Unit 3 Graphical User Interface – II

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3.1 Introduction

In the previous unit you learnt about the popularity of graphics and the concept of direct manipulation.In this unit you are going to learn about graphical systems, principles of GUI and popularity of web user interface along with its characteristics.

Successful GUIs share many common characteristics. Most importantly, good GUIs are more natural than their character-based counterparts. One way to achieve this is to use real-world metaphors whenever possible. Let us understand the principles of graphical systems that will make GUI successful.

Objectives

After studying this unit, you should be able to:

- discuss on graphical systems
- describe the principles of graphical user interface
- explain the popularity and characteristic of Web user interface.

3.2 Graphical Systems

Competing in today's global economy requires companies to rapidly enter the market with innovative products that offer increased functionality and operate flawlessly graphical system design meets this need by providing a unified platform for designing, prototyping, and deploying applications. This platform empowers engineers to integrate real-world signals sooner for earlier error detection, reuse code for maximum efficiency, benefit immediately from advances in computing technology, and optimize system performance in a way that outpaces traditional design methodologies Graphical systems is one such systems which is different from traditional methods.

Let’s now discuss various advantages and disadvantages of graphical systems.

Advantages:

The following lines list the advantages of Graphical Systems:

1. Reduce the memory requirements.
2. Reduce system learning requirements Symbols recognized faster than text
3. Faster learning
4. Faster use and problem solving
5. Easier remembering
6. More natural
7. Exploit visual/spatial cues
8. Foster more concrete thinking
9. Provide context
10. Fewer errors
11. Increased feeling of control
12. Immediate feedback
13. Predictable system responses
14. Easily reversible actions
15. Less anxiety concerning use
16. More attractive
17. May consume less space
18. Replace national languages
19. Easily augmented with text displays
20. Smooth transition from command language system

Disadvantages:

The following lines list the disadvantages of Graphical Systems:

1. Greater design complexity:
2. Learning still necessary
3. Replace national languages

4. Easily augmented with text displays
5. Smooth transition from command language system
6. Lack of experimentally-derived design guidelines
7. Use of a pointing device may also have to be learned
8. Working domain is the present
9. Human comprehension limitations
10. Window manipulation requirements
11. Production limitations
12. Few tested icons exist
13. Inefficient for touch typists
14. Inefficient for expert users
15. Not always the preferred style of interaction
16. Not always fastest style of interaction
17. Increased chances of clutter and confusion
18. May consume more screen space
19. Hardware limitations

Typically, the user interacts with information by manipulating visual widgets that allow for interactions appropriate to the kind of data they hold. The widgets of a well-designed interface are selected to support the actions necessary to achieve the goals of the user. A Model-view-controller allows for a flexible structure in which the interface is independent from and indirectly linked to application functionality, so the GUI can be easily customized. This allows the user to select or design a different skin at will, and eases the designer's work to change the interface as the user needs evolve. Nevertheless, good user interface design relates to the user, not the system architecture.

The visible graphical interface features of an application are sometimes referred to as "chrome". Larger widgets, such as windows, usually provide a frame or container for the main presentation content such as a web page, email message or drawing. Smaller ones usually act as a user-input tool.

A GUI may be designed for the rigorous requirements of a vertical market. This is known as an "application specific graphical user interface." Among early application specific GUIs was Gene Mosher's 1986 Point of Sale touchscreen GUI. Other examples of an **application specific GUIs are:**

- Self-service checkouts used in a retail store.
- Automated teller machines (ATM).
- Airline self-ticketing and check-in.
- Information kiosks in a public space, like a train station or a museum.
- Monitors or control screens in an embedded industrial application which employ a real time operating system (RTOS).

The latest cell phones and handheld game systems also employ application specific touchscreen GUIs. Newer automobiles use GUIs in their navigation systems and touch screen multimedia centers.

Successful GUIs share many common characteristics. Most importantly, good GUIs are more intuitive than their character-based counterparts. One way to achieve this is to use real-world metaphors whenever possible. For example, an application recently examined used bitmaps of the Visa and MasterCard logos on buttons that identified how a customer was going to pay. This graphical representation was immediately intuitive to users and helped them learn the application faster. Another important characteristic of good GUIs is speed, or more specifically, responsiveness. Many speed issues are handled via the design of the GUI, not the hardware.

Depending on the type of application, speed can be the make-or-break factor in determining an application's acceptance in the user community. For example, if your application is oriented toward online transaction processing (OLTP), slow performance will quickly result in users wanting to abandon the system. You can give a GUI the appearance of speed in several ways. Avoid repainting the screen unless it is absolutely necessary. Another method is to have the entire field validations occur on a whole-screen basis, instead of on a field-by-field basis. Also, depending upon the skills of the user, it may be possible to design features into a GUI that give the power user the capability to enter each field of each data record rapidly. Such features include mnemonics, accelerator keys, and toolbar buttons with meaningful icons, all of which allow the speed user to control the GUI and rate of data entry.

Self Assessment Questions

1. Which of the following is NOT the advantage of graphical system?
   1. Faster learning
   2. Faster use and problem solving

   3. Easier remembering
   4. Replace national languages
2. One of the limitations in Graphical systems is the Hardware requirement. (True/False)

3.3 Principles of Graphical User Interface

Graphical user interfaces (GUIs) have become the user interface of choice. Yet despite the GUI's popularity, surprisingly few programs exhibit good interface design. Moreover, finding information explaining what constitutes a good and intuitive interface is exceedingly difficult. This section, describe the basic rules for all good interfaces – the cardinal do's and don'ts.

However, before starting in on what constitutes good design, let us know the causes of bad design. This way, if you are tempted to deviate from the tried and true, you'll know where the wrong path leads and, get back to good design.

Design Mistake 1 – Forgetting the User: Developers often design for what they know, not what the user knows. This age-old problem occurs in many other areas of software development, such as testing, documentation, and the like. It is even more pernicious in the interface because it immediately makes the user feel incapable of using the product. Avoid this error diligently.

Design Mistake 2 – Failing to Give the User Control: The GUI designer's predilection for control is evident in applications that continually attempt to control user navigation by graying and blackening menu items or controls within an application. Controlling the user is completely contradictory to event-driven design in which the user, rather than the software, dictates what events occur. As a developer, if you are spending a lot of time dynamically graying and blackening controls, you need to re-examine your design approach and realize that you may be controlling the user, who may not want to be controlled. As business changes at a faster pace, flexibility in user interfaces will become a key enabler for change. Allowing the user to access the application in ways that you never dreamed can be scary, but satisfying, for you as a developer and empowering for the user.

Design Mistake 3 – Providing Too Many Features at the Top Level: Examine a VCR built in 1985, and then examine one built in 1995. You will see a startling difference in the interface of the two models. The model built in 1985 will have an abundance of buttons readily available on the faceplate of the unit, many of which will remain a mystery since the manual was lost years ago. The 1995 model will have only a few buttons for the key features that people use: play, fast forward, reverse, stop, and eject. The newer model will probably have even more features than the model built a decade before, yet the features will be cleverly tucked away behind a drop-down panel or sliding door, accessible when needed but not staring the user in the face.

Likewise, you should ensure that features used frequently in an application are readily available. Avoid the temptation to put everything on the first screen or load the toolbar with rarely used buttons. Do the extra analysis necessary to find out which features can go behind the panel instead of on the faceplate.

Every good developer should have the goal of designing the best GUIs possible. But how does a developer make this goal a reality? By following sound, proven GUI design principles such as those listed below.

Design Principle 1 – Understand People: Applications must reflect the perspectives and behaviors of their users. To understand users fully, developers must first understand people because we all share common characteristics. People learn more easily by recognition than by recall. Always attempt to provide a list of data values from which the user can select, rather than having the user key in values from memory. The average person can recall about 2,000 to 3,000 words, yet can recognize more than 50,000 words.

Design Principle 2 – Be Careful of Different Perspectives: Many designers unwittingly fall into the perspective trap when it comes to icon design or the overall behavior of the application. I recently saw an icon designed to signify "Rolled Up" totals for an accounting system. To show this function, the designer put a lot of artistic effort into creating an icon resembling a cinnamon roll. Unfortunately, the users of the system had no idea what metaphor the icon was supposed to represent even though it was perfectly intuitive from the designer's perspective. A reserved icons table containing standard approved icons, such as the one shown in Table 3.1, will help eliminate these problems.

Table 3.1: Reserved Icons

Meaning and Behavior	**Used to Identify an Application**	**Used to Identify a Function**	**Reserved Word Text Label**
Information message	No	Yes (identifies an information message box)	None
Warning message	No	Yes (identifies a warning message box)	None
Question message	No	Yes (identifies a question message box)	None
Error message	No	Yes (identifies an error message box)	None

Design Principle 3 – Design for Clarity: GUI applications often are not clear to end users. One effective way to increase the clarity of an application is to develop and use a list of reserved words. A common complaint among users is that certain terms are not clear or consistent. When the application is released, one screen may say "Item," while the next screen says "Product," and a third says "Merchandise", when all three terms denote the same thing. This lack of consistency ultimately leads to confusion and frustration for users. Table 3.2 gives an example of a list of reserved words. An application development group might complete and expand the table with additional reserved words.

Table 3.2: List of Reserved Words

Text	**Meaning And Behavior**	**Appears on Button**	**Appears on Menu**	**Mnemonic Keystrokes**	**Shortcut Keystrokes**
OK	Accept the data entered or acknowledge the information presented and remove the window	Yes	No	None	Return or Enter

Cancel	Do not accept the data entered and remove the window	Yes	No	None	Esc
Close	Close the current task and continue working with the application; close the view of the data	Yes	Yes	Alt+C	None
Exit	Quit the application	No	Yes	Alt+X	Alt+F4
Help	Invoke the application's help facility	Yes	Yes	Alt+H	F1
Save	Save the data entered and stay in the current window	Yes	Yes	Alt+S	Shift+F12
Save As	Save the data with a new name	No	Yes	Alt+A	F12
Undo	Undo the latest action	No	Yes	Alt+U	Ctrl+Z
Cut	Cut the highlighted information	No	Yes	Alt+T	Ctrl+X
Copy	Copy highlighted information	No	Yes	Alt+C	Ctrl+C
Paste	Paste the copied or cut information at the insertion point	No	Yes	Alt+P	Ctrl+V

Design Principle 4 – Design for Consistency: Good GUIs use consistent behavior throughout the application and build upon a user's prior knowledge of other successful applications. When writing software for business applications, provide the user with as many consistent behaviors as possible. Each new and exciting experience you provide in the software can become an anxiety-inducing experience or an expensive call to your help desk.

Design Principle 5 – Provide Visual Feedback: If you've ever found yourself mindlessly staring at the hourglass on your terminal while waiting for an operation to finish, you know the frustration of poor visual feedback. As a general rule, most users like to have a message dialog box with a progress indicator displayed when operations are going to take longer than seven to ten seconds. This number is highly variable based on the type of user and overall characteristics of the application.

Design Principle 6 – Be Careful with Audible Feedback: audible feedback can be useful in cases where you need to warn the user of an impending serious problem, such as one in which proceeding further could cause loss of data or software. Allow users to disable audio feedback, except in cases when an error must be addressed.

Design Principle 7 – Keep Text Clear: Developers often try to make textual feedback clear by adding a lot of words. However, they ultimately make the message less clear. Concise wording of text labels, user error messages, and one-line help messages is challenging. Textual feedback can be handled most effectively by assigning these tasks to experienced technical writers.

Design Principle 8 – Provide Traceable Paths: If your users ever say something akin to, "I don't know how I got to this window, and now that I'm here, I don't know how to get out," then you have not provided a traceable (or, in this case, retraceable) path. Providing a traceable path is harder than it sounds. It starts with an intuitive menu structure from which to launch your specific features. You must also identify areas where you can flatten the menu structure and avoid more than two levels of cascading menus. Providing a descriptive title bar within each dialog box greatly helps to remind users what menu items or buttons were pressed to bring them to the window now in focus.

Design Principle 9 – Provide Keyboard Support: Keyboards are a common fixture on users' desktops and provide an efficient means to enter text and data. With the introduction of GUI applications, we often assume users will embrace a mouse as the primary interactive device. Using a mouse can become time-consuming and inefficient for the touch typist or frequent users of an application. Keyboard accelerators can provide an efficient way for users to access specific menu items or controls in a window. The accelerators used should be easy to access and limited to one or two keys (such as F3 or Ctrl-P). Keyboards have limitations in the GUI world, such as when trying to implement direct-manipulation tasks like drag and drop, pointing, and re-sizing. In contrast, you will always find a smaller set of users who are not touch typists and hence embrace the mouse as a point-and-click nirvana. The result is that you need to provide complete and equal keyboard and mouse support for all menu and window operations.

Design Principle 10 – Watch the Presentation Model: A critical aspect that ties all these facets of the interface together is the interface's look and feel. The look and feel must be consistent. On the basis of users' experiences with one screen or one dialog box, they should have some sense of how to interact with the next screen or control. Searching the interface model for good design and continuity is very important. The model should involve careful decisions, such as whether the application has a single or multiple document interfaces. The model also will validate how users perform the main tasks within the application. Identifying the appropriate presentation for the application greatly facilitates the subsequent windows being developed since they will have a common framework in which to reside. On the other hand, if you do not define the presentation model early in the design of your GUI, late changes to the look and feel of the application will be much more costly and time-consuming because nearly every window may be affected.

Design Principle 11 – Use Modal vs. Modeless Dialogs Appropriately: When we need input from the user, we often use a modal dialog box. Using modal dialogs has long been shunned by many developers as too constraining on the user. However, modal dialogs do have many uses in complex applications since most people only work on one window at a time. Try to use modal dialogs when a finite task exists. For tasks with no fixed duration, modeless dialogs are normally the preferable choice with a major caveat: Try to keep the user working in no more than three modeless windows at any one time. Go beyond this magical number and the support-desk phones will start ringing, as users spend their time managing the open windows rather than concentrating on their tasks. Use the table 3.3 to determine the appropriate use of dialog boxes and windows.

Table 3.3: When to Use Dialog Boxes or Windows

Type	**Description**	**Use**	**Example**
Modal	Dialog box	Presentation of a finite task	File Open dialog box, Save As dialog box
Modeless	Dialog box	Presentation of an ongoing task	Search dialog box, History List dialog box, Task List dialog box
Application window	Window frame with document (child) windows contained within	Presentation of multiple instances of an object, Comparison of data within two or more windows	Word processor, Spreadsheet
Document window	Modeless dialog box or document window contained within and managed by the application window	Presentation of multiple parts of an application	Multiple views of data (sheets)
Secondary window	Primary window of a secondary application	Presentation of another application called from the parent window	Help window in an application

Design Principle 12 – Use controls correctly: Controls are the visual elements that let the user interact with the application. GUI designers are faced with an unending array of controls from which to choose. Each new control brings with it expected behaviors and characteristics. Use the table 3.4 as a guideline for control usage in your screens.

Table 3.4: Guidelines for Using Controls

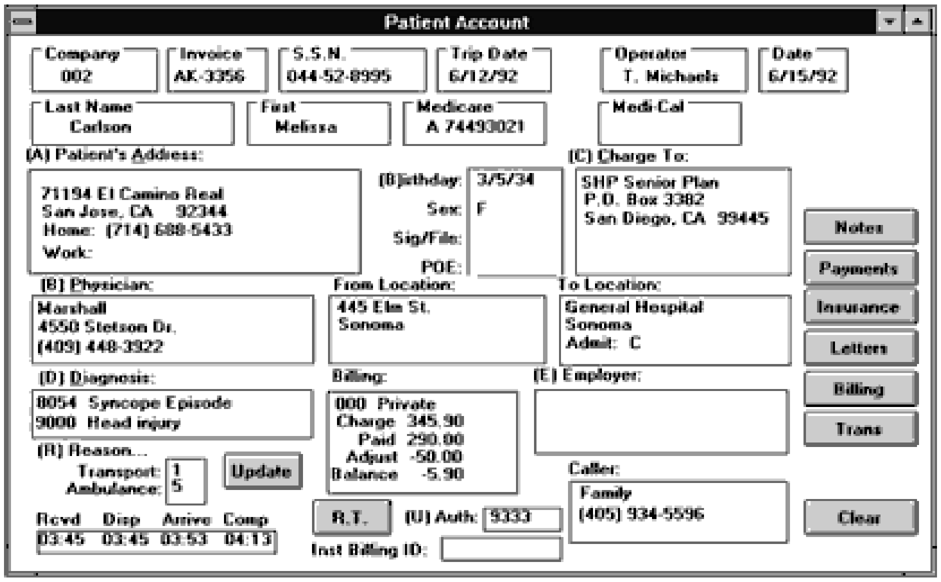
Control	**Number of Choices in the Domain Shown**	**Type of Control**
Menu bar	Maximum of 10 items	Static action
Pull-down menu	Maximum of 12 items	Static action
Cascading menu	Maximum of 5 items, 1 cascade deep	Static action
Pop-up menu	Maximum of 10 items	Static action
Push button	1 for each button, maximum of 6 per dialog box	Static action
Check box	1 for each box, maximum of 10 to 12 per group	Static set/select value
Radio button	1 for each button, maximum of 6 per group box	Static set/select value
List box	Maximum of 50 in the list, display 8 to 10 rows	Dynamic set/select value
Drop-down list box	Display 1 selection in the control at a time, up to 20 in a drop-down box	Dynamic set/select single value
Combination list box	Display 1 selection in the control at a time in standard format, up to 20 in a drop-down box	Dynamic set/select single value; add a value to the list
Spin button	Maximum of 10 values	Static set/select value
Slider	Dependent on the data displayed	Static set/select value in range

Finally, try to keep the basic behavior and placement of these controls consistent throughout your application. As soon as you change the behavior of these basic controls, your user will feel lost. Make changes thoughtfully and apply the changes consistently.

Applying design principles, understanding the principles behind good GUI design and applying them to your applications can be a challenge. Let's examine an application to see how these principles can result in an improved interface.

Part 1: Exploring a GUI in Need of Redesign

The interface in Figure 3.1 is used by an ambulance-dispatching company to maintain customer data, provide billing information, and dispatch ambulances. The application was a port from a character-based system and contains several design errors that affect the user's performance with this mission-critical application. Keep in mind that GUI ease of use and clarity is especially important in a critical application such as this where the rapid handling of a request can make the difference between life and death. Here is what is wrong with this screen:



Company: 002
Invoice: AK-3356
S.S.N.: 044-52-8995
Trip Date: 6/12/92
Operator: T. Michaels
Date: 6/15/92
Last Name: Carlson
First: Melissa
Medicare: A 74493021
Medi-Cal:

(A) Patient's Address:
71194 El Camino Real
San Jose, CA 92344
Home: (714) 688-5433
Work:

(B)irthday: 3/5/34
Sex: F
Sig/File:
POE:

(C) Charge To:
SHP Senior Plan
P.O. Box 3382
San Diego, CA 99445

(B) Physician:
Marshall
4550 Stetson Dr.
(409) 448-3922

From Location:
445 Elm St.
Sonoma

To Location:
General Hospital
Sonoma
Admit: C

(D) Diagnosis:
8054 Syncope Episode
9000 Head injury

Billing:
000 Private
Charge 345.90
Paid 290.00
Adjust -50.00
Balance -5.90

(E) Employer:

(R) Reason...
Transport: 1
Ambulance: 5

Caller:
Family
(405) 934-5596

Rcvd	Disp	Arrive	Comp
03:45	03:45	03:53	04:13

(U) Auth: 9333
Inst Billing ID:

Fig. 3.1: Exploring a GUI in Need of Redesign

Too many functions at the top level. The users requested that the new application provide all of the information at their fingertips. This results in the screen being used for both customer maintenance and ambulance dispatching. If you enter extensive customer information and then press the Update button, the record is updated. However, if you enter minimal customer information, such as social security number, diagnosis, from-location, and to-location, and then press the Trans button, an ambulance will be dispatched. Updating and dispatching functions need to be in separate dialog boxes.

Too many buttons. The buttons along the right should be on the application's parent window, possibly in a toolbar, but not on this child window.

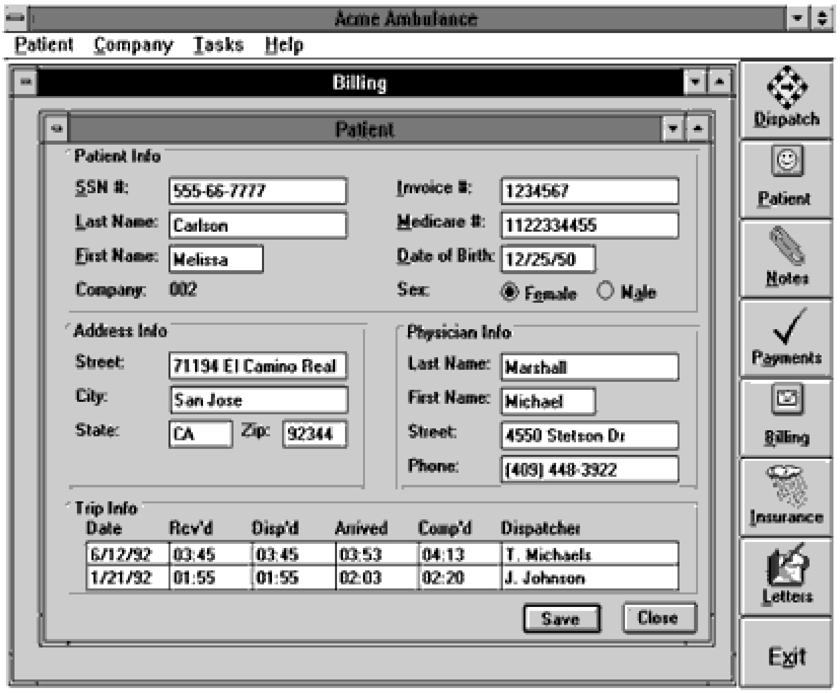
Poor navigational assistance. GUI controls should be positioned according to frequency of use. The most important field should be in the upper left; the least important field should be in the lower right. It's hard to imagine how the company and invoice number could be the most important fields when dispatching an ambulance.

Inappropriate use of controls. The designer chose to use text labels rather than group boxes to identify which groups of data would be placed in the boxes. This many group boxes with text labels in these positions makes the screen appear convoluted and makes it difficult to distinguish the data from the labels. Also, the editable fields should be identified with a box around them, so that it is intuitively obvious which fields can be changed.

Lack of symmetry. Just lining up fields, group boxes, and buttons will make this GUI much easier to use. Our brains like order, not chaos.

Part 2: Looking at an Improved Interface

Figures 3.2 and 3.3 show a much improved interface for this same application:



Patient Info

SSN #:	555-66-7777	Invoice #:	1234567
Last Name:	Carlson	Medicare #:	1122334455
First Name:	Melissa	Date of Birth:	12/25/50
Company:	002	Sex:	[✓ Female] Male

Address Info

Street:	71194 El Camino Real
City:	San Jose
State:	CA
Zip:	92344

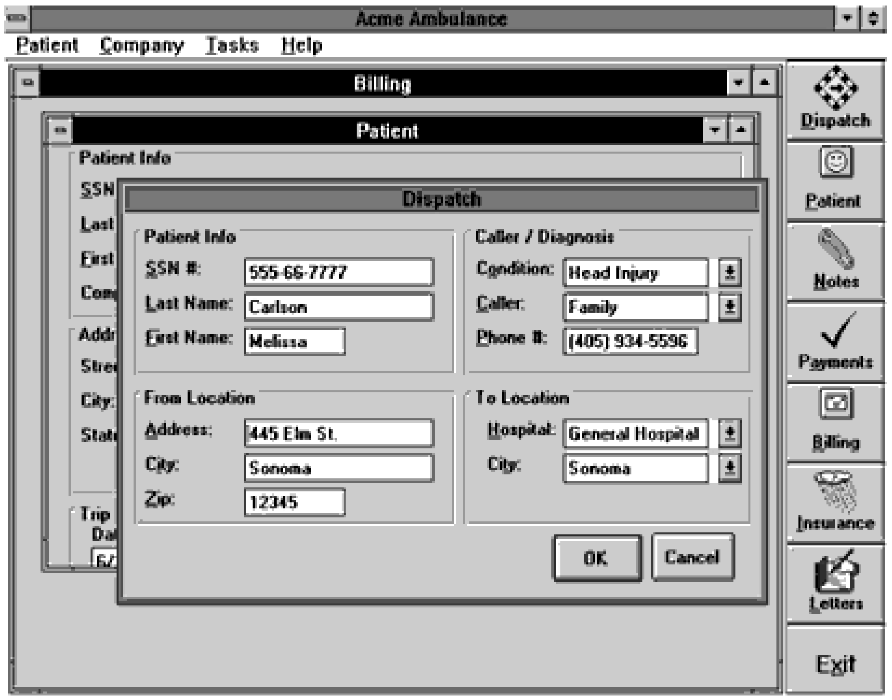
Physician Info

Last Name:	Marshall
First Name:	Michael
Street:	4550 Stetson Dr
Phone:	(409) 448-3922

Trip Info

Date	Rcv'd	Disp'd	Arrived	Comp'd	Dispatcher
6/12/92	03:45	03:45	03:53	04:13	T. Michaels
1/21/92	01:55	01:55	02:03	02:20	J. Johnson

Fig. 3.2: Improved Interface-1



SSN #:	555-66-7777
Last Name:	Carlson
First Name:	Melissa
Condition:	Head Injury
Caller:	Family
Phone #:	(405) 934-5596
Address:	445 Elm St.
City:	Sonoma
Zip:	12345
Hospital:	General Hospital
City:	Sonoma

Fig. 3.3: Improved Interface-2

Order out of chaos. This application should contain several child windows for the different tasks that a user might perform. These tasks can be accessed easily through the Tasks menu or by pushing a button on the vertical toolbar. The Dispatch button invokes a modal dialog box instead of a modeless child window. That way, you can require the user to acknowledge the completion of the dispatching task. If it were a modeless window, the user might overlay it without ever dispatching the ambulance.

Reordering input fields. The confusing order of fields has been more logically structured based on importance and frequency of use.

Improved controls. The revised interface features a consistent use of data-entry fields. Any field in which a user can enter data is surrounded by a border. Group boxes are used to group related fields together or to illustrate a domain.

These changes, suggested by the principles that we have previously discussed, make for a clean and more intuitive interface.

Implementing Effective Standards

Once you implement some good design practices into your GUI applications, how do you ensure others in your organization will do the same? The most cost-effective way to ensure consistency among your GUI applications is to implement GUI standards that are easy to use, clear, and concise. We've all experienced the "standards" manual that is energetically distributed to coworkers only to be placed immediately on the developer's shelf next to other unread manuals. To ensure that your standards do not meet this same fate, provide them in an online hypertext format. Divide your standards into rules – which must be followed or the developer will have some explaining to do – and recommendations. Developers like to know what is mandatory and where they have discretion.

Concluding the design principle section we can say that designing good GUIs is a critical skill for application developers, regardless of the GUI platform for which they are designing. Good GUI designs don't happen naturally. They require that the developer learn and apply some basic principles, including making the design something the user will enjoy working with every day. They also require that the developer get as much experience as possible in working on and being exposed to good GUI designs. Ifwe apply the principles and get some experience in good GUI design, users will have an easier time getting their jobs accomplished using the GUIs you produce for them.

Self Assessment Questions

3. Graphical user interface Applications must reflect the perspectives and behaviors of their users. (True/False).
4. Good GUIs use consistent behavior throughout the application and build upon a user's prior knowledge of other successful applications. (True/ False).
5. GUI does not require Keyboard accelerators as it is not an efficient way for users to access specific menu items or controls in a window. (True/ False).

3.4 Web User Interface

The emergence of the World Wide Web has made it possible for individuals with appropriate computer and telecommunications equipment to interact as never before. An explosion of next-generation information systems is flooding the commercial market. This cyberspace convergence of data, computers, networks, and multimedia presents exciting challenges to interface designers.

3.4.1 Popularity of the web

Although the ubiquity of the Internet and the wealth of information available through it are stunning, the user interface took a giant step backwards from the set of applications people were using before its arrival. There is very little interaction with web sites other than finding and clicking on action buttons that promise continuing good information.

Most of the user issues have to do with navigation, readability of the material presented, and impatience with long system response times. In order to make sense out of mountains of information in a web site (like the gateway to the University's store of information), designers are borrowing principles from library science, creating a field called information architecture.

In information architecture the focus is on the organization, navigation, labeling, and search systems that offer accessibility to the end. With information architecture coupled with good user interface design principles, there is hope that the users will be better able to realize what information resides in a large web site and then be able to navigate through it to find what they want. In addition to the design and organization issues are issues of motivation and trust. There are design prescriptions gleaned from empirical studies of web searching behavior that claim that if in three clicks users do not find information that at least suggests they are on the right track, they will leave the site.

This bold prescription harkens to the Card and Pirolli information-foraging theory, making explicit the effort people will expend in an information patch before moving on to another source. Also, when encountering a site for purchasing goods or for getting professional advice, people need to assess the trustworthiness of the service. Some people are reluctant to enter their credit card information or reveal their illness concerns, whereas others are unconcerned with the potential loss of privacy.

Transforming web products and services into engaging and compelling experiences takes more than a collection of pretty images and marketing spin. Strategists and designers combine a deep understanding of user psychology with sophisticated design principles to create experiences that deliver real value for both companies and their customers. A successful interactive user experience design is not ultimately about the web pages, it's about building loyal relationships between customers and brands through powerful, useful, and usable products and services.

Following are the golden rules that you as web application designers and web designers should always practice:

Early stage user testing:
Usability should be a consideration that is part of the design and building process of any website. Integrating functionality will help direct and define what the design should be. This is why conducting user testing from the very beginning of a project phase is so valuable to the end product. Great presentation is always married to functionality.

Human psychology:
How does the human mind naturally absorb, function, and interact? User interface web design must necessarily account for and reflect this consideration. Layout and design must be intuitive to user. Too often, web application designers build sites according to the structure of the platform they are using and fail to consider how the content would be most logically presented. Organizing content in a comprehensive, sensible manner is always a requisite to a positive user experience; delivery of content is an essential element of usability, especially with a robust site that has a lot to offer.

Less is more:
Contrary to popular belief, good interface web design practices won't give the user too many options. It's the job of the designer to define the scope of the user's focus. Giving website content a hierarchical structure can help to do this, with visual clues and centralized navigation. U.I. Will help you build only what user's need-- this makes easier for you to create and for the user to navigate.

Self Assessment Questions

7. What are the components of Cyberspace?

____

8. ________ has made it possible for individuals with appropriate computer and telecommunications equipment to interact as never before.

3.5 Summary

This unit has provided you an overview of graphical systems, principles of GUI, web user interface-its popularity and characteristics. Let's summaries the important points covered in this unit:

- Graphical system design provides a unified platform for designing, prototyping, and deploying applications. This platform empowers engineers to integrate real-world signals sooner for earlier error detection, reuse code for maximum efficiency, benefit immediately from advances in computing technology, and optimize system performance in a way that outpaces traditional design methodologies. Every good developer should have the goal of designing the best GUIs possible.
- The emergence of the World Wide Web has made it possible for individuals with appropriate computer and telecommunications equipment to interact as never before. This cyberspace convergence of data, computers, networks, and multimedia presents exciting challenges to interface designers.

3.6 Terminal Questions

1. What are the advantages of graphical system?
2. Briefly describe the causes of bad GUI design.
3. What are the principles of a good GUI design?

3.7 Answers

Self Assessment Questions

1. d) Replace national languages
2. True
3. True
4. True
5. False
6. data, computers, networks, and multimedia
7. World Wide Web

Terminal Questions

1. Some of the advantages and disadvantages are

   Advantages

   i) Reduce the memory requirements.
   ii) Reduce system learning requirements Symbols recognized faster than text

   Disadvantages

   i) Greater design complexity:
   ii) Learning still necessary(For details refer section 3.2)

2. The causes of bad design are
   Forgetting the User Developers
   Failing to Give the User Control
   Providing Too Many Features (Refer section 3.3)

3. The principles of a good GUI design are:
   - Understand People
   - Be Careful of Different Perspectives
   - Design for Clarity
   - Design for Consistency
   - Provide Visual Feedback
   - Be Careful with Audible Feedback
   - Keep Text Clear
   - Provide Traceable Paths
   - Provide Keyboard Support
   - Watch the Presentation Model
   - Use Modal vs. Modeless Dialogs Appropriately
   - Use controls correctly

   (Refer section 3.3)