

# Human Computer Interaction

## Fundamentals and Practice [ SWE - 431 ]

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### Chapter: 2

### Specific HCI Guidelines

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- Principles are general, where guidelines are specific.
- International Organization for Standardization (ISO) provide guidelines covering visual display, physical input devices, workplace ergonomics, tactile/heptic interactions.
- Guidelines can be divided into two categories:
  - Domain specific ( Specific to user, platform etc )
  - General HCI Design
- Guidelines can be relevant and common across the different categories.
  - Eg. guidelines for e-commerce application might also address different general HCI design issues such as display layout, how to solicit input, how to promote vendor-specific styles, and how to target for a particular user group.

### Examples of Criteria/Categories for HCI Guidelines

Criteria	Main Categories	Examples
User Type	Age/generation Disability/accessibility Gender Consumer group Occupation Culture/country	Kids, elders, visually challenged, baby boomers, students, parents, East asians, athletes etc
Platform/system setup	Mobile/handheld Desktop Large display/virtual reality Embedded Public installation Operating system/network	Smartphone, padlike device, desktop, kiosk, embedded OS, cloud based, navigation systems, personal game players, MP3 players, e-book, etc.

### Examples of Criteria/Categories for HCI Guidelines

Criteria	Main Categories	Examples
Vendors/organizations	Private Public	NASA, Korea University, Android™, iOS, Windows® XP, etc.
Interface style/ modality/technology	WIMP ( <i>windows, icon, mouse, pointer</i> ) Non-WIMP 3-D Multimodal	Voice/aural, gesture, single/ multitouch, tactile/haptic, multimodal, menu driven, GUI/ widgets, visual perception, etc.
Task/operational context	Location/place Time Noise/lighting Bodily constraints	Office, outdoor, road/street, home, automobile, subway, classroom, eyes free, hands free, handedness, etc.

### Examples of Criteria/Categories for HCI Guidelines

Criteria	Main Categories	Examples
Applications	Game Media/information Electronic commerce Design/editing Social network service	
General HCI design	Display layout Information structure/navigation Soliciting input Information/output visualization Design process and practices User experience General aesthetics	

- Still hard to apply guidelines into the HCI design.
  - Even though guidelines are much more specific than the principles, it is still not very clear how to reflect them into the HCI design in a concrete and consistent manner
- Tidwell's guidelines address many category of the HCI issues illustrating specific UI examples with description what it does, why and when it should be used. Here we will discuss few examples.

## Visual Display Layout (General HCI Design)

- Organizing and allotting relevant information in one visible screen is concerning.
- Generally one should try to:
  - Organize the display layout based on information content. ( importance, sequence, functionality )
  - Divided into proper sections
  - Attention grabbing
  - Visually pleasing ( align and with restricted use of colors )

On the next page, we will see the summarized gui for web-page layout put-forth by the US Department of Health and Human Services.

Guidelines	Explanation
Avoid cluttered displays	Create pages that are not considered cluttered by users
Place important items consistently	Put important, clickable items in the same locations and closer to the top of the page, where their location can be better estimated
Place important items at top center	Put the most important items at the top center of the web page to facilitate users finding the information
Structure for easy comparison	Structure pages so that items can be easily compared when users must analyze those items to discern similarities, differences, trends, and relationships
Establish level of importance	Establish a high-to-low level of importance for information and apply this approach throughout each page on the website



Guidelines	Explanation
Optimize display density	To facilitate finding target information on a page, create pages that are not too crowded with items of information
Align items on a page	Visually align page elements, either vertically or horizontally
Set appropriate page lengths	Make page-length decisions that support the primary use of the web page
Choose appropriate line lengths	If reading speed is most important, use longer line lengths (75–100 characters per line); if acceptance of the website is most important, use shorter line lengths (50 characters per line)
Use frames when functions must remain accessible	Use frames when certain functions must remain visible on the screen as the user accesses other information on the site

## Information Structuring and Navigation (General HCI Design)

- Single display is insufficient to encompass all the required information or to control UI of the application.
- Structuring the information and making easy to move among items is must for high usability.
- This is closely related to the principle of Understanding the Task.
  - Understanding the task involves identifying subtask sequences and actions, each linked to input or output information. The task structure, action sequence, and content organization guide interaction flow, ensuring optimal information and control timing.

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An example of site map for a website

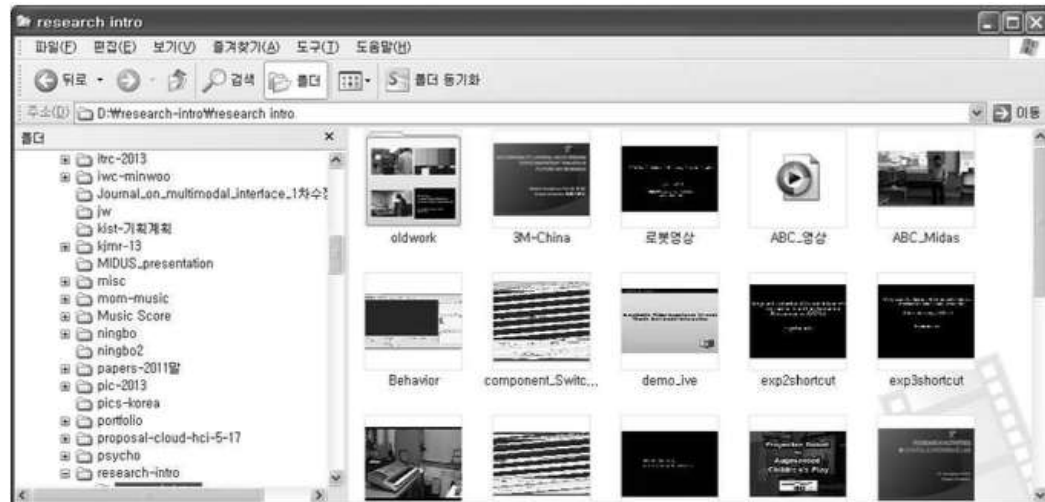
- Fast and easy navigation is also important to enable users to find the needed action and information quickly.
- Designers should include site maps, and provide effective feedback on the user's location within the site.
- To facilitate navigation designers should
  - Differentiate and group navigation elements
  - Use appropriate menu types
  - Use descriptive tab labels
  - Provide clickable list of page contents on long pages
  - Add “glosses” on links when needed
  - Must not trap users on dead-end pages

Example of two design patterns from Tidwell.

**What:** Put two side-by-side panels on the interface. In the first, show a set of items that the user can select at will; in the other, show the content of the selected item.

**When:**

- Display is large enough to show two separate panels at once
- Presenting list of objects, categories or even actions.
- Allow users to see the overall structure of list



The use of a two-panel selector, a design pattern for information structuring and facilitated navigation

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Example of two design patterns from Tidwell.



**What:** Show each of the application's pages within a single window. As a user drills down through a menu of options, or into an object's details, replace the window contents completely with the new page.

**When:**

- Device with tight space restrictions
- Application consists of many pages of content
- Many application windows open - confuse average computer users.

The use of one-window drilldown as a designer pattern for content organization and fast navigation

## Taking User Input ( General HCI Design )

Modern interfaces use GUI elements (window, text box, button, menu, forms, dialog box, icon), support techniques (autocompletion, deactivating irrelevant options, voice recognition), and devices (mouse, touch screen) for varied user input. UI designers must compose these methods considering design constraints (user type, task characteristics, operating environment).

Some guidelines for use in applying these input methods to facilitate data entry are:

- *Consistency of data-entry transactions:* Similar sequences of actions should be used under all conditions (similar delimiters, abbreviations, etc.) Eg. Same date format across all the applications [ MM/DD/YYYY ]
- *Minimal input actions by user:* Fewer input actions means greater operator productivity.
  - Proper use of single-key commands
  - Mouse selection
  - Auto-completion features
  - Selecting from list
  - Use default values
  - Avoid switching between keyboard and mouse

- *Minimal memory load on users:* Use menus and button choices so that users do not have to remember a lengthy list of codes and complex syntactic command strings.
- *Compatibility of data entry with data display:* The format of data-entry information should be linked closely to the format of displayed information (i.e., what you see is what you get).
- *Clear and effective labeling of buttons and data-entry fields:* Use consistent labeling. Distinguish between required and optional data entry. Place labels close to the data-entry field.
- Match and place the sequence of data-entry and selection fields in a natural scanning and hand-movement direction (e.g., top to bottom, left to right).
- *Do not place semantically opposing entry/selection options close together:* For example, do not place “save” and “undo” buttons close together. Such a placement is likely to produce frequent erroneous input.

Situations become more complicated when other forms of input are also used such as touch, gesture, 3-D selection and voice. There are separate guidelines for them.

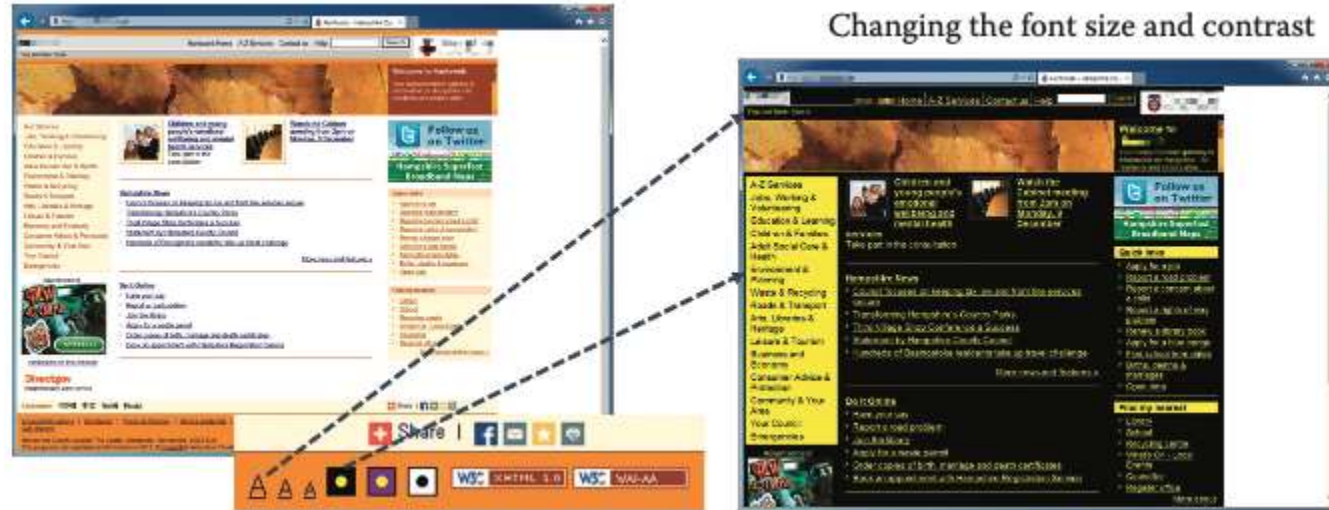


## User with Disability ( User Type )

- Web content Accessibility Guidelines (WCAG) explains how to make web content more accessible to people with disabilities. Summary of guidelines:
- Perceivable
  - Provide text alternatives for non text content
  - Provide captions and other alternatives for multimedia
  - Create content that can be presented in different ways, including by assistive technologies, without losing meaning
  - Make it easier for user to see and hear content

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Adjustment feature for visually challenged users. The colors of the background and foreground text can be changed.

- Operable
  - Make all functionality available from a keyboard
  - Give users enough time to read and use content
  - Do not use content that causes seizures
  - Help users navigate and find content
- Understandable
  - Make text readable and understandable
  - Make content appear and operate in predictable ways
  - Help users avoid and correct mistakes
- Robust
  - Maximize compatibility with current and future user tools

## Mobile Device ( Platform type )

- Fast status information
- Minimize typing and leverage on varied input hardware
- Fierce task focus [ maintaining a strong emphasis on the primary task at hand and minimizing distractions or unnecessary elements in a user interface ]
- Large hit targets
- Efficient use of screen space
- Set of guidelines from Nokia developers' home page
  - Enable shortcuts ( hot keys )
  - Keep the user informed of his or her actions
  - Follow the devices interface patterns



(a)

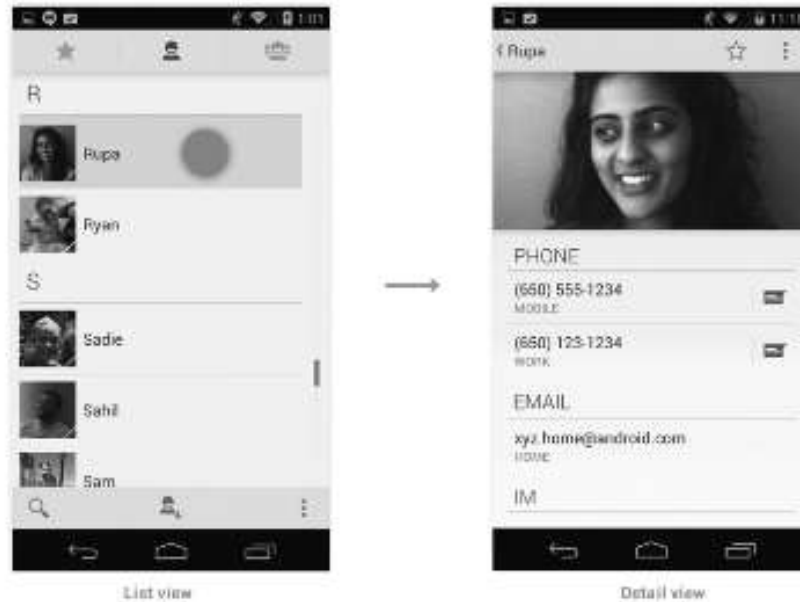


(b)

Comparison of two mobile game interfaces (the initial entry screen):

(a) information and object density is needlessly high and distracting

(b) simple and minimal layout, and object sizes fitted to ergonomic usage



Android design guideline promoting the use of list views and detailed views (multiple panels) to efficiently use the screen size of mobile devices.

## Icons for apple ios and Fonts for Windows

Apple has published a design guideline document that details how application icons should be designed and stylized

- Try to balance eye appeal and clarity of meaning in your icon so that it is rich and beautiful and clearly conveys the essence of your app's purpose.
- Investigate how your choice of image and color might be interpreted by people from different cultures.
- Create different sizes of your app icon for different devices. For iPhone and iPod touch, both of these sizes are required

Windows's guidelines for the choice of fonts and its size promote organizational styling and its identity and ultimately its consistency in user interfaces

- Franklin Gothic is used only for text over 14-point size. It is used for headers and should never be used for body text.
- Tahoma is used as the system's default font. Tahoma should be used at 8-, 9-, or 11-point sizes.
- Verdana (bold, 8 point) is used only for title bars of tear-off/floating palettes.
- Trebuchet MS (bold, 10 point) is used only for the title bars of Windows (Figure 2.8).





An example of Trebuchet font used for a window title bar.

## Earcon design for Aural interface

- Similar to visual icons, must capture underlying meaning
- Draw attention for easy recognition
- Should be designed to be intuitive
- Blattner, Sumikawa and Greenberg suggest three types of earcons
  - Symbolic: Rely on social convention. Eg. applause for approval
  - Nomic: Physical. Eg. Door slam
  - Metaphoric: Based on capturing similarities. Eg. falling pitch for a falling object

## Making calls in Automobiles ( Task )

- Basic:
  - Car phones should operate like phones people have at home. Eg. The use of send, power to turn of or on.
- Voice dialog
  - Verbal commands and button labels should use the same terms
  - Commands of interest include dial, store, recall and clear
- Manual dialing
  - The store and recall buttons, used for similar functions.



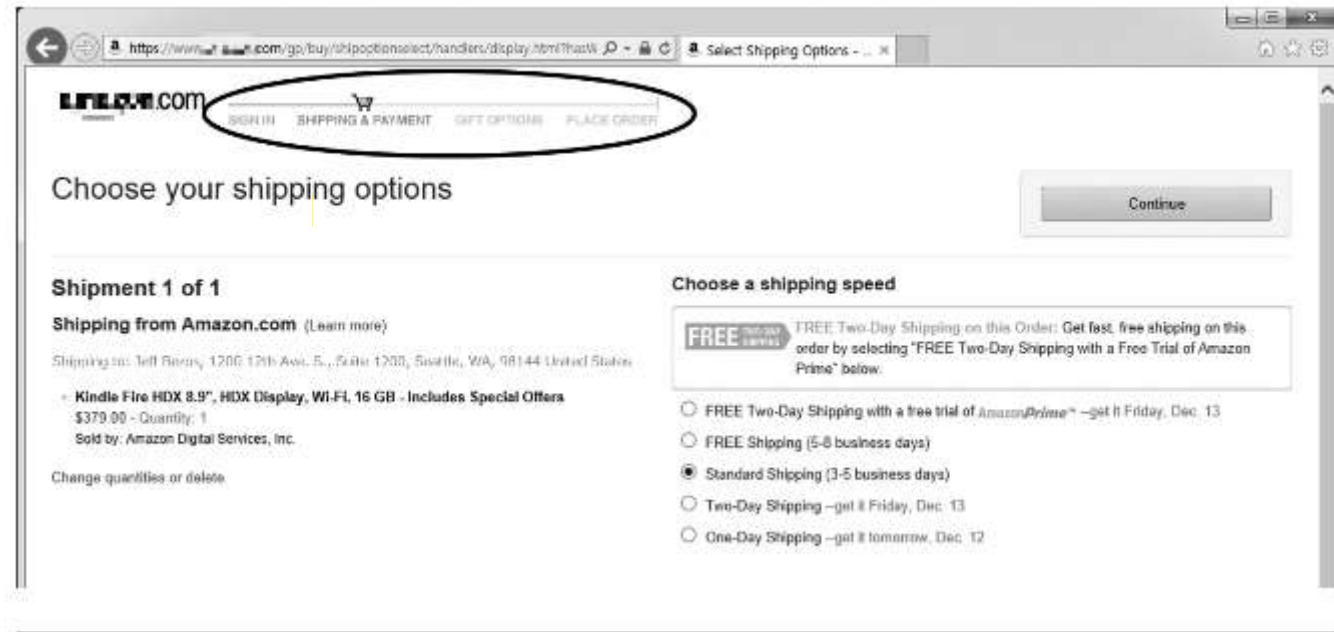
Phone interface for automobiles.

## E-Commerce ( Application )

Kalsbeek has collected and formulated very extensive, detailed, and structured HCI guidelines for e-commerce applications with 404 guidelines structured in four groups - general, input/output forms, UI elements and checkout process.

Guidelines under the checkout process section:

- Check-out should start at the shopping cart
- Should be followed by gift options or shipping methods
- Shipping address, billing address payment information collection from user
- Order review
- Order summary
- Displaying a confirmation page



Status information (circled) shown in the process of a book purchase