**Chapter 5 Questions and Answers**

1. Define direct manipulation. Describe the benefits and potential problems.

**Definition:** Interface design with visual representation of the world of action, immediate visibility of the objects and actions of interest; rapid, reversible, incremental actions; and replacement of typed commands by a pointing action on the object of interest. Dragging a file to a trash can is an example. Analogical reasining is tapped. **Benefits:** Users report high satisfaction with direct manipulation because of a “feeling of involvement directly with a world of objects rather than of communicating with an intermediary” . Direct manipulation breaches the gulf of execution and the gulf of evaluation . **Problems:** 1. Spatial or visual representations are not necessarily an improvement over text, especially for blind or vision-impaired users who need special software. 2. Direct-manipulation designs may consume valuable screen space and thus force valuable information offscreen, requiring scrolling or multiple actions. 3. Users must learn the meanings of visual representations. A graphic icon may be meaningful to the designer but, for users, may require as much learning time as a word, or more. 4. The visual representation may be misleading. 5. for experienced typists, taking a hand off the keyboard to move a mouse or point with a finger may take more time than typing the relevant command. 6. on small mobile devices with limited screen sizes. A finger pointing at a device may partially block the display, rendering a good portion of the device not visible. Also, if the icons are small because of the limited screen size, they may be hard to select or, because of limited resolution and viewing capabilities (especially for older adults), not clearly distinguishable, resulting in their meanings becoming lost or confused. 7. History/tracing may be difficult. 8. Macro techniques may be weak.

1. What are the three principlesof direct manipulation?
* Continuous representations of the objects and actions of interest with meaningful visual metaphors
* Physical actions or presses of labeled buttons, instead of complex syntax.
* Rapid, incremental, reversible actions whose effects on the objects of interest are visible immediately.
1. What are the guidelines for effective use of icons?
* Represent the object or action in a familiar and recognizable manner.
* Limit the number of different icons.
* Make the icon stand out from its background.
* Carefully consider three-dimensional icons; they are eye-catching but also can be distracting.
* Ensure that a single selected icon is clearly visible when surrounded by unselected icons.
* Make each icon distinctive from every other icon.
* Ensure the harmoniousness of each icon as a member of a family of icons.
* Design the movement animation: when dragging an icon, the user might move the whole icon, just a frame, possibly a grayed-out or transparent version, or a black box.
* Add detailed information, such as shading to show the size of a file (larger shadow indicates larger file), thickness to show the breadth of a directory folder (thicker means more files inside), color to show the age of a document (older might be yellower or grayer), or animation to show how much of a document has been printed (document folder absorbed progressively into the printer icon).

• Explore the use of combinations of icons to create new objects or actions—for example, dragging a document icon to a folder, trash can, outbox, or printer icon has great utility.

1. What are the guidelines for adding 3-D elements to an interface without undermining usability?
* Use occlusion, shadows, perspective, and other 3D techniques carefully.
* Minimize the number of navigation steps required for users to accomplish their tasks.
* Keep text readable (better rendering, good contrast with background, and no more than 30-degree tilt).
* Avoid unnecessary visual clutter, distraction, contrast shifts, and reflections.
* Simplify user movement (keep movements planar, avoid surprises like going through walls).
* Prevent errors (that is, create surgical tools that cut only where needed and chemistry kits that produce only realistic molecules and safe compounds).
* Simplify object movement (facilitate docking, follow predictable paths, limit rotation).
* Organize groups of items in aligned structures to allow rapid visual search.
* Enable users to construct visual groups to support spatial recall (placing items in corners or tinted areas).