UNIT 4: SYSTEM INTERACTIVE DESIGN PATTERNS

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1.0   INTRODUCTION

A pattern is an invariant solution to a recurrent problem within a specific context.
An HCI design pattern is an approach to reusing knowledge about successful design solutions
Patterns do not exist in isolation but are linked to other patterns in *languages* which enable complete designs to be generated

2.0   OBJECTIVES

By the end of this unit, you should be able to:
- Know the guides for developing effective design patterns
- Understand the processes of design
- Describe various screen designs and layout
- Know how to design acceptable presentation
- Understand Prototyping

.0   MAIN CONTENT

.1   CHARACTERISTICS OF PATTERNS

The characteristics of patterns include the following:
- Capturing the design practice and not the theory
- Capturing the essential common properties of good examples of design
- Representing design knowledge at varying levels of social, organizational, and conceptual framework
- Embodying values and expressing what is humane in interface design
- Patterns are intuitive and readable and can therefore be used for communication between all stakeholders
- A pattern language should be generative and assist in the development of complete designs.

.2   GUIDES AT DEVELOPING EFFECTIVE DESIGN PATTERNS

3.1.1 Commencement of design process:
The human interaction designer would commence his design process by asking the following questions: The design:
- What is the design all about?
- What are the interventions?
- What are the goals?
- What are the constraints?

    The design process
- What happens when?

    The Users
- Who are the users?
- What are their likes and dislikes on interactivity?

    Navigation of Interaction
- How does the user find his way around a system?

3.2.2 Design Considerations:

Scenarios of interaction
Part of the scenarios is a probe of rich stories relating to design issues that include users' experiences and expectations.

Iteration and prototypes
Remember that the designer never get it right the first time!

Interactions and Interventions
The designer should design interactions not just interfaces and not just the immediate interaction because technology changes
The designer should design interventions not just artefacts and not just the system, but also

related documentation such as manuals and tutorials.

What is design?
Design is achieving goals within constraints, so the design should consider those to benefit from the goals and for what purpose.
The design should consider the constraints in terms of materials and platforms and the corresponding trade-offs.
The Golden rule of design is for the designer to understand his materials for Human—Computer Interaction Understanding materials means understanding computer's limitations, its capacities, its tools and   platforms.
It also means understanding people, their psychological and social aspects.
The design should consider the possibility of human error and their interaction, since to err is human

'To err is human' example:
Example of accident reports on air crash, industrial accident, hospital mistake, reveal the enquiry blaming 'human error' on all. But concrete lintel breaks because of too much weight applied on it so the blame goes to 'lintel error' not design error since we know how concrete behaves understress.
So human 'error' is normal and we know how users behave under stress hence design for it!
Treat the user at least as well as physical materials! The Central focus is the user.

3. 3   THE DESIGN PROCESSES

3. 3.1 The design life cycle
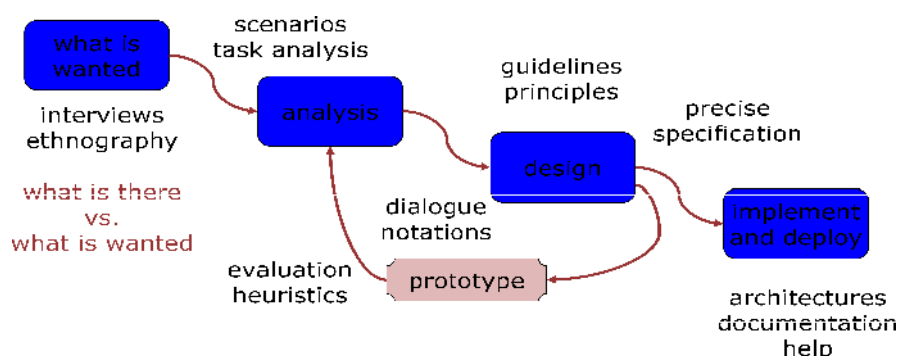
Explanation of processes in the diagram :
Requirements: This is identifying what is there and what is wanted Analysis: This is on ordering and understanding
Design: This concerns what to do an how to decide on what to do
Interaction and prototyping: Means getting it right and finding what is really needed
Implementation and deployment: Making it happen and deliveringed!

To carry out the above, consider The limited time available as a design The usability: Find out problems that trade-off may work against the ultimate usage of the designed interaction and ensure such problem(s) are tackled rright from the onset.

Remember that a perfect system is one that was badly designed; so do not expect to design a perfect system. Systems are dynamic.

3. 3.2 User focuses

It is essential that you know your use Talk to those class of users, watch them and use your imagination of their perception of the system they want.

Innovate a 'user' model not necessarily, their personality and cultural probes.
Design's cultural probes

Cultural probes can be carried out as follows:

- By direct observation though sometimes hard; for example on psychiatric patients
- By giving out probe packs that consist of items to prompt responses. These are given to people to open in their own environment and to record what is meaningful *to them*. These probe packs are used to inform interviews, prompt ideas and en-culture designers
- Gathered stories for the design are used and reused
- By communicating with others to validate models and understand dynamics
- Finding out what will users want to do by step-by-step walkthrough on what they can see using

  sketches, screen shots etc or what they are used to doing e.g manipulating keyboard and mouse, etc.
- Find out their thinking on the proposed interaction design
- Explore the depths by exploring interaction to determine what happens when
- Explore cognition to determine the users thinking
- Explore architecture of the system to determine what is happening inside
- Use particular scenarios to communicate with other designers, clients and users
- Validate other models by comparing them with your models
- Express dynamics through screenshots appearances and scenario behaviours.
- Use several scenarios and use several methods since scenarios provide one linear path through

  system design,

An example of a personality probe for a design.

Sola is 37 years old, She has been the Warehouse Manager for five years and worked for an Engineering company for twelve years. She didn't go to the university, but has studied in her evenings for a business diploma. She has two children aged 15 and 7 and does not like to work late. She did part of an introductory in-house computer course some years ago, but it was interrupted when she was promoted and could no longer afford to take the time. Her vision is perfect, but her right-hand movement is slightly restricted following an industrial accident 3 years ago. She is enthusiastic about her work and is happy to delegate responsibility and take suggestions from her staff. However, she does feel threatened by the introduction of yet another new computer system (the third in her time at the Engineering company).

3. 3. 3 Navigation design

Within the local structure, utilize a single screen within the global structure, utilize a whole site

Levels of design to guide the designer include:-
- Widget choice level containing menus, buttons etc.
- Screen design level
- Application navigation design
- Environment design level that comprises other applications and operating systems.

Example of a web design:
A web interaction design comprises:
- The widget choice level containing elements and tags e.g. <a href = li ...." >
- The screen design such as page design
- The application navigation design such as site structure
- The environment design such as the web, the browser, and external links

The physical devices interaction design comprises:
- The widget choice level comprising the controls such as buttons, knobs and dials
- The screen design such as the physical layout
- The application navigation design such as the modes of device
- The environment design such as the real world

Structure of design should be viewed
- Within a screen
- Locally looking from one screen
- Globally from thestructure o

And wider still, consider relationship with other applications

Example of where you are of a Website address:

shows path through web site hierarchy
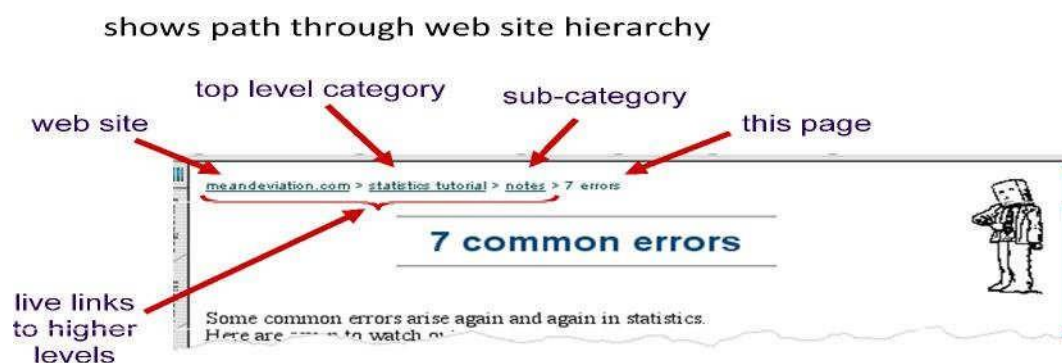
The following Hierarchical diagram s hows parts of application with screens or gro ups of screens typically showing a
Functional separation.
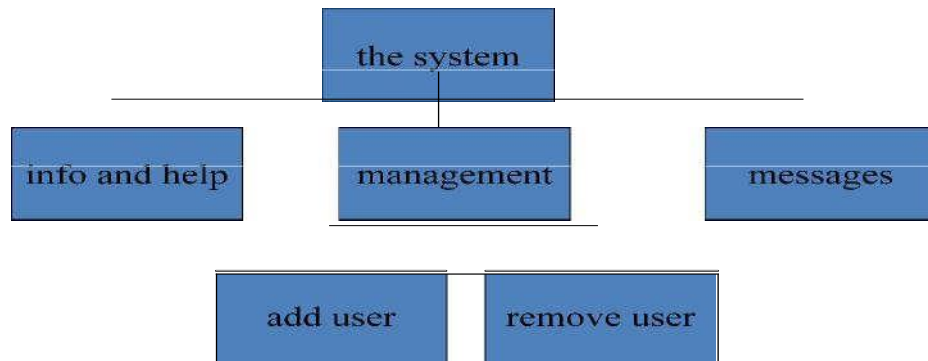
Drawing navigating hierarchies enables short term memory but not the menu size.It also shows many items on each screen with the items structured within the

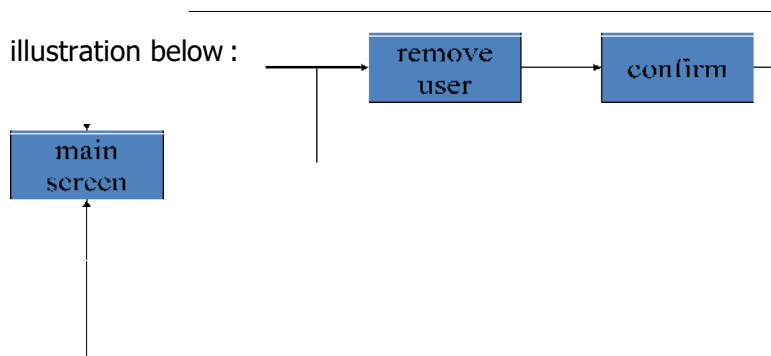Dialogue in User Interaction design i and system but details differ each ti
scr

a computer dialogue having patterns of
raction between users

int e

Network diagrams show different pa than the hierarchy.

It shows the relationship between ap

ths through system including branches that more task oriented plications and beyond. See

illustration below :

Network diagram shows what leads tonal branches and is more task oriented than a hierarchic
When considering style issues, it ide
Network diagrams also identify (i) fu embedded applications and links to
navigation issues such as

ign and layout are the grouping of data that the screen displays, the a
Use of white space to separate group of dat is also recommended as

r is doing, he should think of what informat ion should be displayed, parisons. The design should ensure that for m follows function on

add user
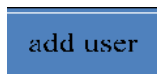
o what, what happens when, it shows functial diagram.
tify platform standards and consistency functional issues such as cut and paste and (ii) ther applications such as the web browsing.

3.4   SCREEN DESIGNS AND LAYOU T:

3.4.1 Principles of design
The basic principles in the screen des structure, order and their alignment. shown in the diagrams below.
The designer should ask what the us the order of display and possible com display.

ABCDEF₄HIJₓLM
NⁿPQRSTUVWXYZ

3.4.2 Grouping and Structure design

From the diagram above, one can distinguish items that are logically together as those physically

Billing details:
  Name
  Address: ...
  Credit card no

Delivery details:
  Name
  Address: ...
  Delivery time

Order details:
  item   quantity cost/item   cost
  size 10 screws (boxes)   7   3.71   25.97
  ....

The order of groups and items is important and should be considered in the design. Think about what is a natural order; the order should match the screen order!
Use boxes, space etc and set up the right tabbing.

Decoration: Using boxes to group logical items
Use fonts for emphasis and headings but these should not be too many!!
Consider the best method to align items; for example, you can separate items using white spaces as in the example above.

3.4. 3 Alignment of text

- **you read from left to right** (English and European)
     ⇒ **align left hand side**

Willy Wonka and the Chocolate Factory
Winston Churchill - A Biography
Wizard of Oz
Xena - Warrior Princess

boring but
readable!

fine for special effects
but hard to scan

Willy Wonka and the Chocolate Factory
Winston Churchill - A Biography
Wizard of Oz
Xena - Warrior Princess

⇒ align left hand side
Alignment of names

- **Usually scanning for surnames**
     ⇒ **make it easy!**

Alan Dix
Janet Finlay
Gregory Abowd
Russell Beale

Alan   Dix
Janet   Finlay
Gregory Abowd
Russell   Beale

Dix , Alan
Finlay, Janet
Abowd, Gregory
Beale, Russell

From the three boxes illustrated above, the alignment of names in the first box does not enable easy recognition or identification of surnames from the first name. The second and third boxes enable easy recognition of surnames. The second commas.
box has its names separated by white spaces and the third by

Alignment of numbers
While aligning numbers, think of the purpose such alignment would serve. Consider the biggest and the smallest numbers.
Usually the longest and/or the bigger numbers appear immediately feasible to the eye gaze.
Align decimal numbers properly eigther left or right. Right align integers (number s without

decimals) Examine the illustrations below and observe the most feasible.

think purpose!

which is biggest?

532.56
179.3
256.317
15
73.948
1035
3.142
497.6256

visually:
long number = big number

align decimal points
or right align integers

627.865
1.005763
382.583
2502.56
432.935
2.0175
652.87
56.34

In multiple columns tables as in the above illustrations, scanning across gaps bet ween lines of data is hard. It is particularly harder with table of data containing large database fields.

sherbert	75	sherbert	75	sherbert	75	sherbert	75
toffee	120	toffee	120	toffee	120	toffee	120
chocolate	35	chocolate	35	chocolate	35	chocolate	35
fruit gums	27	fruit gums	27	fruit gums	27	fruit gums	27
coconut dreams	85	coconut dreams	85	coconut dreams	85	coconut dreams	85

Graying to highlight
Scanning across gaps hard here

In multiple columns, use leaders (lin To highlight data within a table, you be covered from being feasible. See

Use leaders alignment ca n help visuals

s that link data with their field names or description). See above can light grey out the data. Do not colour, otherwise the data would he last table above.

Use space to structure
Use space to highlight

Observing the above tables of data, ne can see that spaces can be used to separ ate data, it can be used to structure and highlight as well.

.5   PRESENTATION AND PHYSICAL CONTROLS OF DATA

9

5.1 Grouping and Ordering of Items

Here items of same functions are grouped together
displayed in order of priority of functions

Here items are

Here different colours are used to differentiate functions
centered in buttons here with lines around related buttons

Text are

Gaps aid grouping here

Use white space within gaps to aid grouping and proper alignment as in the above illustration.

5.2 Forms and dialogue boxes

In designing forms and dialogue box s, the designer should pay attention to presentation of the form and dialogue box. He should also consider how data would be entered into the form. He should consider the importance of similar layout issues concerning the form and dialogue boxes suchas alignment and the label lengths.

In presenting an effective logical layout, the designer should use task analysis, appropriate groupings , a natural order for entering information such as from top to bottom, left to right (depending on the culture adopted) and setting tab order for keyboard entry.

Look at the illustration below:

The box or form in the middle (The second) presents an acceptable arrangement

The designer should indicate which and what area is active and passive such as w here the user should click and where to type.

The styles used should be consistent such as in web underlined links.
The labels and icons should have standards for common actions. The language used in the labels should be bold and should represent the current state or action.

5.5. 3 Creating 'affordances' in design

The word 'affordances' is a psychological term used for physical objects. The shapes and sizes of the objects suggest actions to be taken on the object. Actions such as pick up, twist and throw. So in a user interface terminology, one can say that buttons 'afford' pushing depending on their state.
For screen objects, the button-like object 'affords' mouse click while the physical -like objects suggest use. There is a culture of computer language use such as icons 'afford' clicking or eve double clicking.

The designer should design appropri te appearance for interface objects to pres nt accurate information. Aesthetics, utility, colour and 3D feat ures could be added for appropriate usability.
In presenting information, purpose atters. The purpose would enable the desi ner determine the sort order, in which column would the da ta be input and whether it is numeric or alp abetic.
See the table of figures above.
The designer should consider using t ext or diagram to make his presentation effe ctive. He can also consider presenting the information using graphs such as scatter graph or histog am.
In every decision on presentation, th e designer should use the paper presentatio n principles but add interactivity. An example is a 'dancin g histogram'.

5.4 Aesthetics and Utility
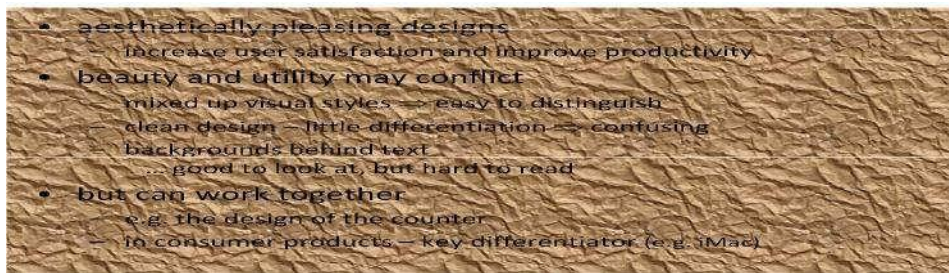
Aesthetically pleasing designs increase user satisfaction and improve productivity .
Beauty and utility may however sometimes conflict.
Mixed up visual styles make presention easy to distinguish.
Clean design and little differentiation leads to confusion on the part of the user. or
example, backgrounds behind text may be good to look at, ut hard to read. Look at the
illustration above. Both can however work together if carefully done, as demonstrated in
the design of the counter in consumer products presentation.

5.5   Using Colour and 3D in presentation.

Both Colour and 3D effects are oftenused very badly!
In using colour, the designer should remember that older monitors have limited

modern monitors have millions of colours to manipulate hence colour is over use abundance.
The designer should also beware of colour blindness as a result of using too man
be used sparingly in order to reinforce other information.
3D effects are good for physical information and some graphs but if over used as 3D pie charts,
it can blur Information .

Bad Use of Colour

alette of colours while d because of its

 colours. Colours should in text in perspective and

A bad use of colour is an over use of cause colour blindness .
Poor use of contrast as occurs when

Example of Bad Use of colour without very good reason (e.g. kids's you do adjust your set! For

example, when y

Item) which may eventually ou adjust your monitor to require changing interfaces greys only,

you may not be able to read your screen.

Across countries and cultures, there is localization and internationalization that r for simply change language particular cultures and languages.
In globalization, when you try to choose symbols etc. that work everywhere, you sizes and left-right order, and use 'resource' database instead of literal text. But changes are required on etc.
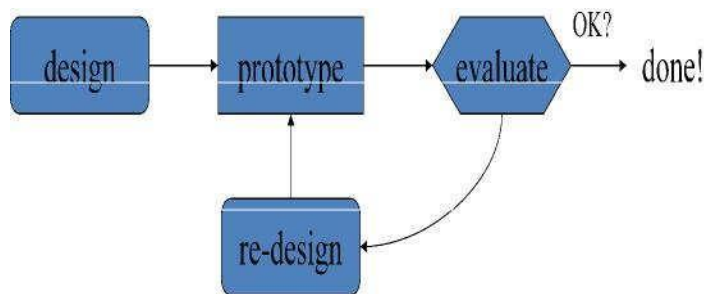
3.6 PROTOTYPING

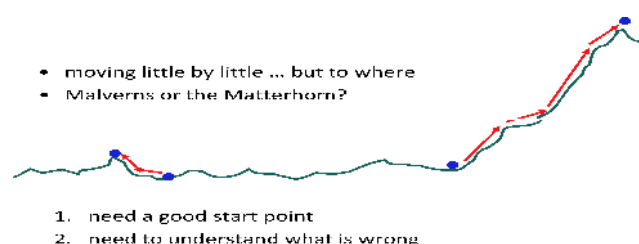Prototyping is an essential component of interactive system design.
Prototypes may take many forms, from rough sketches to detailed working proto types. They provide concrete representations of design ideas and give designers, users, developers a d managers an early glimpse into how the new system will look and feel. Prototypes increase creativity, allow early evaluation of design ideas, help designers think through, solve design problems, and support communication within multidisciplinary design teams.
Prototypes are concrete and are not abstract; hence provide a rich medium for exploring a design space. They suggest alternate design paths and reveal important details about particular design decisions. They force designers to be creative and to articulate their design decisions. Prototypes embody design ideas and encourage designers to confront the r differences of opinion.
The precise aspects of a prototype o fer specific design solutions and designers can decide to generate and compare alternatives. The imprecise or incomplete aspects of a prototype highlight the areas that must be refined or require additional ideas.

In prototyping you never get it right first time; if at first you don't succeed then continue...

- moving little by little ... but to where
- Malverns or the Matterhorn?

1. need a good start point
2. need to understand what is wrong

Pitfalls of prototyping are
Moving little by little ... but to where say that

1. The designer needs a good start. These pitfalls are avoided by Malvern's or t e Matterhorn rules that point and
   2. needs to understand what is wrong

4.0   CONCLUSION

Design is an active process of working with a design space, expanding it by generating new ideas and contracting as design choices are ma de. Designing effective interaction is difficult systems (including many websites) h ave a good look but a poor feel. The quality of interaction is tightly linked to the end users and a deep understand practices. Designers must take the c ntext of use into account when designing the details of the Interaction.and many interactive of their work

Prototypes are flexible tools that help designers envision a design space, reflect upon it, and test their design decisions. Prototypes are diverse and can fit within any part of the design process, from the earliest ideas to the final details of the designing. Prototypes provide one of the most effective means for designers to communicate with each other, as well as with users, developers, and managers, throughout the design process.

5. 0 SUMMARY

The processes of design comprise requirements, analysis, the design itself, Interaction and prototyping, Implementation and deployment.

The basic principles in screen design and layout are the grouping of data that the screen displays, the structure, order and their alignment.

In designing forms and dialogue box s, the designer should pay attention to presentation and purpose of presentation.

'Affordances' is a term used to reflection the shapes and sizes of physical object that suggest actions to be taken on the object.

Aesthetically pleasing designs increase user satisfaction and improve productivity while mixed up visual styles make presentation easy to distinguish.

The designer should beware of colour blindness resulting from using too many colours. Colours should be used sparingly in order to reinforce other information.

A bad use of colour is an over use of colour without very good reason and it may eventually cause colour blindness .

3D effects are good for physical information and some graphs but if over used ca n blur Information. Prototypes provide concrete representations of design ideas and give designers, users, developers and managers an early glimpse into how the new system will look and feel.

6.0   Tutor Marked Assignment

1. Define the term Pattern, particularly as it relates to Human Computer Interaction (HCI)
2. Mention any four of the s ix characteristics of design patterns
3. For effective commencement of the design process, the designer should ask himself certain questions as guides, what are those likely areas of question?
4. What are those issues that are likely to be considered by the designer during his design process?
5. Describe the design lifecycle of a typical design pattern
6. What are the major user focuses and cultural probes that can guide the pattern designer in his design process?

7. (i) Produce the hierarchical diagram that relates functional parts of applications with their groups of screens. What are the advantages of this diagram to designer?
   (i) Draw a network diagram that shows the relationship between applications. What are the significances of the network diagram when considering design style issues?
8. Describe the basic principles governing screen design and layout
9. What are the concepts the designer should consider for effective presentation and physical controls of data? How do you relate these concepts specifically to the design of forms and dialogue boxes?
10. What do you understand by the term "Affordances in designing"? Do you agree that the designer should use "Affordances" concepts in his design process, and why?
    (a) Why do designers have to include aesthetics, utilities, and 3D effects in their design patterns?
    (b) What are the negative implications of over applying these effects in the designs?
11. Itemize the benefits of prototyping interactive System designs

7.0 Further Readings / References

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