Paradigms , interaction design basics & HCI in the software process

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HUMAN-COMPUTER INTERACTION

THIRD EDITION

DIX
FINLAY
ABOWD
BEALE

chapter 4

paradigms

why study paradigms

Concerns

- how can an interactive system be developed to ensure its usability?
- how can the usability of an interactive system be demonstrated or measured?

History of interactive system design provides paradigms for usable designs

What are Paradigms

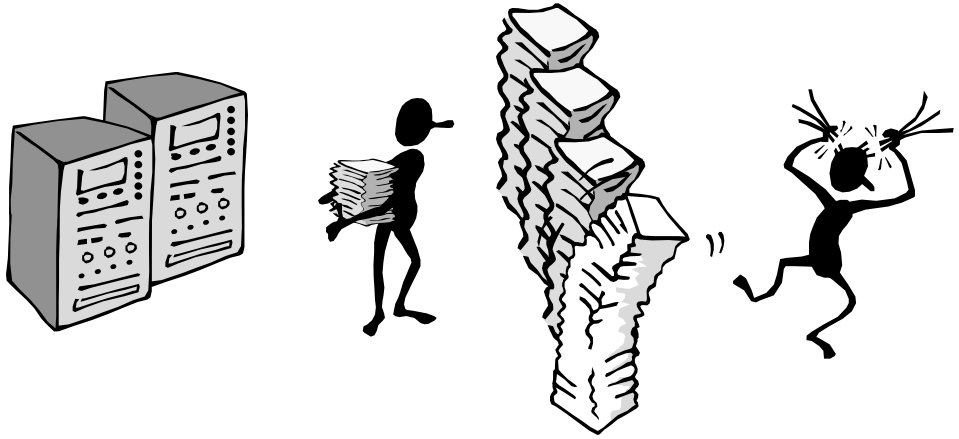
- Predominant theoretical frameworks or scientific world views
  - e.g., Aristotelian, Newtonian, Einsteinian (relativistic) paradigms in physics
- Understanding HCI history is largely about understanding a series of paradigm shifts
  - Not all listed here are necessarily “paradigm” shifts, but are at least candidates
  - History will judge which are true shifts

Paradigms of interaction

- New computing technologies arrive, creating a new perception of the human—computer relationship.
- We can trace some of these shifts in the history of interactive technologies.

The initial paradigm

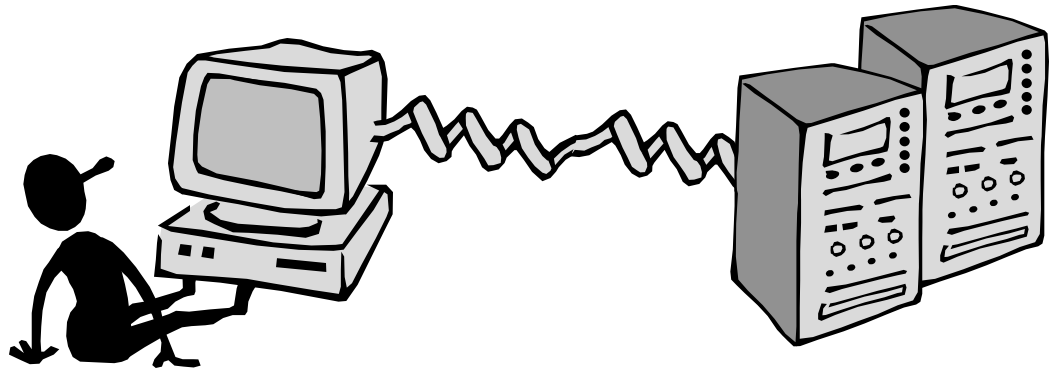
- Batch processing



Impersonal computing

Example Paradigm Shifts

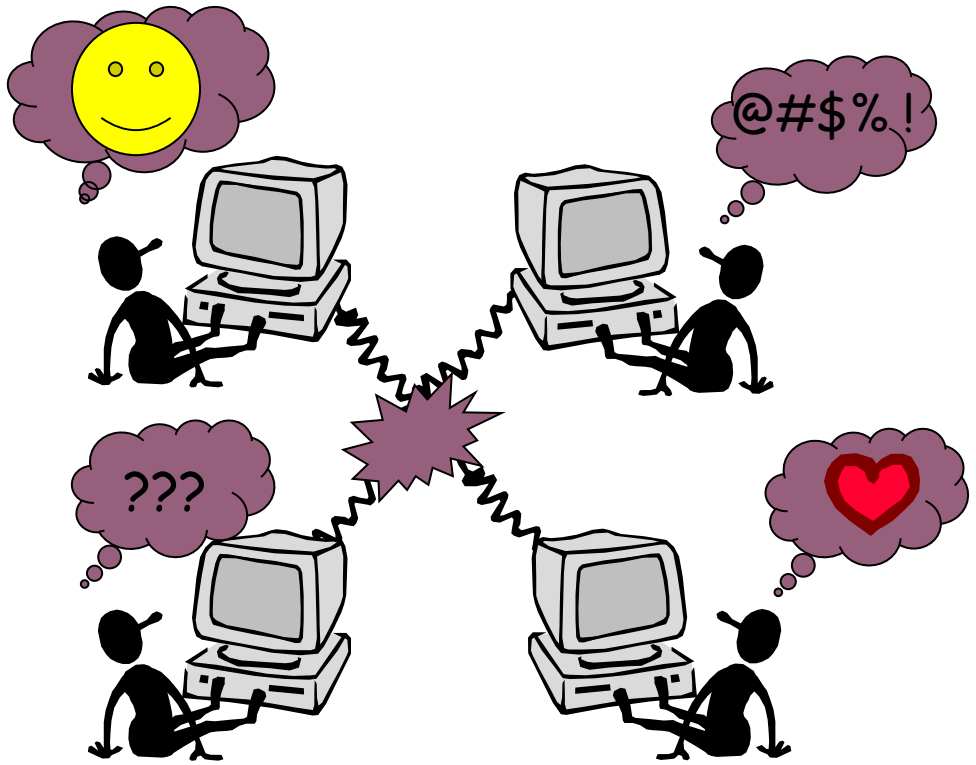
- Batch processing
- Time-sharing



Interactive computing

Example Paradigm Shifts

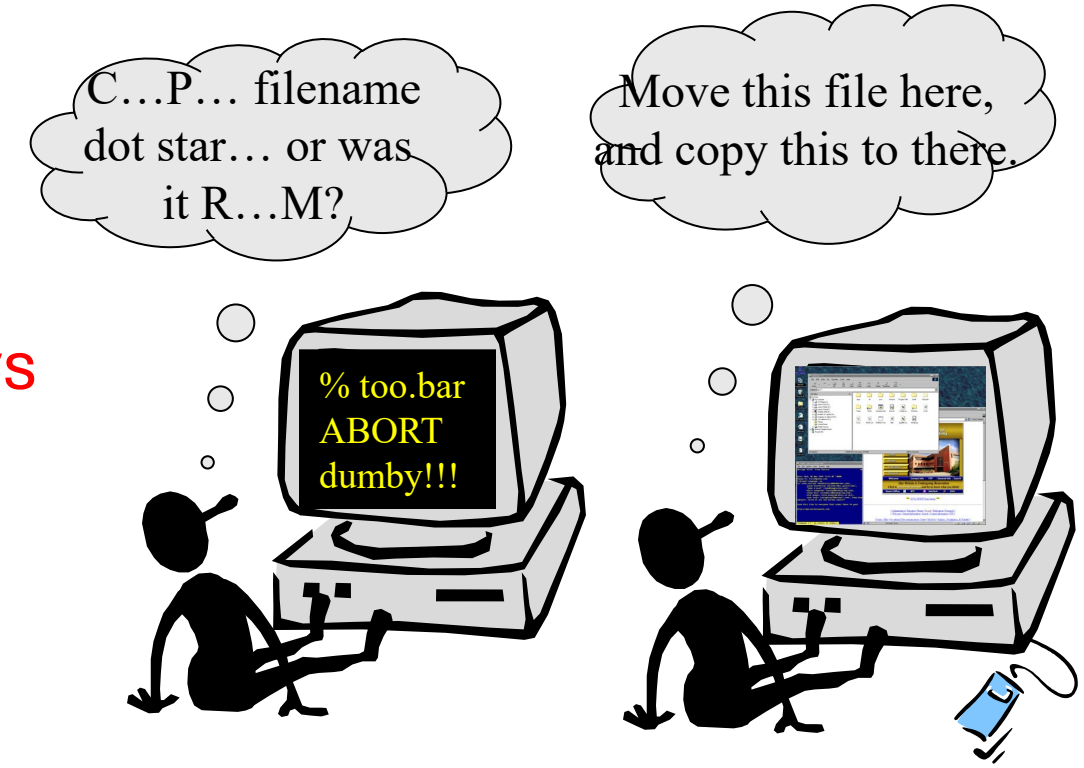
- Batch processing
- Timesharing
- Networking



Community computing

Example Paradigm Shifts

- Batch processing
- Timesharing
- Networking
- Graphical displays



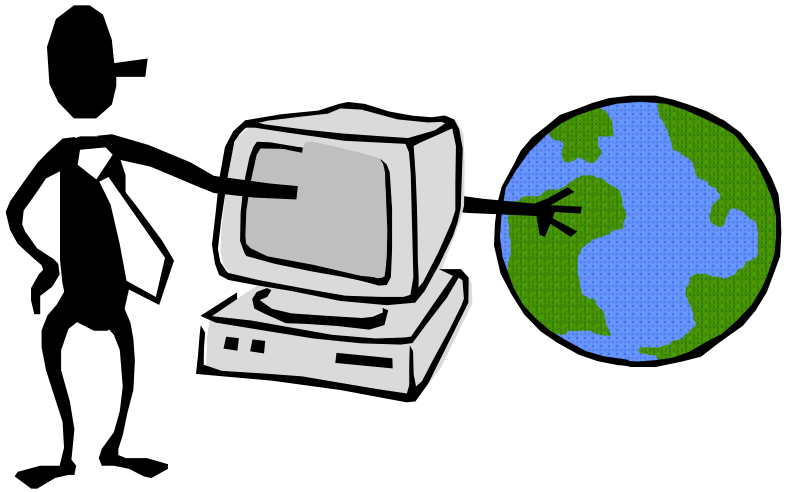
Example Paradigm Shifts

- Batch processing
- Timesharing
- Networking
- Graphical display
- Microprocessor

Personal computing

Example Paradigm Shifts

- Batch processing
- Timesharing
- Networking
- Graphical display
- Microprocessor
- WWW

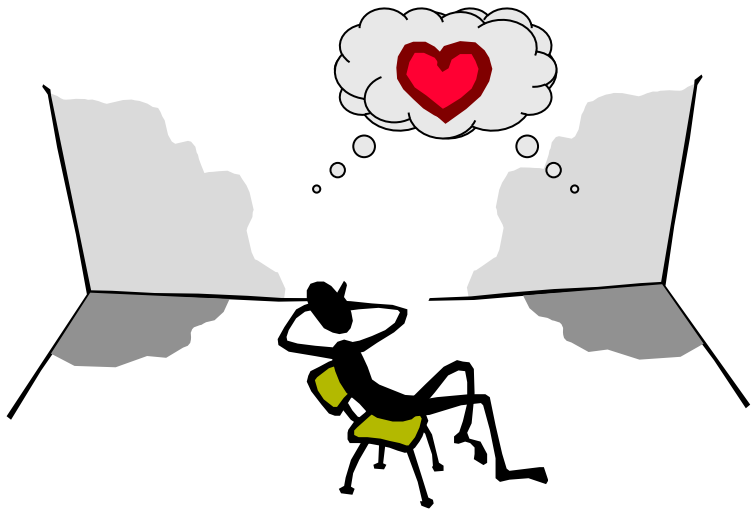


Global information

Example Paradigm Shifts

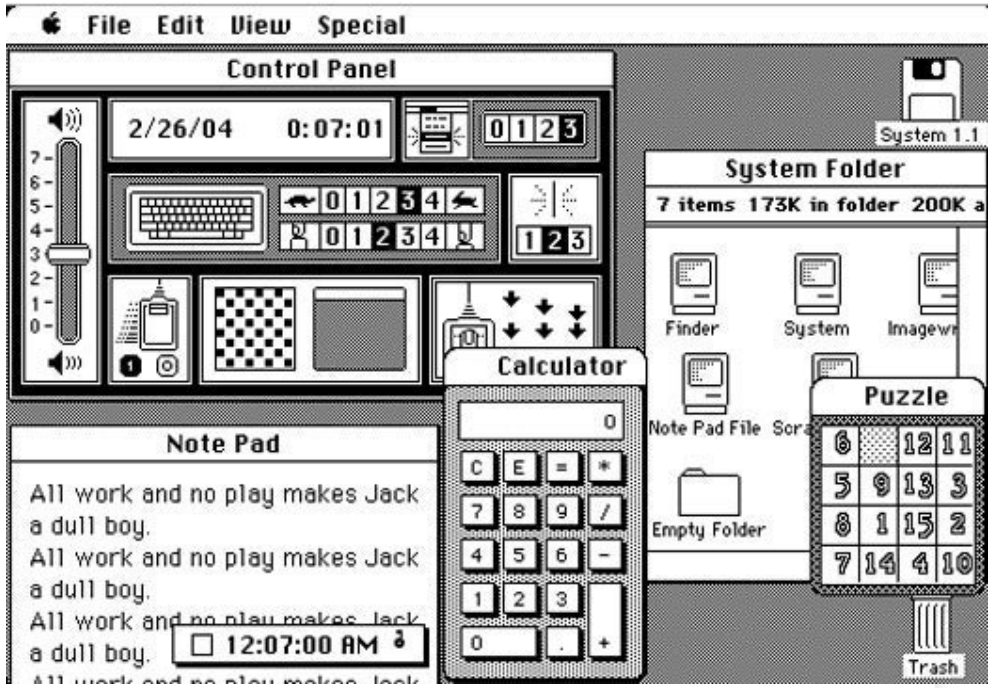
- Batch processing
- Timesharing
- Networking
- Graphical display
- Microprocessor
- WWW
- Ubiquitous Computing

- A symbiosis of physical and electronic worlds in service of everyday activities.



Time-sharing

- 1940s and 1950s – explosive technological growth
- 1960s – need to channel the power
- J.C.R. Licklider at ARPA
- single computer supporting multiple users



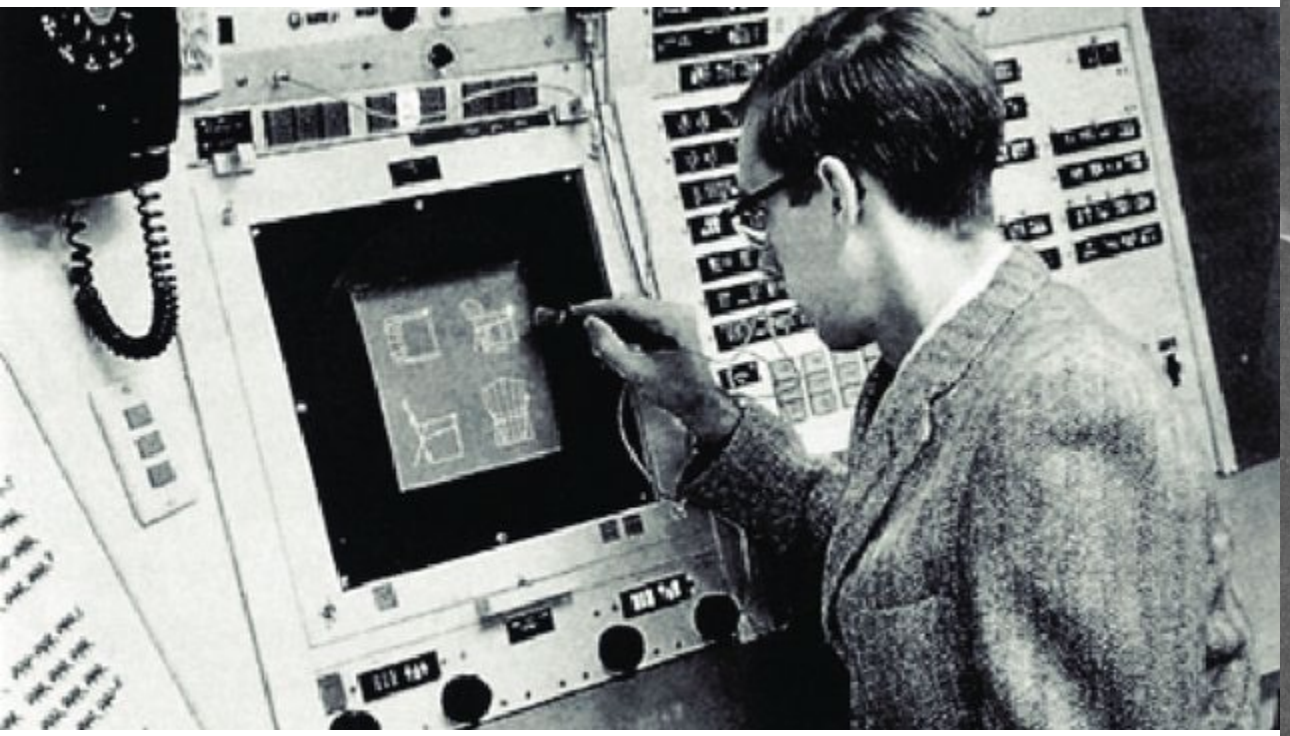
Video Display Units

more suitable medium than paper

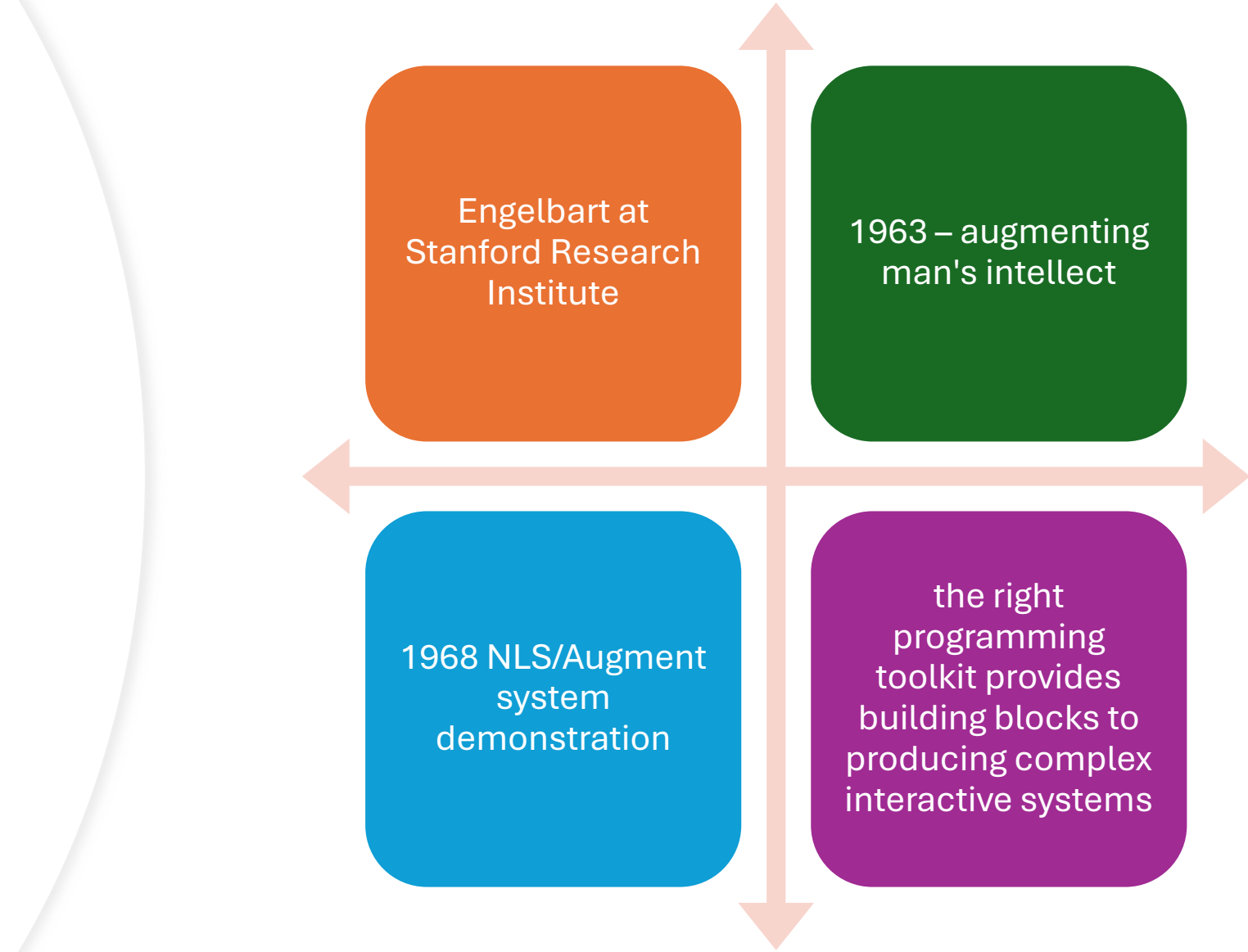
1962 – Sutherland's Sketchpad

computers for visualizing and manipulating data

one person's contribution could drastically change the history of computing



Programming toolkits

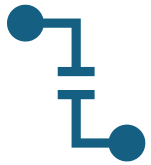


Personal computing

- 1970s – Papert's LOGO language for simple graphics programming by children
- A system is more powerful as it becomes easier to user
- Future of computing in small, powerful machines dedicated to the individual
- Kay at Xerox PARC – the Dynabook as the ultimate personal computer

Window systems and the WIMP interface

humans can pursue more than one task at a time



windows used for dialogue partitioning, to “change the topic”

1981 – Xerox Star first commercial windowing system

windows, icons, menus and pointers now familiar interaction mechanisms

Metaphor

relating computing to other real-world activity is effective teaching technique

- LOGO's turtle dragging its tail
- file management on an office desktop
- word processing as typing
- financial analysis on spreadsheets
- virtual reality – user inside the metaphor

Problems

- some tasks do not fit into a given metaphor
- cultural bias

Direct manipulation

1982 – Shneiderman describes appeal of graphically-based interaction

- visibility of objects
- incremental action and rapid feedback
- reversibility encourages exploration
- syntactic correctness of all actions
- replace language with action

1984 – Apple Macintosh

the model-world metaphor

What You See Is What You Get (WYSIWYG)

Hypertext

- 1945 – Vannevar Bush and the memex
- key to success in managing explosion of information
- mid 1960s – Nelson describes hypertext as non-linear browsing structure
- hypermedia and multimedia
- Nelson's Xanadu project still a dream today

Multimodality

a mode is a human communication channel

emphasis on simultaneous use of multiple channels for input and output

Computer Supported Cooperative Work (CSCW)

CSCW removes bias of single user / single computer system

Can no longer neglect the social aspects

Electronic mail is most prominent success

The World Wide Web

Hypertext, as originally realized, was a closed system

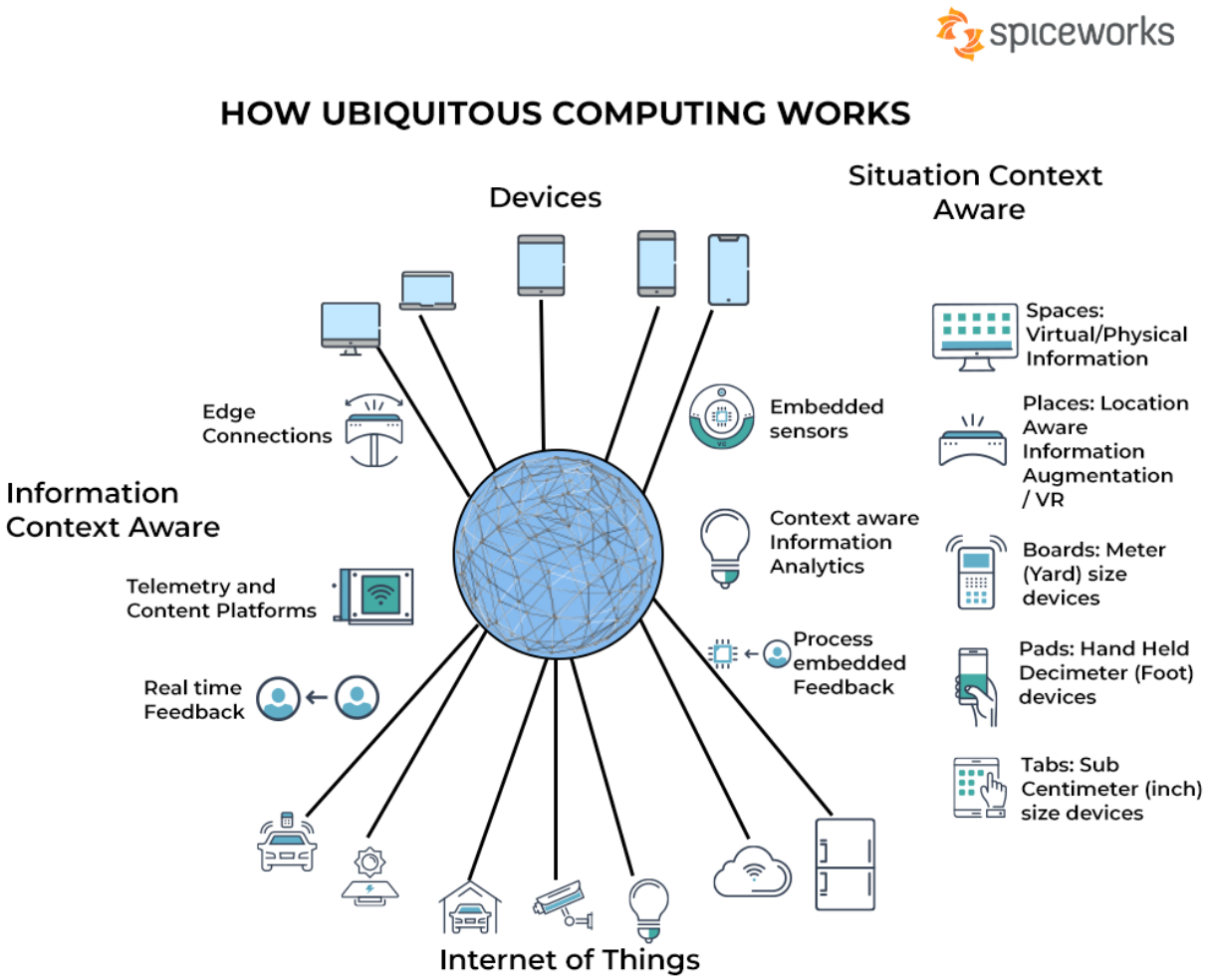
Simple, universal protocols (e.g. HTTP) and mark-up languages (e.g. HTML) made publishing and accessing easy

Critical mass of users lead to a complete transformation of our information economy.

Agent-based Interfaces

Original interfaces	• Commands given to computer • Language-based
Direct Manipulation/WIMP	• Commands performed on “world” representation • Action based
Agents - return to language by instilling proactivity and “intelligence” in command processor	• Avatars, natural language processing

Ubiquitous Computing



"The most profound technologies are those that disappear."

Mark Weiser, 1991

Late 1980's: computer was very apparent

How to make it disappear?

- Shrink and embed/distribute it in the physical world
- Design interactions that don't demand our intention

Sensor-based and Context-aware Interaction

Humans are good at recognizing the "context" of a situation and reacting appropriately

Automatically sensing physical phenomena (e.g., light, temp, location, identity) becoming easier

How can we go from sensed physical measures to interactions that behave as if made "aware" of the surroundings?

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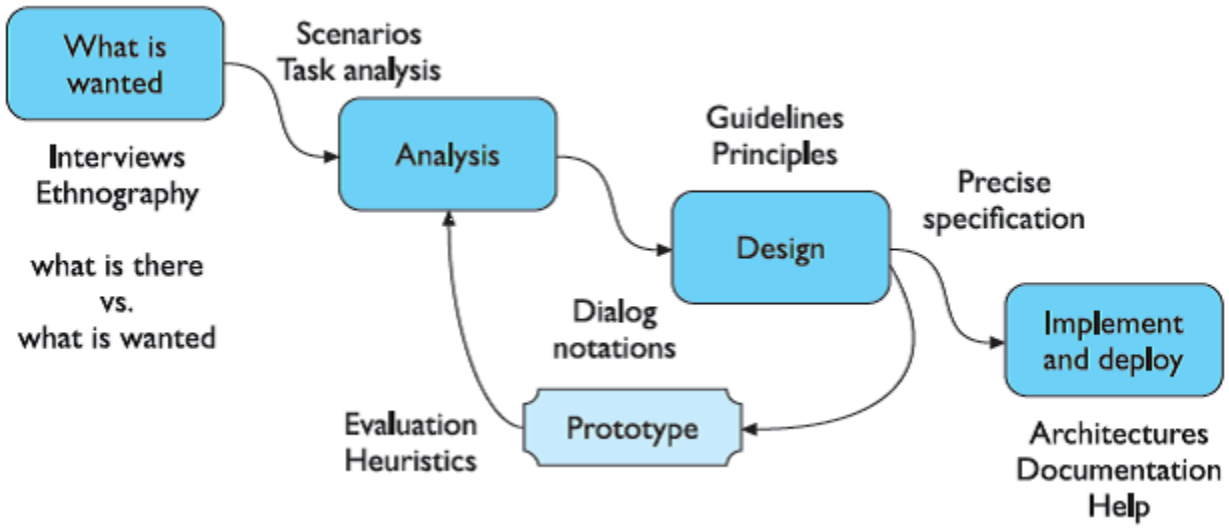
chapter 5

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!

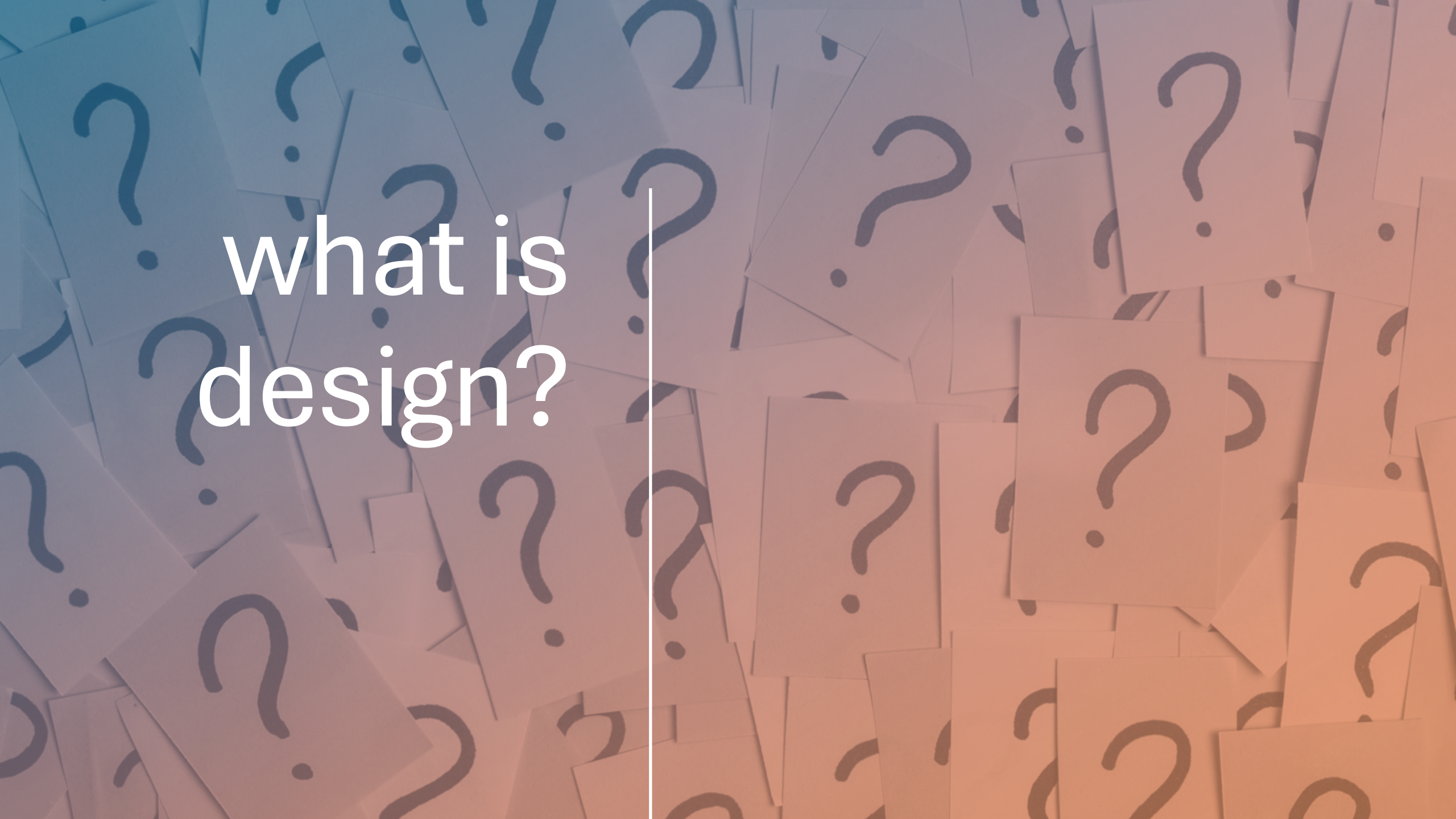
interactions and interventions

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

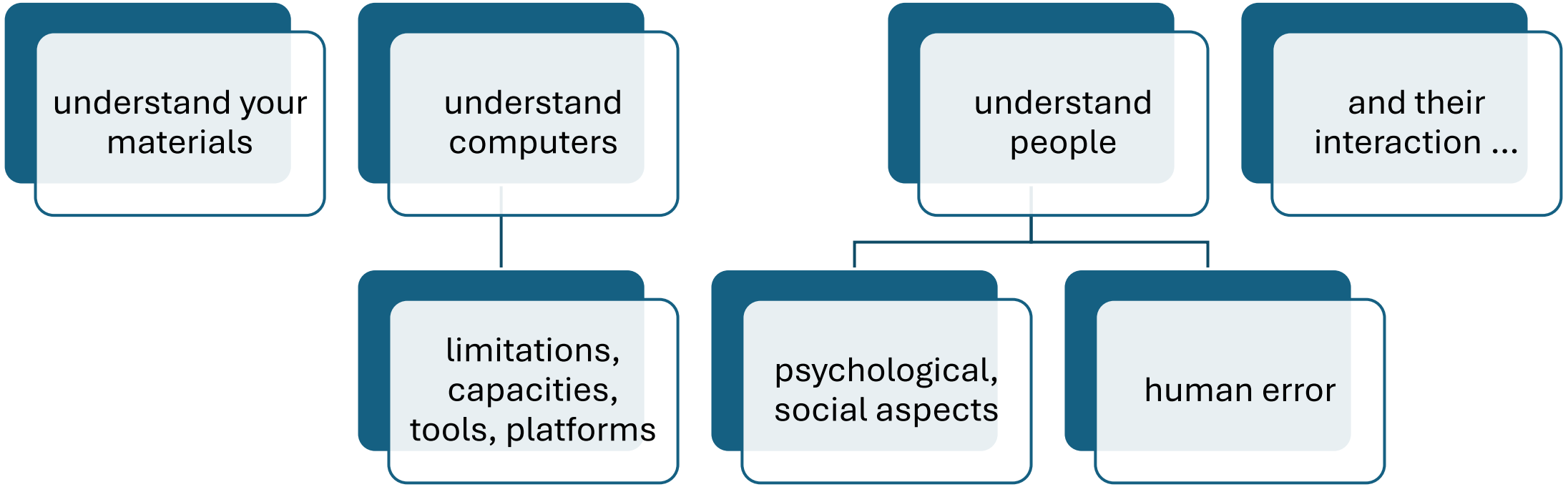
- materials, platforms

trade-offs

golden rule of design

understand your materials

for Human–Computer Interaction

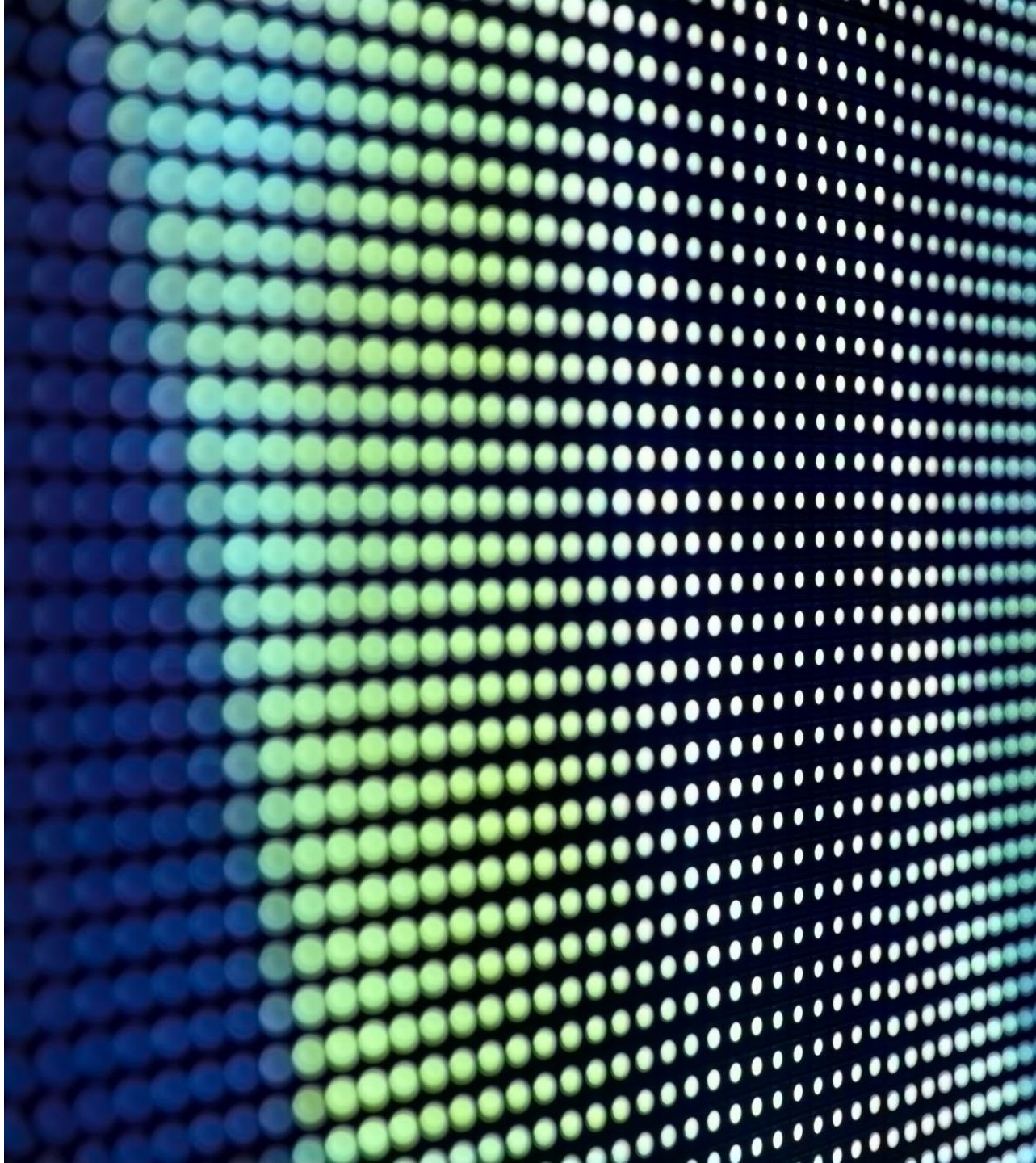


To err is human

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

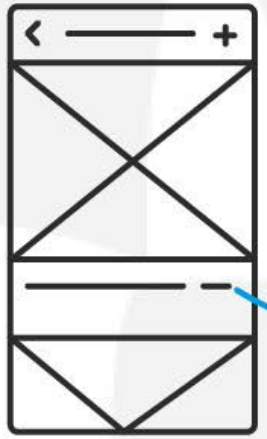
Central message ...

the user



UX Storyboard

1. Landing Page

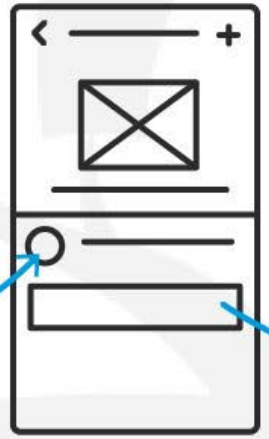


Tapping the share link in the header sends the user to the share screen.

Animation
Screen slides left

Go to home screen

2. Invite User

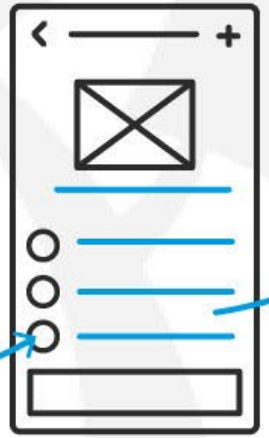


Text field promts the user to add an email address.

Animation
None

New user appears

3. Update User List

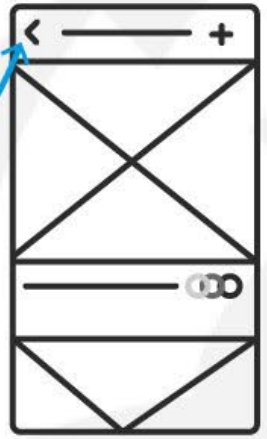


New people get added to the bottom of the list. Hitting 'X' or 'Save' closes this screen.

Animation
Username fades in

Back to board screen

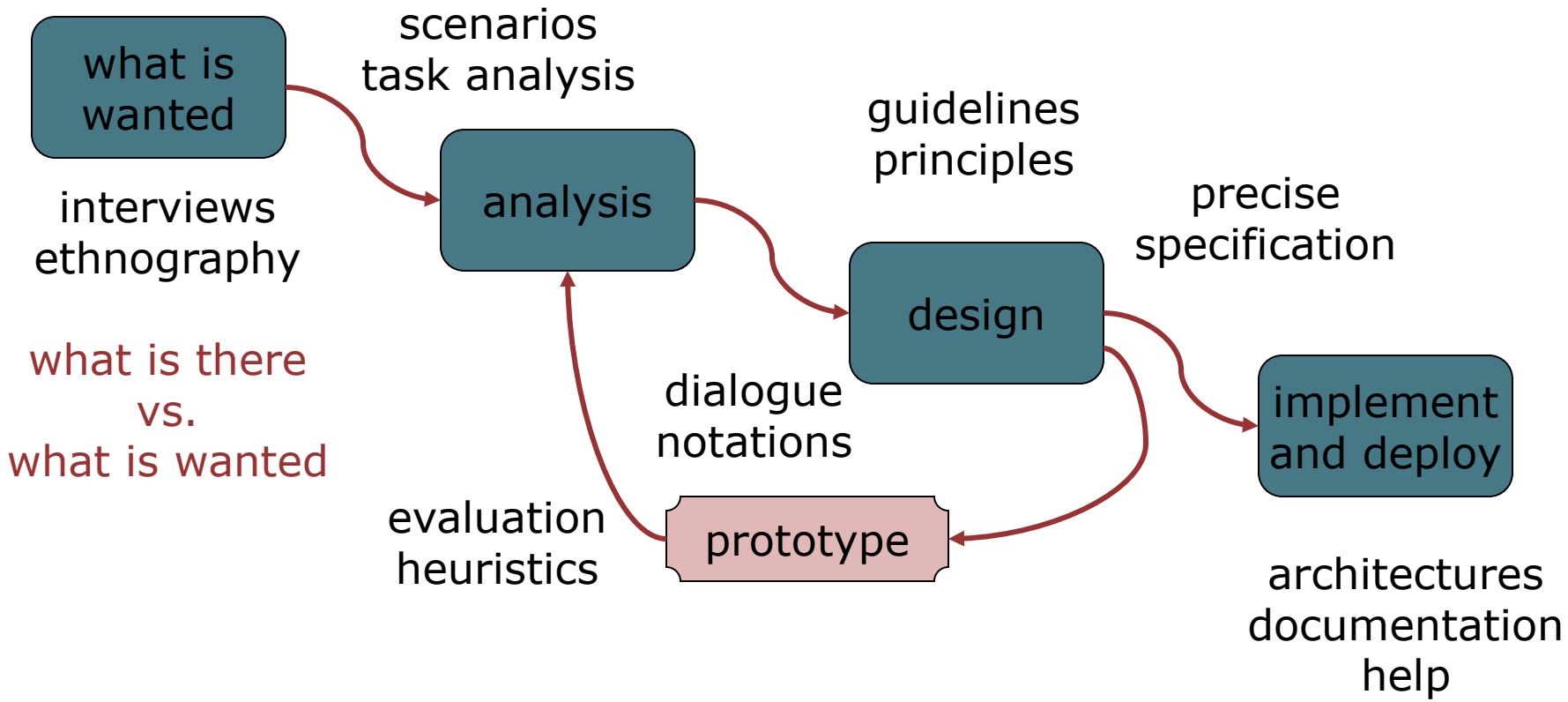
4. Update Landing Page



User is taken back to the feed where the new images are displayed.

Animation
Screen slides right

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

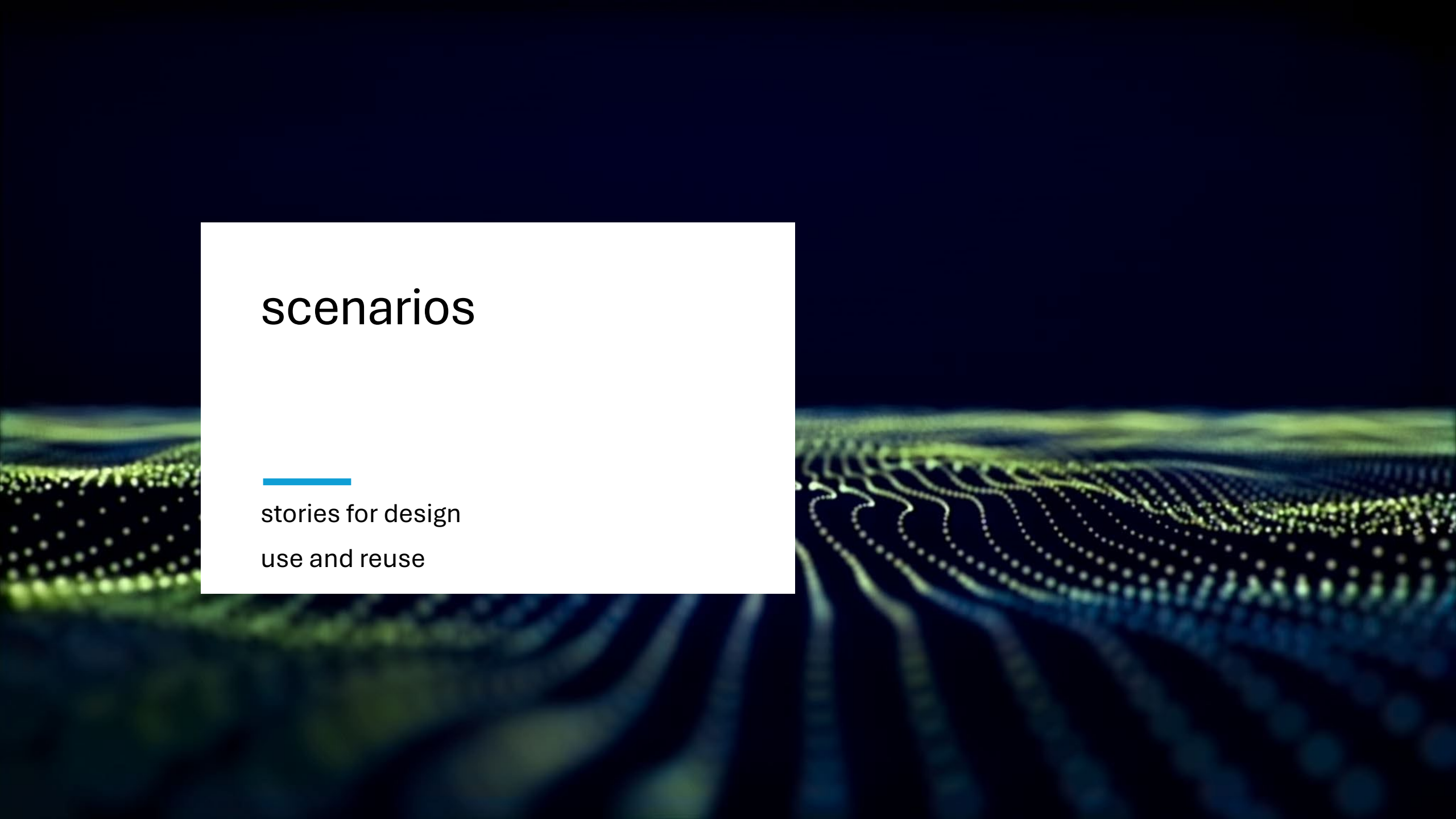
- sometimes hard
  - in the home
  - psychiatric patients, …

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

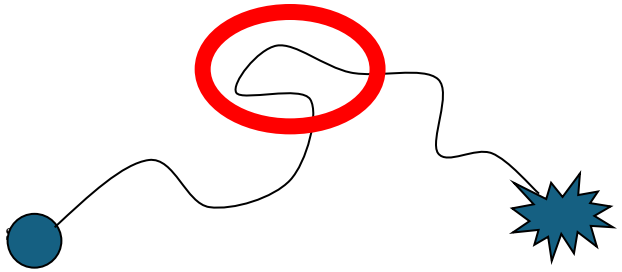
Pros:

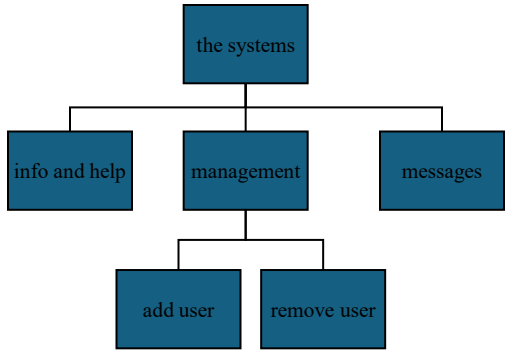
- life and time are linear
- easy to understand (stories and narrative are natural)
- concrete (errors less likely)

Cons:

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

- So:
  - use several scenarios
  - use several methods

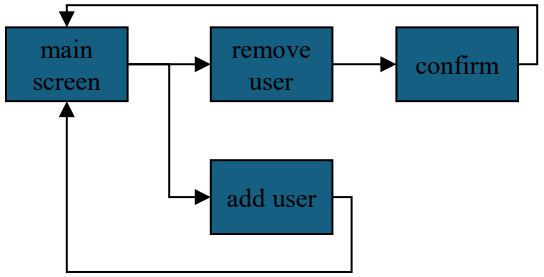




navigation design

local structure – single screen

global structure – whole site



levels

1

widget choice

- menus, buttons etc.

2

screen design

3

application navigation design

4

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

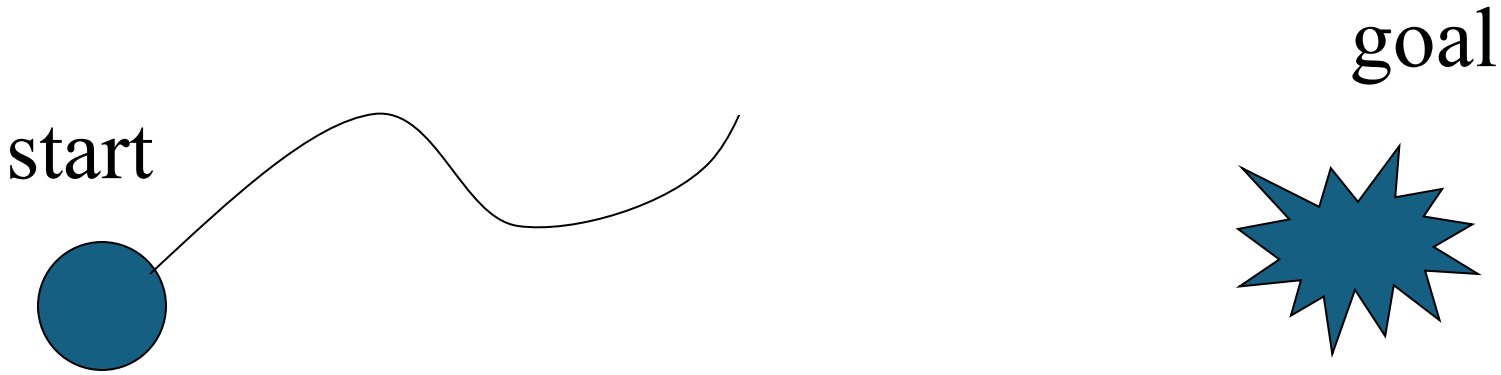
think about structure

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


local
from one screen looking out

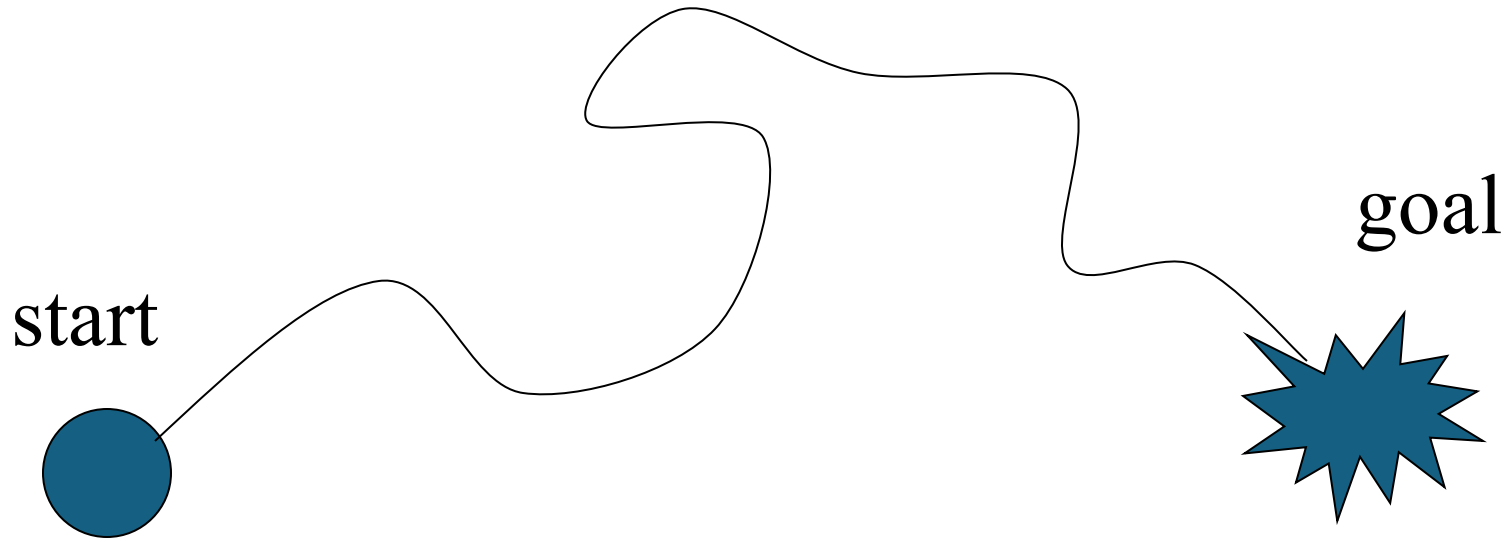
goal seeking

goal seeking



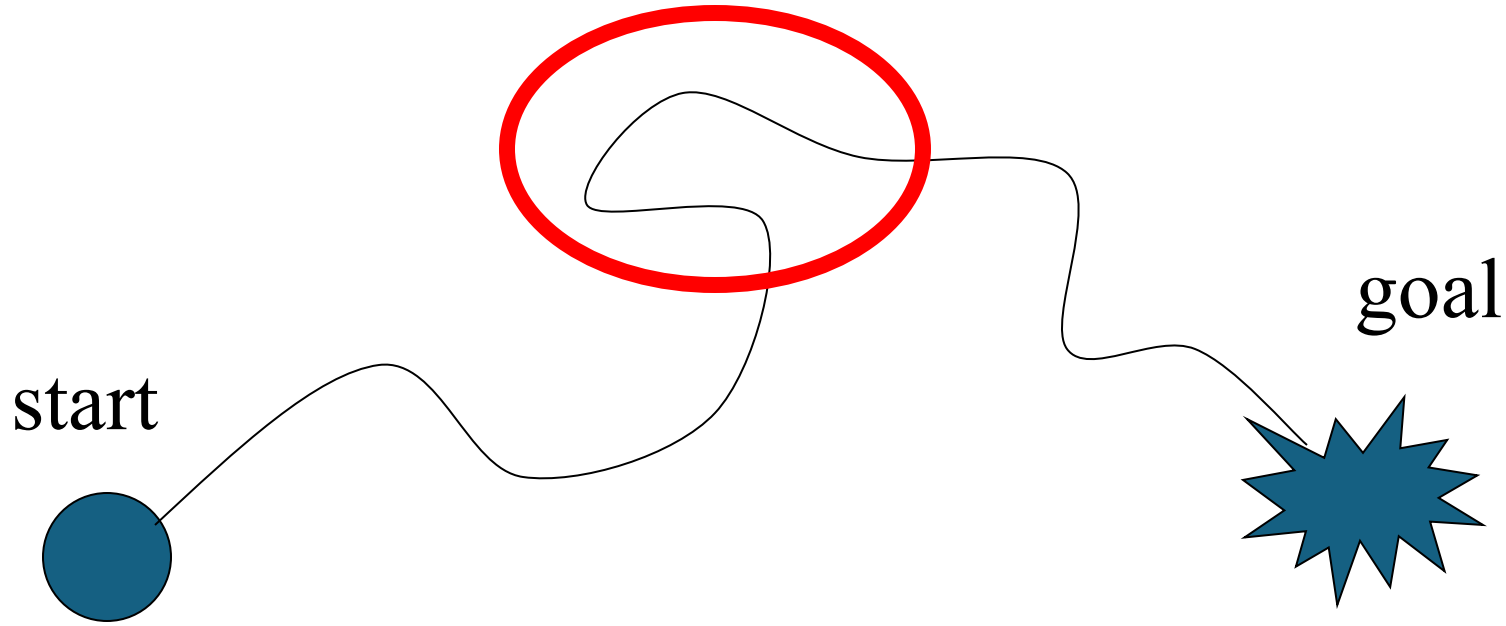
progress with local knowledge only ...

goal seeking



… but can get to the goal

goal seeking



… try to avoid these bits!

four golden rules

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

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