Human-Computer Interaction (HCI)

DECO2500/7250

Dr Maxime Cordeil

04

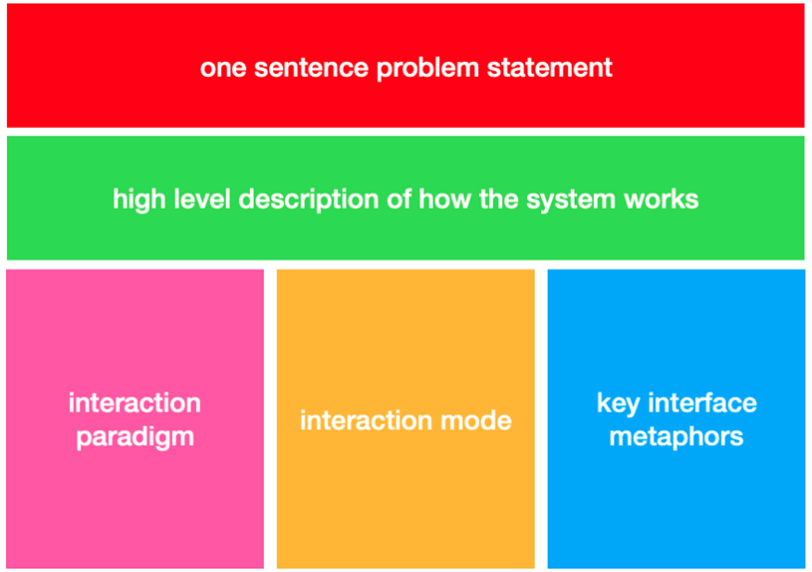
Prototyping, Interaction Paradigms and Modes

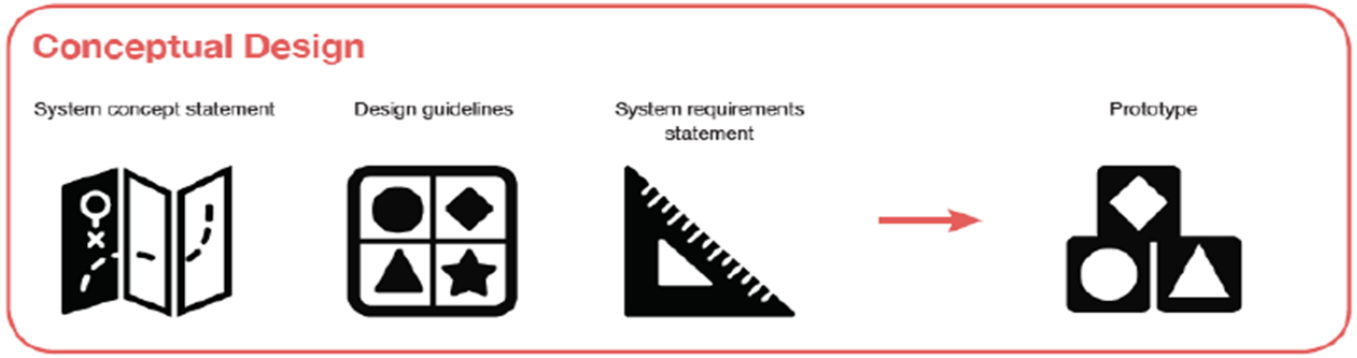
In this session…

- Conceptual Design: Prototyping
- Interaction Paradigms
- Interaction Modes
- Introduction to Assignment 1 "Design Proposal"

Conceptual Design

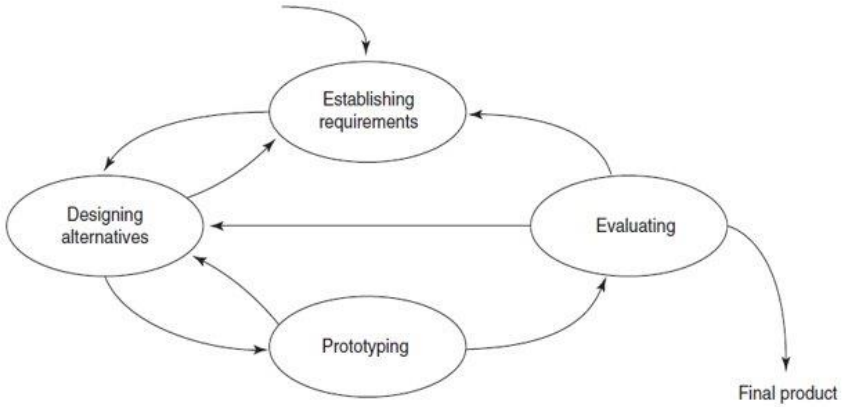
- System Concept
- Initial Design Guidelines
- Initial System Requirements
- **Prototype**





Interaction Design approach

1. Who are the users?
2. What do we mean by ‘needs’?
3. Scenario? Story? Tasks?
4. **How to generate alternatives**
5. How to choose among alternatives



Prototypes as conceptual design artefacts

- Representation
- Precision
- Interactivity
- Evolution

From Beaudouin-Lafon, M. and Mackay, W.E. (2002) Prototyping Development and Tools. In J.A. Jacko and A. Sears (Eds), Handbook of Human-Computer Interaction. New York: Lawrence Erlbaum Associates, pages 1006-1031. (Revised edition 2007) Chapter available at: https://www.lri.fr/~mackay/pdffiles/Prototype.chapter.pdf

Representation

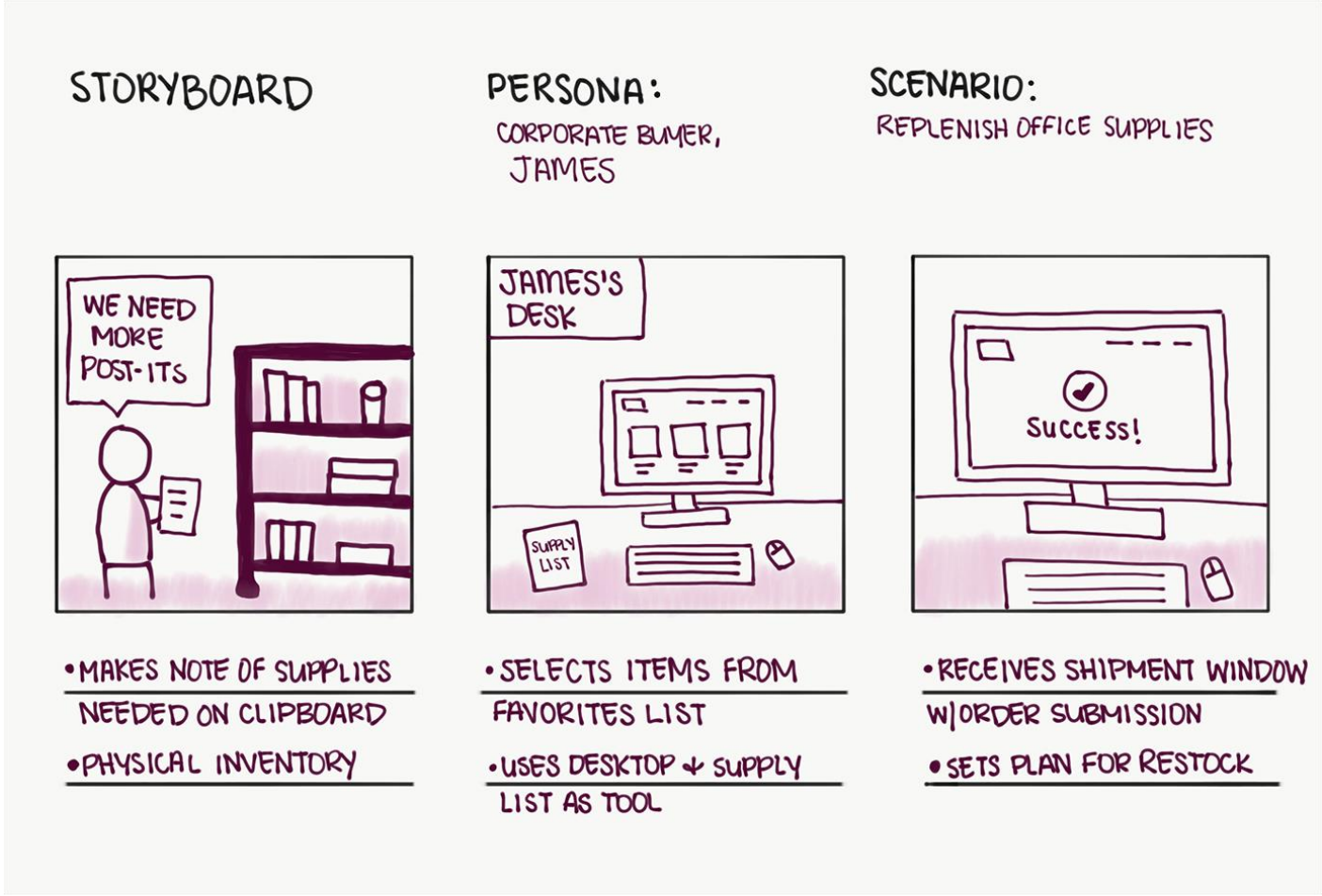
Form of the prototype

Off-line (paper prototypes)

- Sketches, storyboards, mock-ups, role-play
- Cheap & fast – can do many iterations at low cost. Perfect for brainstorming

Storyboard

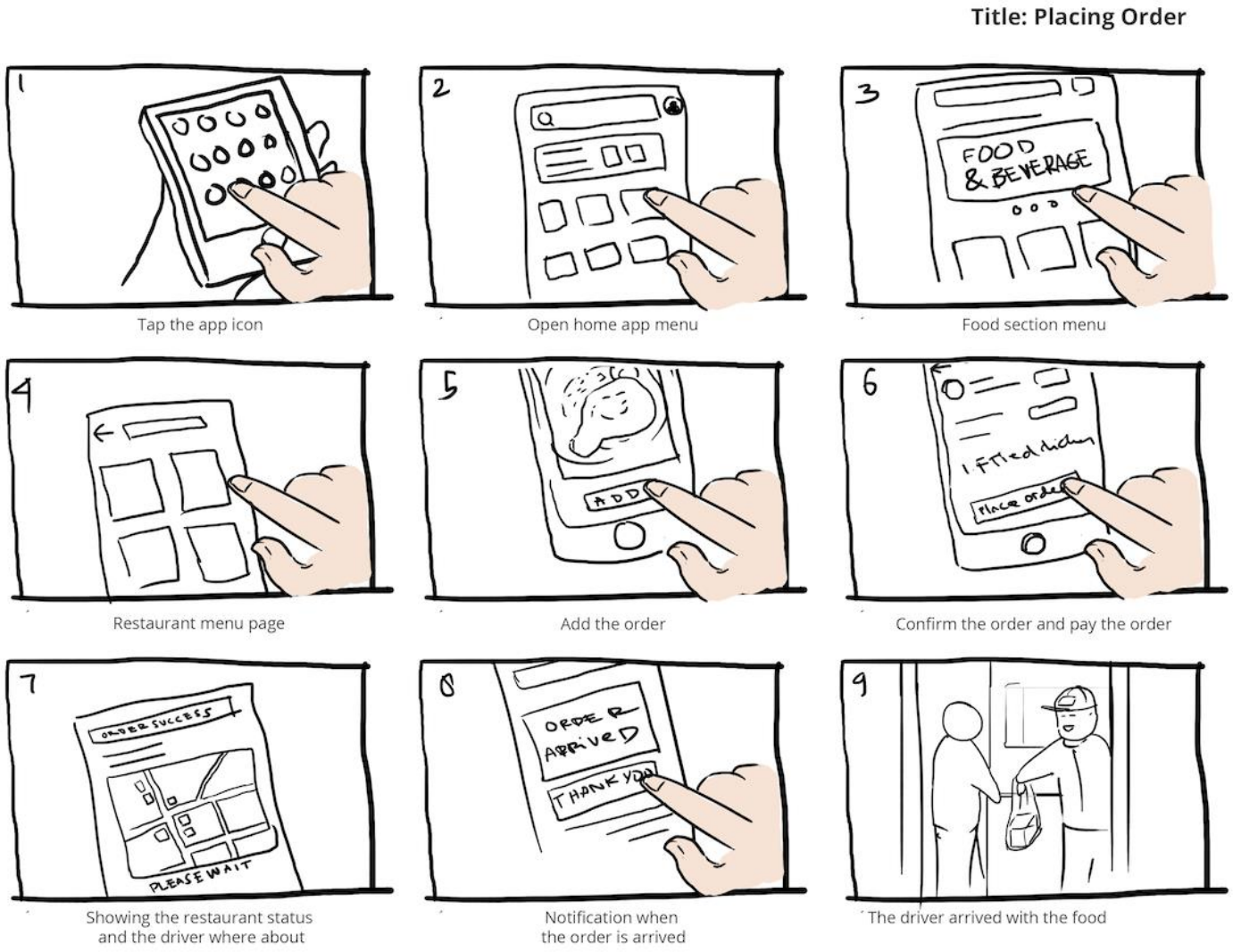
- Based on Scenario and Persona



[Storyboarding and User-interface design! | by Shaktiditya katiyar | UX Planet]

[Storyboards Help Visualize UX Ideas (nngroup.com)]

Storyboard



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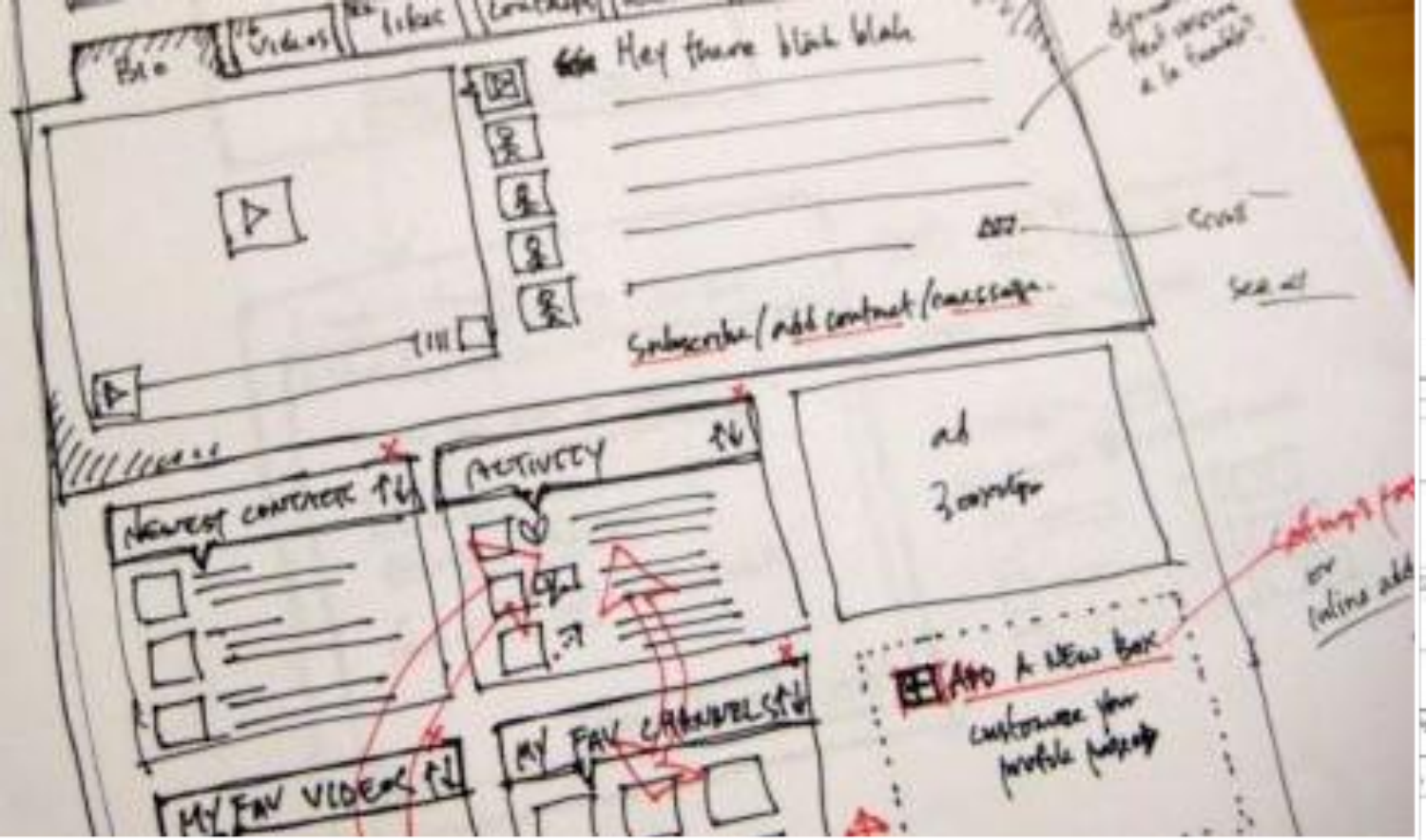
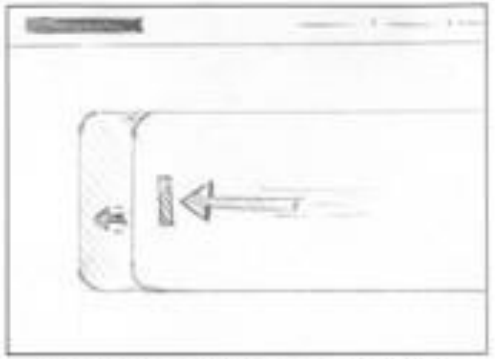
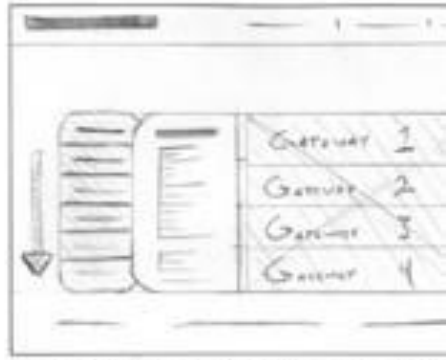


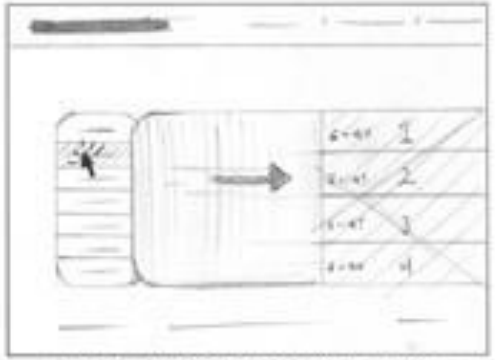


Main menu buttons are revealed as main interface area stops.

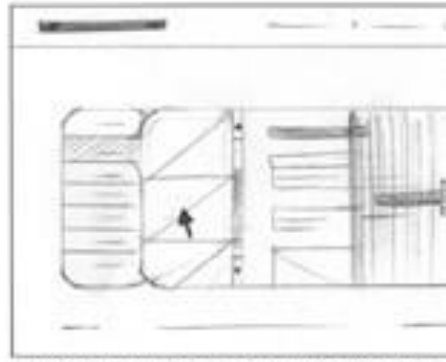


Main section buttons are revealed. Welcome message with gatew

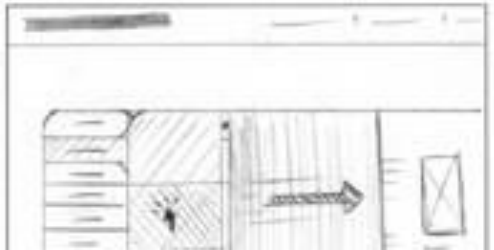
User rolls over main section button. Rollover effect occurs.

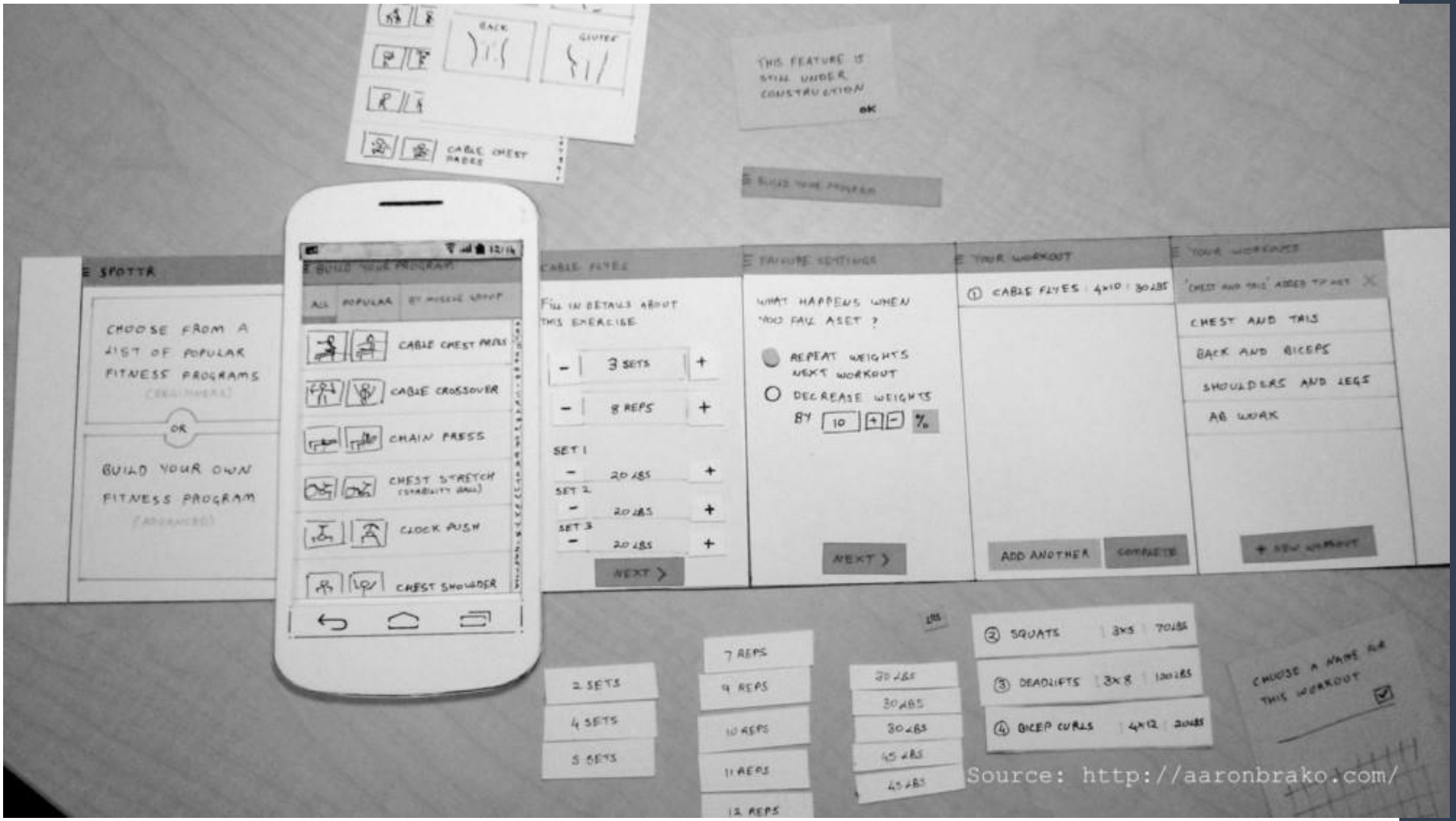


User clicks main section button. Main content area hides . . .



Main content area transitions to section content. Sublinks rev





Source: http://aaronbrako.com/

Representation

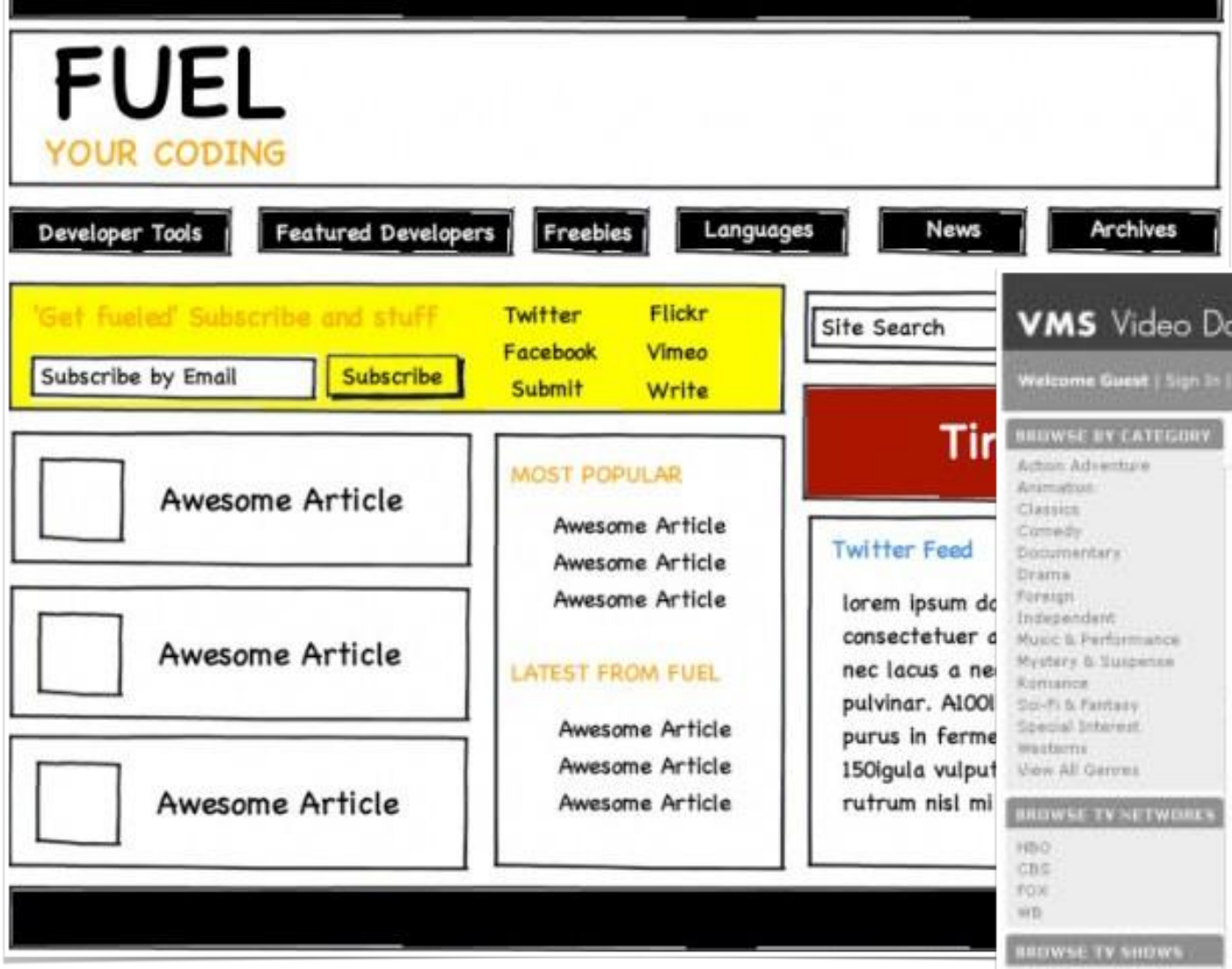
Form of the prototype

On-line (software prototypes)

- Partially implemented or digitally mocked-up
- Animations, interactive video, scripted apps

Representations

- Should suit purpose: should correspond to where you're at in the design process
- Allows to test the concept further, "more realistic setup"


FUEL
YOUR CODING
Developer Tools
Featured Developers
Freebies
Languages
News
Archives
'Get fueled' Subscribe and stuff
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Facebook
Submit
Flickr
Vimeo
Write
Site Search
Awesome Article
Awesome Article
Awesome Article
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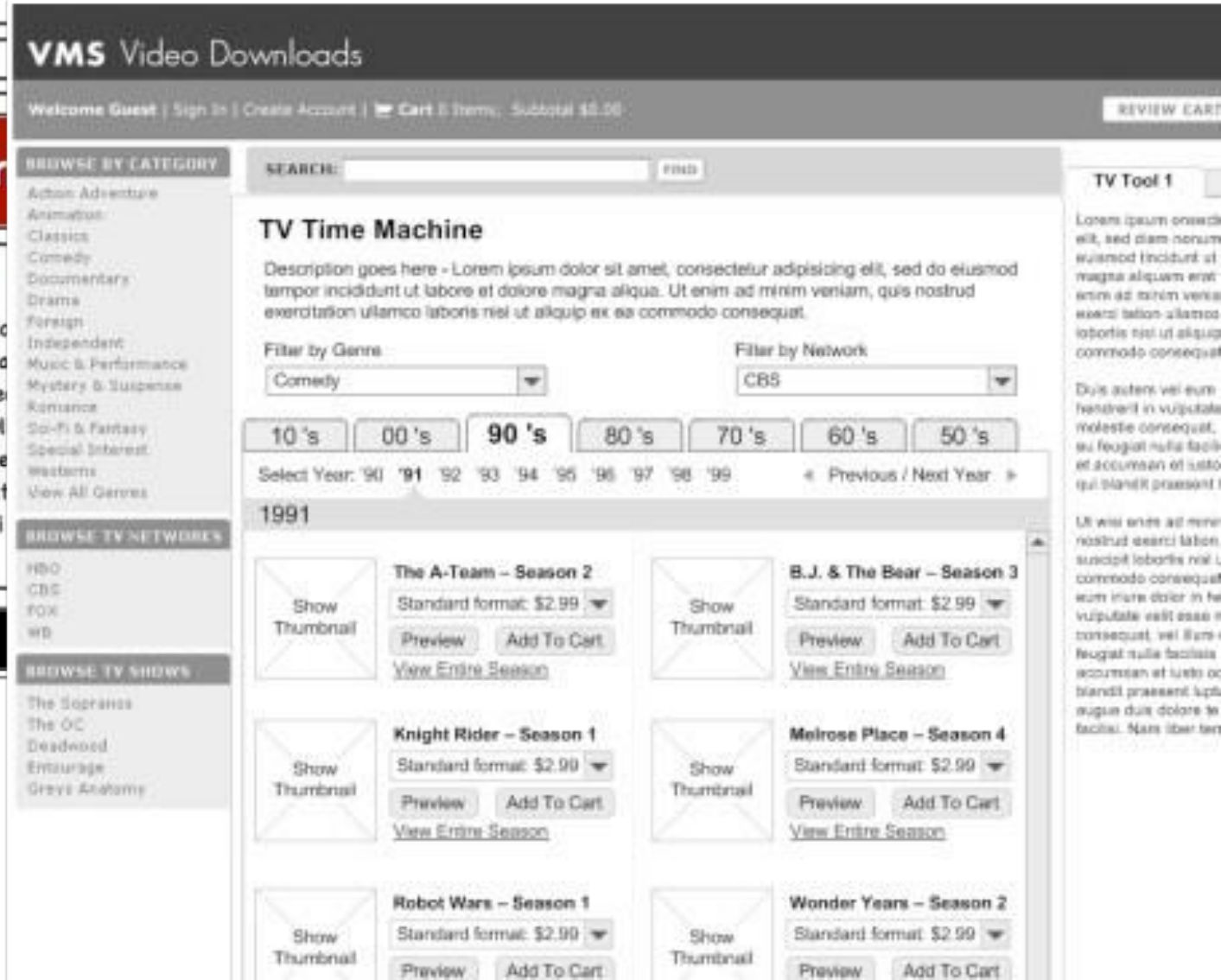
VMS Video Downloads
Welcome Guest | Sign In | Create Account | Cart
REVIEW CART
BROWSE BY CATEGORY
Action Adventure
Animation
Classics
Comedy
Documentary
Drama
Foreign
Independent
Music & Performance
Mystery & Suspense
Romance
Sci-Fi & Fantasy
Special Interest
Westerns
View All Genres
BROWSE TV NETWORKS
HBO
CBS
FOX
WB
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The Sopranos
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Filter by Genre
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60 's
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Show Thumbnail
The A-Team – Season 2
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Preview
Add To Cart
View Entire Season
Show Thumbnail
B.J. & The Bear – Season 3
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Knight Rider – Season 1
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Melrose Place – Season 4
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Robot Wars – Season 1
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Wonder Years – Season 2
Standard format: $2.99
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Carrier
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More
Photo Gallery
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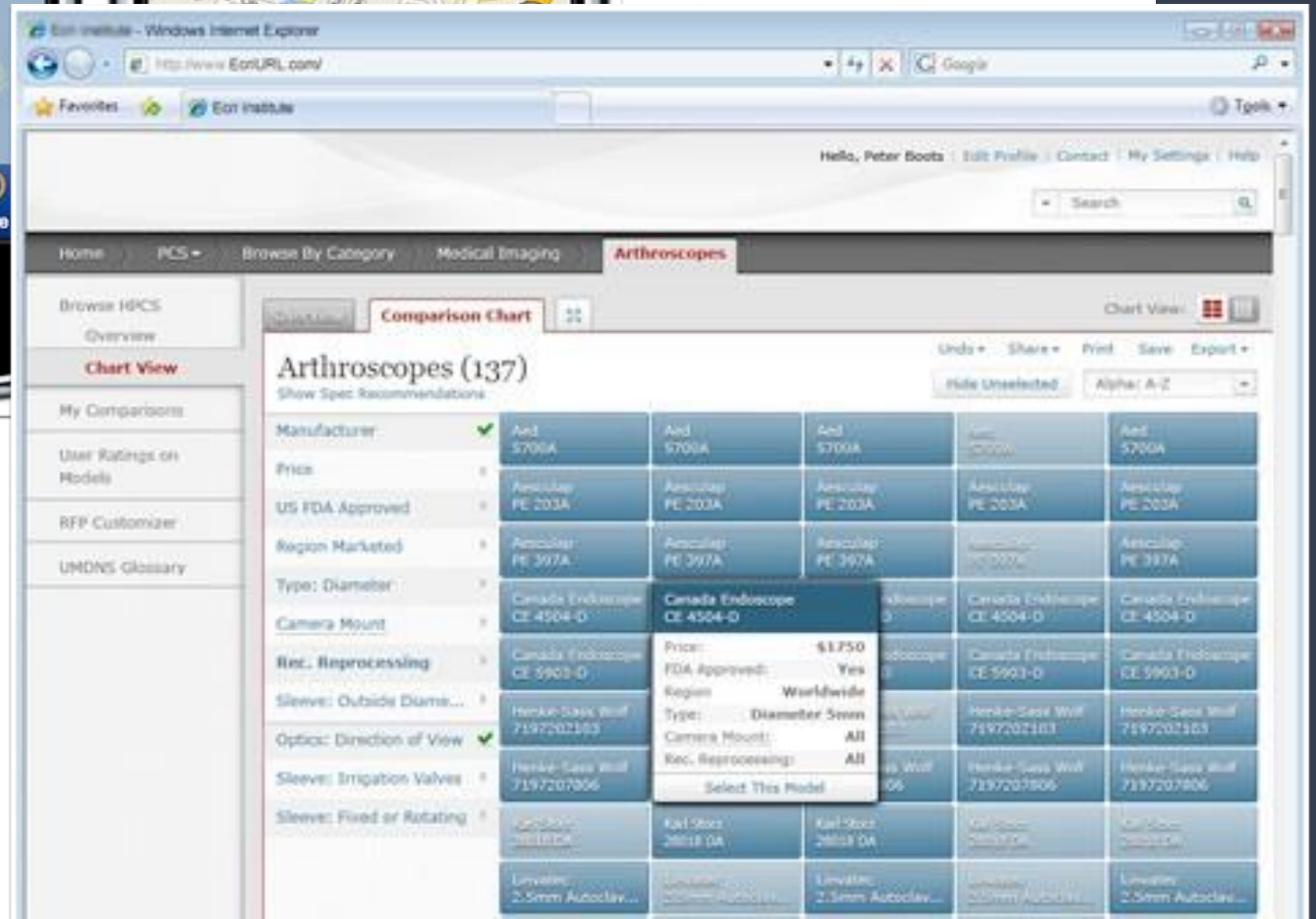

Hello, Peter Boots
Home
PCS
Browse By Category
Medical Imaging
Arthroscopes
Comparison Chart
Arthroscopes (137)
Chart View
Canada Endoscope
CE 4504-D
Price: $1750
FDA Approved: Yes
Region: Worldwide
Type: Diameter 5mm
Camera Mount: All
Rec. Reprocessing: All
Select This Model

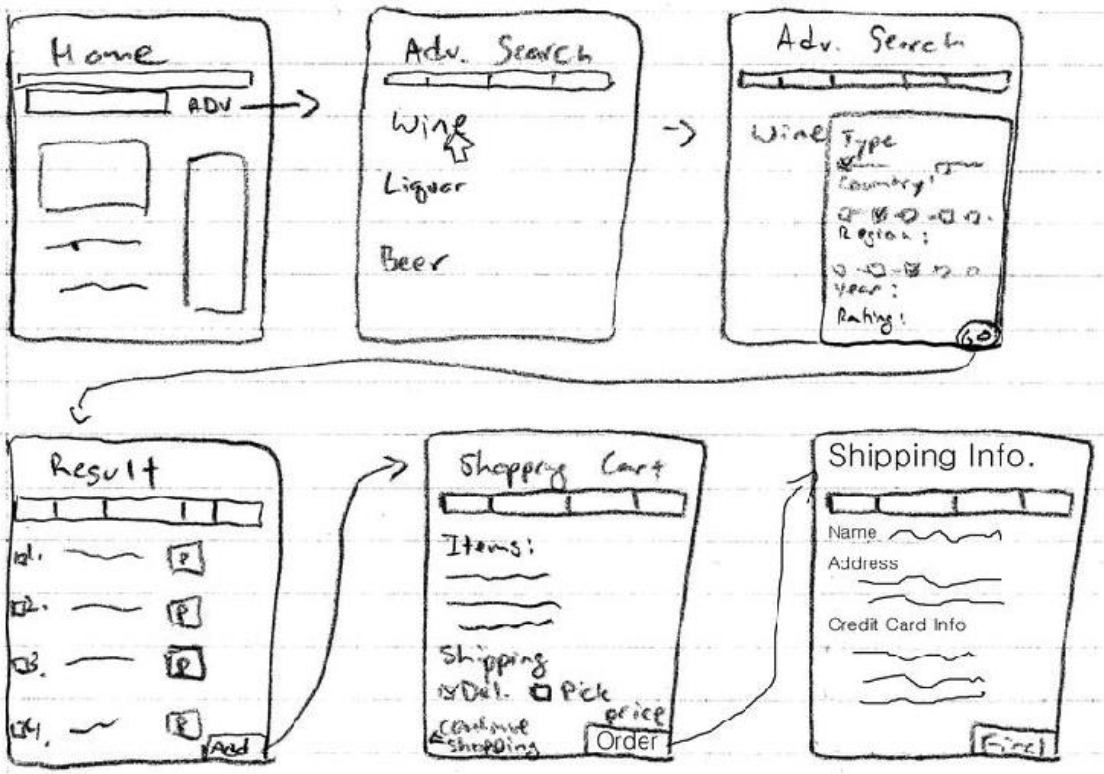
Precision

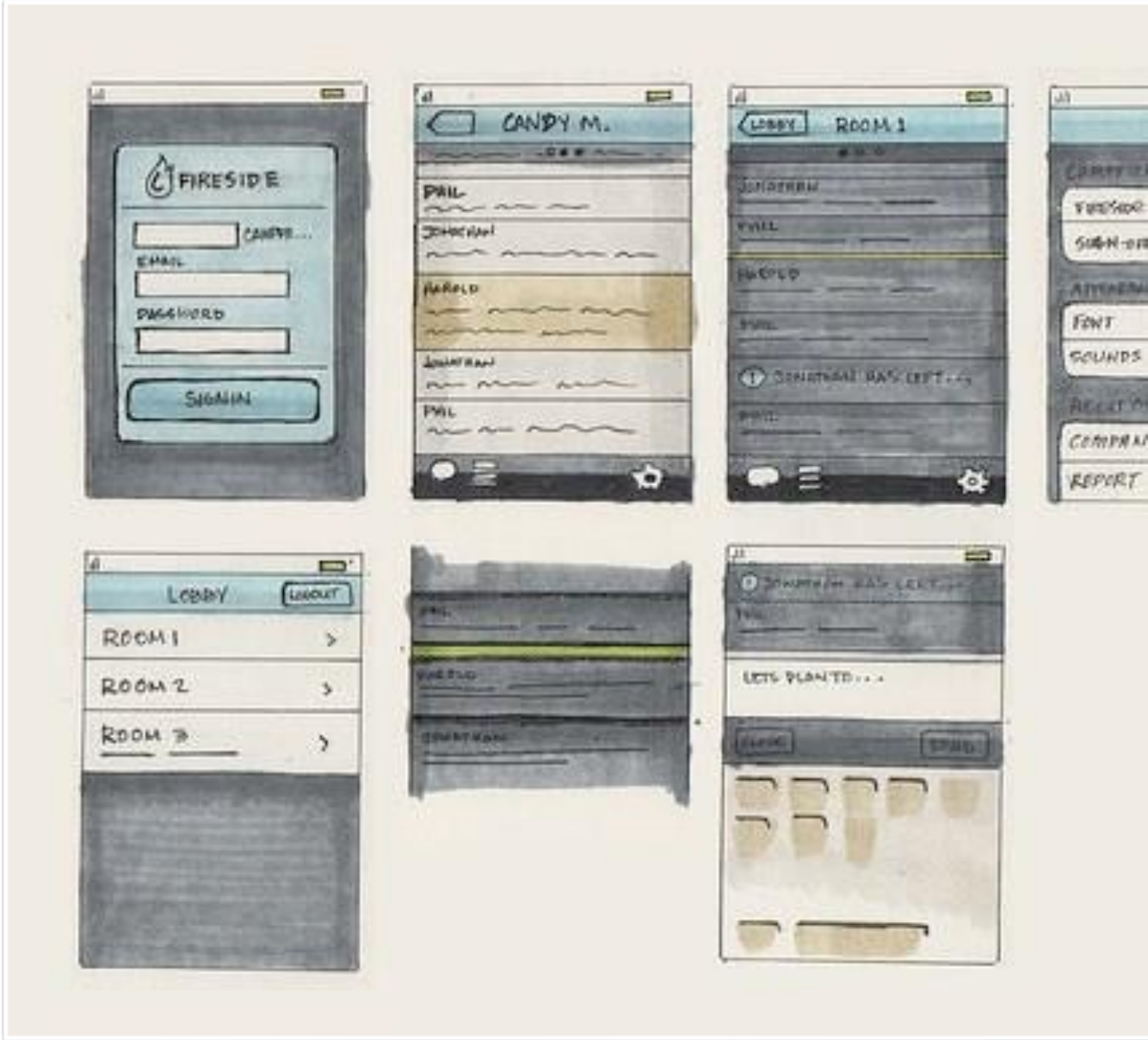
Level of detail in the prototype

- Relevance of detail in the prototype
- Should suit purpose/goal of prototype
- Less precise == more open for discussion

Finding right wine to purchase

Using Advanced Search






NOV 14
9:30PM
User Name
Distance in miles
Location / Hood/State
Tap & slide options


THINKTANK
Less than 30 feet
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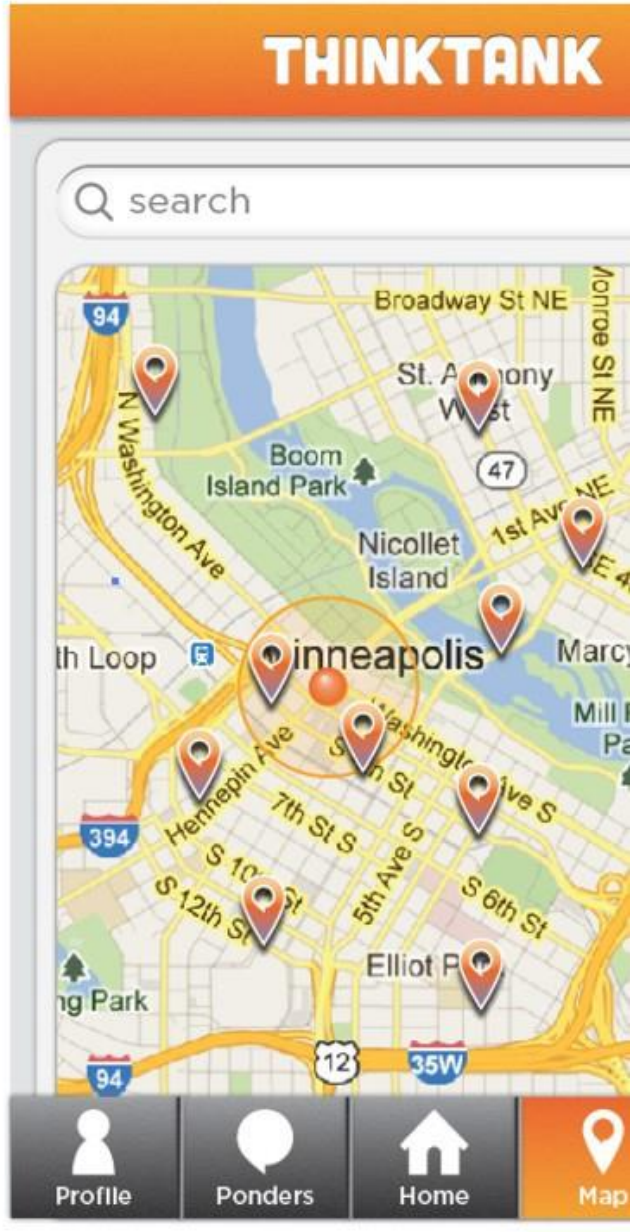
Profile
Ponders
Home
Map
Nearby


THINKTANK
search
Broadway St NE
Monroe St NE
St. Anthony West
Boom Island Park
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N Washington Ave
Nicollet Island
1st Ave NE
Loop
Minneapolis
Marcy
Hennepin Ave
7th St S
5th Ave S
S 6th St
S 12th St
394
Elliot Park
94
12
35W
Profile
Ponders
Home
Map

Interactivity

How much can the user do with the prototype

Fixed (video, animation, storyboard)

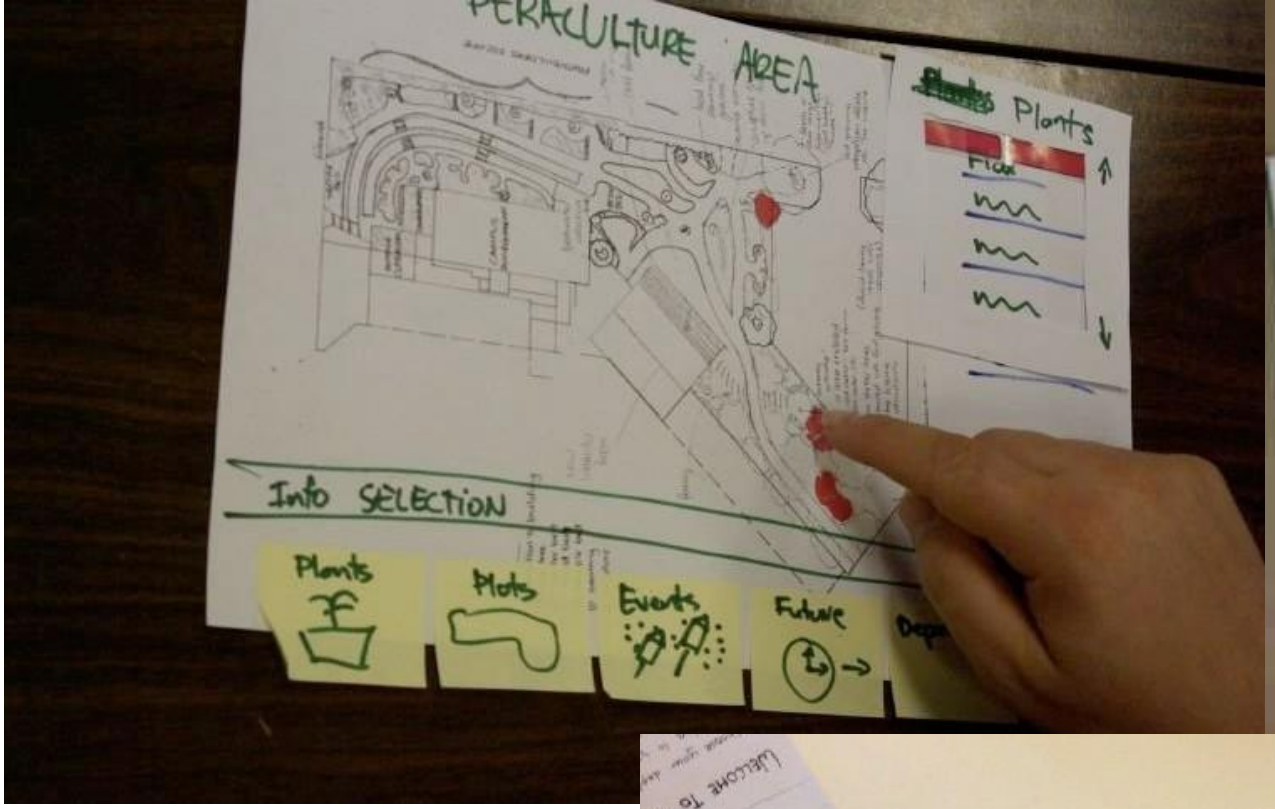
What will the interaction look like?

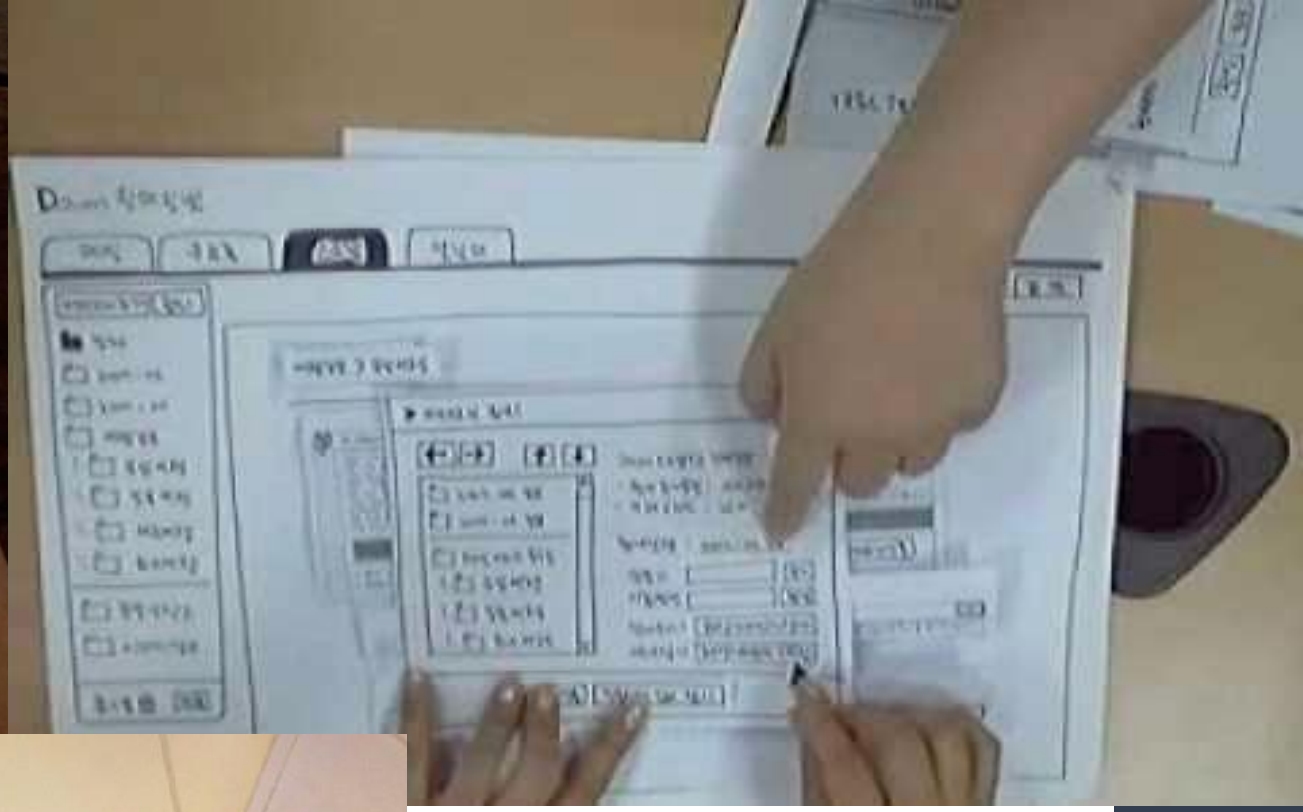
Fixed Path (scripted, click throughs, screenflows)

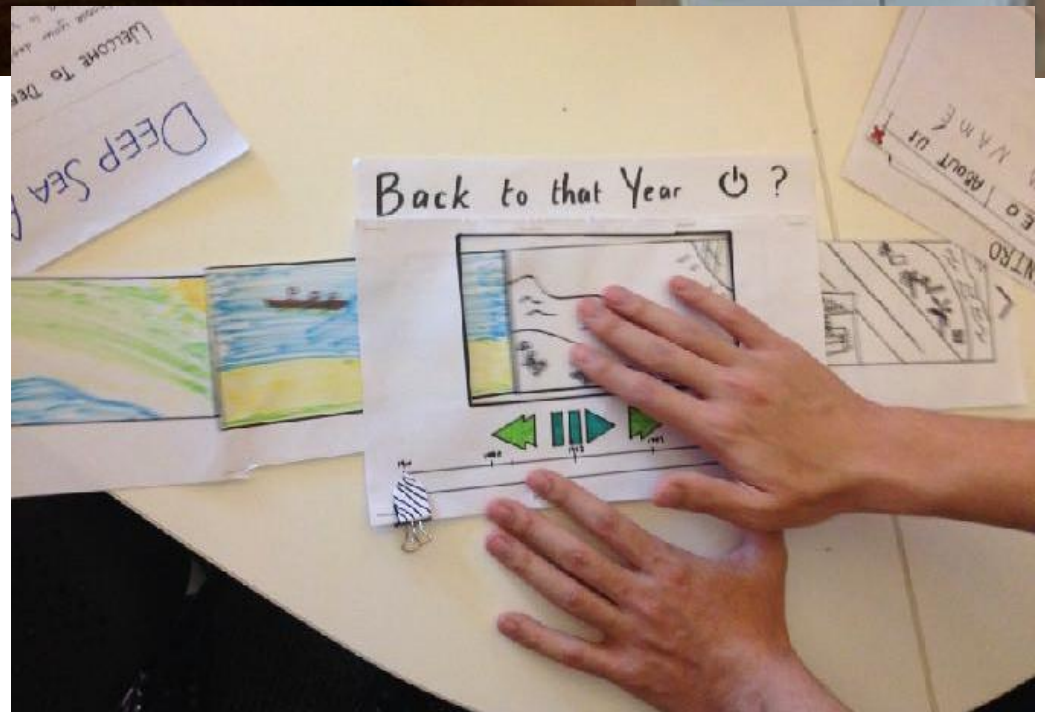
Experience of interacting with a predetermined scenario

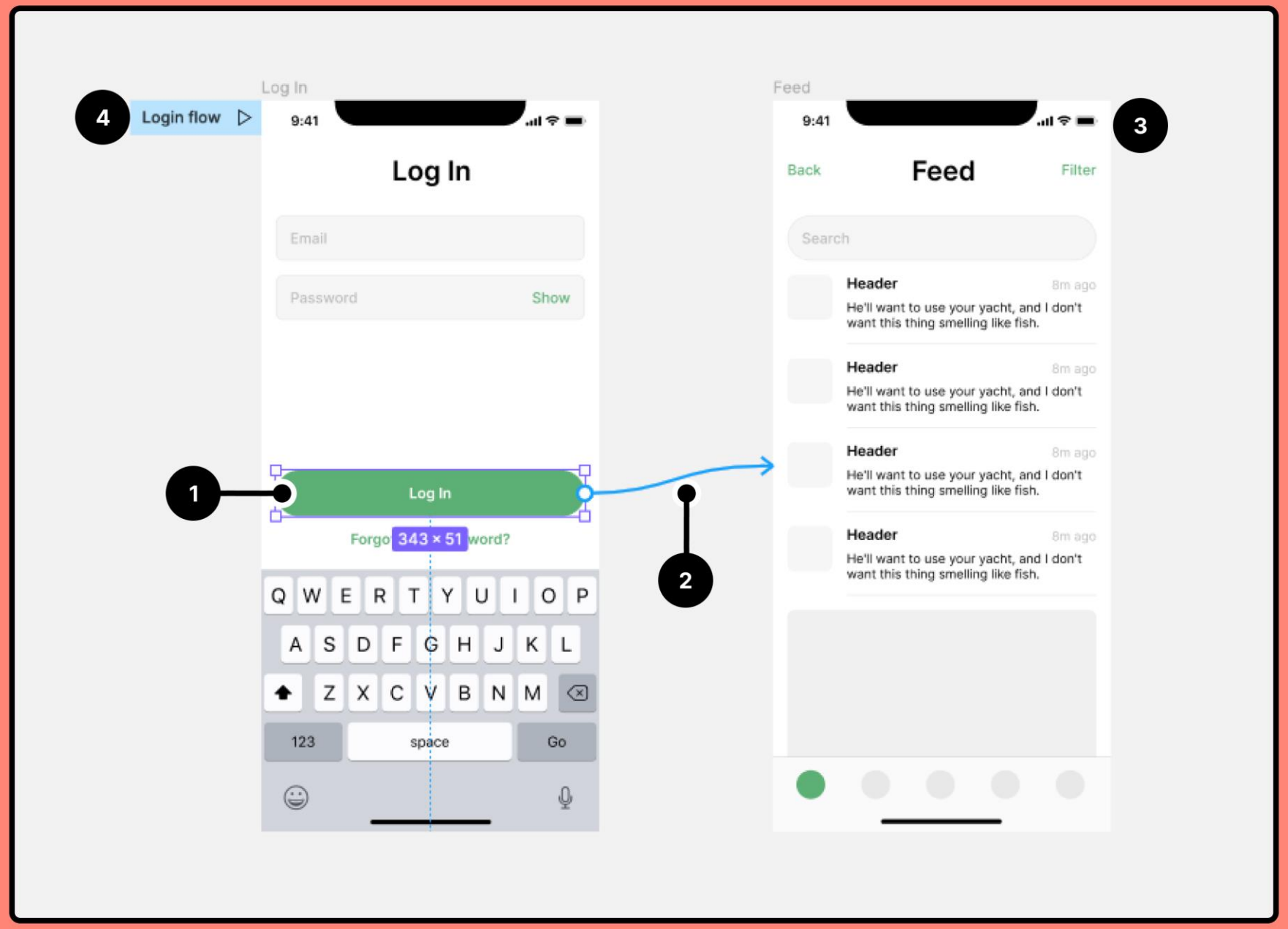
Open

Experience of interacting with near-to-full system


PERACULTURE AREA
Plants
Info SELECTION
Plants
Plots
Events
Future




Back to that Year ?


4
Login flow
Log In
9:41
Log In
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Password
Show
1
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Forgo
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word?
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123
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Go
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Feed
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Header
8m ago
He'll want to use your yacht, and I don't want this thing smelling like fish.
Header
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Header
8m ago
He'll want to use your yacht, and I don't want this thing smelling like fish.
Header
8m ago
He'll want to use your yacht, and I don't want this thing smelling like fish.

Evolution

- Lifecycle of the prototype
  - **Rapid**
    - throw-away, fast iterative
    - evolve through design iterations
  - **Evolutionary**
    - type of iterative
    - evolves into part of the final system

Evolution

The goal of a prototype (and to some extent stage in process) will dictate:

- its form (*representation*)
- the level of detail (*precision*)
- how much control a user has over it (*interactivity*)
- how long it exists for (*evolution*)

Rapid prototyping with paper

- Rapid Prototyping: Sketching | Google for Startups - YouTube
- Mobile Application Design : Paper Prototype Video - YouTube
- Simulate:
  - interaction/input (mouse, keyboard, touch …)
  - events/feedback (pages changing, popups, messages...)
- Don't have to code it, simulating enough to test concepts

Paradigms & Modes

Paradigms

- "*A model of something, or a very clear and typical example of something*" – Cambridge Dictionary
- HCI history depicts a number of paradigm shifts
- As new technology arrives, new insights into the relationship between humans and computers are created

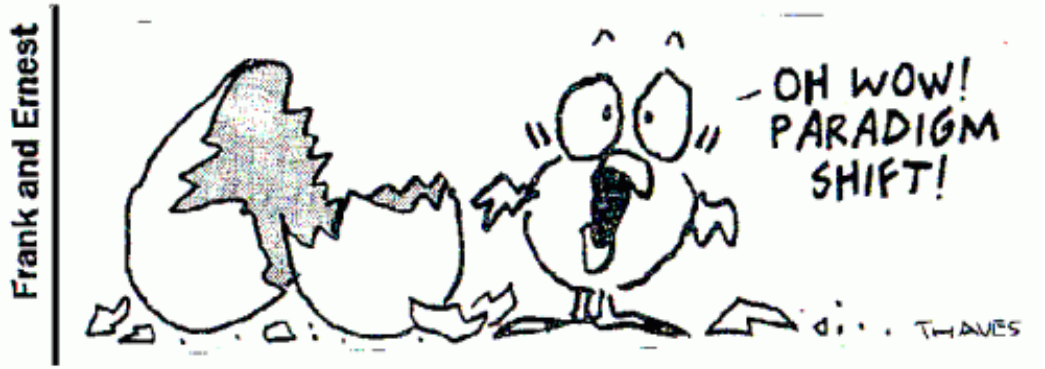
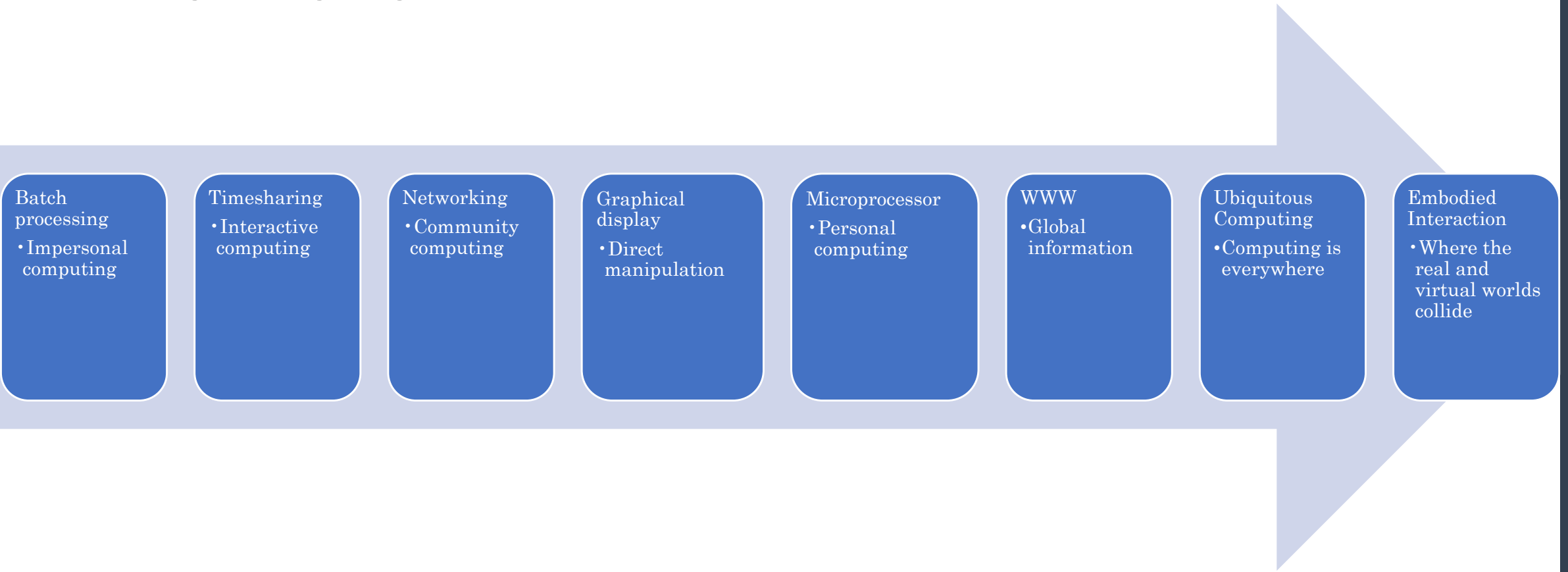


Image source: https://1john417.wordpress.com/2015/01/12/paradigm-shift/

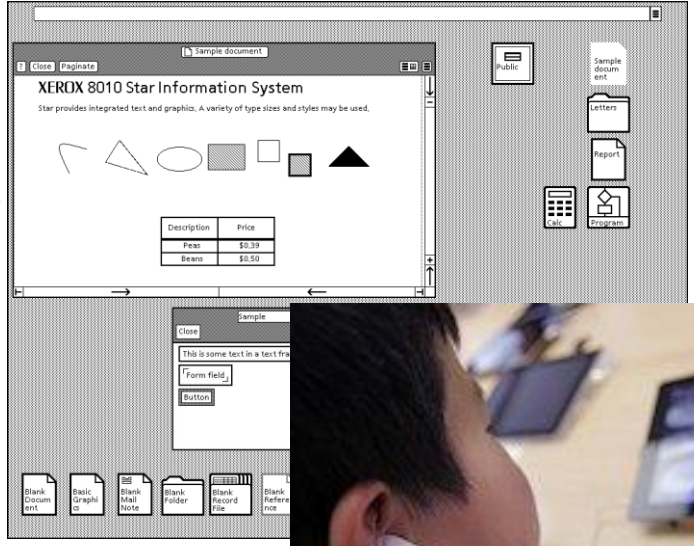
Paradigms of Interaction

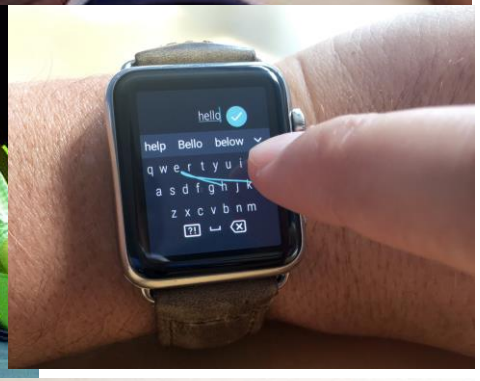
- Informs design of a conceptual model
- A particular philosophy or way of thinking about interaction design
  - E.g., designing applications for the desktop environment



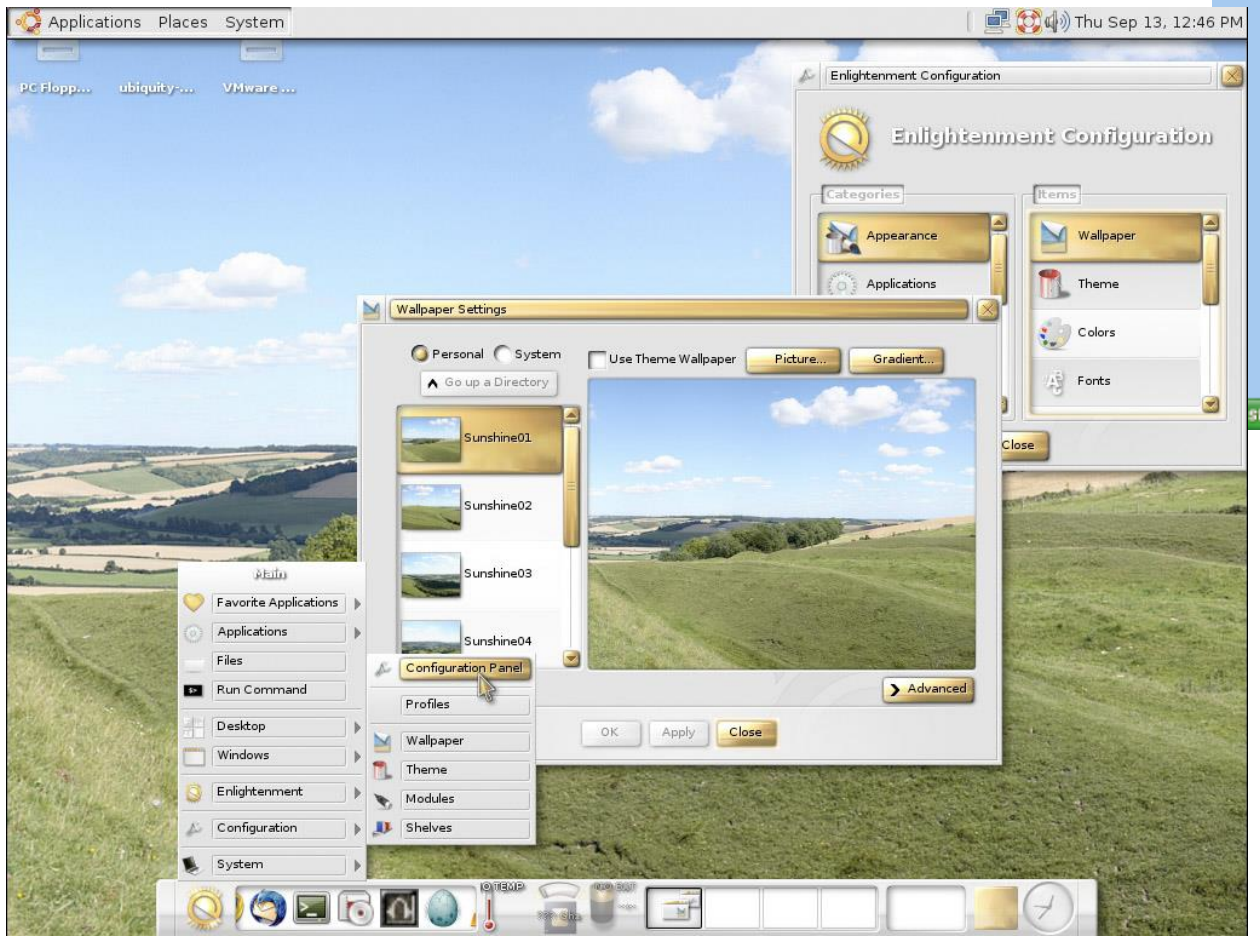
Interaction Paradigms

- Windows, Icons, Menus, Pointer
  - WIMP
- Mobile/wearable
  - Gestures (swipe, drag, pinch), voice
- Ubiquitous Computing
  - Implicit/explicit
- Pervasive Computing
  - Smart devices
- Embodied Interaction
  - Mixed reality, tangible, social, virtual





WIMP



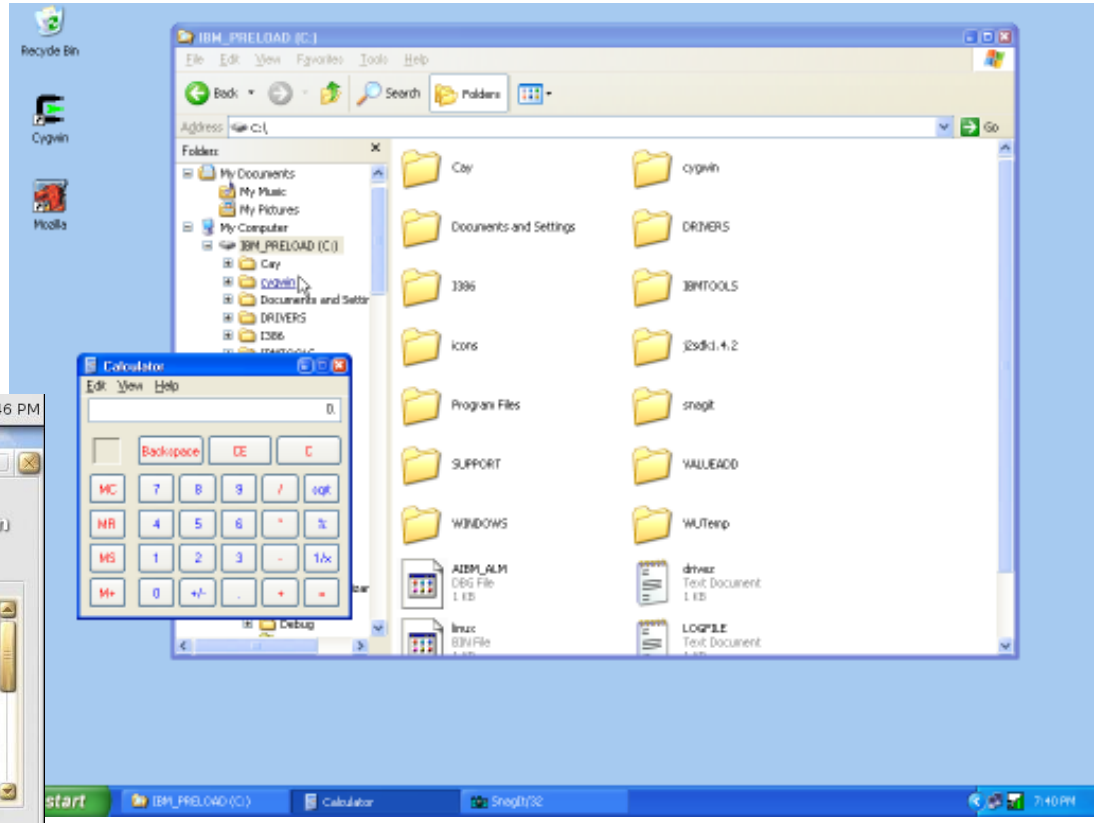


Image source: http://horstmann.com/bigj/help/windows/tutorial.html

Mobile/Wearable Devices

- Mobile computing involves mobile communication, mobile hardware, and mobile software to allow computers to be transported
- Smartphones, laptops, tablets and wearables, etc. all require different design approaches

Ubiquitous Computing

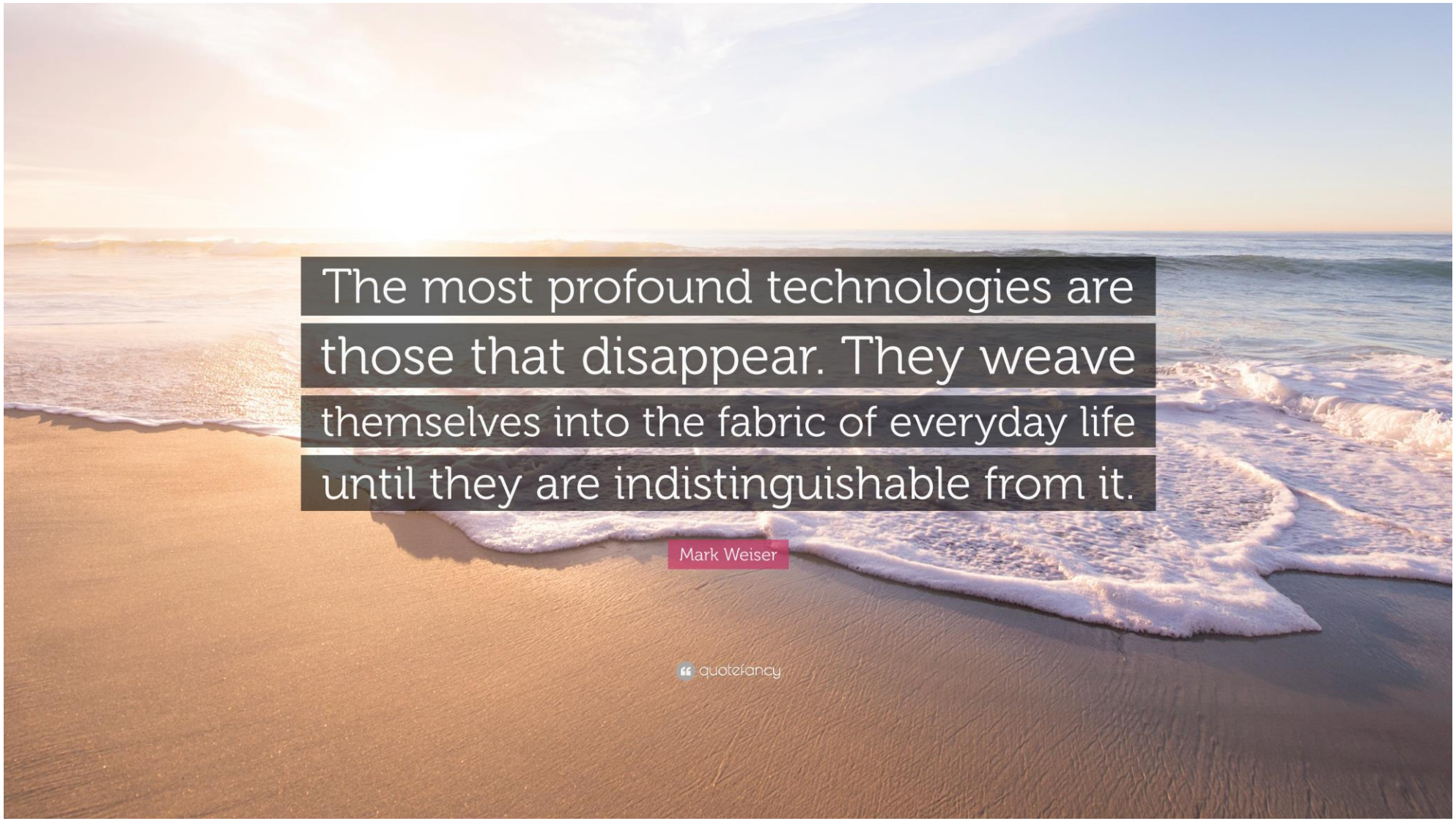


Image source: https://quotefancy.com/quote/1694471/Mark-Weiser-The-most-profound-technologies-are-those-that-disappear-They-weave-themselves

Ubiquitous Computing

- Paradigm shift whereby technology becomes almost invisible in our lives
- Ubiquitous computing is the opposite of virtual reality

Image source: https://www.parc.com/blog/defining-ubiquitous-computing-vs-augmented-reality/

Pervasive Computing

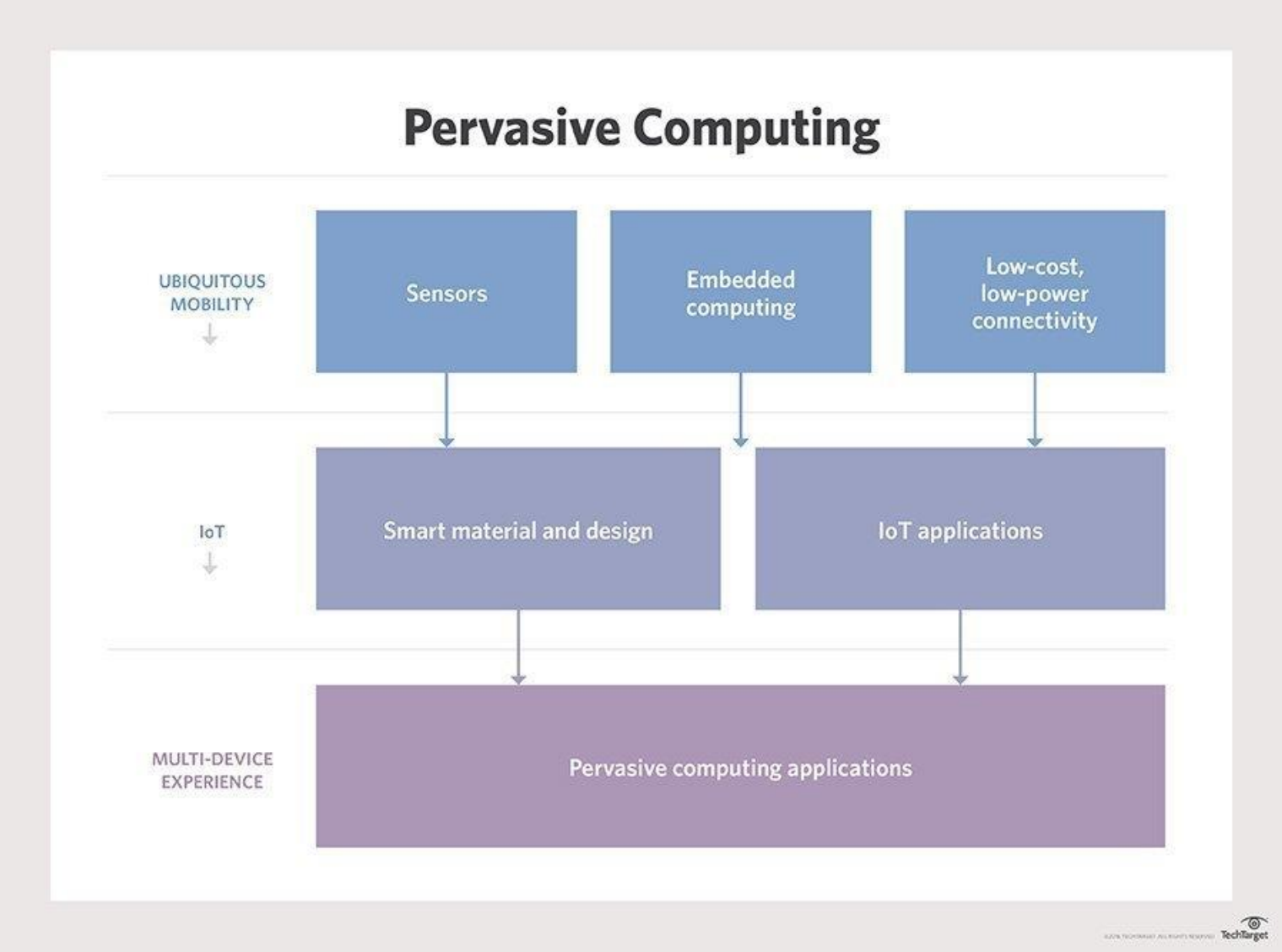
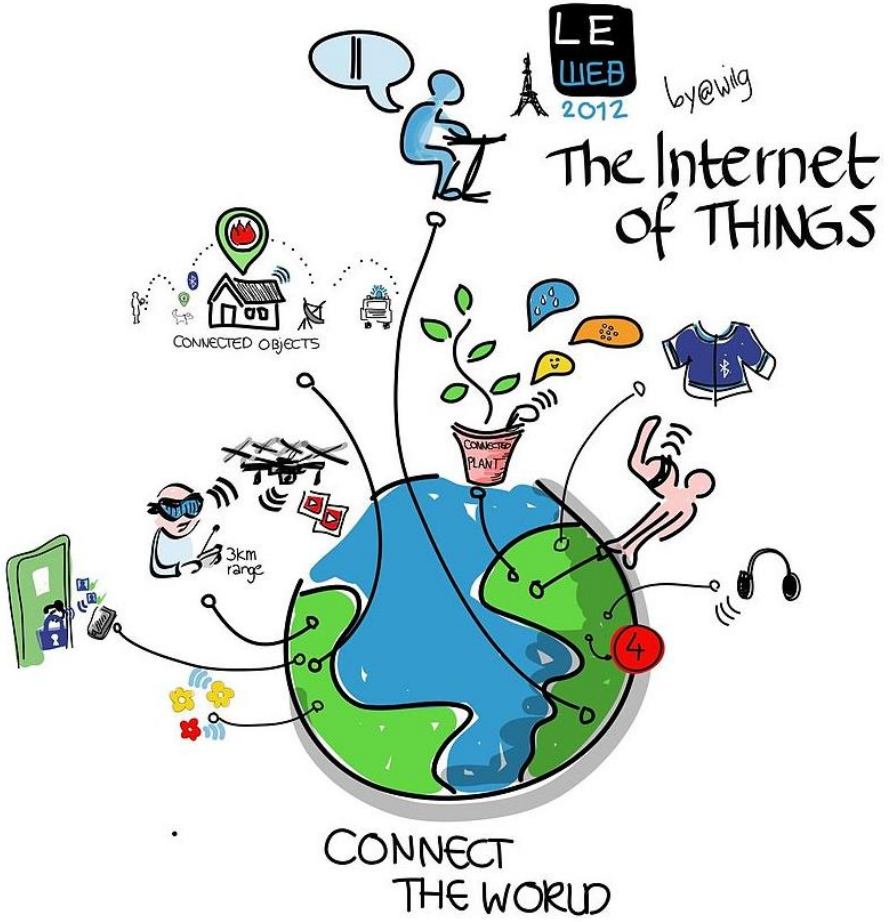


Image source: https://internetofthingsagenda.techtarget.com/definition/pervasive-computing-ubiquitous-computing

Internet of Things

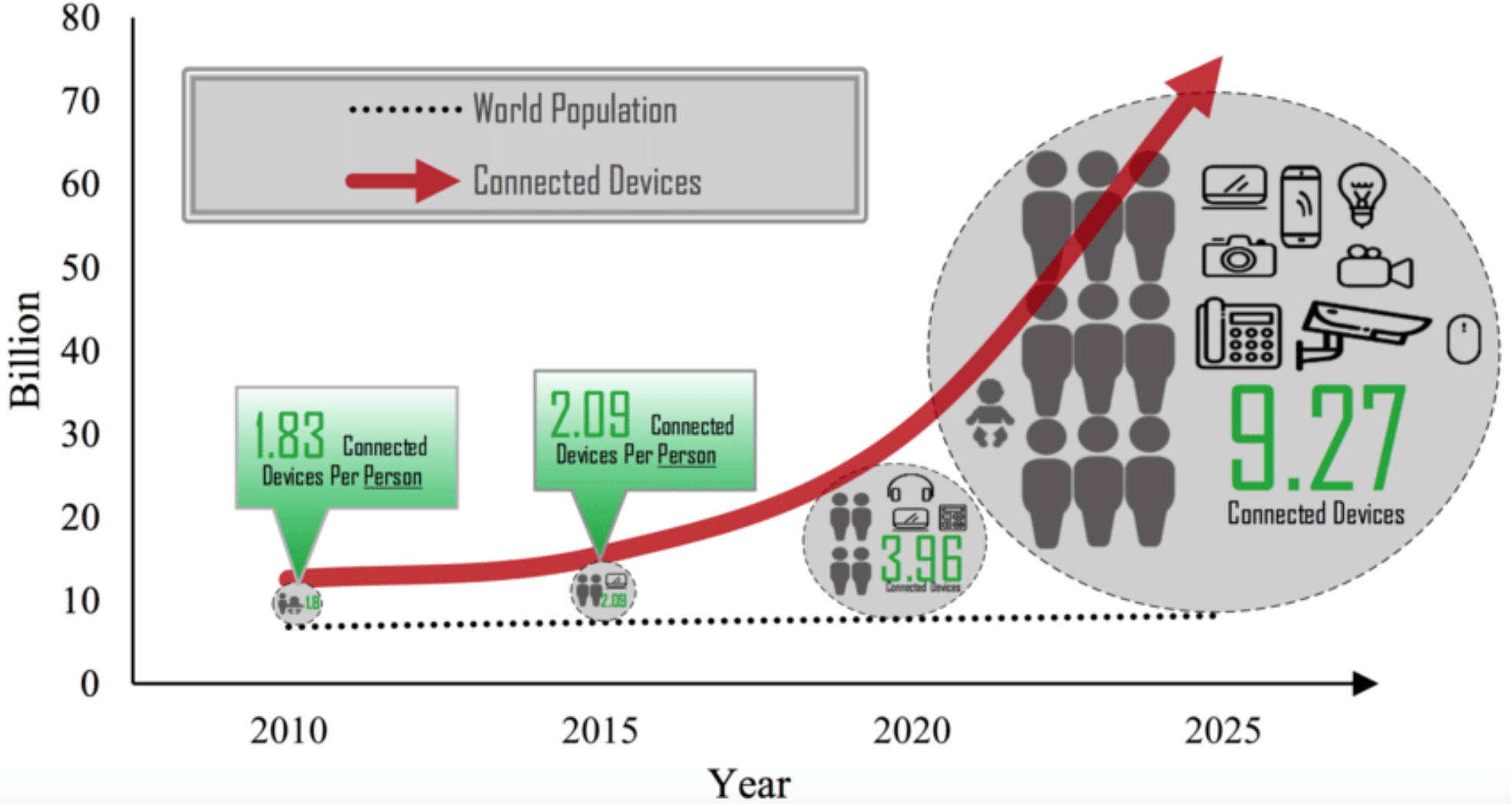
- Allows objects to be networked with unique addresses so that they can interact with each other and cooperate with their neighbours to reach a common goal
- As more objects become internet-enabled requires different design approaches

https://www.youtube.com/watch?v=LVlT4sX6uVs



C. Dobbins, M. Merabti, P. Fergus, and D. Llewellyn-Jones, "The Big Data Obstacle of Lifelogging," in *The 28th IEEE International Conference on Advanced Information Networking and Applications (AINA'14)*, 2014, pp. 922–926.

Internet of Things



B. Safaei, A. M. H. Monazzah, M. B. Bafroei and A. Ejlali, "Reliability side-effects in Internet of Things application layer protocols," *2017 2nd International Conference on System Reliability and Safety (ICSRS)*, 2017, pp. 207-212, doi: 10.1109/ICSRS.2017.8272822.

Internet of Things Poll

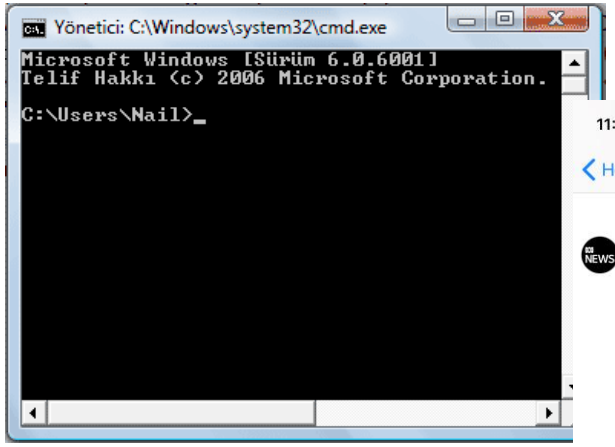
Go to www.menti.com and use the code 8711 5903

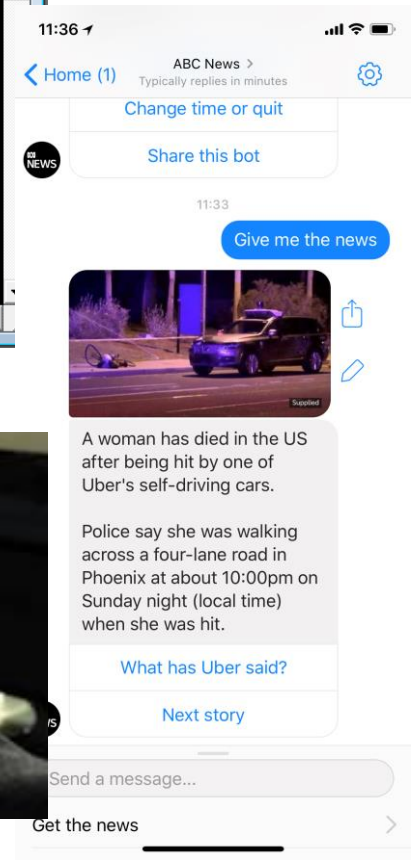
Embodied Interaction

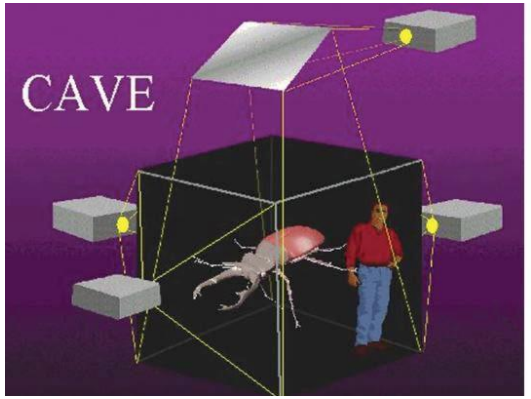
- Tangible User Interfaces
  - Digital information is interacted with through the physical environment
  - https://www.youtube.com/watch?v=lvtfD_rJ2hE&t=19s
- Mixed reality
  - Where the virtual and real world come together into new visualizations to interact in real time (e.g. Microsoft HoloLens)
  - https://www.youtube.com/watch?v=aYdB2xBNFek
- Virtual reality
  - Immersive experience whereby a 3D computer generated environment can be explored and interacted with
  - https://www.youtube.com/watch?v=0_2JWdIQlhw

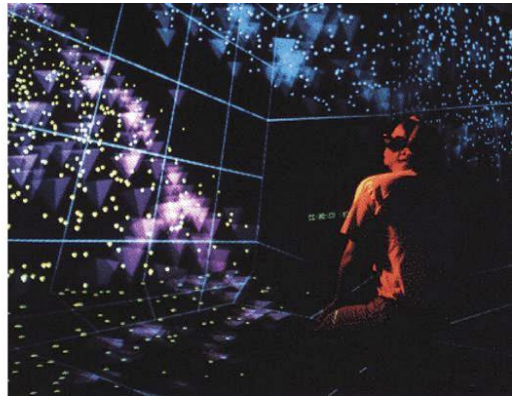
Interaction Modes

- Giving instructions
  - Issuing commands using keyboard and selecting options via menus
- Conversing
  - Interacting with the system as if having a conversation
- Manipulating and navigating
  - Acting on objects and interacting with virtual objects
- Exploring and browsing
  - Finding out and learning things



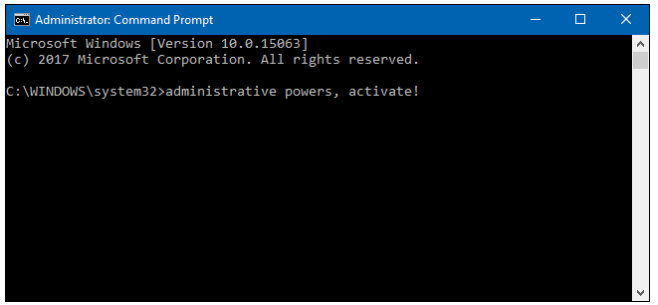


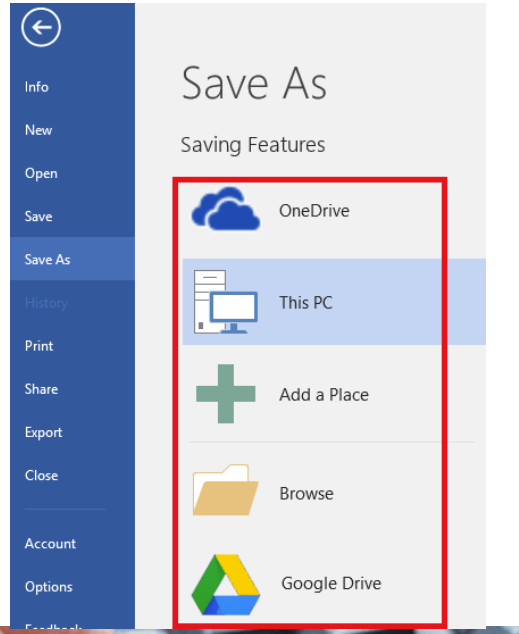




Instructions

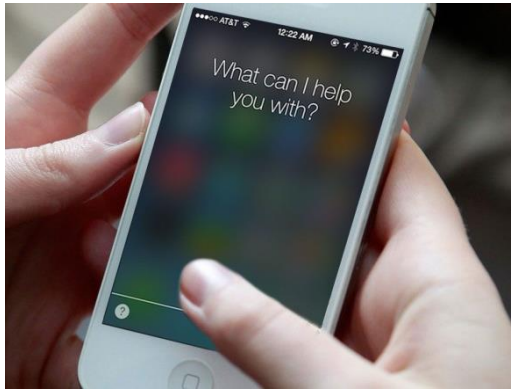
- Shell command line interpreters for operating systems
- Command Prompt is available in most Windows operating systems
- The Linux operating system, first released in 1991, mainly uses command-line interfaces (CLI) or graphical user interfaces (GUI)
- Users interact with the computer via The Shell
  - Allows commands to be typed into a text interface

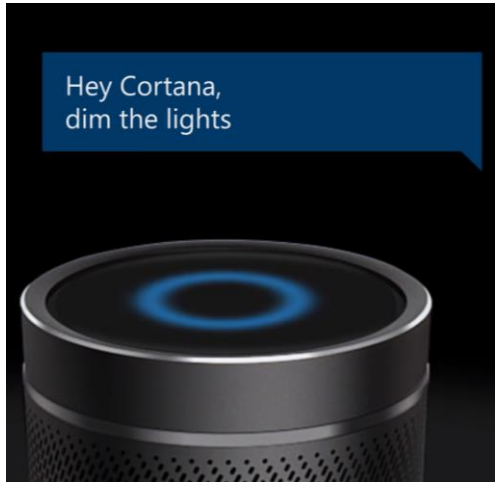




Voice as an Input

- Voice commands (instructions) are issued to machines using Direct Voice Input (DVI)
- Speech recognition technology is easy to use and readily available
- Downsides include inaccuracy due to ambient noise and variations in pronunciation
- Designing for a system that doesn't have an interface is a new challenge





Voice as an Input

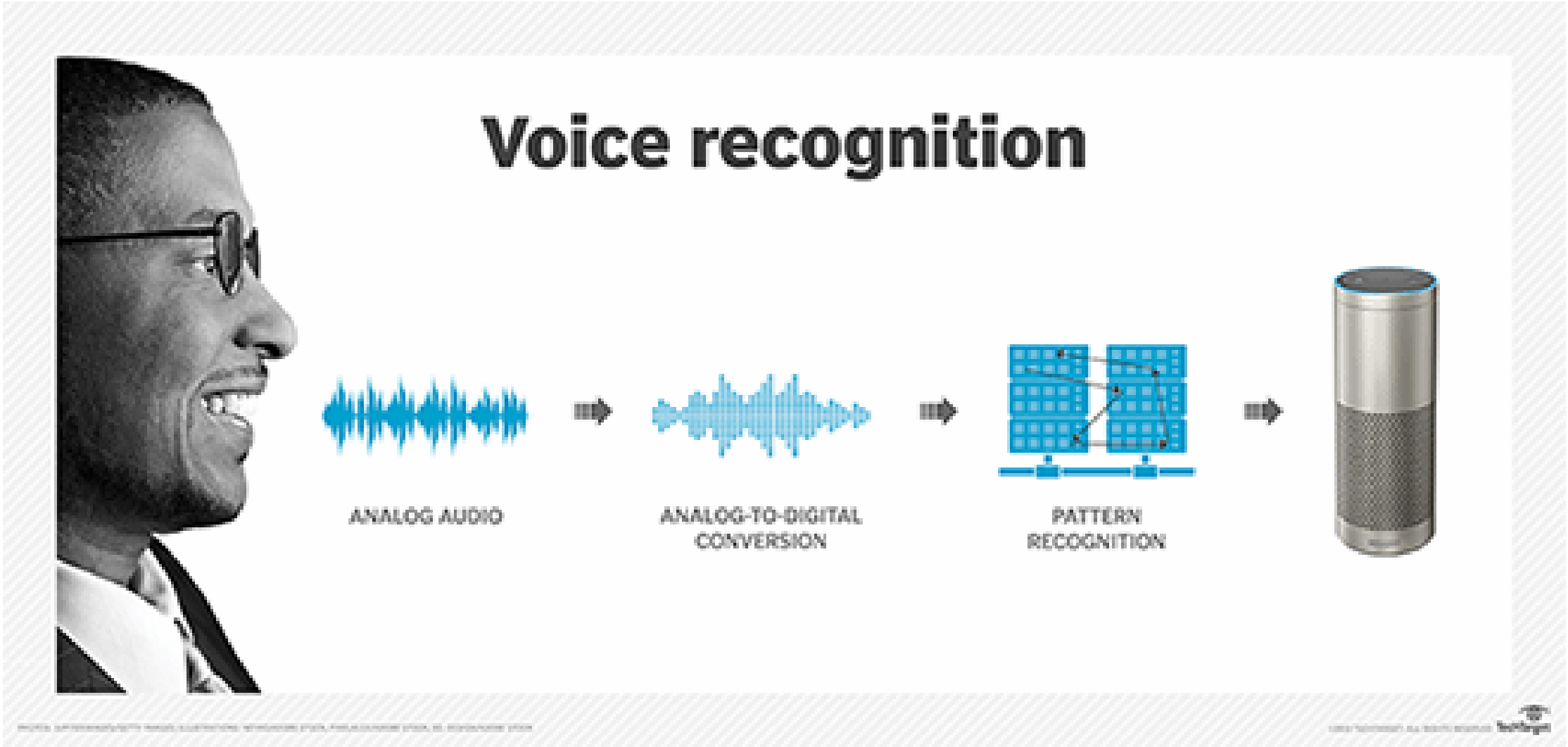


Image source: https://searchcrm.techtarget.com/definition/voice-recognition

Sign Language as an Input

- Sign language technologies are often Disability Dongles
  - A well intended elegant, yet ***useless*** solution to a problem we never knew we had – Liz Jackson (Founding Member @DisabledListOrg)
- Listen to your prospective users
- Work *with* end users in your projects, especially those with a disability and people from cultural and linguistic minorities
- Work on projects those with a disability *want* worked on
- "*The solutions proposed by signed language recognition and other similar technologies (e.g. signed language gloves, avatars) are generally not feasible, because they are also based on naïve understandings of what deaf community signed languages are and how they work, or even the realistic needs and desires of deaf and hard of hearing signers striving for improved communication access.*" Dr Gabrielle Hodge, Deaf academic, UCL

TECHNOLOGY

Why Sign-Language Gloves Don't Help Deaf People

Wearable technologies that claim to translate ASL overlook the intricacies of the language, as well as the needs of signers.

MICHAEL ERARD NOVEMBER 9, 2017

Jose Hernandez-Rebollar demonstrates his AcceleGlove, which claimed to "translate" sign language into written and spoken forms. (STEPHEN J. BOITANO / AP)

Along with jet packs and hover boards, a machine to translate from any language to any other is so appealing as a fantasy that people are willing to overlook clunky prototypes as long as they can retain the belief that the future promised by science fiction has, at last, arrived. One particularly clunky subspecies of the universal language translator has

nivchara yahel @nivchara_yahel · Feb 5

Designers who create wheelchairs that climb stairs misunderstand the problem. The problem is the stairs, not the wheelchair.

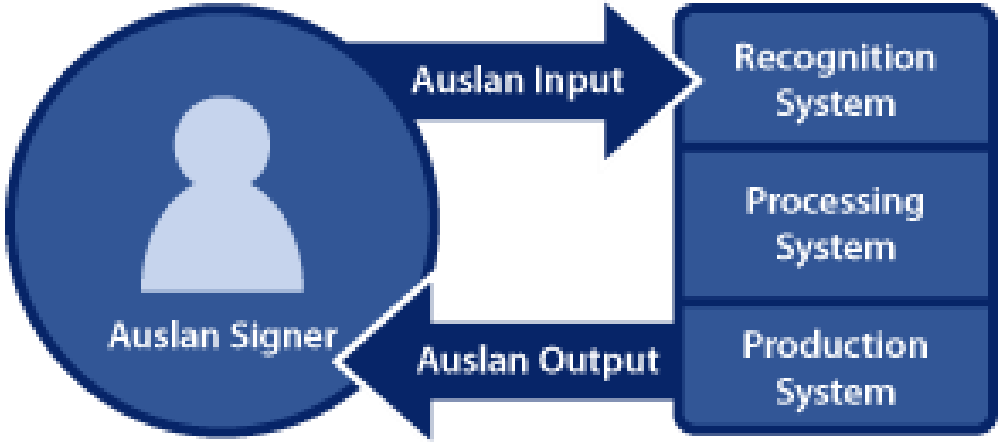
A lot of people don't use wheelchairs, but also can't climb stairs. By mistaking the problem, designers leave us out. #DisabilityDongle #HellaInaccessible

Image source: https://www.theatlantic.com/technology/archive/2017/11/why-sign-language-gloves-dont-help-deaf-people/545441/

https://twitter.com/nivchara_yahel/status/1224914103711543297

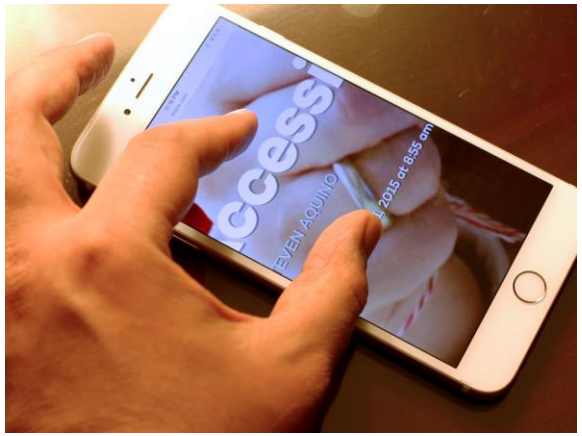
Sign Language as an Input

- The Auslan Communication Technologies Pipeline (Auslan CTP) project by Dr Jessica Korte (UQ/AQ TAS DCRC Fellow)
- "[The project] *is a proposed AI-based language technology for Auslan (Australian Sign Language). I like to think of it as creating a prototype "Alexa for Auslan". It is being developed using a participatory, human-centred design approach*" Dr Jessica Korte
- A human-centred design approach has been applied to the Auslan CTP project that involves potential users in the design process
  - Known philosophy of design approaches, including participatory design, celebrates that real users have abilities and insights that developers may not be aware of



Manipulating and Navigating

- Replicating the sense of touch within virtual technologies is seen as a new challenge
- Haptics is an emerging research area that allows touch-enabled interaction with virtual objects
  - Gloves are often used as input devices
- Objects can also be manipulated on mobile devices via pinching and spreading gestures



https://www.youtube.com/watch?v=ha2gtpXKboI

Lennart Thurfjell, John McLaughlin, Johan Mattsson, Piet Lammertse, (2002) "Haptic interaction with virtual objects: the technology and some applications", *Industrial Robot: An International Journal*, Vol. 29 Issue: 3, pp.210-215, https://doi.org/10.1108/01439910210425487

Exploring and Browsing

- Involves moving through virtual environments
- A cave automatic virtual environment (CAVE) system is an immersive virtual reality environment that users navigate through
- Can be enhanced with sound, video and haptic feedback (force feedback vibrations)

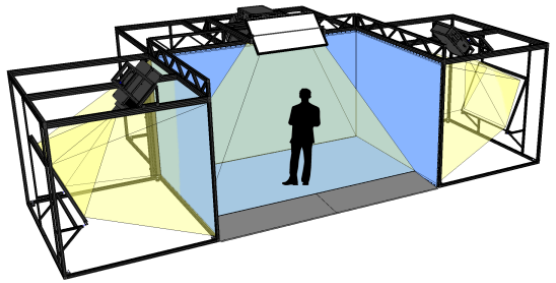


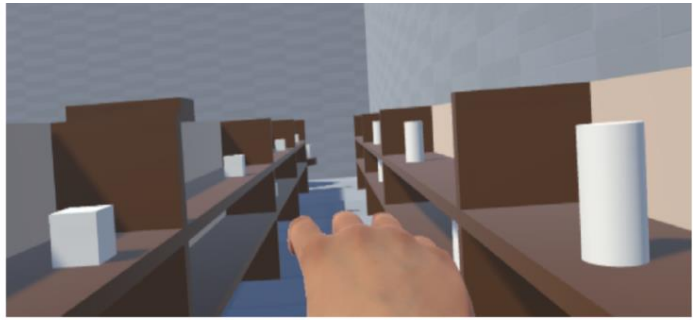
Image source: https://en.wikipedia.org/wiki/Cave_automatic_virtual_environment#/media/File:CAVE_Crayoland.jpg http://www.visbox.com/products/cave/

Face-Controlled VR Tech

- Interacting with virtual reality using facial expressions in place of handheld controllers or touchpads

Fig. 2. Facial expressions used to interact with the virtual environments. Left - smile; middle- frown, and right - clench.

(a) Happy



(b) Neutral

(c) Scary

Arindam Dey, Amit Barde, Bowen Yuan, Ekansh Sareen, Chelsea Dobbins, Aaron Goh, Gaurav Gupta, Anubha Gupta, Mark Billinghurst, "Effects of interacting with facial expressions and controllers in different virtual environments on presence, usability, affect, and neurophysiological signals," *International Journal of Human-Computer Studies*, vol. 160, no. July 2021, p. 102762, Apr. 2022, doi: 10.1016/j.ijhcs.2021.102762

https://www.gizmodo.com.au/2022/02/virtual-reality-facial-expressions/

Interaction Analysis

- What the user will be doing when carrying out the task?
  - E.g. searching information, exploring a virtual environment, etc.
- What interaction mode(s) are best suited for the task?
- Any other constraints?
  - E.g. budget, suitability of the technology for the activity

DESIGN PROPOSAL

- **Due date**

Summary

- Interaction types provide a way of thinking about how best to support the activities users will be doing when using a product or service
  - These lists are not exclusive or exhaustive
- They give you ways of thinking about the solution space to the problems you have identified
- This is a design process and therefore one of creation
- Not simply the case of crank the handle, follow the process and tick the boxes

Next Time…

- In our next session, we will look at **Cognition**