User interface design

Easy to learn?

Easy to use?

Easy to understand?

User interface design

- Designing effective interfaces for software systems
- Objectives
  - To suggest some general design principles for user interface design
  - To explain different interaction styles
  - To introduce styles of information presentation
  - To introduce usability attributes and system approaches to system evaluation

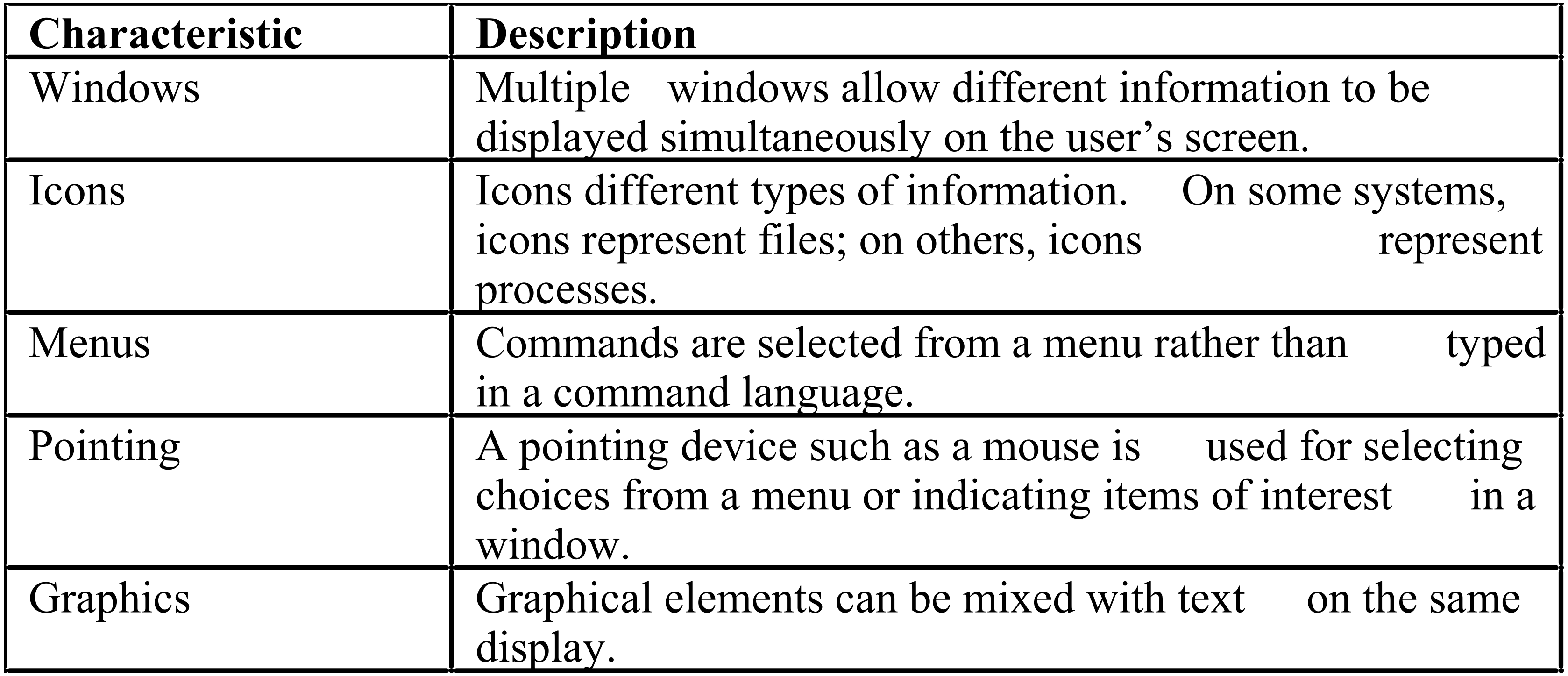
Golden Rules

- Place the user in control
- Reduce the user’s memory load
- Make the interface consistent

The user interface

- System users often judge a system by its interface rather than its functionality
- A poorly designed interface can cause a user to make catastrophic errors
- Poor user interface design is the reason why so many software systems are never used
- Most users of business systems interact with these systems through graphical user interfaces (GUIs)
- In some cases, legacy text-based interfaces are still used

GUI characteristics

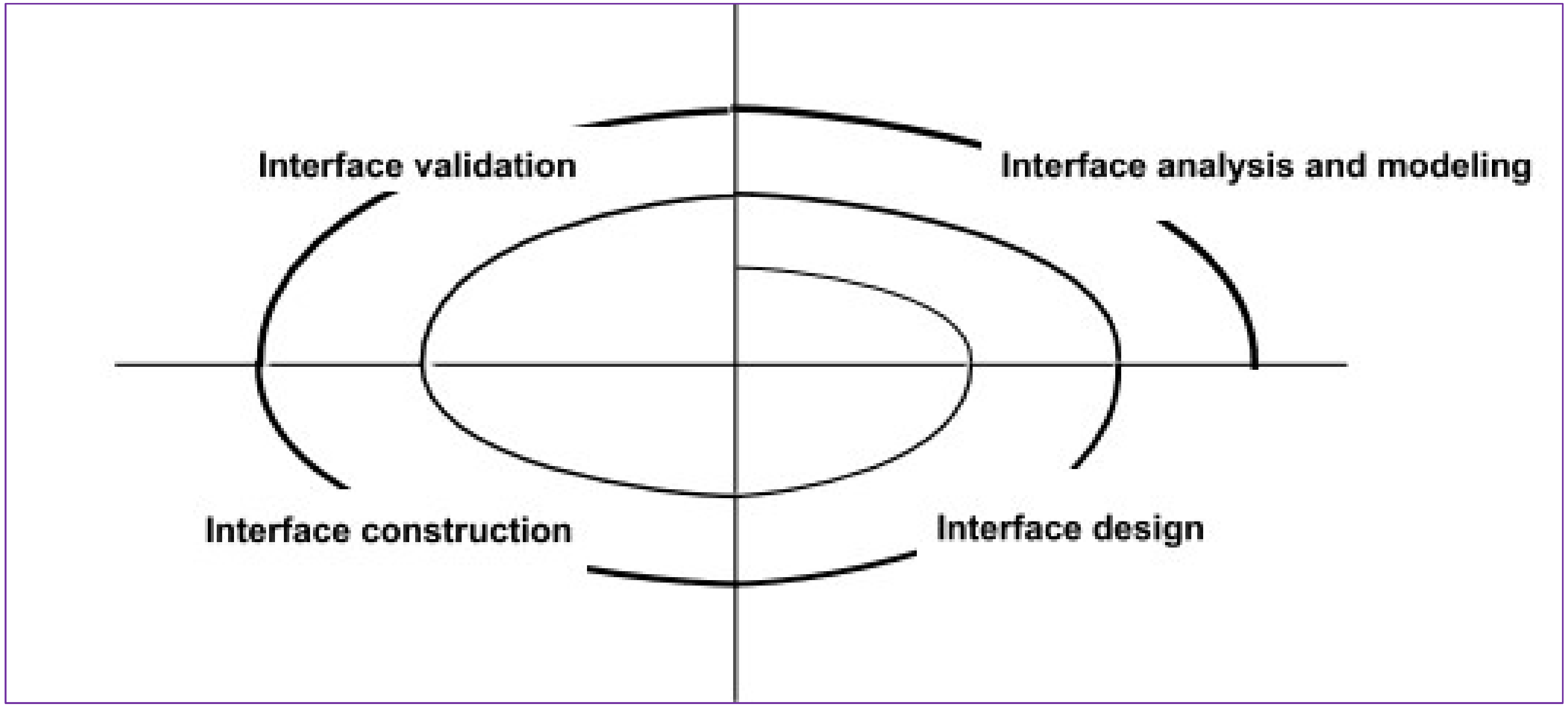


Characteristic	Description
Windows	Multiple windows allow different information to be displayed simultaneously on the user's screen.
Icons	Icons different types of information. On some systems, icons represent files; on others, icons represent processes.
Menus	Commands are selected from a menu rather than typed in a command language.
Pointing	A pointing device such as a mouse is used for selecting choices from a menu or indicating items of interest in a window.
Graphics	Graphical elements can be mixed with text on the same display.

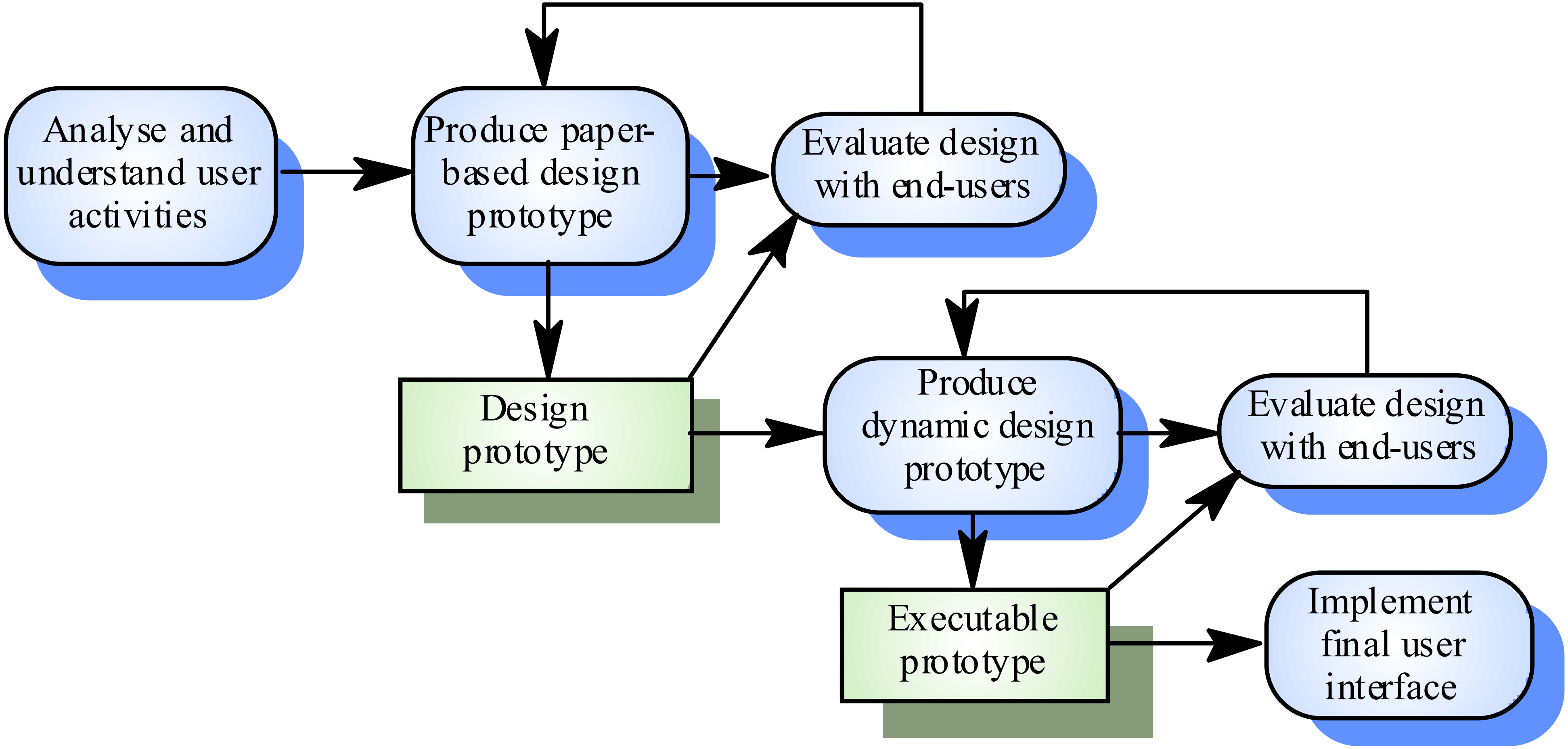
GUI advantages

- They are easy to learn and use.
    - Users without experience can learn to use the system quickly.
- The user may switch quickly from one task to another and can interact with several different applications.
    - Information remains visible in its own window when attention is switched.
- Fast, full-screen interaction is possible with immediate access to anywhere on the screen

User Interface Design Process



User interface design process


Analyse and understand user activities
Produce paper-based design prototype
Evaluate design with end-users
Design prototype
Produce dynamic design prototype
Evaluate design with end-users
Executable prototype
Implement final user interface

UI design principles

- User familiarity
  - The interface should be based on user-oriented terms and concepts rather than computer concepts
  - E.g., an office system should use concepts such as letters, documents, folders etc. rather than directories, file identifiers, etc.
- Consistency
  - The system should display an appropriate level of consistency
  - Commands and menus should have the same format, command punctuation should be similar, etc.
- Minimal surprise
  - If a command operates in a known way, the user should be able to predict the operation of comparable commands

UI design principles (cont.)

- Recoverability
  - The system should provide some resilience to user errors and allow the user to recover from errors
  - This might include an undo facility, confirmation of destructive actions, 'soft' deletes, etc.
- User guidance
  - Some user guidance such as help systems, on-line manuals, etc. should be supplied
- User diversity
  - Interaction facilities for different types of user should be supported
  - E.g., some users have seeing difficulties and so larger text should be available

User-system interaction

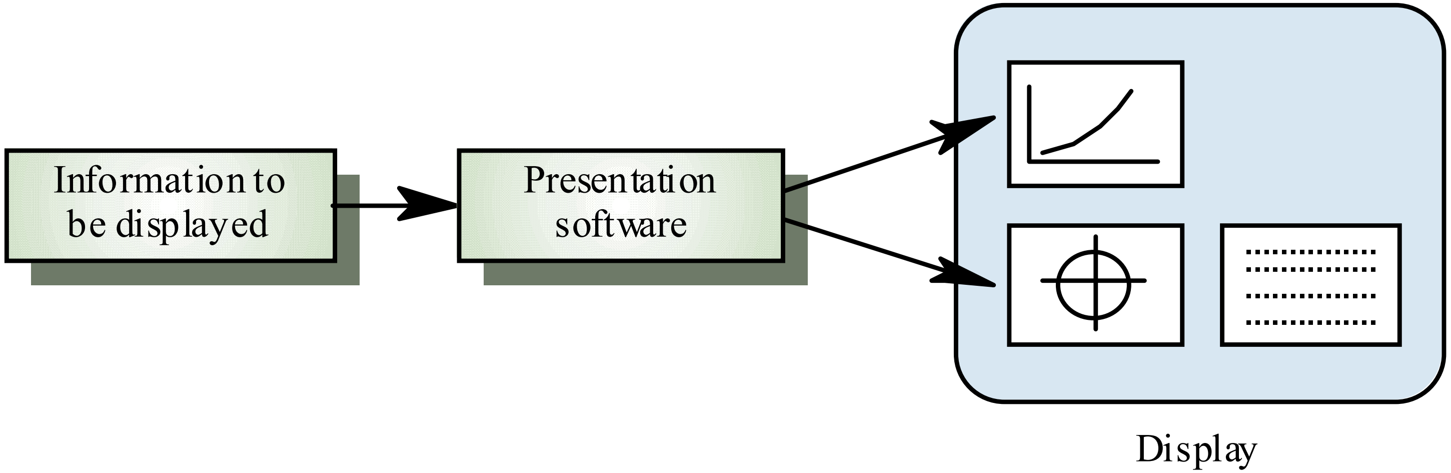
- Two problems must be addressed in interactive systems design
  - How should information from the user be provided to the computer system?
  - How should information from the computer system be presented to the user?
- User interaction and information presentation may be integrated through a coherent framework such as a user interface metaphor

Interaction styles

- Direct manipulation
  - Easiest to grasp with immediate feedback
  - Difficult to program
- Menu selection
  - User effort and errors minimized
  - Large numbers and combinations of choices a problem
- Form fill-in
  - Ease of use, simple data entry
  - Tedious, takes a lot of screen space
- Command language
  - Easy to program and process
  - Difficult to master for casual users
- Natural language
  - Great for casual users
  - Tedious for expert users

Information presentation

- Information presentation is concerned with presenting system information to system users
- The information may be presented directly or may be transformed in some way for presentation
- The Model-View-Controller approach is a way of supporting multiple presentations of data



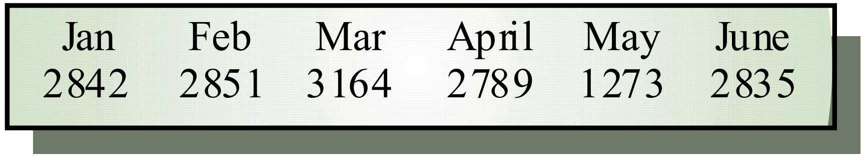
Information display factors

- Is the user interested in precise information or data relationships?
- How quickly do information values change? Must the change be indicated immediately?
- Must the user take some action in response to a change?
- Is there a direct manipulation interface?
- Is the information textual or numeric? Are relative values important?

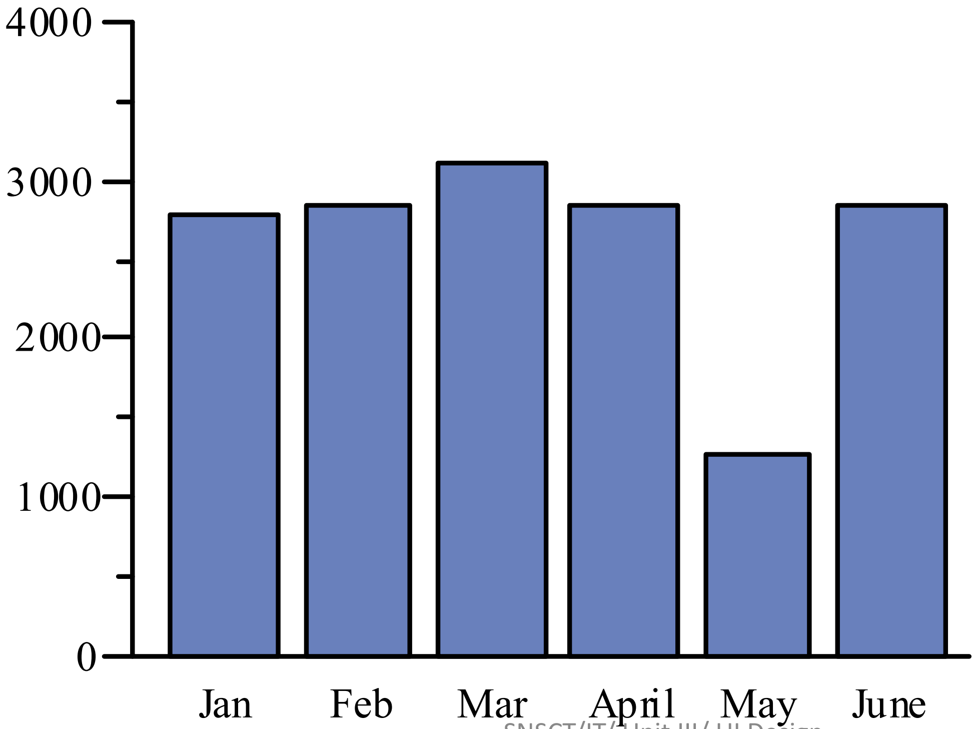
Analog vs. digital presentation

- Digital presentation
  - Compact - takes up little screen space
  - Precise values can be communicated
- Analog presentation
  - Easier to get an 'at a glance' impression of a value
  - Possible to show relative values
  - Easier to see exceptional data values

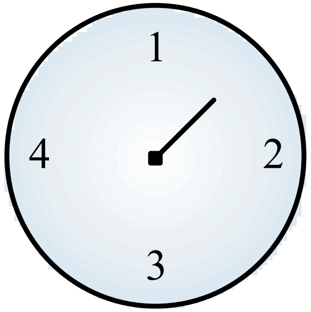
Alternative information presentations



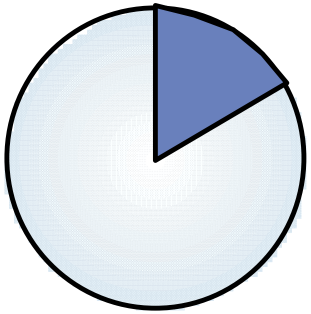
Jan	Feb	Mar	April	May	June
2842	2851	3164	2789	1273	2835



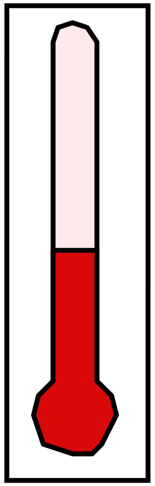
Information display



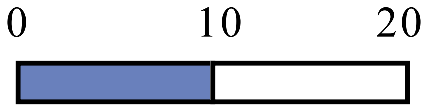
Dial with needle



Pie chart

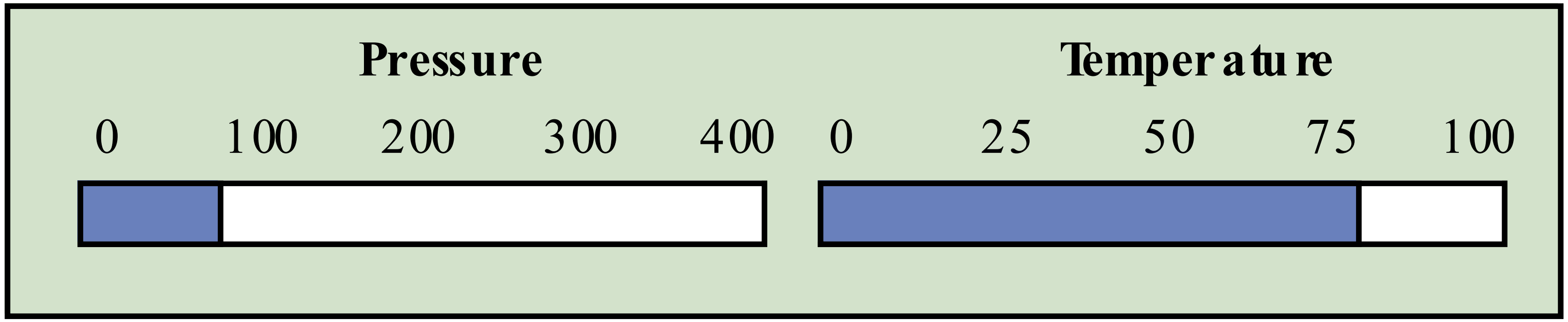


Thermometer

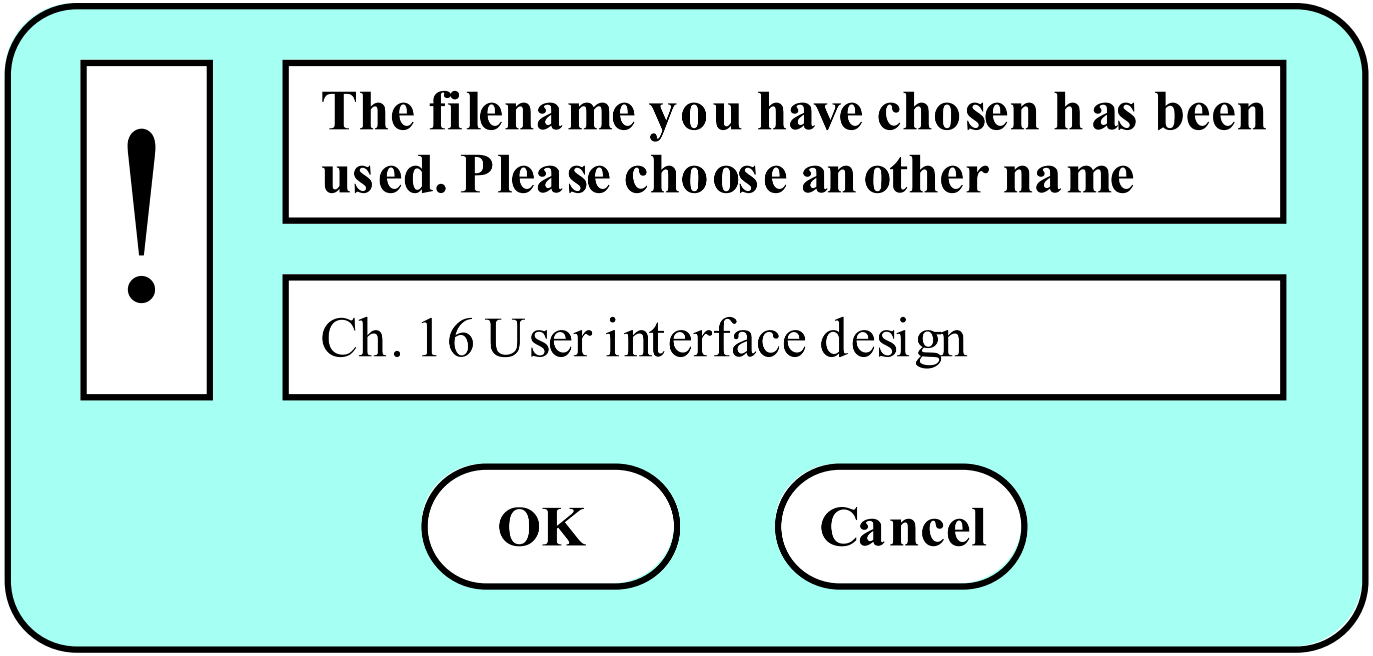


Horizontal bar

Displaying relative values



Textual highlighting



The filename you have chosen has been used. Please choose another name

Ch. 16 User interface design

Data visualisation

- Concerned with techniques for displaying large amounts of information
- Visualisation can reveal relationships between entities and trends in the data
- Possible data visualisations are:
    - Weather information
    - State of a telephone network
    - Chemical plant pressures and temperatures
    - A model of a molecule
    - Hyperweb

Colour displays

- Colour adds an extra dimension to an interface and can help the user understand complex information structures
- Can be used to highlight exceptional events
- What are some common mistakes in the use of colour?
  - The use of colour to communicate meaning
  - Over-use of colour in the display

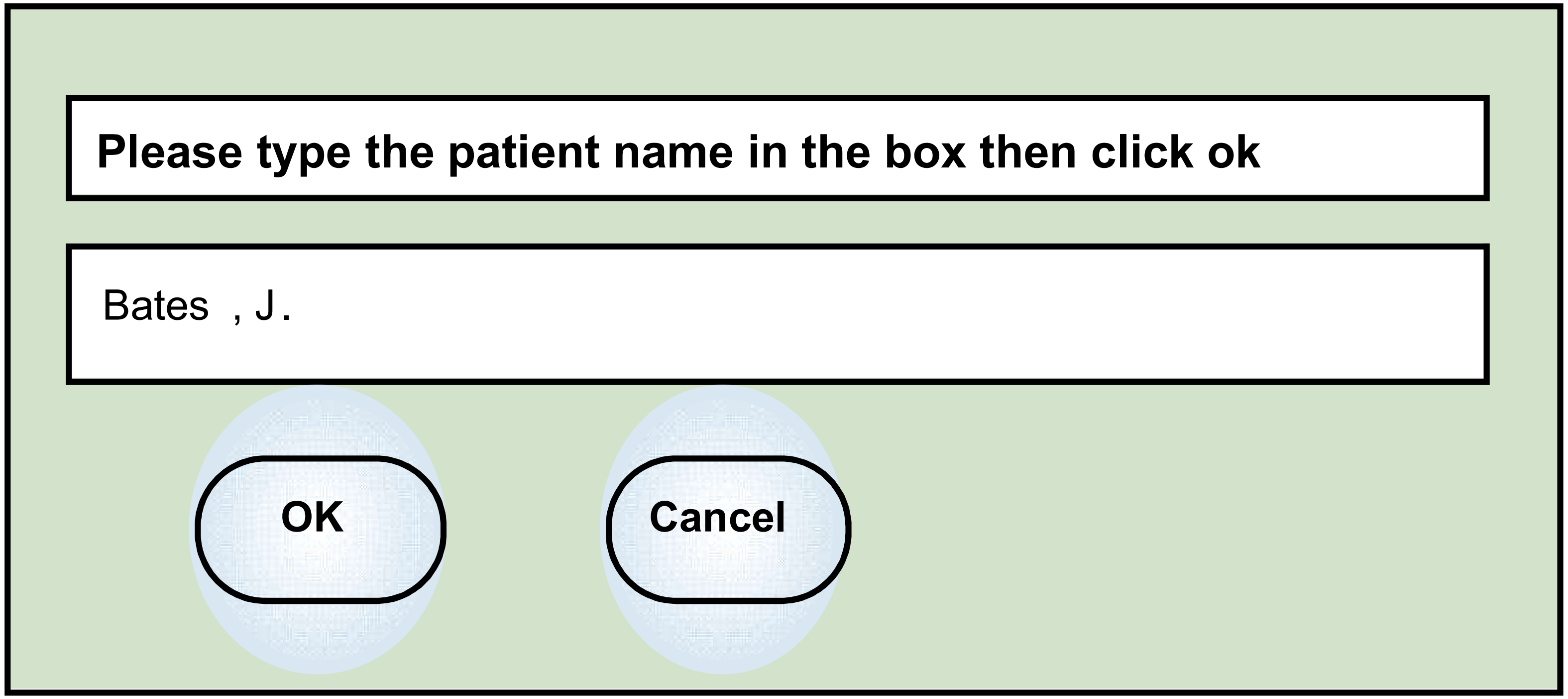
Colour use guidelines

- Don't use too many colours
- Use colour coding to support use tasks
- Allow users to control colour coding
- Design for monochrome then add colour
- Use colour coding consistently
- Avoid colour pairings which clash
- Use colour change to show status change
- Be aware that colour displays are usually lower resolution

Error messages

- Error message design is critically important. Poor error messages can mean that a user rejects rather than accepts a system
- Messages should be polite, concise, consistent and constructive
- The background and experience of users should be the determining factor in message
  design

Nurse input of a patient’s name

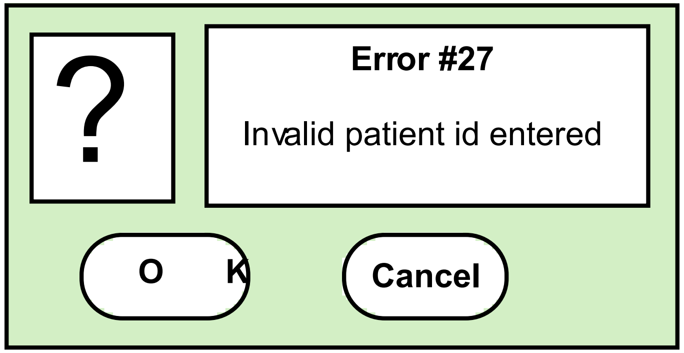


Please type the patient name in the box then click ok

Bates , J.

System and user-oriented error messages

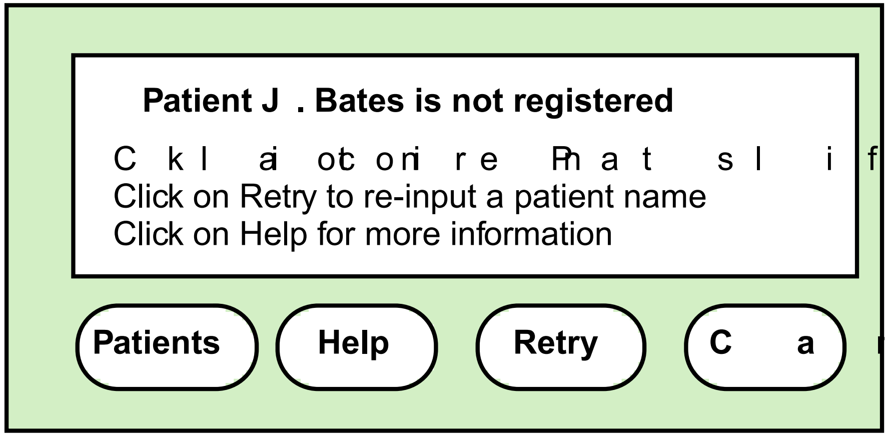
System-oriented error message



Error #27

Invalid patient id entered

User-oriented error message



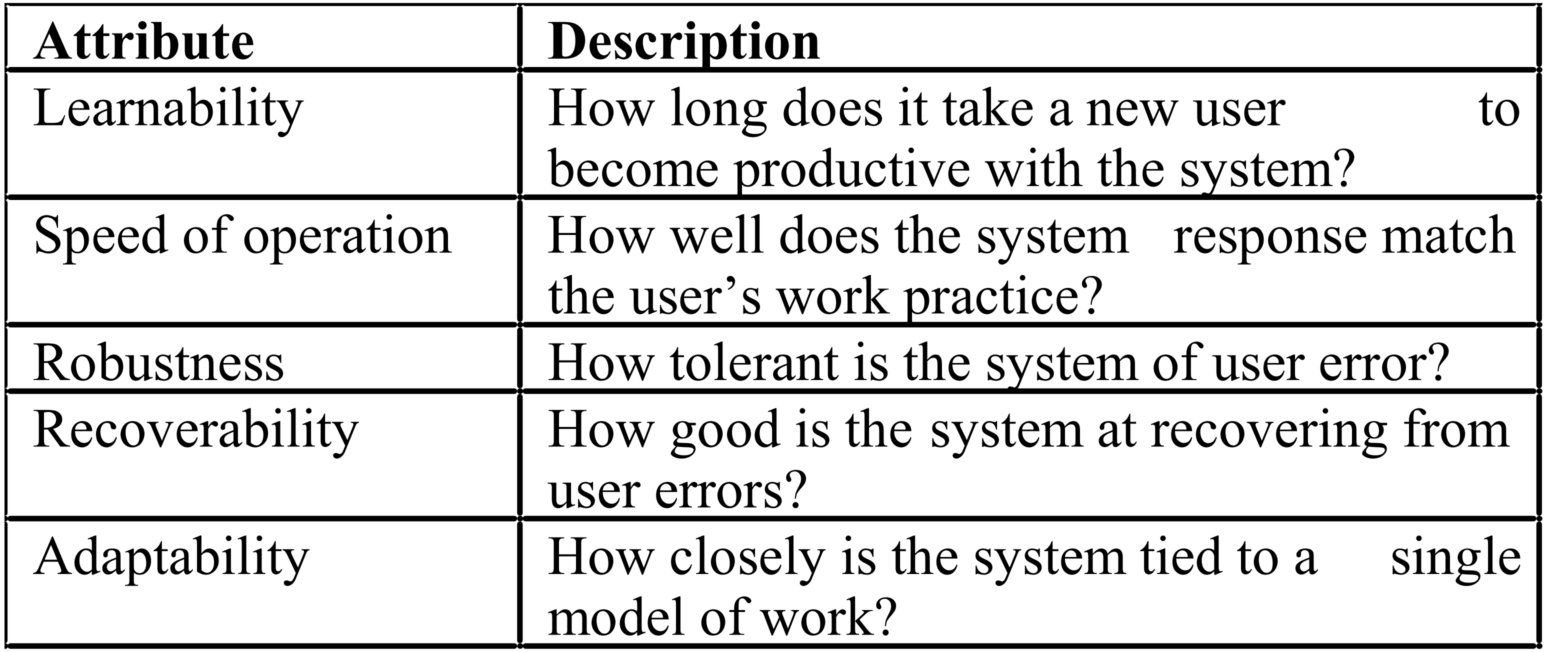
Patient J . Bates is not registered

C k l ai otc oni r e Pha t s l i f
Click on Retry to re-input a patient name
Click on Help for more information

User interface evaluation

- Some evaluation of a user interface design should be carried out to assess its suitability
- Full scale evaluation is very expensive and impractical for most systems
- Ideally, an interface should be evaluated against a usability specification
- However, it is rare for such specifications to be produced

Usability attributes



Attribute	Description
Learnability	How long does it take a new user to become productive with the system?
Speed of operation	How well does the system response match the user’s work practice?
Robustness	How tolerant is the system of user error?
Recoverability	How good is the system at recovering from user errors?
Adaptability	How closely is the system tied to a single model of work?

Simple evaluation techniques

- Questionnaires for user feedback
- Video recording of system use and subsequent tape evaluation.
- Instrumentation of code to collect information about facility use and user errors.
- The provision of a “gripe” button for on-line user feedback.

Key points

- Interface design should be user-centred. An interface should be logical and consistent and help users recover from errors
- Interaction styles include direct manipulation, menu systems form fill-in, command languages, and natural language
- Graphical displays should be used to present trends and approximate values. Digital displays when precision is required
- Colour should be used sparingly and consistently

Key points

- Ideally, a user interface should be evaluated against a usability specification
- What about help for the user?
  - Systems should provide on-line help. This should include “help, I’m in trouble” and “help, I want information”
  - A range of different types of user documents should be provided