HUMAN-COMPUTER INTERACTION THIRD EDITION

DIX FINLAY ABOWD BEALE

chapter 5

interaction design basics

interaction design basics

- design:
  - what it is, interventions, goals, constraints
- the design process
  - what happens when
- users
  - who they are, what they are like …
- scenarios
  - rich stories of design
- navigation
  - finding your way around a system
- iteration and prototypes
  - never get it right first time!

interactions and interventions

design interactions not just interfaces

not just the immediate interaction

e.g. stapler in office – technology changes interaction style

- manual: write, print, staple, write, print, staple, …
- electric: write, print, write, print, …, staple

designing interventions not just artefacts

not just the system, but also …

- documentation, manuals, tutorials
- what we say and do as well as what we make

what is design?

what is design?

achieving goals within constraints

- goals - purpose
  - who is it for, why do they want it
- constraints
  - materials, platforms
- trade-offs

golden rule of design

understand your materials

for Human-Computer Interaction

understand your materials

- understand computers
  - limitations, capacities, tools, platforms
- understand people
  - psychological, social aspects
  - human error
- and their interaction …

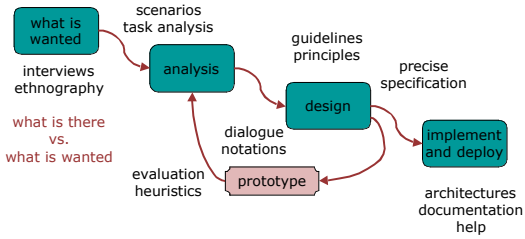
To err is human

- accident reports ..
  - aircrash, industrial accident, hospital mistake
  - enquiry … blames … 'human error'
- but …
  - concrete lintel breaks because too much weight
  - blame 'lintel error' ?
    … no – design error
    we know how concrete behaves under stress
- human 'error' is normal
  - we know how users behave under stress
  - so design for it!
- treat the user at least as well as physical materials!

Central message …

the user

The process of design



Steps …

- requirements
  - what is there and what is wanted …
- analysis
  - ordering and understanding
- design
  - what to do and how to decide
- iteration and prototyping
  - getting it right … and finding what is really needed!
- implementation and deployment
  - making it and getting it out there

… but how can I do it all ! !

- limited time ⇒ design trade-off
- usability?
  - finding problems and fixing them? ✗
  - deciding what to fix? ✓
- a perfect system is badly designed
  - too good ⇒ too much effort in design

user focus

know your user
personae
cultural probes

know your user

- who are they?
- probably not like you!
- talk to them
- watch them
- use your imagination

persona

- description of an 'example' user
  - not necessarily a real person
- use as surrogate user
  - what would Betty think
- details matter
  - makes her 'real'

example persona

Betty is 37 years old, She has been Warehouse Manager for five years and worked for Simpkins Brothers Engineering for twelve years. She didn't go to 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 SBE).

cultural probes

- direct observation
  - sometimes hard
    - in the home
    - psychiatric patients, …
- probe packs
  - items to prompt responses
    - e.g. glass to listen at wall, camera, postcard
  - given to people to open in their own environment they record what is meaningful *to them*
- used to …
  - inform interviews, prompt ideas, enculture designers

scenarios

stories for design
use and reuse

scenarios

- stories for design
  - communicate with others
  - validate other models
  - understand dynamics
- linearity
  - time is linear - our lives are linear
  - but don't show alternatives

scenarios …

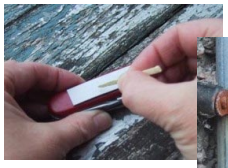
- what will users want to do?
- step-by-step walkthrough
  - what can they see (sketches, screen shots)
  - what do they do (keyboard, mouse etc.)
  - what are they thinking?
- use and reuse throughout design

scenario – movie player

Brian would like to see the new film "Moments of Significance" and wants to invite Alison, but he knows she doesn't like "arty" films. He decides to take a look at it to see if she would like it and so connects to one of the movie sharing networks. He uses his work machine as it has a higher bandwidth connection, but feels a bit guilty. He knows he will be getting an illegal copy of the film, but decides it is OK as he is intending to go to the cinema to watch it. After it downloads to his machine he takes out his new personal movie player. He presses the 'menu' button and on the small LCD screen he scrolls using the arrow keys to 'bluetooth connect' and presses the select button. On his computer the movie download program now has an icon showing that it has recognised a compatible device and he drags the icon of the film over the icon for the player. On the player the LCD screen says "downloading now", a percent done indicator and small whirling icon. … … …

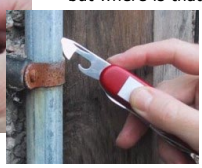
also play act …

- mock up device
- pretend you are doing it
- internet-connected swiss army knife …



use toothpick as stylus

but where is that thumb?



… explore the depths

- explore interaction
  - what happens when
- explore cognition
  - what are the users thinking
- explore architecture
  - what is happening inside

use scenarios to ..

- communicate with others
  - designers, clients, users
- validate other models
  - 'play' it against other models
- express dynamics
  - screenshots – appearance
  - scenario – behaviour

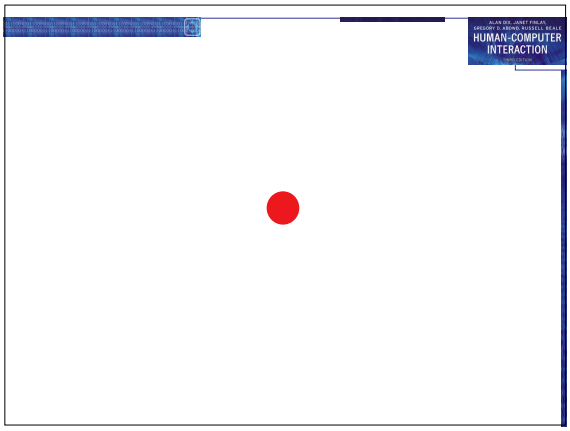
linearity

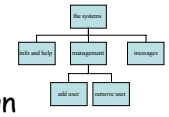
Scenarios – one linear path through system

Pros:
- life and time are linear
- easy to understand (stories and narrative are natural)
- concrete (errors less likely)

Cons:
- no choice, no branches, no special conditions
- miss the unintended

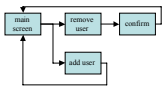
- So:
  - use several scenarios
  - use several methods





navigation design

local structure – single screen
global structure – whole site



levels

- widget choice
  - menus, buttons etc.
- screen design
- application navigation design
- environment
  - other apps, O/S

the web ...

- widget choice
- screen design
- navigation design
- environment
- elements and tags
  - `<a href="...">`
- page design
- site structure
- the web, browser, external links

physical devices

- widget choice
- screen design
- navigation design
- environment
- controls
  - buttons, knobs, dials
- physical layout
- modes of device
- the real world

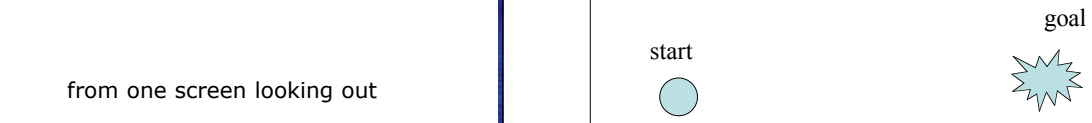
think about structure

- within a screen
  - later ...
- local
  - looking from this screen out
- global
  - structure of site, movement between screens
- wider still
  - relationship with other applications

local

from one screen looking out

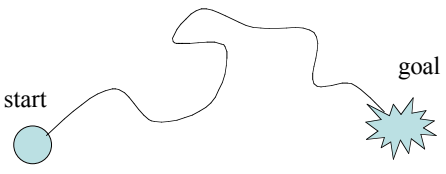
goal seeking



goal seeking

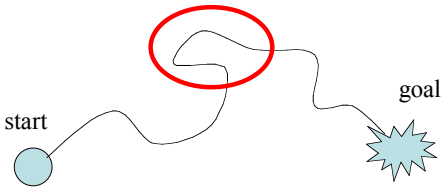
progress with local knowledge only ...

goal seeking



... but can get to the goal

goal seeking



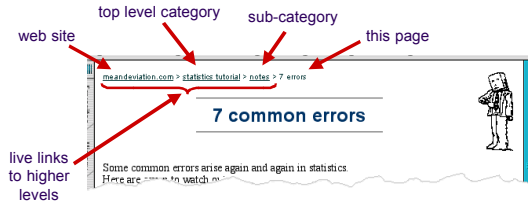
... try to avoid these bits!

four golden rules

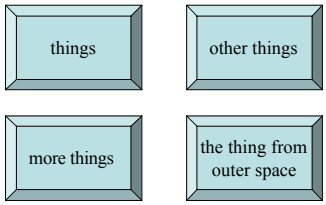
- knowing where you are
- knowing what you can do
- knowing where you are going
  - or what will happen
- knowing where you've been
  - or what you've done

where you are – breadcrumbs

shows path through web site hierarchy



beware the big button trap



- where do they go?
  - lots of room for extra text!

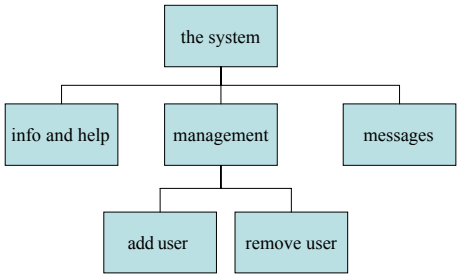
modes

- lock to prevent accidental use ...
  - remove lock - 'c' + 'yes' to confirm
  - frequent practiced action
- if lock forgotten
  - in pocket 'yes' gets pressed
  - goes to phone book
  - in phone book ...
    'c' – delete entry
    'yes' – confirm
    ... oops !

global

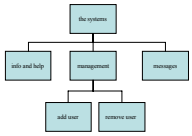
between screens
within the application

hierarchical diagrams



hierarchical diagrams ctd.

- parts of application
  - screens or groups of screens
- typically functional separation



navigating hierarchies

- deep is difficult!
- misuse of Miller's 7 ± 2
  - short term memory, not menu size
- optimal?
  - many items on each screen
  - but structured within screen

see /e3/online/menu-breadth/

think about dialogue

what does it mean in UI design?

Minister: do you *name* take this woman …
Man: I do
Minister: do you *name* take this man …
Woman: I do
Minister: I now pronounce you man and wife

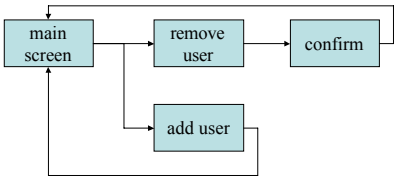
think about dialogue

what does it mean in UI design?

Minister: do you *name* take this woman …

- marriage service
  - general flow, generic – blanks for names
  - pattern of interaction between people
- computer dialogue
  - pattern of interaction between users and system
  - but details differ each time

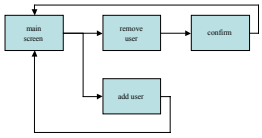
network diagrams



- show different paths through system

network diagrams ctd.

- what leads to what
- what happens when
- including branches
- more task oriented then hierarchy



wider still

between applications
and beyond ...

wider still ...

- style issues:
  - platform standards, consistency
- functional issues
  - cut and paste
- navigation issues
  - embedded applications
  - links to other apps ... the web

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

screen design and layout

basic principles
grouping, structure, order
alignment
use of white space

basic principles

- ask
  - what is the user doing?
- think
  - what information, comparisons, order
- design
  - form follows function

available tools

- grouping of items
- order of items
- decoration - fonts, boxes etc.
- alignment of items
- white space between items

grouping and structure

logically together ⇒ physically together

Billing details:	**Delivery details**:
Name	Name
Address: …	Address: …
Credit card no	Delivery time

Order details:

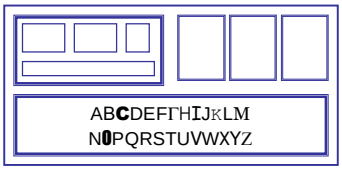
item	quantity	cost/item	cost
size 10 screws (boxes)	7	3.71	25.97
……	…	…	…

order of groups and items

- think! - what is natural order
- should match screen order!
  - use boxes, space etc.
  - set up tabbing right!
- instructions
  - beware the cake recipie syndrome!
    … mix milk and flour, add the fruit after beating them

decoration

- use boxes to group logical items
- use fonts for emphasis, headings
- but not too many!!



alignment - 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

alignment - 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

alignment - numbers

think purpose!

which is biggest?

532.56
179.3
256.317
15
73.948
1035
3.142
497.6256

alignment - numbers

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

multiple columns

- scanning across gaps hard:

(often hard to avoid with large data base fields)

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

multiple columns - 2

- use leaders

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

multiple columns - 3

- or greying (vertical too)

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

multiple columns - 4

- or even (with care!) 'bad' alignment

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

white space - the counter

WHAT YOU SEE

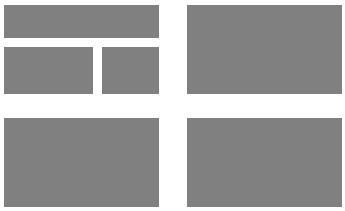
white space - the counter

WHAT YOU SEE

THE GAPS BETWEEN

space to separate

space to structure



space to highlight

physical controls

- grouping of items
  - defrost settings
  - type of food
  - time to cook

physical controls

- grouping of items
- order of items
  1) type of heating
  2) temperature
  3) time to cook
  4) start

physical controls

- grouping of items
- order of items
- decoration

different colours for different functions

lines around related buttons (temp up/down)

physical controls

- grouping of items
- order of items
- decoration
- alignment

centred text in buttons

? easy to scan ?

physical controls

- grouping of items
- order of items
- decoration
- alignment
- white space

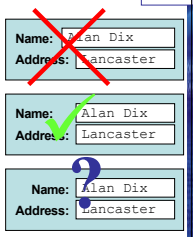
gaps to aid grouping

user action and control

entering information
knowing what to do
affordances

entering information

- forms, dialogue boxes
  - presentation + data input
  - similar layout issues
  - alignment - N.B. different label lengths
- logical layout
  - use task analysis (ch15)
  - groupings
  - natural order for entering information
    - top-bottom, left-right (depending on culture)
    - set tab order for keyboard entry



N.B. see extra slides for widget choice

knowing what to do

- what is active what is passive
  - where do you click
  - where do you type
- consistent style helps
  - e.g. web underlined links
- labels and icons
  - standards for common actions
  - language – bold = current state or action

affordances

- psychological term
- for physical objects
  - shape and size suggest actions
    - pick up, twist, throw
  - also cultural – buttons 'afford' pushing
- for screen objects
  - button–like object 'affords' mouse click
  - physical-like objects suggest use
- culture of computer use
  - icons 'afford' clicking
  - or even double clicking … not like real buttons!

appropriate appearance

presenting information
aesthetics and utility
colour and 3D
localisation & internationalisation

presenting information

- purpose matters
  - sort order (which column, numeric alphabetic)
  - text vs. diagram
  - scatter graph vs. histogram
- use paper presentation principles!
- but add interactivity
  - softens design choices
    - e.g. re-ordering columns
    - 'dancing histograms' (chap 21)

name	size
chap10	12
chap5	16
chap1	17
chap14	22
chap20	27
chap8	32
…	…

aesthetics and utility

- aesthetically pleasing designs
  - increase user satisfaction and improve productivity
- beauty and utility may conflict
  - mixed up visual styles ⇒ easy to distinguish
  - clean design – little differentiation ⇒ confusing
  - backgrounds behind text
    - good to look at, but hard to read
- but can work together
  - e.g. the design of the counter
  - in consumer products – key differentiator (e.g. iMac)

colour and 3D

- both often used very badly!
- colour
  - older monitors limited palette
  - colour over used because 'it is there'
  - beware colour blind!
  - use sparingly to reinforce other information
- 3D effects
  - good for physical information and some graphs
  - but if over used …
    e.g. text in perspective!! 3D pie charts

bad use of colour

- over use - without very good reason (e.g. kids' site)
- colour blindness
- poor use of contrast
- do adjust your set!
  - adjust your monitor to greys only
  - can you still read your screen?

across countries and cultures

- localisation & internationalisation
  - changing interfaces for particular cultures/languages
- globalisation
  - try to choose symbols etc. that work everywhere
- simply change language?
  - use 'resource' database instead of literal text
    … but changes sizes, left-right order etc.
- deeper issues
  - cultural assumptions and values
  - meanings of symbols

    e.g tick and cross … +ve and -ve in some cultures
    … but … mean the same thing (mark this) in others

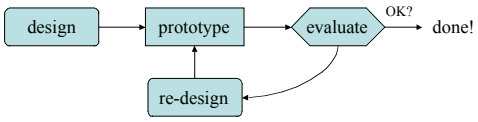
prototyping

iteration and prototyping

getting better …
… and starting well

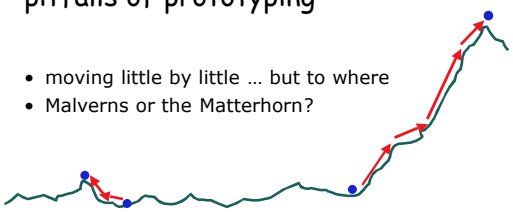
prototyping

- you never get it right first time
- if at first you don't succeed …



pitfalls of prototyping

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



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