

USABILITY ENGINEERING

GOOD DESIGN DOES NOT HAPPEN BY CHANCE

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LECTURERS



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STUDY MATERIAL

- ▶ all slides will be made available on ILIAS after the lecture
- ▶ password: UEN_2022

OFFICIAL DATES

- ▶ Lecture: Wednesdays, 14:50 - 16:30
- ▶ Exercise: Wednesdays, 16:35 - 18:15

- ▶ **important:** schedule and lecture format will be adapted to requirements of a practical course
- ▶ see next slide for actual course program

COURSE SCHEDULE

Week	Date	Topic
1	21.09.2022	Exam Week
2	28.09.2022	Lecture 1: Introduction
3	05.10.2022	Lecture 2: Interaction Design Basics
4	12.10.2022	Lecture 3: Software Process & Design Rules
5	19.10.2022	Lecture 4: Evaluation Techniques & Data Analysis
6	26.10.2022	Lecture 5: Presentation of Practical Project
7	02.11.2022	Practical Project
8	09.11.2022	Participation in User Study 1
9	16.11.2022	1. Check-In: Q&A Software & Usability Study
10	23.11.2022	Practical Project
11	30.11.2022	Practical Project
12	07.12.2022	Practical Project
13	14.12.2022	2. Check-In: Q&A Data Analysis & Usability Report
14	21.12.2022	Practical Project
15	28.12.2022	Christmas Holidays
16	04.01.2023	Participation in User Study 2
17	11.01.2023	Practical Project
18	18.01.2023	Deadline for Usability Report
19	25.01.2023	Exam Week
20	01.02.2023	Exam Week

EXAM

Requirements for Successful Completion

- ▶ completion of practical project
- ▶ participation in user studies
- ▶ written report (graded)

Usability Engineering

Interaction Design Basics

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- ▶ What is Design?
- ▶ The Process of Design
- ▶ User Focus
- ▶ Scenarios
- ▶ Navigation Design
- ▶ Screen Design and Layout
- ▶ Iteration and Prototyping
- ▶ Summary

- ▶ **What is Design?**
- ▶ The Process of Design
- ▶ User Focus
- ▶ Scenarios
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What is Design?



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“

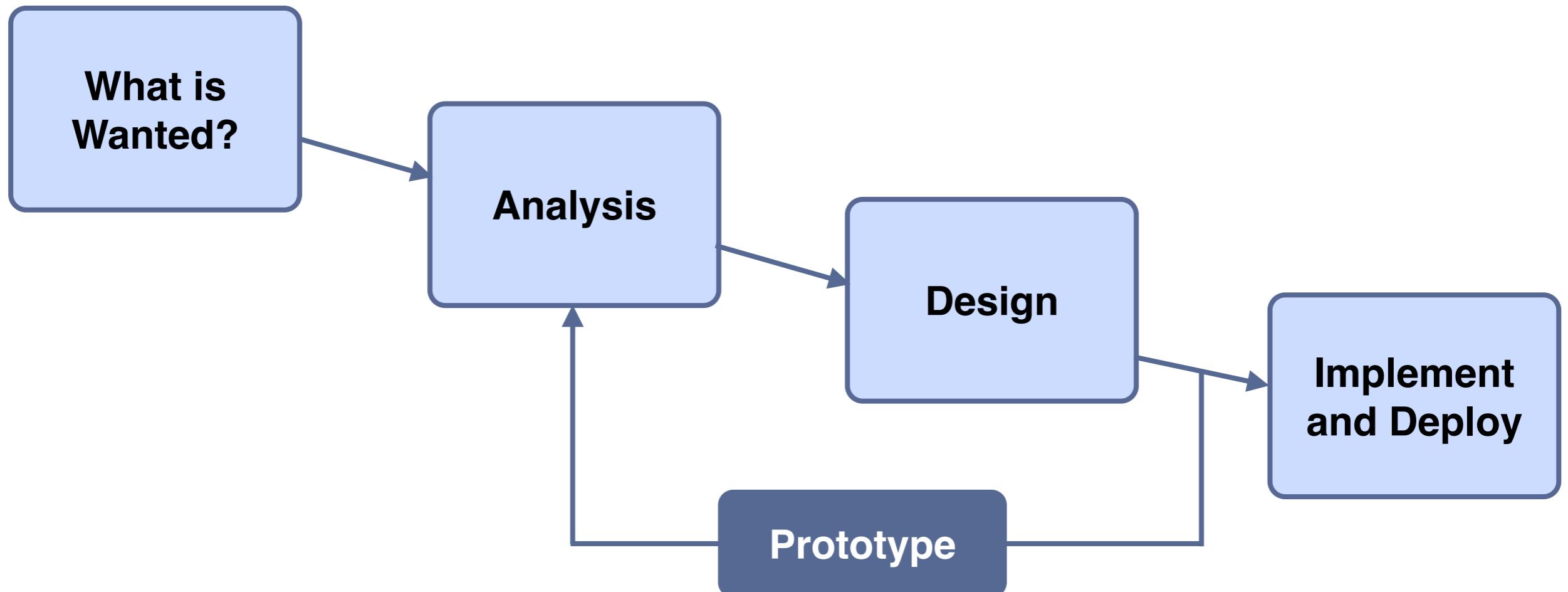
Consequence for Human-Computer Interaction

- ▶ understand computers
 - limitations, capacities, tools, platforms
- ▶ understand people
 - psychological, social aspects
 - human error
- ▶ understand interaction

- ▶ What is Design?
- ▶ **The Process of Design**
- ▶ User Focus
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The Process of Design

Interaction Design Process



The Process of Design



- ▶ 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

- ▶ What is Design?
- ▶ The Process of Design
- ▶ **User Focus**
- ▶ Scenarios
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Know your Users

- ▶ 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’

Persona: Example

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 Probe

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



- ▶ What is Design?
- ▶ The Process of Design
- ▶ User Focus
- ▶ **Scenarios**
- ▶ Navigation Design
- ▶ Screen Design and Layout
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- ▶ stories for design
 - communicate with others
 - validate other models
- ▶ linearity
 - time is linear - our lives are linear
 - but don't show alternatives
- ▶ 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

Example: 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 recognized 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-Acting

- ▶ mock up device
- ▶ pretend you are doing it
- ▶ e.g., internet-connected swiss army knife ...



use toothpick as stylus



but: where is that thumb?

In-Depth Exploration

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

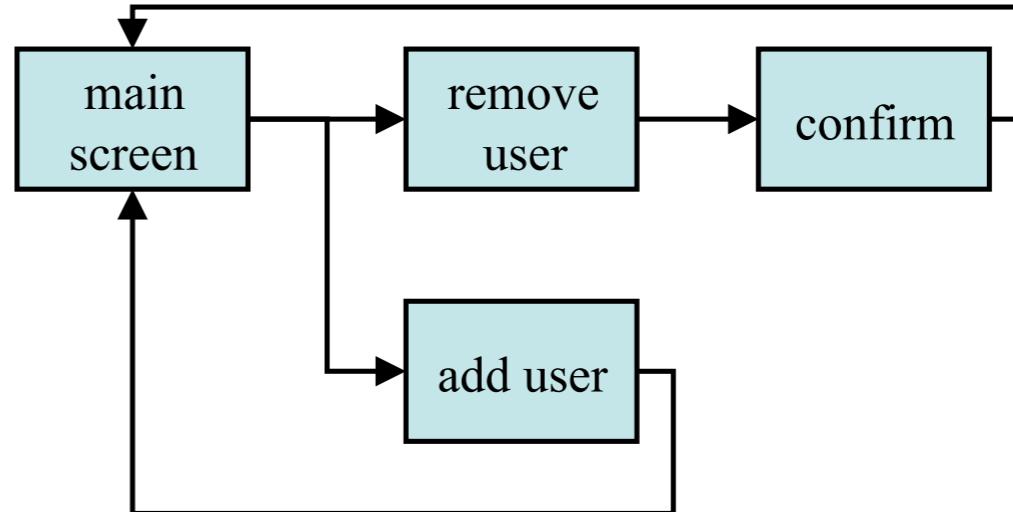
Use Scenarios to ...

- ▶ communicate with others
 - designers, clients, users
- ▶ validate other models
 - ‘play’ it against other models
- ▶ express dynamics
 - screenshots: appearance
 - scenario: behavior

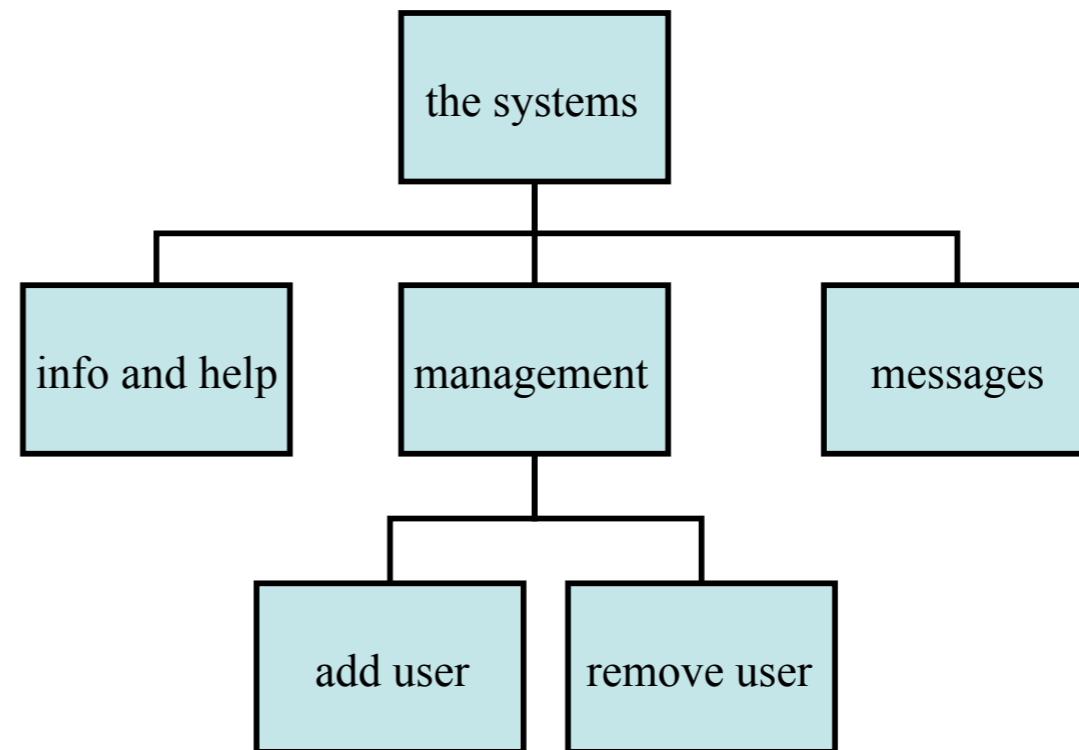
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- ▶ **Navigation Design**
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Navigation Design

- ▶ local structure
 - single screen



- ▶ global structure
 - whole site



Navigation Design

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

- ▶ Example: Internet

widget choice	elements and tags <code></code>
screen design	page design
navigation design	site structure
environment	the web, browser, external links

- ▶ Example: Physical Devices

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

Think about Structure

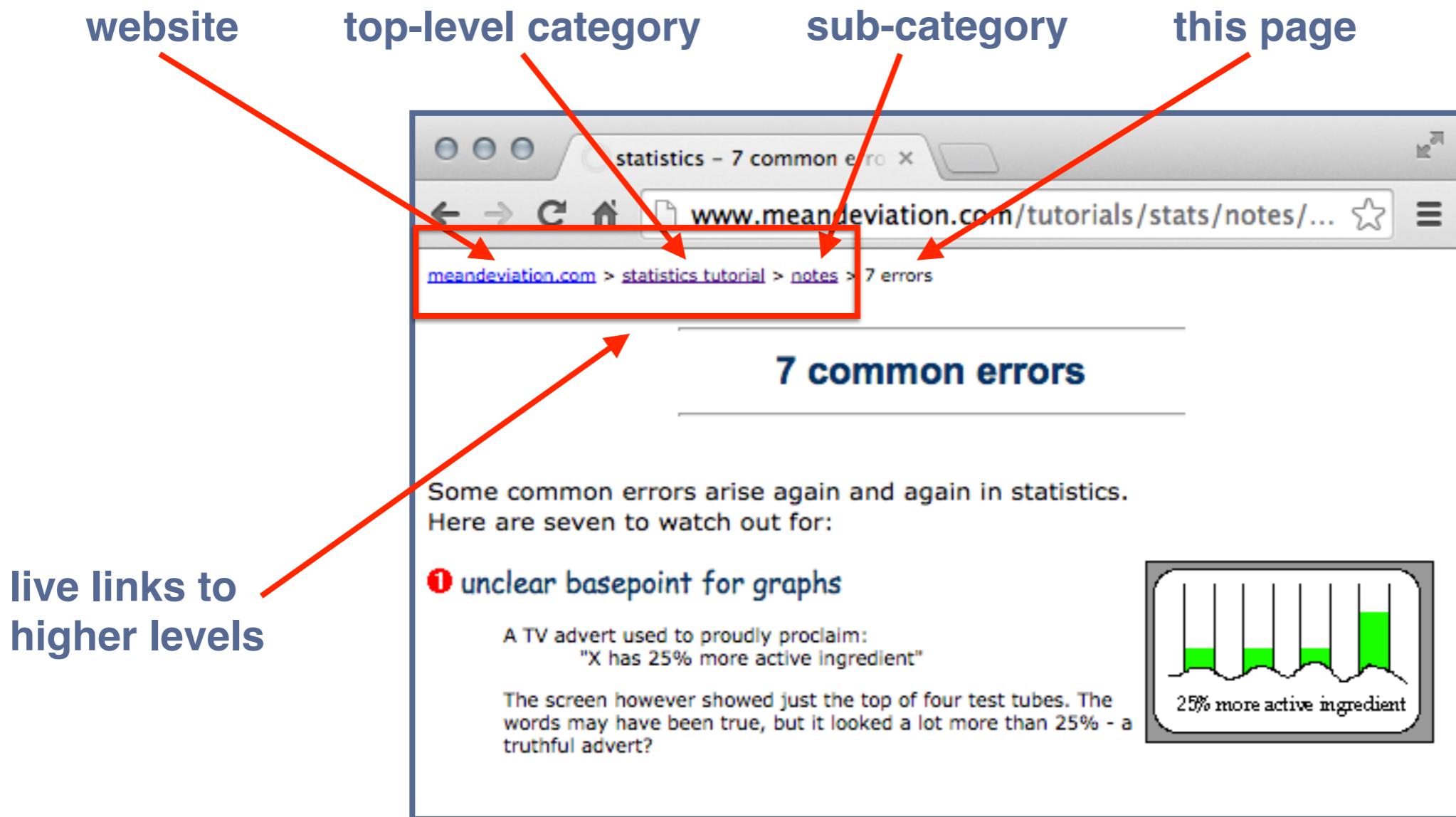
- ▶ within a screen
 - will be addressed later ...
- ▶ local
 - looking from this screen out
- ▶ global
 - structure of site, movement between screens
- ▶ wider still
 - relationship with other applications

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

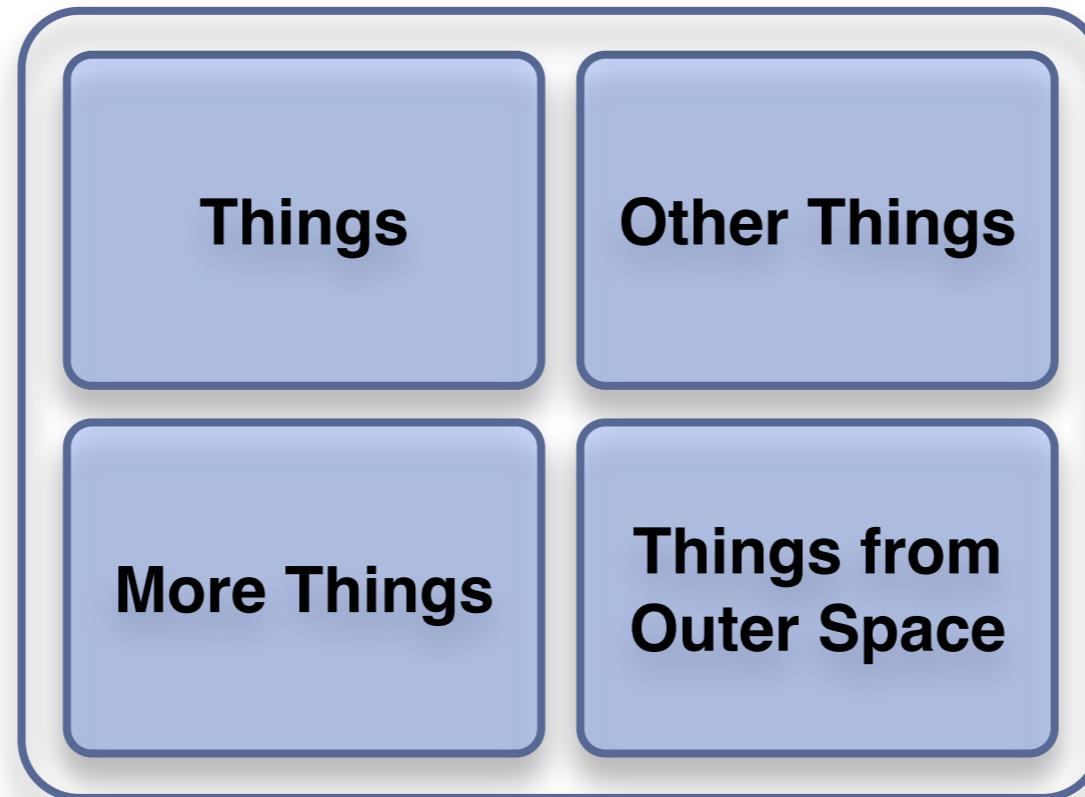
Example: Website

- ▶ shows path through website hierarchy



Example: Big Button Trap

- ▶ not clear where they go
 - usually only one or two words
 - hard to choose the right ones that are meaningful for everyone
- ▶ but: lots of room for extra text



Navigation Design

Example: Ticket Vending Machine

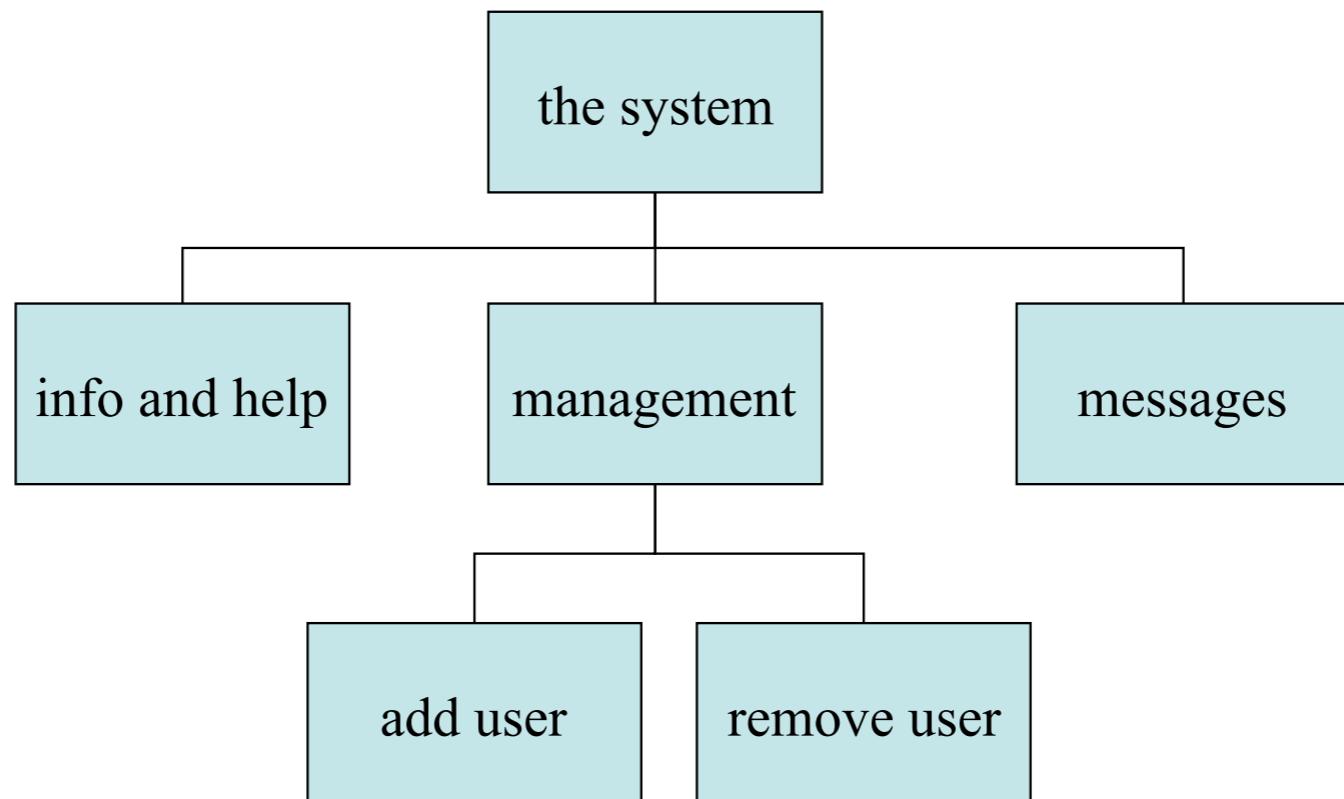


Global Structure

- ▶ between screens
- ▶ within the application

Hierarchical Diagrams

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



Navigation 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

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

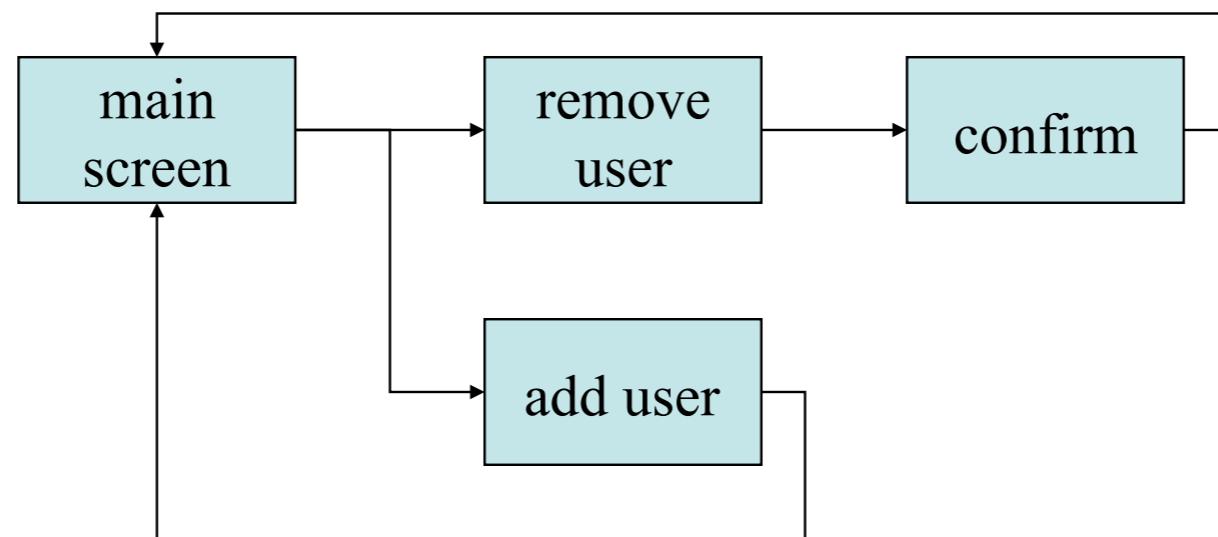
Dialogue

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



Structure between applications and beyond ...

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

- ▶ What is Design?
- ▶ The Process of Design
- ▶ User Focus
- ▶ Scenarios
- ▶ Navigation Design
- ▶ **Screen Design and Layout**
 - **Grouping and Structure**
 - **User Action and Control**
 - **Appropriate Appearance**
- ▶ Iteration and Prototyping
- ▶ Summary

Basic Principles

- ▶ Ask
 - what is the user doing?
- ▶ Think
 - what information, comparison, 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: Name Address: ... Credit card no	Delivery details: Name Address: ... Delivery time
<hr/>	
Order details: item size 10 screws (boxes)	quantity cost/item cost
	7 3.71 25.97

Order of Groups and Items

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

Screen Design and Layout

Decoration

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

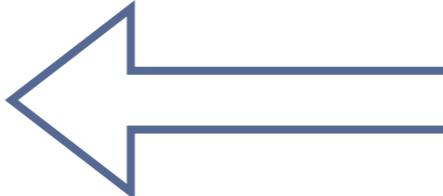


Alignment of Text

- ▶ you read from left to right
- ▶ 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 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



Alignment of Numbers

- ▶ think of purpose
- ▶ example: which is biggest?

532,56
179,3
256,317
15
73,948
1035
3,142
497,6256

Alignment of Numbers

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

532,56
179,3
256,317
15
73,948
1035
3,142
497,6256

Multiple Columns

- ▶ scanning across gaps hard
 - often hard to avoid with large data base fields

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

Multiple Columns (2)

- ▶ use leaders

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

Multiple Columns (3)

- ▶ or greying
 - vertical too

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

Multiple Columns (4)

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

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

White Space

WHAT YOU SEE

IDEAS BETWEEN GAPS

Space to Separate



Space to Structure



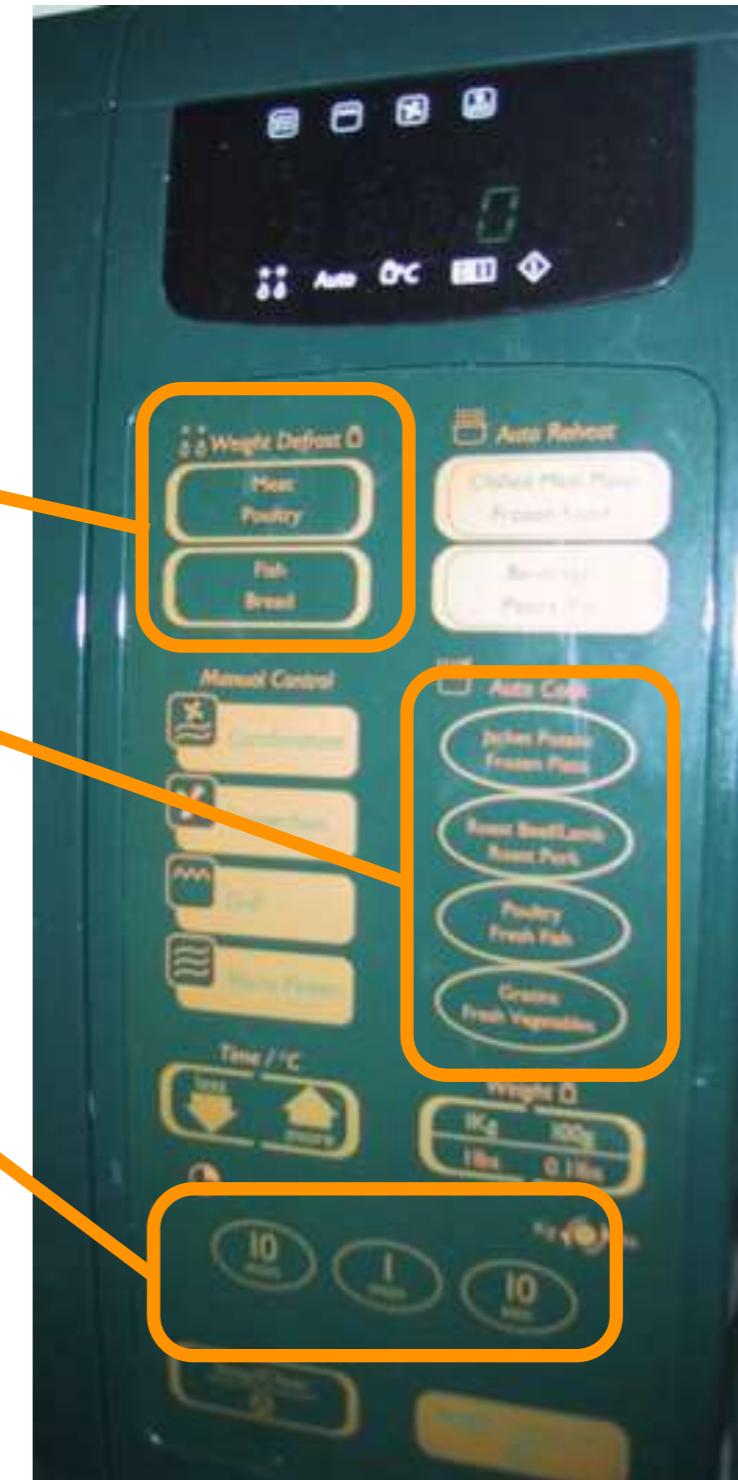
Space to Highlight



Screen Design and Layout

Example: Physical Controls

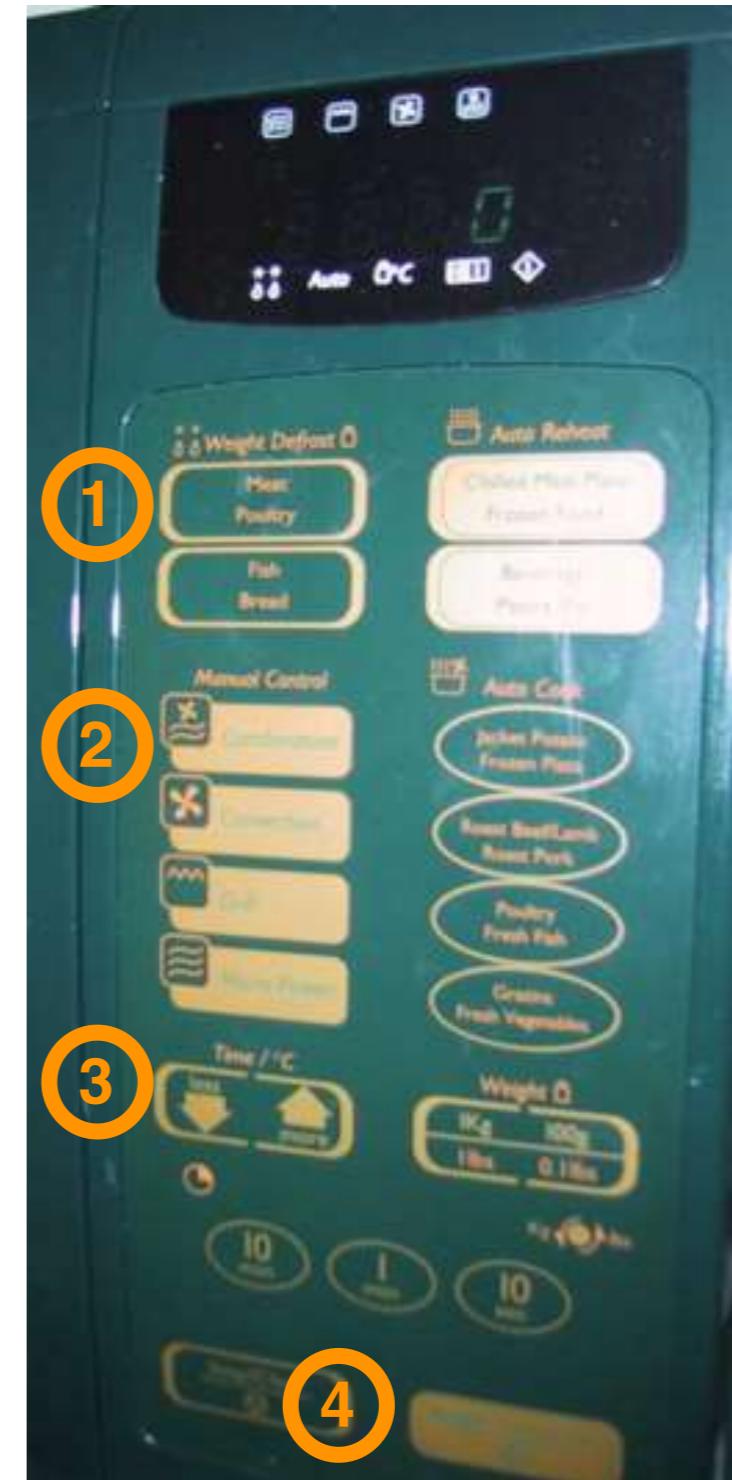
- ▶ grouping of items
 - defrost settings
 - type of food
 - time to cook



Screen Design and Layout

Example: Physical Controls

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



Screen Design and Layout

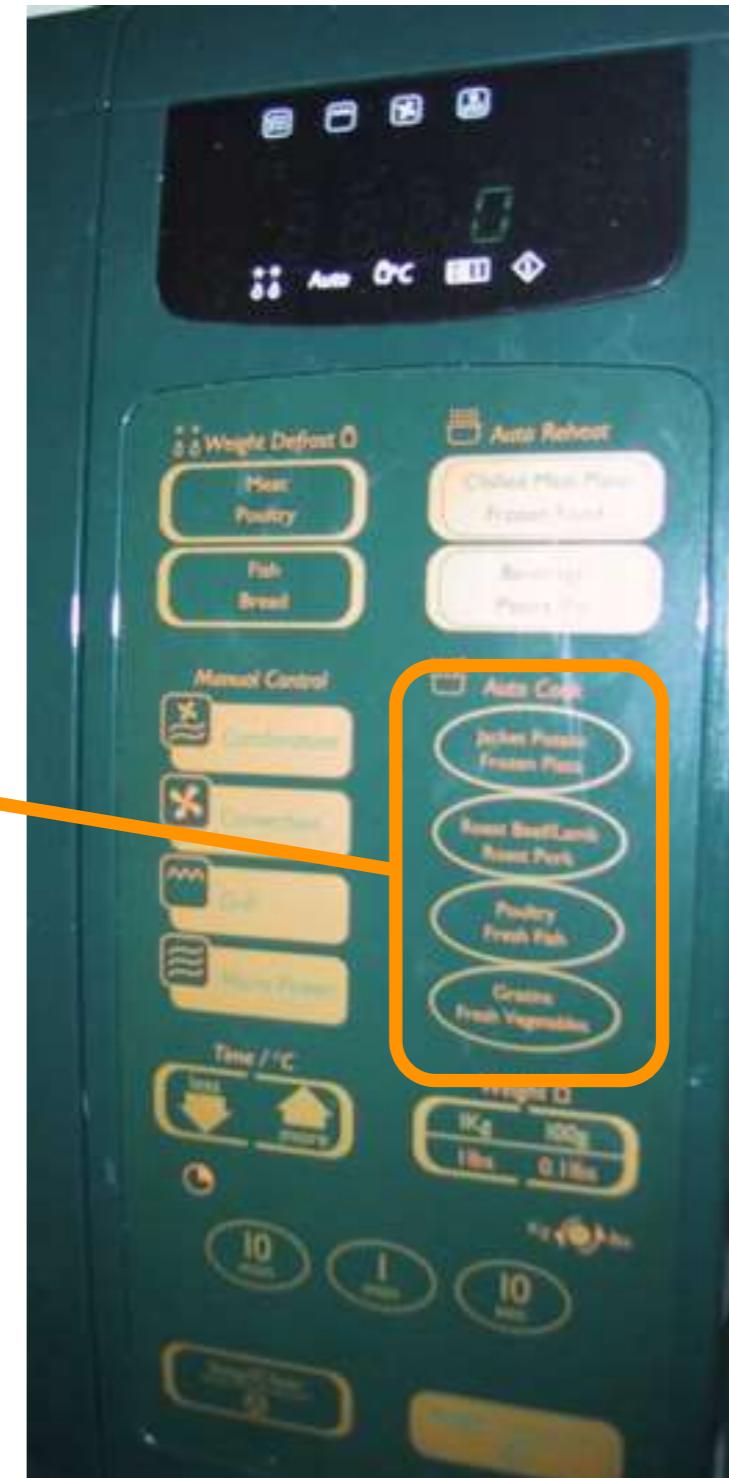
Example: Physical Controls

- ▶ grouping of items
- ▶ order of items
- ▶ decoration
 - different colors for different functions
 - lines around related buttons (temp up/down)



Example: Physical Controls

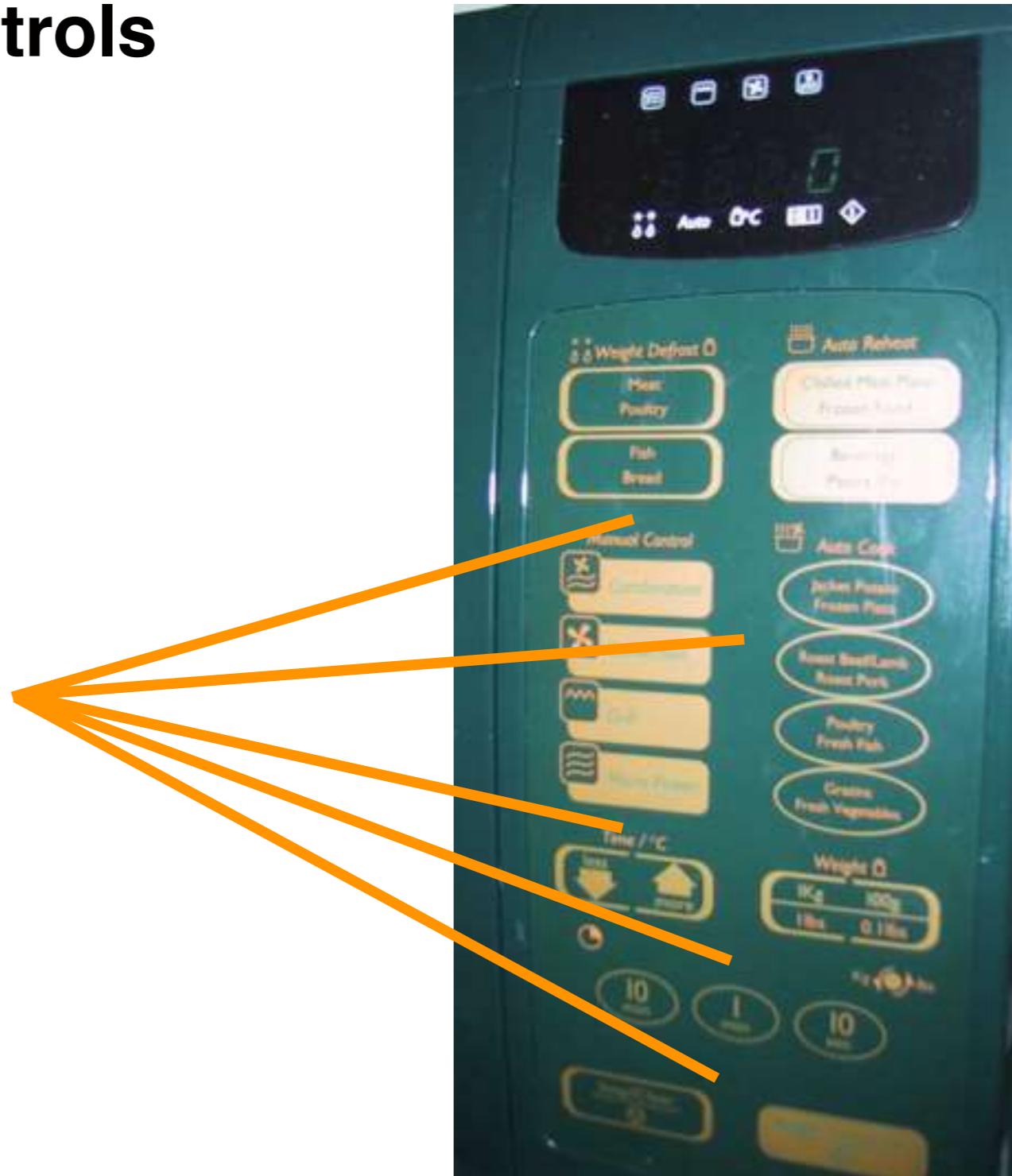
- ▶ grouping of items
- ▶ order of items
- ▶ decoration
- ▶ alignment
 - centered text in buttons
 - easy to scan



Screen Design and Layout

Example: Physical Controls

- ▶ grouping of items
- ▶ order of items
- ▶ decoration
- ▶ alignment
- ▶ white space
 - gaps to aid grouping



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

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

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

Across Countries and Cultures

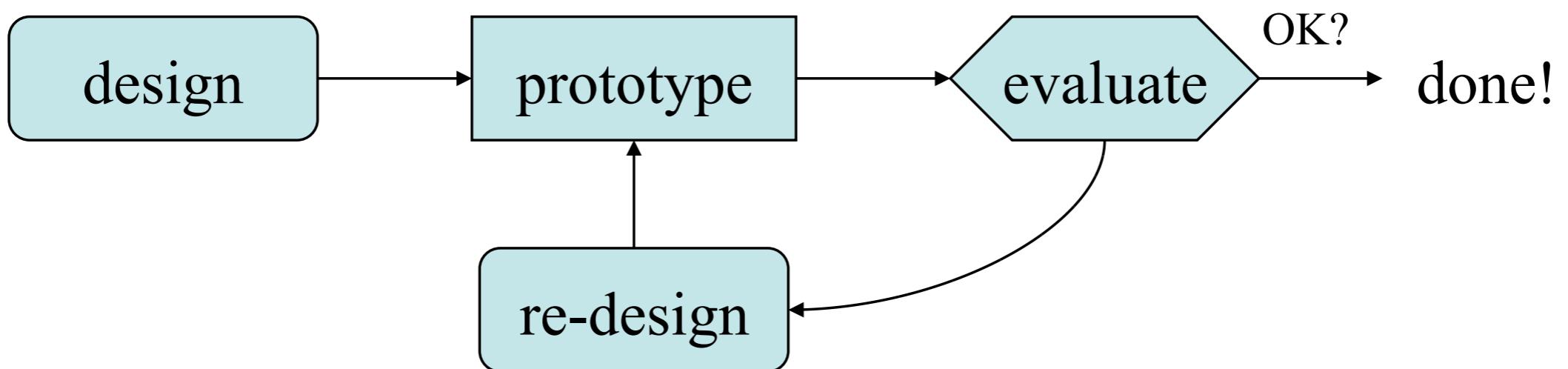
- ▶ localisation and internationalisation
 - changing interfaces for particular cultures/languages
- ▶ globalisation
 - try to choose symbols etc. that work everywhere
- ▶ simply change language?
 - translation changes sizes, left-right order etc.
- ▶ deeper issues
 - cultural assumptions and values
 - meanings of symbols, e.g., tick and cross in questionnaire
 - *Anglo-American culture: opposite meaning*
 - *European culture: usually same meaning*



- ▶ What is Design?
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- ▶ **Iteration and Prototyping**
- ▶ Summary

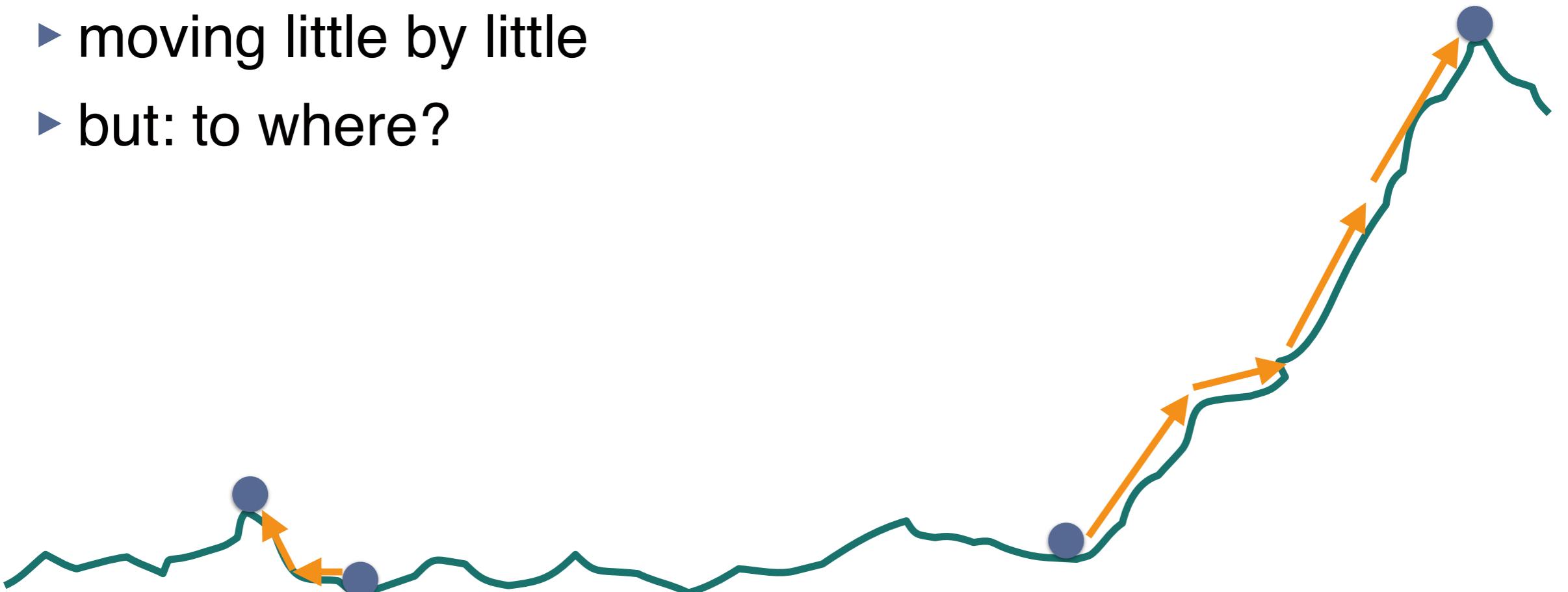
Prototyping

- ▶ goal: getting better
- ▶ important: starting well



Pitfalls of Prototyping

- ▶ moving little by little
- ▶ but: to where?



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

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- ▶ **Summary**

- ▶ **Interaction design** is about creating interventions in often complex situations using technology of many kinds including PC software, the web and physical devices.
- ▶ **Design** involves:
 - achieving goals within constraints and trade-off between these
 - understanding the raw materials
 - accepting limitations of humans and of design.
- ▶ The **design process** has several stages and is iterative and never complete.

- ▶ **Interaction** starts with getting to know the users and their context:
 - finding out who they are and what they are like
 - talking to them, watching them.
- ▶ **Scenarios** are rich design stories, which can be used and reused throughout design:
 - they help us to see what users will want to do
 - they give a step-by-step walkthrough of users' interactions: including what they see, so and are thinking.

- ▶ **Users** need to find their way around a system. This involves:
 - helping users know where they are, where they have been and what they can do next
 - creating overall structures that are easy to understand and fit the users' needs
 - designing comprehensible screens and control panels.
- ▶ **Complexity of design** means we don't get it right first time:
 - we need iteration and prototypes to try out and evaluate
 - but iteration can get trapped in *local maxima*, designs that have no simple improvements, but are no good
 - theory and models can help give good start points.