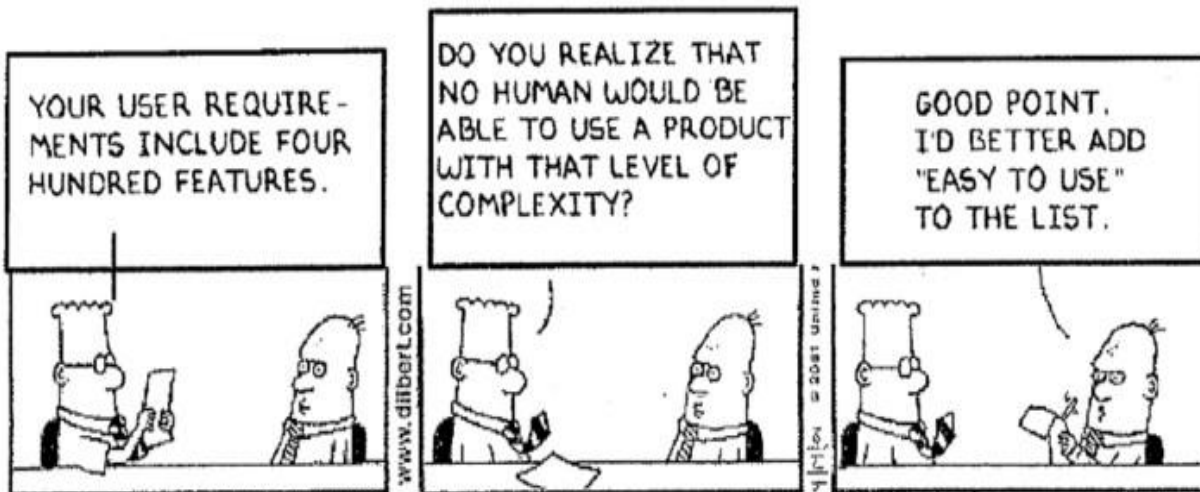
Designing the user interfaces

UI DESIGN PROCESS

Design process of UI

- User Analysis
 - Understand what users will do with the system
- Prototyping
 - Develop (many) prototypes
- Evaluation
 - Experiment with the prototypes

User Analysis – Humor



User Analysis

- Ask questions, show examples, explain what can (more importantly cannot) be done, . . .
 - Requirements solicitation
 - Ethnography (Observe the user at work)
- **Tangible** information (feedback) from user:
 - I want to control my computing device using voice commands
 - I want to control my computing device using voice commands and it must only follow my voice commands
 - I want to mind-control my computing device

Prototyping

- Provide users a direct experience with the interface
- Helps in getting users' judgment
- Simple prototypes
 - Paper + pencil
 - Story-boards, scenarios, use-cases, etc.
 - Digital with dummy buttons
 - e.g., Sketch, Pencil Project <http://pencil.evolus.vn>
 - Pencil is free and open-source GUI prototyping tool
 - Digital with some functionality
 - e.g., scripting, visual language, etc.



Evaluation – Usability

- Conformance to domain-specific vocabulary
- Recognition of options
- Consistency
- Visibility of system status
- Error prevention
- Error information
- Easy recovery methods
- Precise and concise information
- Help and manuals
- Flexibility for experts

Evaluation – Usability

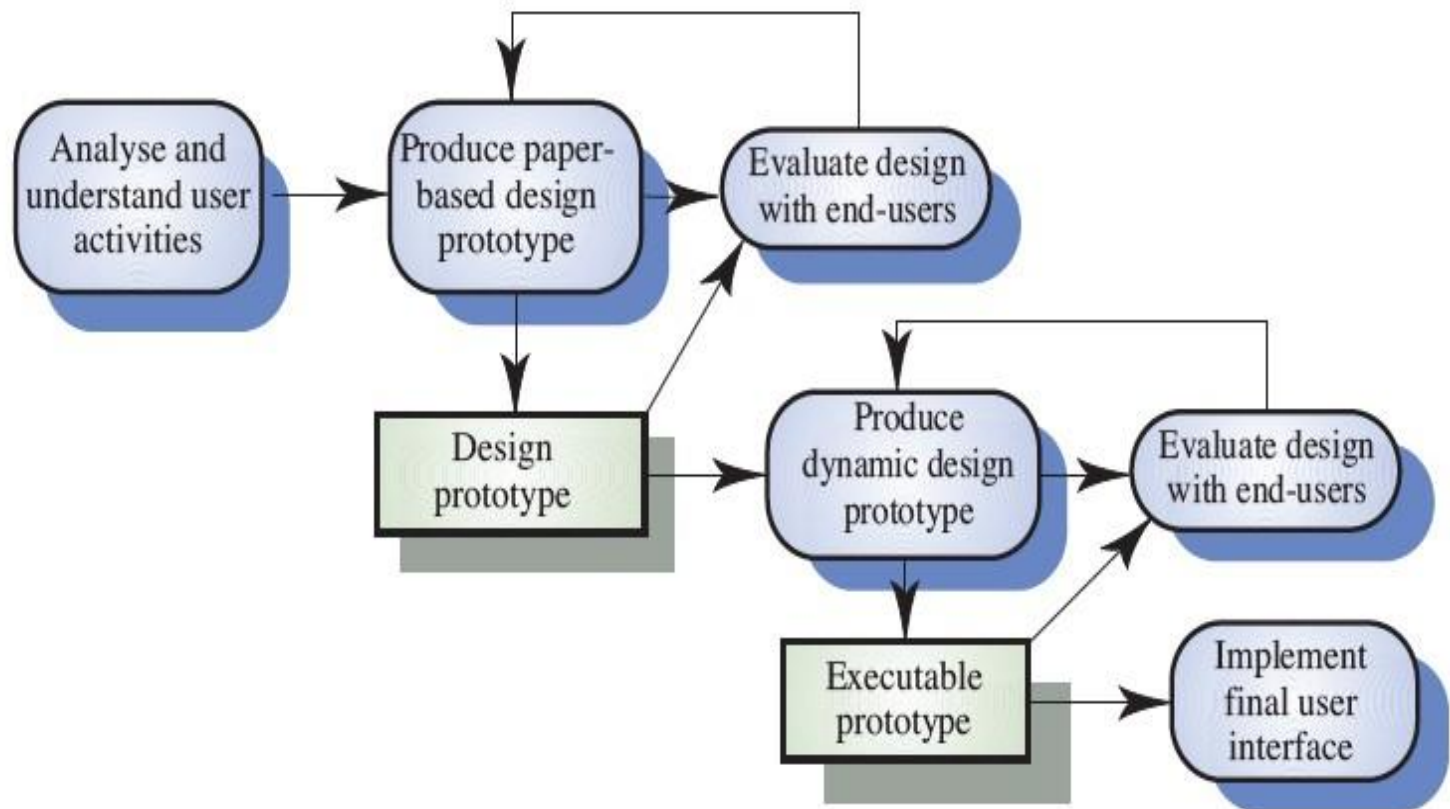
Designing the User Interface (Ben Shneiderman criteria):

1. Strive for consistency.
2. Give shortcuts to the user.
3. Offer informative feedback.
4. Make each interaction with the user yield a result.
5. Offer simple error handling.
6. Permit easy undo of actions.
7. Let the user be in control.
8. Reduce short-term memory load on the user.

<https://www.interaction-design.org/literature/article/shneiderman-s-eight-golden-rules-will-help-you-design-better-interfaces>

Typical UI Design – UI Development cycle

- Iterative design offers a way to manage the inherent risk in user interface design:



UI designer tasks

- **Collaboration – Design – Prototyping**
- **Collaboration:** Collaborating with others (client, UX designer and developers)
 - Communication is key at every stage of UI design
- **Design:** Using tools to design screens and create visual touch points, as well as the interactivity behind them
 - Ensuring consistency - so creating a style guide, or visual language, to be used across the board
- **Prototyping:** Enabling to showcase visual designs in action, helping to quickly identify flaws and smooth

User interface (UI) principles – Recap

- Keep the users in mind
- Get feedback often!
- Prepare multiple (progressively advanced) prototypes

UI:
Digital practice that considers all the visual, interactive elements of a product interface including buttons, icons, spacing, typography, color schemes, and responsive design!

Construction of UI

- UI allows users interact with the data
 - Manage
 - View
 - Modify
- Location of data & type of interaction
 - Stand-alone applications: data hosted on the client
 - Client-server applications
 - Data hosted on the server, user-interface and computations on the client
 - Data hosted on the server, computations on the server, user-interface on the client
 - Data hosted on the server, computations partitioned between client and server (data requested when needed or pre-fetched), user-interface on the client.

Literature – User Interfaces

- <https://www.interaction-design.org/literature/topics/ui-design>
- <https://blog.teamtreehouse.com/10-user-interface-design-fundamentals>
- http://web.cs.wpi.edu/~matt/courses/cs563/talks/smartin/int_design.html
- www.interaction-design.org
- Marcus, A. SIGGRAPH 93 tutorial notes: Graphic Design for User Interfaces. August 1993.
- Designing the User Interface (6th Edition) by Ben Shneiderman and Catherine Plaisant

