Human Computer Interaction

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

what is wanted
- interviews
- ethnography

what is there vs. what is wanted

analysis
- scenarios
- task analysis

guidelines
- principles

design
- precise
- specification

implement and deploy
- architectures
- documentation
- help

evaluation
- heuristics

prototype
- dialogue
- notations
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).
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. ... ... ...
... 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 on navigation design

- 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
local
from one screen looking out
goal seeking

start

goal
goal seeking

start

progress with local knowledge only ...
goal seeking

... but can get to the goal
... 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

live links to higher levels
Beware the big button trap

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

- things
- other things
- more things
- the thing from outer space
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

the system

info and help

management

messages

add user

remove user
hierarchical diagrams ctd.

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

![Hierarchical diagram]

- the system
  - info and help
  - management
  - messages
    - add user
    - remove user
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/
network diagrams

- show different paths through system
network diagrams ctd.

- what leads to what
- what happens when
- including branches

- more task oriented then hierarchy
screen design and layout

basic principles

- grouping, structure, order
- alignment

- use of white space
wider still ...

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

<table>
<thead>
<tr>
<th>Billing details:</th>
<th>Delivery details:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name</td>
</tr>
<tr>
<td>Address: ...</td>
<td>Address: ...</td>
</tr>
<tr>
<td>Credit card no</td>
<td>Delivery time</td>
</tr>
</tbody>
</table>

| Order details:           |                         |
| item                     | quantity | cost/item |
| 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 recipe syndrome!
    ... mix milk and flour, add the fruit after beating them
alignment - numbers

- think purpose!
- which is biggest?

<p>| | | | |</p>
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<thead>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>532.56</td>
<td>179.3</td>
<td>256.317</td>
<td>15</td>
</tr>
<tr>
<td>73.948</td>
<td>1035</td>
<td>3.142</td>
<td>497.6256</td>
</tr>
</tbody>
</table>
alignment - numbers

- visually:
  - long number = big number
- align decimal points
- or right align integers

<p>| | | |</p>
<table>
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<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
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<td></td>
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<td></td>
<td>1.005763</td>
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<td></td>
<td>382.583</td>
<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>432.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.0175</td>
<td></td>
</tr>
<tr>
<td></td>
<td>652.87</td>
<td></td>
</tr>
<tr>
<td></td>
<td>56.34</td>
<td></td>
</tr>
</tbody>
</table>
multiple columns

- scanning across gaps hard:
  (often hard to avoid with large data base fields)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>sherbert</td>
<td>75</td>
</tr>
<tr>
<td>toffee</td>
<td>120</td>
</tr>
<tr>
<td>chocolate</td>
<td>35</td>
</tr>
<tr>
<td>fruit gums</td>
<td>27</td>
</tr>
<tr>
<td>coconut dreams</td>
<td>85</td>
</tr>
</tbody>
</table>
multiple columns - 2

- use leaders

<p>| | | |</p>
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<td>fruit gums</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>coconut dreams</td>
<td></td>
<td>85</td>
</tr>
</tbody>
</table>
multiple columns - 3

- or greying (vertical too)

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>sherbert</td>
<td>75</td>
</tr>
<tr>
<td>toffee</td>
<td>120</td>
</tr>
<tr>
<td>chocolate</td>
<td>35</td>
</tr>
<tr>
<td>fruit gums</td>
<td>27</td>
</tr>
<tr>
<td>coconut dreams</td>
<td>85</td>
</tr>
</tbody>
</table>
multiple columns - 4

- or even (with care!) ‘bad’ alignment

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>sherbert</td>
<td>75</td>
</tr>
<tr>
<td>toffee</td>
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<tr>
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</tr>
</tbody>
</table>
space to separate
space to structure
space to highlight
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)
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?

- over use - without very good reason (e.g. kids’ site)
- colour blindness
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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

✔️ ❌
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
Any Questions?
Thank You

Terima Kasih

Merci

Grazias

Gratias

Danke

Kiitos