**Chapter 2 Questions and Answers**

1. Give a brief explanation of the Eight Golden Rules of Interface Design.
* **Strive for consistency**. Consistent sequences of actions should be required in similar situations; identical terminology should be used in prompts, menus, and help screens; and consistent color, layout, capitalization, fonts, and so on should be employed throughout. Exceptions, such as required confirmation of the delete command or no echoing of passwords, should be comprehensible and limited in number.
* **Cater to universal usability**. Recognize the needs of diverse users and design for plasticity, facilitating transformation of content. Novice to expert differences, age ranges, disabilities, and technological diversity each enrich the spectrum of requirements that guides design. Adding features for novices, such as explanations, and features for experts, such as shortcuts and faster pacing, can enrich the interface design and improve perceived system quality.
* **Offer informative feedback**. For every user action, there should be system feedback. For frequent and minor actions, the response can be modest, whereas for infrequent and major actions, the response should be more substantial.
* **Design dialogs to yield closure**. Sequences of actions should be organized into groups with a beginning, middle, and end. Informative feedback at the completion of a group of actions gives operators the satisfaction of accomplishment, a sense of relief, a signal to drop contingency plans from their minds, and an indicator to prepare for the next group of actions.
* **Prevent errors**. As much as possible, design the system such that users cannot make serious errors; for example, gray out menu items that are not appropriate and do not allow alphabetic characters in numeric entry fields. If a user makes an error, the interface should detect the error and offer simple, constructive, and specific instructions for recovery. Erroneous actions should leave the system state unchanged, or the interface should give instructions about restoring the state.
* **Permit easy reversal of actions**. As much as possible, actions should be reversible. This feature relieves anxiety, since the user knows that errors can be undone, and encourages exploration of unfamiliar options.
* **Support internal locus of control**. Experienced users strongly desire the sense that they are in charge of the interface and that the interface responds to their actions. They don’t want surprises or changes in familiar behavior, and they are annoyed by tedious data-entry sequences, difficulty in obtaining necessary information, and inability to produce their desired result.
* **Reduce short-term memory load.** Humans’ limited capacity for information processing in short-term memory (the rule of thumb is that we can remember “seven plus or minus two chunks” of information) requires that designers avoid interfaces in which users must remember information from one screen and then use that information on another screen.
1. Describe how the principle of consistency can be applied to interface navigation, display organization, and data entry.

**Navigation**. Standardize task sequences across similar conditions. Make screens/pages appear and operate in predictable ways. **Display Organization.** Data display must be consistent. During the design process, the terminology,abbreviations, formats, colors, capitalization, and so on should all be standardized and controlled by use of a dictionary of these items. **Data Entry.** Format should be related to task.Format of displayed information should be linked clearly to the format of the data entry. Minimal memory load on the user. Users should not be required to remember information from one screen for use on another screen. Tasks should be arranged such that completion occurs with few actions, minimizing the chance of forgetting to perform a step. Labels and common formats should be provided for novice or intermittent users.

1. Describe some ways an interface designer might accommodate different usage classes (Novices, knowledgeable intermittent users, and expert frequent users) in one system.

When multiple user classes must be accommodated in one system, the basic strategy is to permit a multi-layer (sometimes called level-structured or spiral)approach to learning. Novices can be taught a minimal subset of objects and actions with which to get started. They are most likely to make correct choices when they have only a few options and are protected from making mistakes—that is, when they are given a training-wheels interface. After gaining confidence from hands-on experience, these users can choose to progress to ever-greater levels of task concepts and the accompanying interface concepts. The learning plan should be governed by the users’ progress through the task concepts, with new interface concepts being chosen when they are needed to support more complex tasks. For users with strong knowledge of the task and interface concepts, rapid progress is possible. Another option for accommodating different usage classes is to permit users to personalize the menu contents. A third option is to permit users to control the density of informative feedback that the system provides.

1. Name ways a designer can successfully make a user aware of an abonormal condition or of time-dependent information.

Intensity, marking, size, choice of font, inverse video (color), blinking, color, audio.

1. Express how careful study of user tasks and their frequencies shapes interface design.

Such user-needs assessment clarifies what tasks are essential for the design and which ones could be left out to preserve system simplicity and ease of learning. The relative task frequencies are important in shaping, for example, a set of commands or a menu tree. It helps designers to understand task frequencies and sequences to make the tough decisions about what tasks to support. Since no single design would be ideal for all users and situations, successful designers must characterize their users and the context in which their products will be used as precisely andcompletely as possible.

1. What are the advantages and disadvantages of the five primary interaction styles?

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|  | **Advantages** | **Disadvantages** |
| **Direct****Manipulation** | Visually presents task conceptsEasy LearningEasy RetentionAllows errors to be avoidedEncourages ExplorationHigh subjective satisfaction | May be hard to programMay require graphics displayMay require pointing devices |
| **Menu****Selection** | Shortens learningReduces keystrokesStructures decision makingPermits use of dialogue managementEasy support of error handling | Danger of many menusMay slow frequent usersConsumes screen spaceRequires rapid display rate |
| **Form****Fill-In** | Simplifies data entryRequires modest trainingGives convenient assistancePermits use of form management tools | Consumes screen space |
| **Command** **Language** | FlexibleAppeals to “power users”Supports user initiativeAllows convenient creation of user-defined macros | Poor error handlingRequires substantial trainingRequires substantial memorization |
| **Natural** **Language** | Relieves burden of learning syntax | Requires clarification dialogMay not show contextMay require more keystrokesUnpredictable |

1. Describe design characteristics that help prevent user errors and make them easier to correct.

Improve the error messages provided by the interface. Organize screens and menus functionally, designing commands and menu choices to be distinctive, and making it difficult for users to take irreversible actions. Provide feedback about the state of the interface (e.g., changing the cursor to show whether a map interface is in zoom-in or select mode) and design for consistency of actions (e.g., ensuring that Yes/No buttons are always displayed in the same order). **Correct Actions:** Prevent users from dangerously incorrect usage of the products. For example, inappropriate menu items can be grayed out so they can’t be inadvertently selected, and web users can be allowed to simply click on the date on a calendar instead of having to type in a month and day for a desired airline. In some instances, offering automatic command completion to reduce the likelihood of user errors is good. **Complete sequences**: Sometimes an action requires several steps to reach completion. Since people may forget to complete every step of an action, designers may attempt to offer a sequence of steps as a single action. **Consider Universal Usability:** Thinking about universal usability also contributes to reducing errors—for example, a design with too many small buttons may cause unacceptably high error rates with elderly or users with motor control challenges.

1. Describe Norman’s 7 Stages of Action and Four Principles of Good Design.

**Seven Stages of Action** are cyclical, portray the stages of action that users go through in trying to use interactive products such as information appliances, web interfaces, or mobile devices. The stages are: Forming the goal, Forming the intention, Specifying the action, Executing the action, Perceiving the system state, Interpreting the system state, and Evaluating the outcome. The seven-stages model leads naturally to identification of the gulf of execution (the mismatch between the user’s intentions and the allowable actions) and the gulf of evaluation (the mismatch between the system’s representation and the user’s expectations).

**Four Principles of Good Design.** First, thestate and the action alternatives should be visible. Second, there should be agood conceptual model with a consistent system image. Third, the interfaceshould include good mappings that reveal the relationships between stages.Fourth, users should receive continuous feedback.

**Terms and Concepts to Know:**

1. Eight Golden Rules of Interface Design
2. Irreversible actions
3. User memory load
4. Task Analysis
5. Gulf of Execution
6. Gulf of Evaluation
7. The Five Primary Interaction Styles: Direct manipulation, menu selection, form fill-In, command language, natural language
8. Internal locus of control
9. Normans’ 7 Stages of Action
10. Norman’s Four Principles of Good Design
11. Controversy over whether to create tool-like interfaces or to autonomous, adaptive, or anthropomorphic agents that carry out the users’ intents and anticipate needs