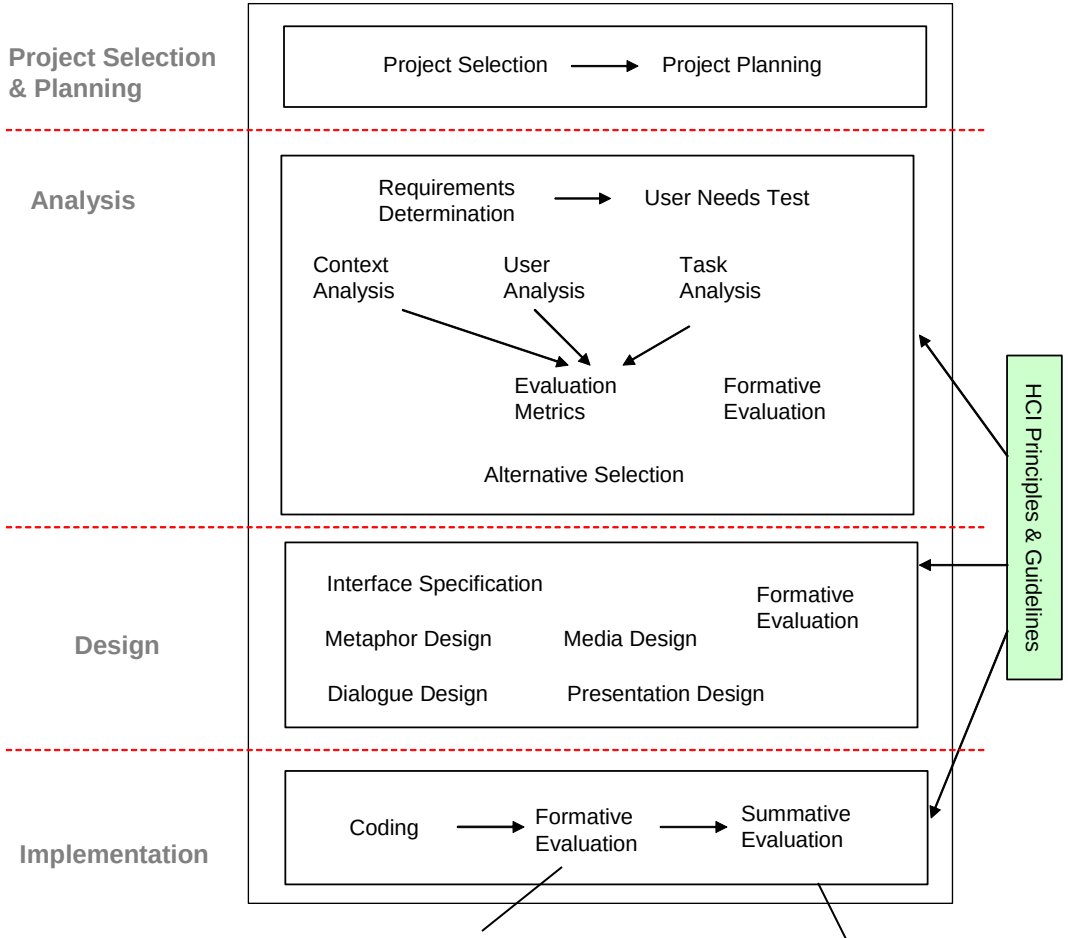
Design Principles and Guidelines

Design Principles and Guidelines in the HCI Methodology



is a method for judging the worth of a program while the program activities are *forming* (in progress). This focuses on the process.

Summarize the development of learners at particular time

Introduction

- Design principles: high-level and context-free design goals based on theories of human-computer interaction.
- Design guidelines: specific and usually context dependent rules for designers to follow in order to achieve the principles.
- Design Standards: standards are to ensure quality,

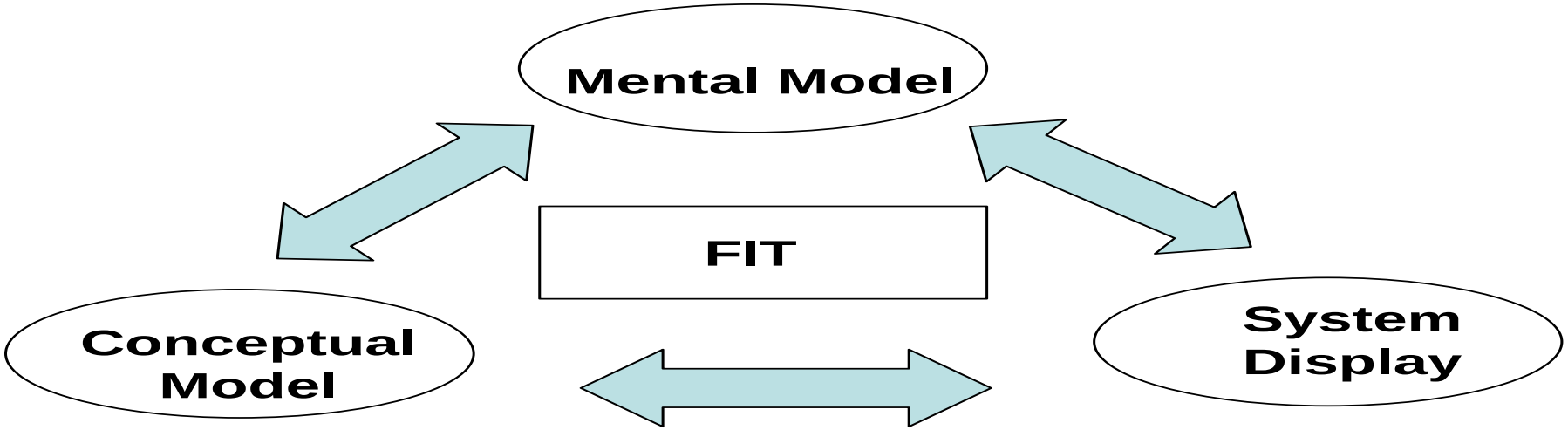
Design Principles

- **Improve users task performance and reduce their effort.**
  - User activity depends on memory and attention.
  - Automate or partially automate the user activity and to do so with minimal user effort.
  - Often compromises in functionality produce higher usability.
    - Example:- Incorrect entry in any online form should not result in filling up the whole form again. Except incorrect entry,

Design Principles

- **Strive for fit between the information representation needed and presented.**
  - **Representation**: a simplified depiction of a real-world phenomenon.
  - **Functionality**: the set of activities.
  - **Usability**: a measure of ease.
  - **Cognitive fit**: system's representation of the problem supports the user's strategies for performing the task.

Design Principles



Three models – the designer's conceptual model, the user's mental model and the display of the system

Design Principles

- **Provide and constrain affordances to capture real-world knowledge.**
- **<u>Affordance</u>**: the aspects of an object that the user perceives as indicating how to use the object, e.g., the handle of a teapot.

Design Principles

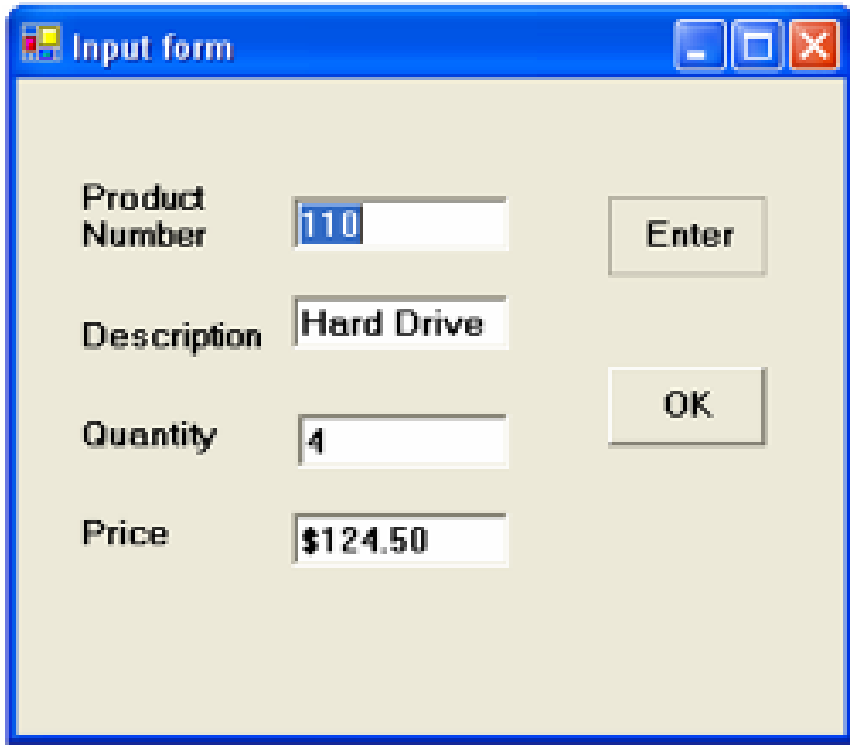


Figure 8. 3 Affordance in the design of buttons – the OK button invites you to push it

Design Principles

- Design for error
- Error: a faulty action due to incorrect intention (mistake) or to incorrect or accidental implementation of the intention (slip), e.g., one can use the ‘reply all’ in an email by mistake, not knowing that everyone on the list will see the reply, or accidentally clicking on the wrong icon because of lack of sufficient attention.

- How Gmail is handling Design for Errors?
- Do you recollect any similar kind of handling of errors?

Table 8. 2 Classification of Errors

Source	Design rule
Mode errors: erroneous classification of the situation (e.g., insert mode versus strikeover mode).	Do not have modes. Distinguish clearly between modes. Distinguish between commands associated with different modes so that inappropriate commands do no damage.
Description errors: ambiguous or incomplete specification of the intention (e.g., specifying the destination for moving files by imprecisely pointing at a location in a directory).	Arrange controls (menus, fields) in functional patterns, procedures. Distinguish between controls (dialogs, displays) with a different look and feel. Make it especially difficult to perform actions with serious cost of error.
Capture errors: when performing a sequence that is similar to a more frequent one, the frequent will capture control (e.g., shutting down a system instead of an intended but less frequent 'restart').	Minimize overlapping sequences. Try to catch it when it occurs by identifying the critical point of deviation from the correct sequence (requires knowledge of the intention).
Activation errors: inappropriate actions get performed and appropriate actions do not.	Maintain a display of incomplete sequences to prompt the user to act appropriately.

Design Principles

- Designing for an enjoyable and satisfying interaction.
- Flow: a feeling of optimal experience, which, in the context of HCI, has to do with a state of being completely absorbed by the interaction and feeling good about it.

Design Principles

- Promote trust
  - Trust is another aspect of HCI that requires analysis beyond task analysis. In e-commerce systems where the interactions translate directly into revenue, trust is a critical component. As developers, we must ask the question, “How can we design HCI that positively affects the user’s trust in the system and in the services it provides?”

Design Principles

- Support diversity of users
  - As designers we have the responsibility to open our design to the effective use of diverse populations of users.
    - We should assume that users from different nationalities with different backgrounds may use the system.
    - Some of the users may be handicapped in one way or another and find it difficult or impossible to use certain features.

Design Guidelines

- Issue I: Consistency Guidelines
  - Consistency has been one of the cardinal rules of design. If the interface is consistent (even if poorly designed), the end user can adapt to it.
  - Is consistency as important as it appears?
  - There are several types of consistency.
  - **Internal consistency**: the same appearance, meaning and operation holds true for all the user's interactions within the same application.

Design Guidelines: Consistency

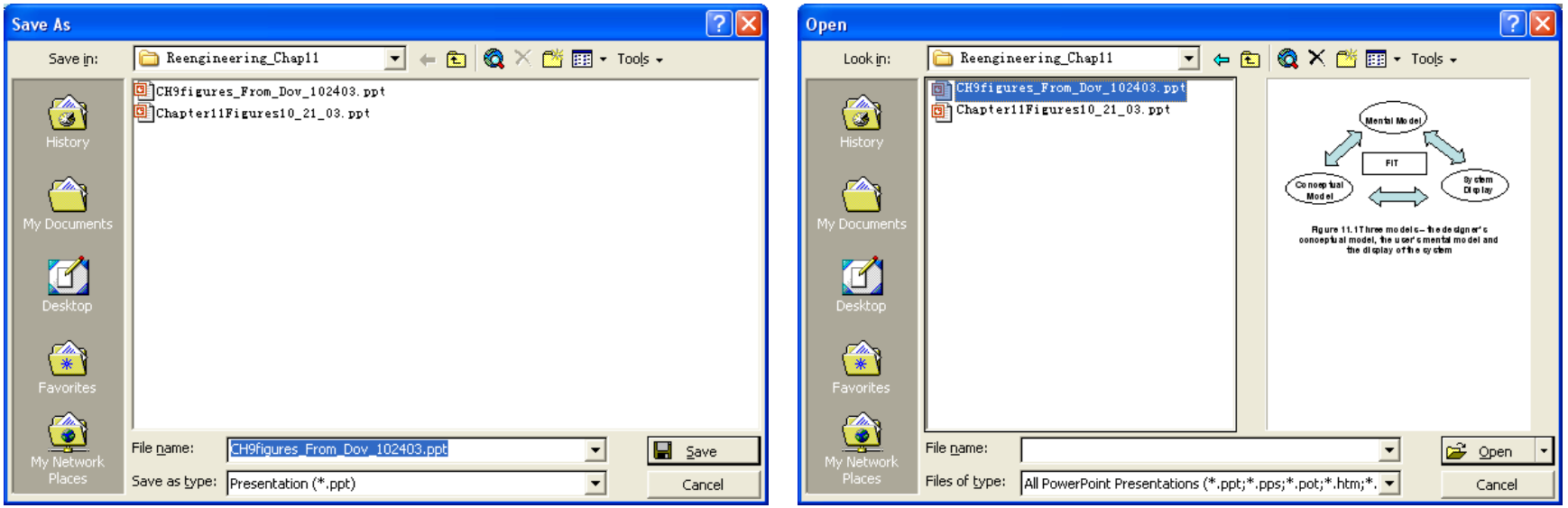
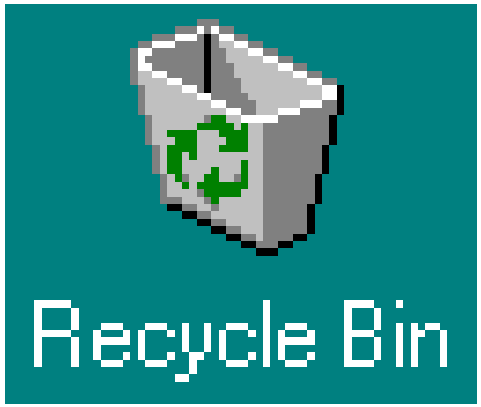


Figure 10. 5 "Save as" and "Open" dialogue boxes in MS PowerPoint illustrating internal consistency

Design Guidelines: Consistency

<u>Analogical consistency</u>: the correspondence between the system's representation and the real-world phenomenon in terms of appearance, meaning and operation.

Design Guidelines: Consistency



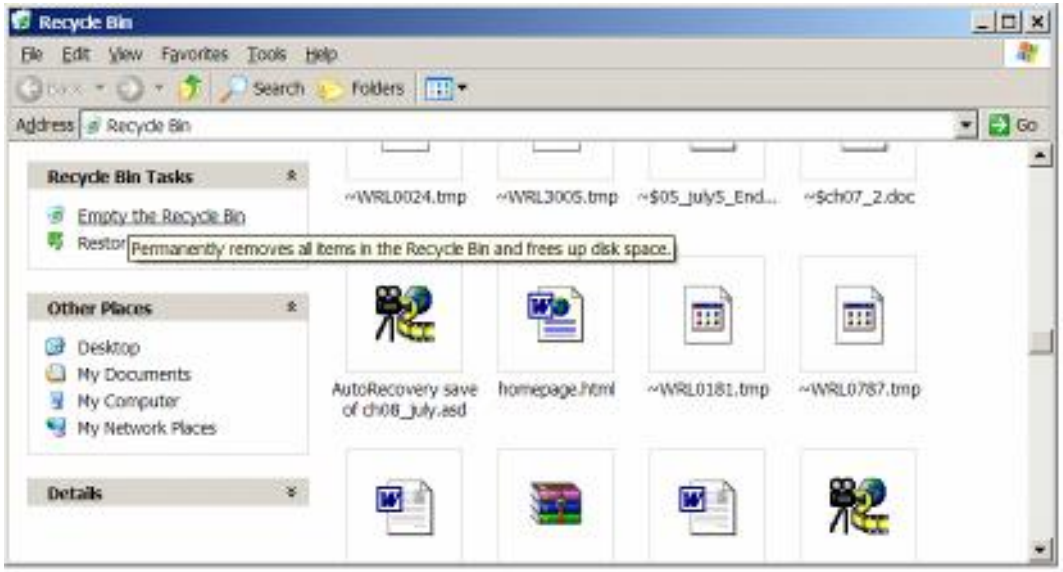


Figure 8. 4 Recycle bin in the Microsoft® Windows® environment illustrating analogical consistency

Design Guidelines: Consistency

- **External consistency**: the same appearance, meaning and operation holds true for the user's interactions across applications.
  - Example :-Use of Cut, Copy, Paste shortcut keys has same operation in all the applications.

Design Guidelines: Consistency

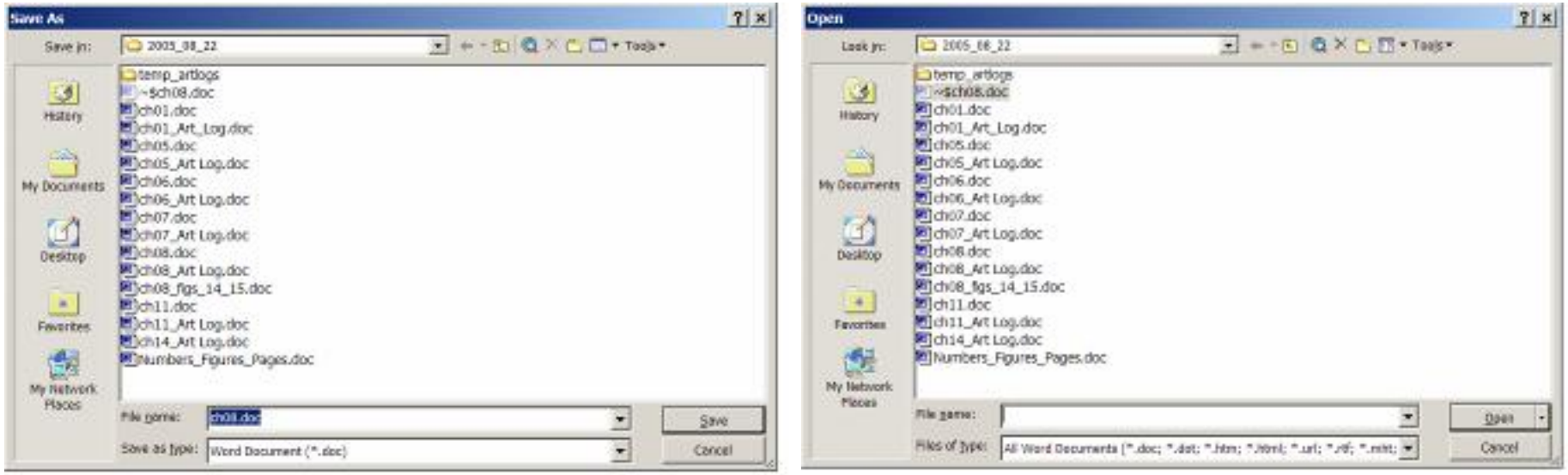


Figure 8.5 “Save as” and “Open” dialog boxes in Microsoft® Word® illustrating internal consistency.

Design Guidelines: Consistency

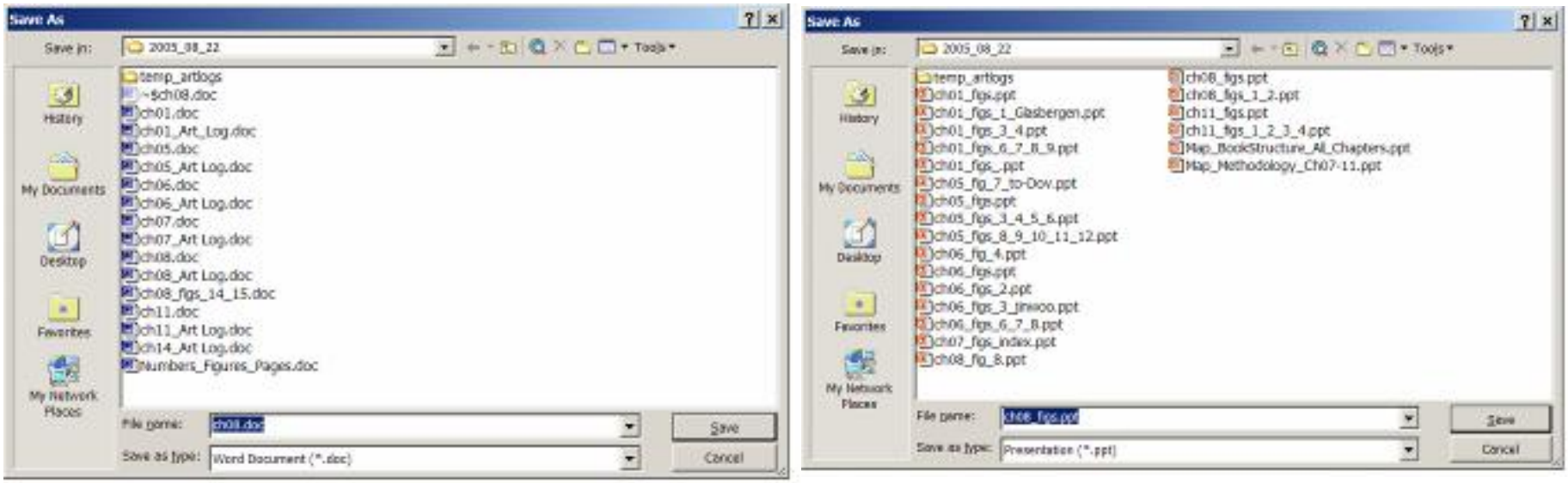


Figure 8.6 “Save as” dialog boxes in Microsoft® Word® and Microsoft® PowerPoint® illustrating external consistency.

Table 8. 4 Design Rules for Consistency

	• Standardization of interface designs: follow accepted (usually published) guidelines whenever possible. • Stability: do not change something unless it really needs changing. • Training: add new skills to the user's skill set rather than expecting the user to modify existing skills. • If you must change, make it a large and obvious one. • Consistent interpretation of user behavior by the system is more important than consistent system objects or behaviors.

Design Guidelines: Consistency

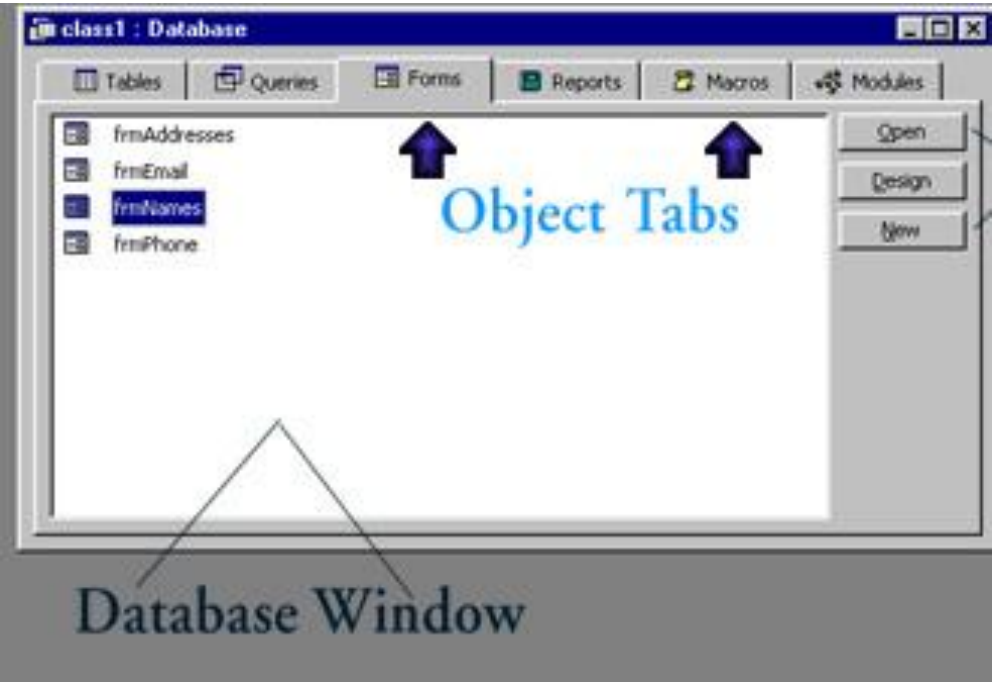


Figure 8.7 Access 97 Interface versus Access 2000.
Violation of the second rule of the Consistency Guideline I.
("Do not change anything unless it needs changing")

Design Guidelines: Consistency

Edit **Cut** **Copy** **Paste** **Paste special**	**Edit** **Cut** **Copy** **Paste** **Paste special**	**Edit** **Cut** **Copy** **Paste**
When text selected	When no text selected	When right mouse button clicked

Figure 8. 8 Inconsistency in Edit menu – good or bad?

Design Guidelines:
Issue II - User control and feedback

- Control and feedback go hand in hand. Providing feedback is probably the most accepted guideline in the design of any interaction.
- However, it is important to understand the rationale for each specific feedback instance.
- Feedback can support three important factors of user activity: motivation, control and learning.

Design Guidelines:
Issue II - User control and feedback

- Control feedback is designed to promote the user's control over the interaction and the completion of the task at hand.
- The first guideline is therefore to ensure that the user perceives that he or she is in control.
  - For example, the user should always be able to abort one activity and initiate another (the system should not 'take over' control).
  - Furthermore, the user should be able to control the pace and format of presentation (e.g., controlling the speed of scrolling and the size of the font).

Design Guidelines:
Issue II - User control and feedback

- Our basic assumption is that optimal control depends on both the *type of user activity* that needs to be controlled and the *level of interaction*.
- Ask:
  - What effect their action has had on the system?
  - Possible consequences of that action.
  - The new system state.
  - The new location of the user in the system or state.

Design Guidelines:
Issue II - User control and feedback

- Feedback should be presented in the manner that most directly supports the action to be taken - ‘strive for fit between the information representation needed and presented’.

Table 8. 5 Design rules for feedback to promote control

- Feedback should correspond to goals and intentions.
- Feedback should help evaluate goal accomplishment.
- Feedback should be sufficiently specific to control user activity.
- Feedback should help develop accurate mental models.
- Feedback should fit the task representation (verbal and visual).
- Feedback should fit the type of behavior (controlled, automatic).

Design Guidelines:
Issue II - User control and feedback

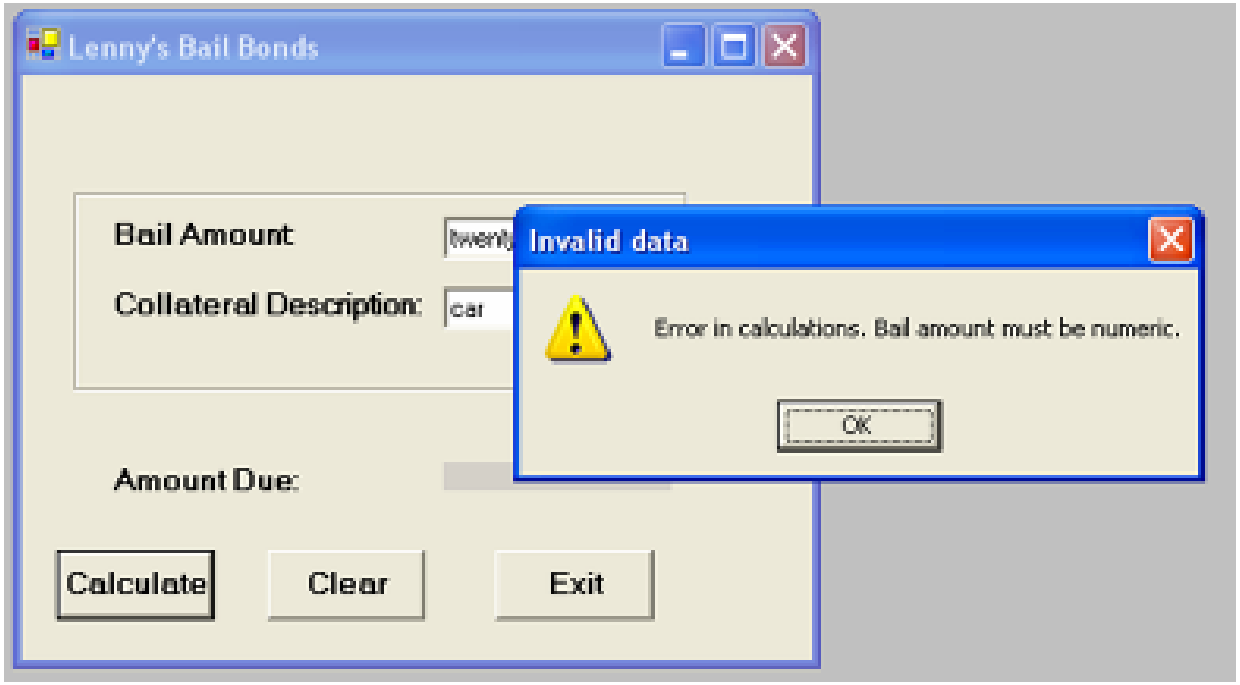


Figure 8. 9 User feedback

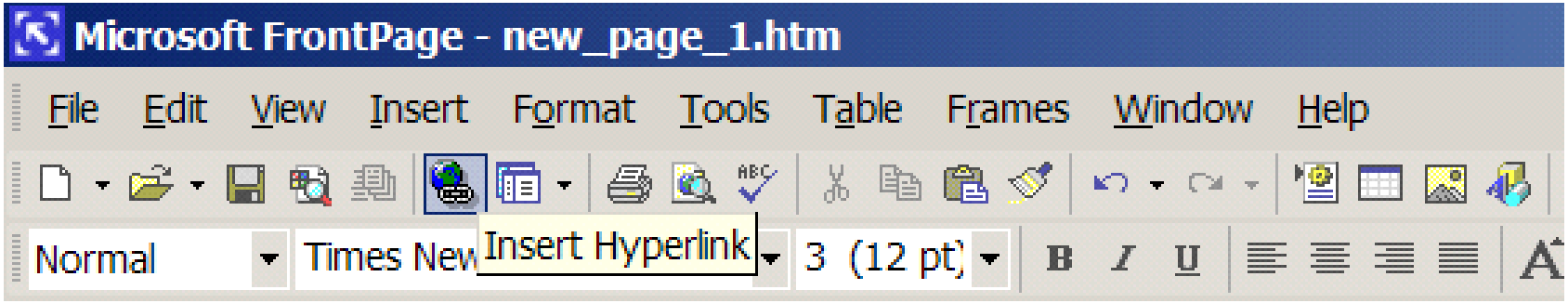
Design Guidelines: Issue III - Metaphors

- **<u>Metaphor</u>**: the use of familiar terms and associations to represent a new concept.
  - The metaphor of the ‘Desktop’ is one of the most commonly used metaphors in HCI.

Metaphors

Metaphor	**Application**
Typewriting (typing, using keyboard)	Word processor
Document (elements of a document and their attributes and operations).	Desk top publishing
Ledger sheet (matrix structure for numbers)	Spreadsheet
Drawing (with paper, pencil and palettes).	Drawing and painting
Table of data (managing data organized in rows and columns).	Database

Design Guidelines:
Issue III - Metaphors



- **Figure 8. 10 depicts a metaphor. It is a globe with a chain link over it.**

Design Guidelines:
Issue IV – Direct Manipulation

- **<u>Direct manipulation</u>**: an interaction style in which objects are represented and manipulated in a manner analogous to the real world (e.g. by directly pointing at an object and dragging it to a location rather than issuing logical instructions to bring about the same effect).
- The general guideline is to use direct manipulation whenever possible.

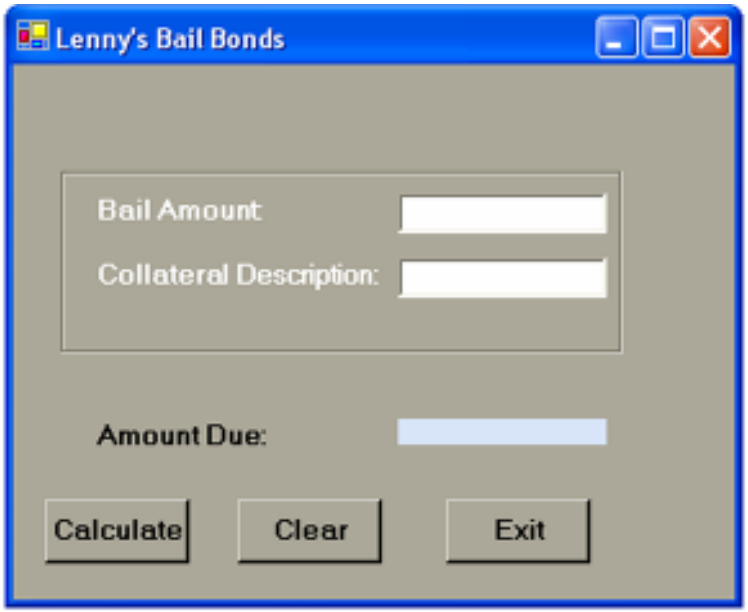
Design Guidelines: Issue IV – Direct Manipulation

- Consider the simple example of moving a file to a trash bin by clicking on its icon and dragging it to the trash bin icon.
- Contrast this with the same action carried out by a sequence of menu options and commands (e.g. locating the appropriate directory of files, finding the exact name of the file, specifying a ‘delete’ command and receiving (at least in some operating systems) confirmation that ‘the file had been deleted’).

Design Guidelines:
Issue V – Aesthetics in Screen Design

- Designs should be aesthetically pleasing ideally without compromising on the usefulness and usability of the system.

Design Guidelines:
Issue V – Aesthetics in Screen Design



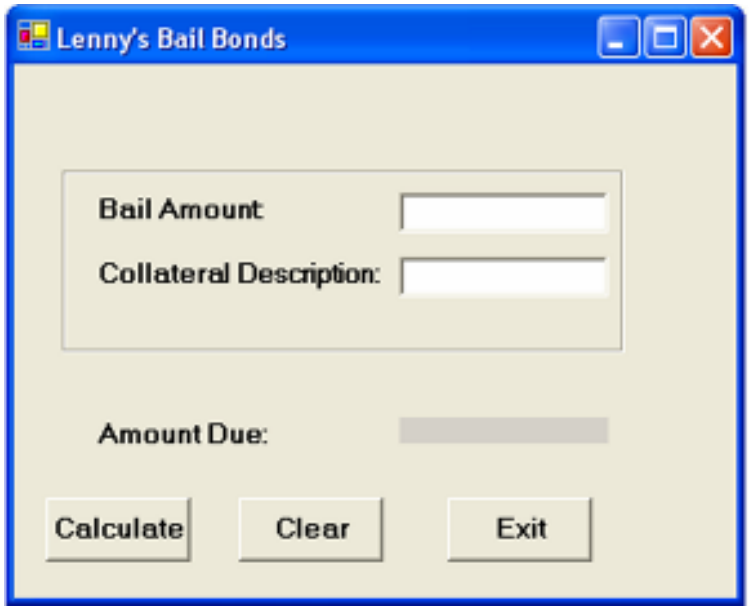


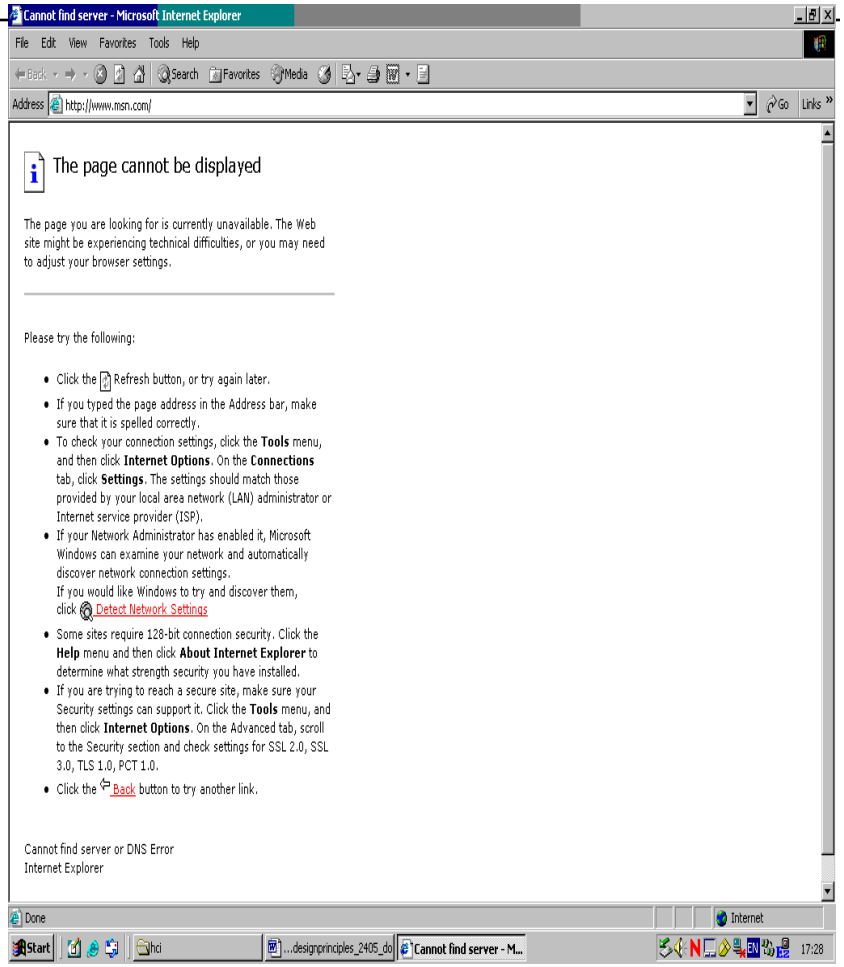
Figure 8. 11 Aesthetics in Screen Design

Table 8. 7 Aesthetic criteria of screen design

Criterion	Aesthetic rule	Example
Balance	Balance the optical weight of screen elements.	Do not place heavy (large) elements on one side of the screen and light elements on the other side.
Equilibrium	Maintain a midway center of suspension.	Place the center of the layout on the center of the screen.
Symmetry	Arrange elements so that elements on one side of the center line are replicated on the other side.	Background colors gradually fade off similarly in upper and lower parts of the screen.
Order	Order elements to correspond with hierarchy of perceptual prominence.	Order from left to right the bigger objects on the screen.
Consistent ratios	Maintain a consistent ratio between height and width.	If the overall frame is wider than higher, arrange the elements to follow this ratio.
Unity	Attempt coherence of the layout by keeping elements in relative proximity.	Arrange elements in closer proximity one to another than distance to frame.
Alignment	Align elements horizontally and vertically.	Three text boxes roughly of the same size but misaligned are usually disturbing to the eye.
Density	Optimize the occupied areas of the screen.	Leaving about half of the screen area as white space is pleasing to the eye.
Rhythm	Introduce regular patterns of changes in the elements.	Two moving elements on the screen should move at the same pace.

Design Guidelines:
Issue V – Aesthetics in Screen Design

Is this page aesthetically pleasing?



Summary

- Design Principles
  - Improve users' task performance and reduce their effort.
  - Strive for fit between the information representation needed and presented.
  - Direct and constrain user affordances to capture real-world knowledge.
  - Design for error.
  - Enable an enjoyable and satisfying interaction.
  - Promote trust.
  - Support diversity of users.

Summary

- Design Guidelines
  - Maintain consistent interaction.
  - Provide the user with control over the interaction, supported by feedback.
  - Use metaphors.
  - Use direct manipulation.
  - Design aesthetic interfaces.