CT318 LECTURE 7

Design Thinking 4: Prototype

- Conceptualising Interaction:
  - Interaction Paradigms
  - Interaction Styles
- Prototyping

CONCEPTUALISING INTERACTION

- A conceptual model is an abstraction for thinking about the design space of an interaction that focuses on the user experience and what it is for
- Components: metaphors for how a product will be used; the kinds of objects, attributes and operations that are involved in the interaction
- Core interaction types can help thinking about the design space: instructing, conversing, exploring, manipulating, responding

INTERACTION DESIGN FRAMEWORK

Do	Feel	Know
How do you do? What sort of ways do you affect the world: poke it, manipulate it, sit on it? (Buttons – discrete, automatic vs Handles – continuous)	How do you feel? What do you sense of the world and what are the sensory qualities that shape media? (Print - exact vs Cartoon - fuzzy, more participation)	How do you know? What are the ways that you learn and plan (or perhaps, how we want you to think)? (Paths vs Maps)

INTERACTION TYPES / PARADIGMS

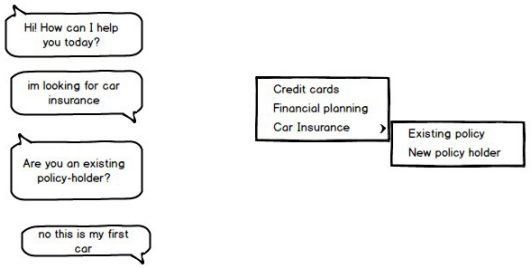
- **How do I do?**
- Five basic metaphors for our interaction with things:
  - *Instructing:* command
  - *Conversing:* languages
  - *Manipulating*: hands: desktop, notebook
  - *Exploring / navigating*: feet/locations and travelling: web, 3D worlds
  - *Responding*

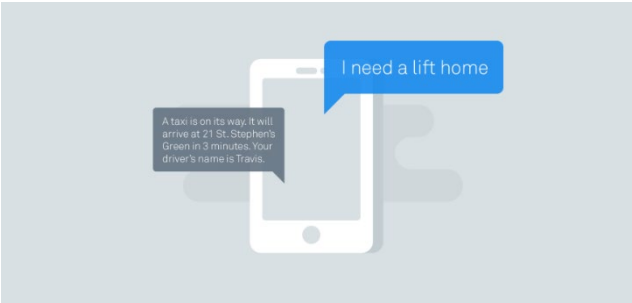
INTERACTION PARADIGM: INSTRUCTION

- Users carry out tasks by telling product what to do
- Command-response sequential model
- Examples: “list the files in my current directory” “show me my account balance”
- Invoked through pressing buttons, typing text, clicking menu item, speaking commands, etc.
- Advantages: quick and efficient; good for frequent repetitive actions

INTERACTION PARADIGM: CONVERSATION

- Conversational metaphor: conversation between people
- Used primarily for scenarios of finding out or providing information
- Driven by advances in speech recognition
- Advisory systems, help facilities, chatbots, robots
  - Concierge services (Path Talk, Magic): via text message; banks of support agents
  - AI applications: chatbots





INTERACTION PARADIGM: MANIPULATION

- Interaction through handling, controlling and influencing objects
- Benefits from user's knowledge of analogous manipulation in the physical world, e.g., moving, selecting, opening, rotating
- Extends physical world analogies: e.g. zooming, stretching, shrinking
- Human actions can be imitated by physical controllers or gestures

Microsoft.com

INTERACTION PARADIGM: EXPLORATION

- Exploring – moving through – physical or virtual environments

INTERACTION PARADIGM: RESPONDING

- System proactively interacts with the user to alert, describe, or show them something
- Disadvantages: becomes tiresome and frustrating; distracting
- Design: Need to understand when a user can be interrupted or when information is useful

INTERACTION STYLES

- **How do I do?**
- Interaction styles represent alternative design strategies for the entry of information at the user interface - first choice in UID: type of interface and interaction it implies
- Three basic metaphors for our interaction with things:
  - *Manipulation*: hands: desktop, notebook
  - *Navigation*: feet/locations and travelling: web, 3D worlds
  - *Conversation* / Instruction: languages: command, conversation

INTERACTION STYLES

- GUI Interaction Styles:
  1. **Direct Manipulation:** WIMP, GUI & Icons
  2. **Task-related Organisation:** menus, forms
- Function Key Interaction
- Touch, Gestural, Haptic Interaction
- **Linguistic:** command line, natural

- Choice of Interaction Style?

INTERACTION STYLES: DM

- Information is displayed in the form of graphical objects, which the user can query and manipulate graphically with a pointing device
- Example: Xerox Star; Apple Macintosh; MS Windows; Video games
- Direct involvement with world of objects
- **Usability**: high for error-reduction and ease of exploratory learning; slower interaction times
- **Advantage** is the directness of the interaction: e.g. driving a car
- **Disadvantage** is lack of step-by-step guide for learning

INTERACTION STYLES: DM

- Problems in visual form? Appropriate representations of reality?
- DM: comprehensible, rapid, simple, reversible actions
- Anxiety recedes and user's sense of control increases
- Common communicative units, interface widgets, including: icons, buttons, check boxes, radio buttons
- These can be grouped into menubars, toolbars, palettes
- Difficulties:
  - Visual representation may be misleading
  - Good icon design is difficult: culture, context

INTERACTION STYLES: DM: WIMP

Windows

- could be scrolled, stretched, overlapped, opened, closed, and moved around the screen using the mouse

Icons

- represented applications, objects, commands, and tools that were opened when clicked on

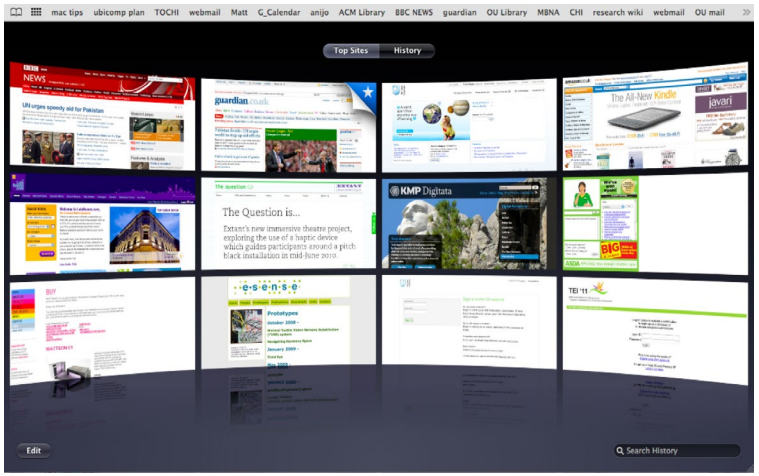
Menus

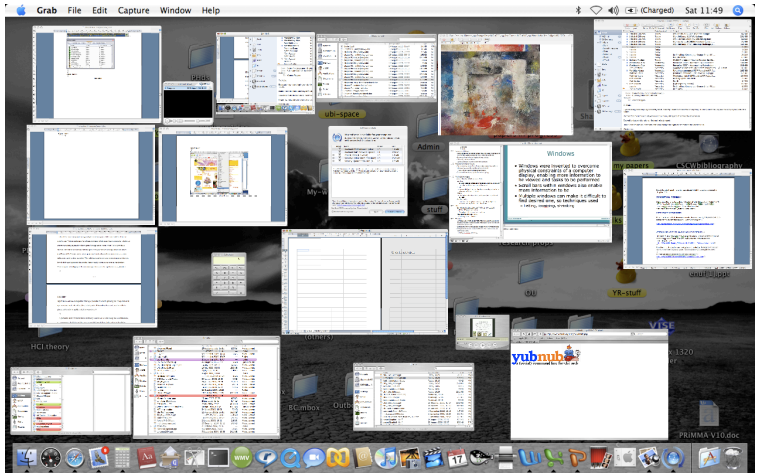
- offering lists of options that could be scrolled through and selected

Pointing device

- a mouse controlling the cursor as a point of entry to the windows, menus, and icons on the screen

GUI & WIMP





INTERACTION STYLES: TASKS

Primary goal is to create a sensible and convenient organisation relevant to users' tasks

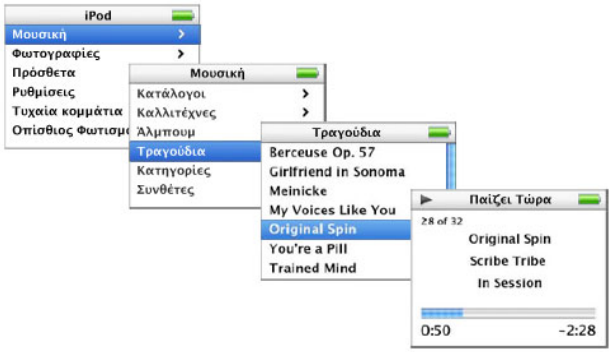
- Menu Selection
- Form Fill-in
- Q & A
- Function-Key Interaction

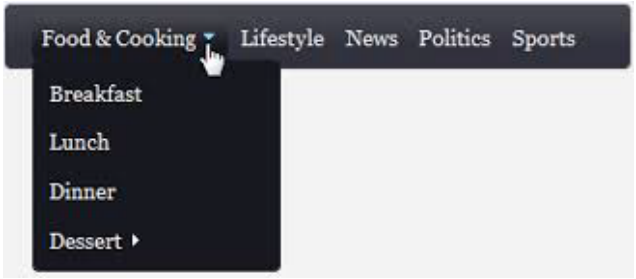
INTERACTION STYLES: MENUS

- User is presented with a display of options to suit circumstances
- Make selection by pointing, touching target on-screen or pressing a button alongside the option
- Used in systems for walk-up use: e.g. ATMs, ticket machines
- Supports easy system navigation
- Usability is good for first-time users; irritating for frequent users as can be time-consuming
- Weak on support for complex actions with many operands

INTERACTION STYLES: MENUS

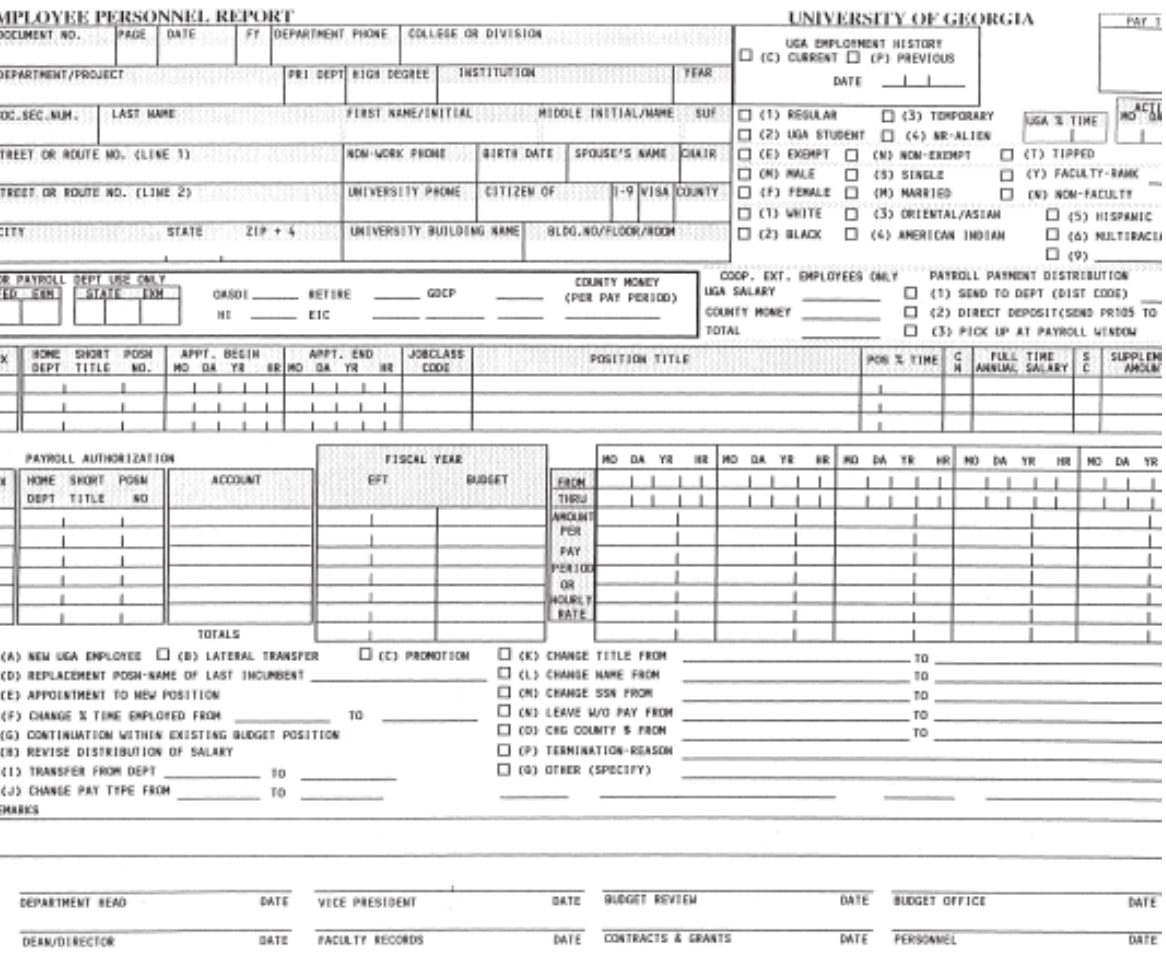
- Menu types:
  - Single, Binary and Multiple selection menus
  - Pull-down and pop-up menus
  - Scrolling and 2D menus
  - Embedded links
  - Iconic menus, toolbars or palettes
  - Tree structured menus: depth vs. breadth
- Item presentation sequence and phrasing

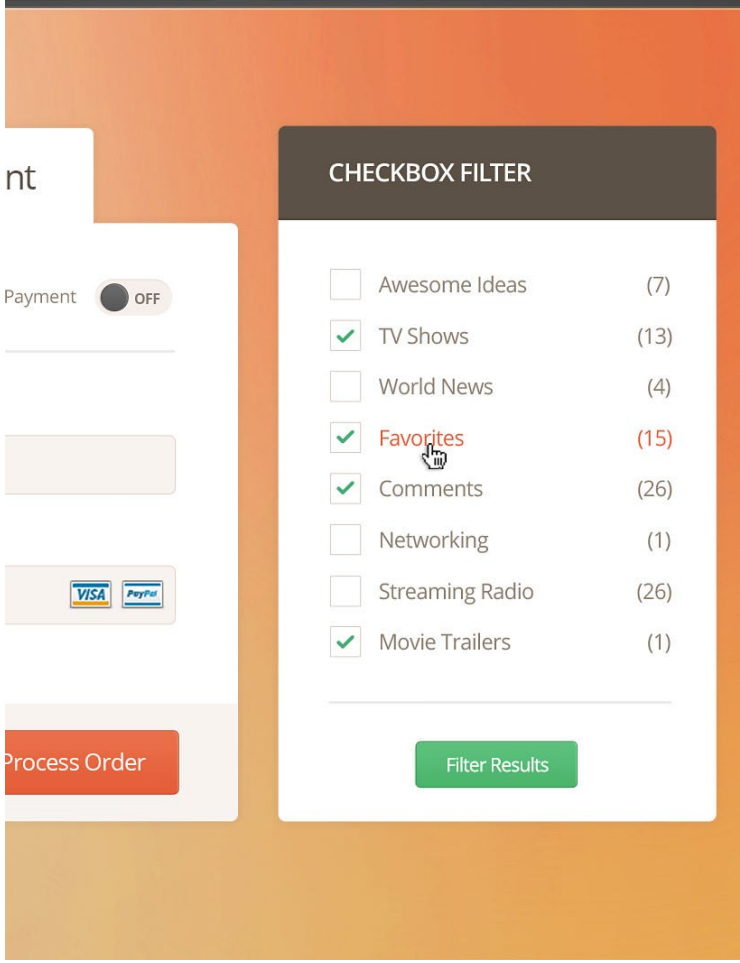




INTERACTION STYLES: FORMS FILL-IN

- Provides a means of both entering and retrieving data
- Supports the editing of existing entries in fields
- Restricted to textual data
- Tends to limit the range of supported tasks: each task requires a pre-defined form
- User needs to be able to type and may need training in use of forms and templates
- Well suited to the support of work activities





INTERACTION STYLES: FORMS FILL-IN

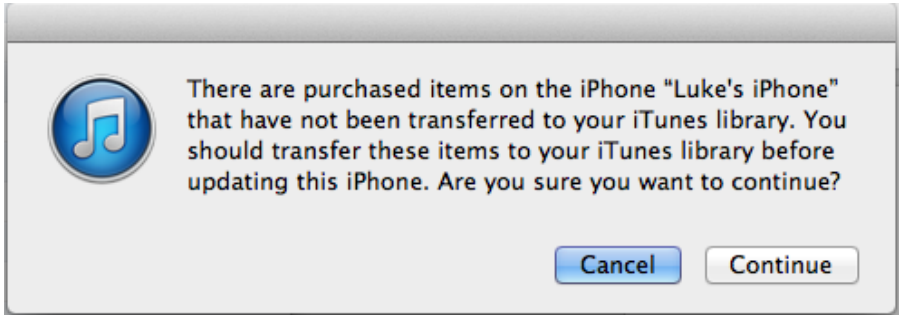
KAREN YOUNG, SCHOOL OF COMPUTER SCIENCE, UNIVERSITY OF GALWAY, 2023-2024

INTERACTION STYLES: FORMS FILL-IN

- Form Fill-in Design:
  - Meaningful title
  - Comprehensible instructions
  - Logical grouping and sequencing of fields
  - Visually appealing layout
  - Familiar field labels
  - Visible space and boundaries for data-entry fields
  - Error handling: prevention, correction, messaging
  - Explanatory messages for fields

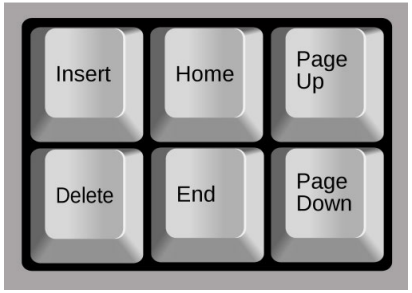
INTERACTION STYLES: Q & A

- User is presented with a series of textual questions, enters answers via keyboard: dialogue between user & computer
- Often best choice for data-entry tasks by unskilled users
- Emphasis on simple data capture: one element at a time
- Poor usability in terms of error correction, feedback, and can ask unnecessary questions



INTERACTION STYLES: FUNCTION-KEY

- Often used in public places - relies less on user keyboard skills
- Can incorporate many interaction devices: numeric keypads, credit-card readers, ID badge detectors etc.
- Usually must be operated in strict sequence: requires mapping of the activation of devices (e.g. VCR, digital watch etc.)



INTERACTION STYLES: LINGUISTIC

- User inputs made on an alpha-numeric keyboard using a particular language
- Command-Line Interaction:
  - user types a command; results are displayed
  - efficient, precise & fast
  - user must know the syntax and semantics of the language: inconsistent abbreviation strategies
  - good for complex functionality and speedy interaction
  - "Know what you are about to Do, for there is no Undo"
  - Poor relationship to user's mental model: Large overhead to learning set of commands **C:\>-**

INTERACTION STYLES: LINGUISTIC

- Text-based Natural Language:
  - User enters information as words and phrases in natural language; train system to understand user's language
  - Makes interface more approachable; lowers initial learning
  - Later learning required for information structure, repertoire of functions, informal syntax etc.
  - Advantage over graphical styles unclear

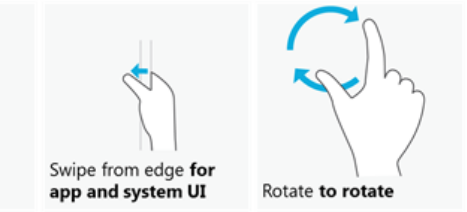
INTERACTION STYLES: SPEECH

- Voice Interaction: hands-free, eyes-free interaction
  - Siri, Google Now: mobile OS; Amazon Echo – stationary device
  - Activation phrase results in execution of user instructions: Echo monitoring every word: privacy vs efficiency
  - Error prevention: detection of activation phrase; background noise; making tasks faster and easier?
  - Semantic processing: default to web search (Siri, Now) vs. Echo's more focused functionality
  - Task efficiency: Echo's shopping list!
  - Visual output? Supporting recognition over recall?

INTERACTION STYLES: TOUCH

- Touch screens, such as walk-up kiosks, detect the presence and location of a person's touch on the display
- Now used for many kinds of displays, such as Smartphones, iPods, tablets and tabletops
- MS Touch UI libraries
- Multi-touch support a range of more dynamic finger tip actions, e.g. swiping, flicking, pinching, pushing and tapping
- More fluid and direct; faster but more error-prone

INTERACTION STYLES: TOUCH



Index finger and **thumb** overlap on to neighboring targets when they are grouped. User can accidentally trigger unintended actions.

KAREN YOUNG, SCHOOL OF COMPUTER SCIENCE,
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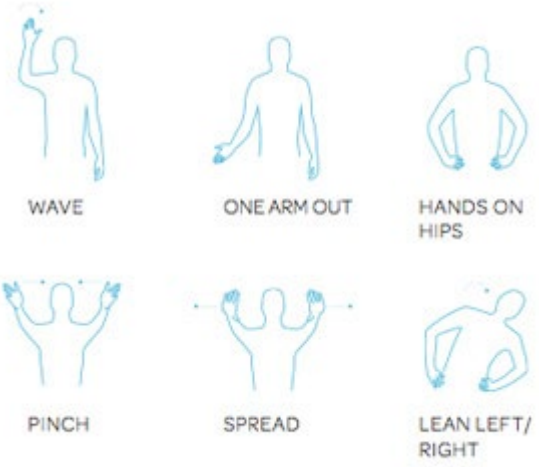
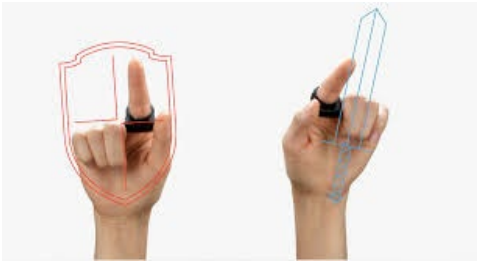
INTERACTION STYLES: GESTURE

- Uses camera recognition, sensor and computer vision techniques: universal appeal
  - can recognise people's body, arm and hand gestures in a room
  - systems include Kinect and EyeToy
- Movements are mapped onto a variety of gaming motions, such as swinging, bowling, hitting and punching
- Players represented on the screen as avatars doing same actions

Interaction Styles: Gesture





INTERACTION STYLES: GESTURE

- Gestural Interaction: visibility, feedback, consistency?
- Recall over Recognition
  - Low affordance
  - Low discoverability
  - Low memorability
- Touch: leverages our understanding of physical world
- Touch, multi-touch and gesture to perform commands and replace DM: inconsistency in how user actions are mapped to system commands
- How natural are NUI's?

INTERACTION STYLES: GESTURE

"But the lack of consistency, inability to discover operations, coupled with the ease of accidentally triggering actions from which there is no recovery threatens the viability of these systems.
We urgently need to return to our basics, developing usability guidelines for these systems that are based upon solid principles of interaction design, not on the whims of the company human interface guidelines and arbitrary ideas of developers."
Nielsen & Norman (2010)

INTERACTION STYLES: HAPTIC

- Tactile feedback
- Can enrich user experience or nudge them to correct error
- Can also be used to simulate the sense of touch between remote people who want to communicate

INTERACTION STYLES: CHOICE?

- One of most important interface decisions
- Provides interface architecture
- Choice is based on functional & usability requirements, as well as cost targets for hardware & software
- Data entry requirements
- Much detailed design work required to achieve a satisfactory interface using selected style(s)
- Combining two or more styles in one UI: consistency

INTERACTION STYLES: CHOICE?

- Choose an appropriate interaction style for each of the following systems:
  - Tourist information kiosk application sited at an airport arrivals area
  - E-mail client: can set colour scheme preferences, incoming mail preferences (alerts, display, download etc.)
  - Mobile phone gaming
  - Account management system
  - Music website

PROTOTYPE

WHAT IS PROTOTYPING?

- Prototyping quickly, and frequently, is the best way to test your assumptions, learn about users, and improve on your ideas.
- *"Prototyping is about bringing conceptual or theoretical ideas to life and exploring their real-world impact before finally executing them. All too often, design teams arrive at ideas without enough research or validation and expedite them to final execution before there is any certainty about their viability or possible effect on the target group."*

IDF

- Why Prototype? Alan Dix:

https://www.interaction-design.org/literature/topics/prototyping

WHAT IS A PROTOTYPE?

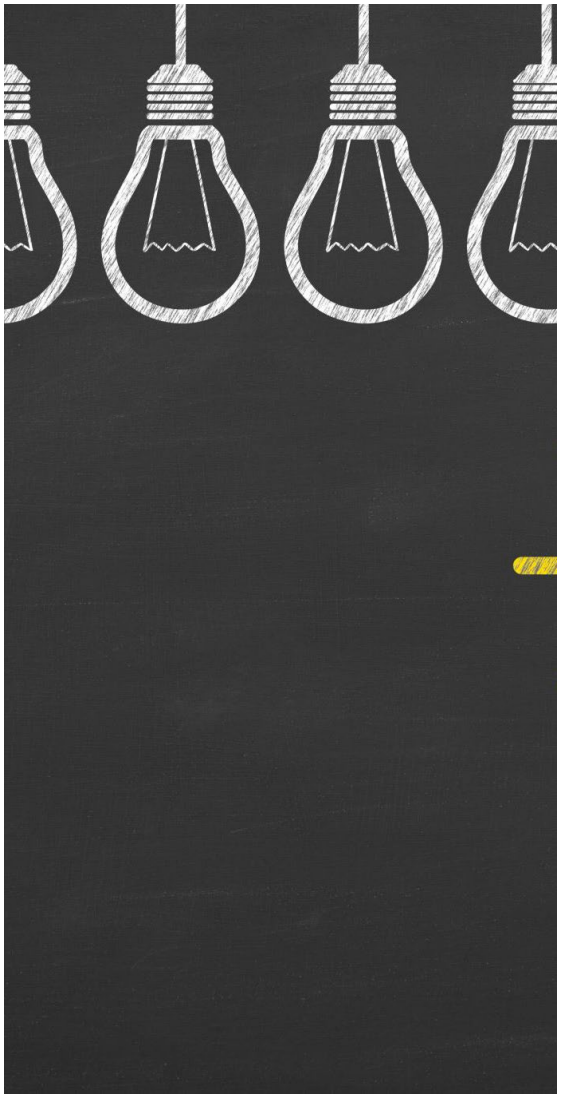
A **prototype** is

- An implementation of ideas in tangible forms to test concept on users

- A simple experimental model of a proposed solution

- Of varying degrees of fidelity, from paper to digital

- Anything from sketches on a napkin to role-playing



PROTOTYPING

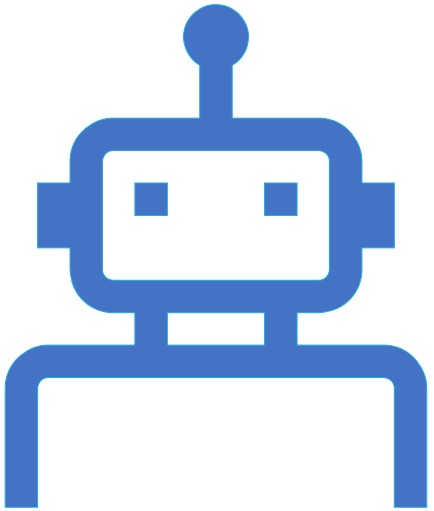
"Prototypes should command only as much time, effort, and investment as is necessary to generate useful feedback and drive an idea forward"

Tim Brown

(Change By Design)

PROTOTYPING ADVANTAGES

- Solid foundation from which to ideate towards improvements: clear picture of the potential benefits, risks and costs associated
- Can adapt changes early, avoiding commitment to a single, falsely-ideal version
- Can experiment with associated parts of the users' needs: insights into less-obvious areas of the users' world
- Iterative user research tool



PROTOTYPING BENEFITS

PROTOTYPING: TYPES

Horizontal: gives a wide view of the entire system or subsystem (e.g. a website)

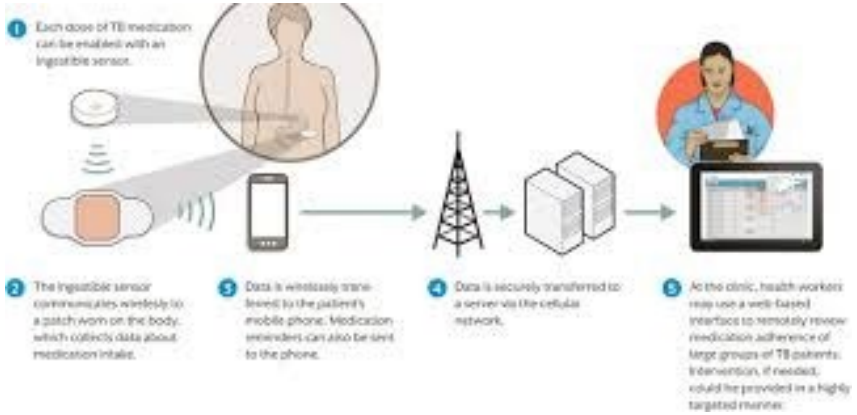
Vertical: gives a detailed view of just one feature (e.g., a checkout process)

Fidelity: the level of detail and functionality in your prototype: low or high. Depends on product development stage

PROTOTYPES

- Sketches
- Paper prototypes
- Wizard of Oz
- Video
- Lego
- Physical
- 3D Printing
- Landing Pages
- User Driven (empathise)

"***Proteus Discover*** is comprised of ingestible sensors, a small wearable sensor patch, an application on a mobile device and a provider portal. Once activated, Proteus Discover unlocks never-before-seen insight into patient health patterns and medication treatment effectiveness, leading to more informed healthcare decisions for everyone involved."

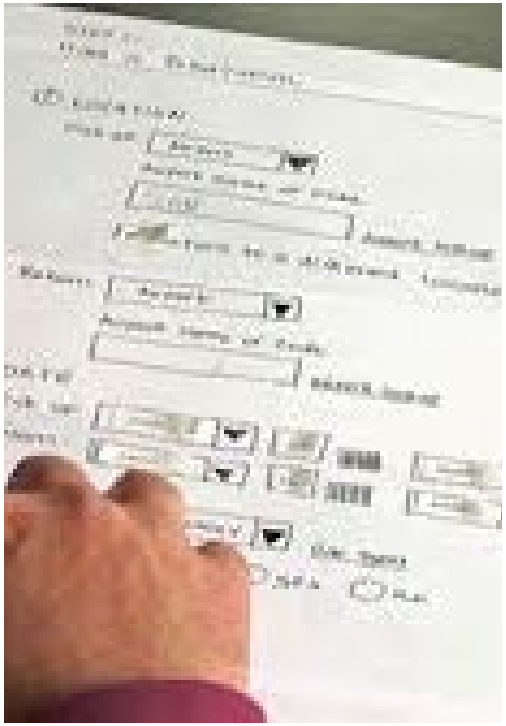


LOW FIDELITY PROTOTYPING

- Uses a medium unlike the final medium, e.g. Paper, cardboard
- Used early in design to explore alternative ideas
- Good for exploring issues of content and structure
- Quick, cheap and easily changed

Examples:
- Sketches of screens, task sequences
- Storyboards

LOW FIDELITY PROTOTYPING



Disadvantages:

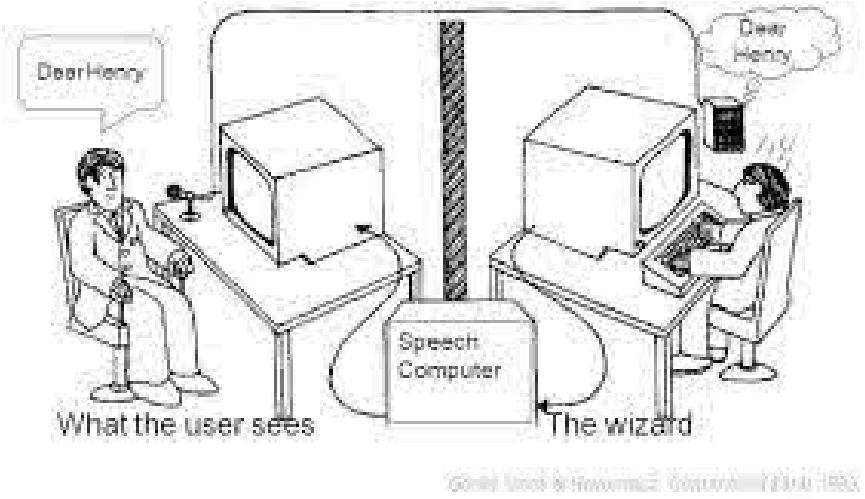
- Lack of realism:
  - Users must imagine how they would use the product
  - Difficult for users to give feedback
- Hard to apply results; may be too basic to reflect the user experience of the finished product
- Lack of interactivity deprives users of direct control
- Can oversimplify complex issues

PAPER PROTOTYPING

- Paper mockup of UI
- Work quickly: fast & fun
- Reduces time and relieves perfectionism: easy to change
- Stick postits on device itself: mockup
- Can mix fidelities
- Test multiple prototypes to get most value: by trying things out and learning, can improve
- Everybody can be involved: give users a pen

WIZARD OF OZ PROTOTYPING

- The user thinks they are interacting with a computer
- More real than paper prototyping
- Works well with forward looking / futuristic UI's
- Problems?



WIZARD OF OZ: IBM

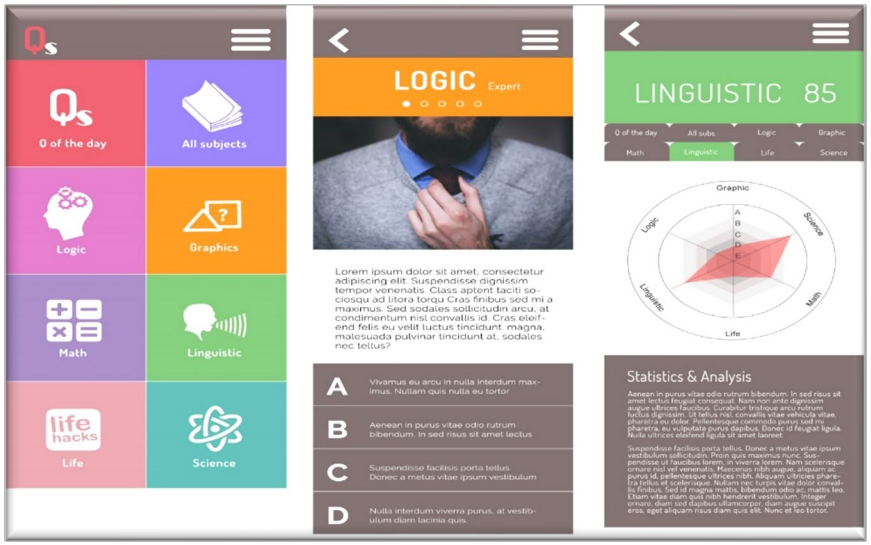
Another example: **IBM** using the 'Wizard of Oz' experimentation method to test whether people would be interested in a program that could transcribe what people were saying. They invited participants into a room with a projector and interviewed them, under the pretense of testing this transcribing program. Whatever the participant was saying would be then projected on the screen. Unbeknownst to the participant, however, the transcribing was not the work of a machine, but a human, typing furiously away, hidden behind a curtain the next room over. IBM just needed to replicate the experience to get fast, relevant feedback.

IBM Speech to Text experiment (1980s)

See IBM Watson Speech Recognition Program: https://www.ibm.com/ibm/history/ibm100/us/en/icons/speechreco/

HIGH FIDELITY PROTOTYPING

- Uses materials that would be in the final product: digital mockup
- Prototype looks more like the final system
- Provides interactive functionality; more engaging
- Useful as a marketing tool
- Common environments are prototyping tools & implementation technology
UI libraries



HIGH FIDELITY PROTOTYPING

Disadvantages:

- Can take a long time to build & more expensive
- Danger that users think they have a full system
- Users are more likely to comment on superficial details than on content
- After all the work, you the designer are likely to dislike the idea of making changes

VIDEO PROTOTYPING

- Create a video showing how you envision use of your system
- Can be any fidelity: low to high
- Really useful early in design cycle: using paper prototypes as design to be elaborated
- Proliferation of video devices: cheap & fast
- Good communication tool
- What goes in a video prototype?
  - Storyboard: whole task, motivation & success, establishing shots and narrative help
  - Tasks: orients interface design to tasks
  - Informs design decisions: shows context of use

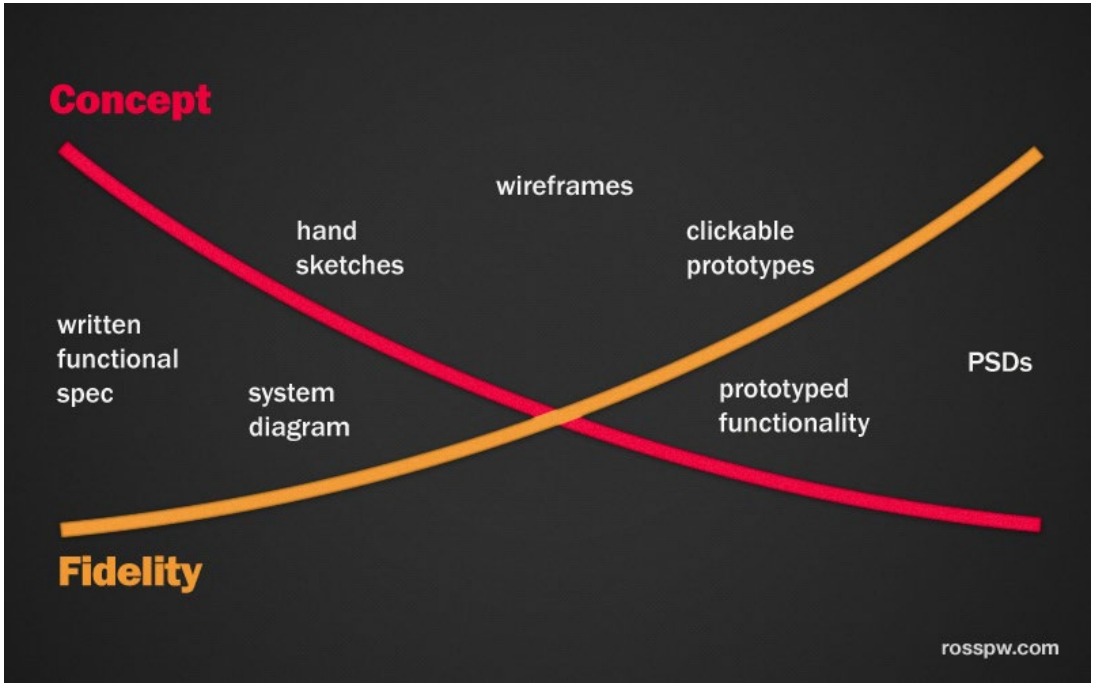
VIDEO PROTOTYPING

- How to?
  - Start with outline storyboards
  - Equipment: phone, people, location
  - Pause editing is most efficient (don't waste time on medium)
  - Focus on message: goal (not high production values)
  - Interface can be paper/mockups: can show success & failure

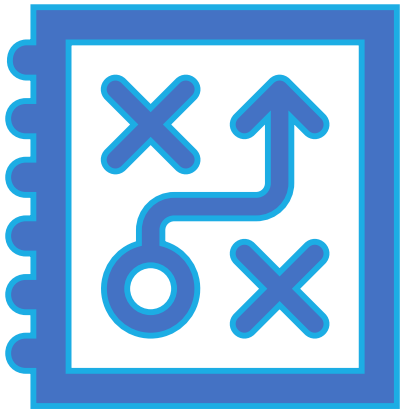
PROTOTYPING TOOLS

- Prototyping tools:
  - Disposable: paper & pen
  - Pen and paper simulators
  - Visual reality: slice and dice: photoshop, HTML, dreamweaver
  - Presentation software: powerpoint, visio, omnigraffle (APAD)
  - Interactive Software: platform specific
  - Generic prototyping tools

PROTOTYPING TOOLS



PROTOTYPING PITFALLS



- Focus on the deliverable, not on the learning
- Too much converging, not enough diverging
- Working in the wrong fidelity
- Too little evaluating
- Fixating on a single prototyping tool

(Jared M. Spool)

CT318 LECTURE 7: REVIEW

Design Thinking 4: Prototype

- Interaction Types
- Interaction Styles
- Prototyping

Week 8: DT 4 Prototype

- Physical Design: Visual Design