

# Unit 05. Design

## Envisioning the future

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# 1. finding suitable representations

# Envisionment overview

- **Envisionment** is concerned with making design ideas visible, with externalizing them in various forms: **stories and scenarios, presentations, sketches, formal models, software prototypes, cardboard models** etc., needed to represent design work to designers and to stakeholders.
- **Different forms** of representation will be useful at **different stages** in the design process. It occurs throughout development as the designer generates multiple design solutions and transforms them to a final product or service.

# Aims

- In this unit, we consider the principal envisionment techniques, various forms of prototyping used to explore and evaluate ideas and the presentation of ideas to stakeholders.
- After studying this unit you should be able to:
  - Use a variety of techniques for envisioning design problems and possible solutions.
  - Understand the role of concrete scenarios in envisioning design.
  - Select and use appropriate prototyping techniques.
  - Understand the main factors in communicating designs effectively.

# The role of suitable representations

- Envisionment is fundamental to effective human-centred design, **to enable designers to see things from other people's perspectives** and to explore design concepts and ideas **with others**.
- **Different representations** of design ideas are useful at different stages for different people, as they help with generation, communication and evaluation of ideas.
- A sketch 'on the back of an envelope' might be useful for generating an idea and expressing it to a colleague – but it is not so good for presenting to a stakeholder.

# Different techniques

- There are many techniques that can be used to help develop an understanding of the design problem and to envision possible solutions.
- None of these techniques in themselves will lead to the perfect design but they will all generate some kind of representation that can be used in the process of **communicating with clients, customers and colleagues.**
- It is through communication that design solutions will arise, be evaluated and (eventually) be transformed into a final service or product.
- Choosing suitable representations for the task at hand is one of the skills of a designer, another is making good use of that representation.

## Challenge: Identify the different design representations and their use.

A car designer has been commissioned to produce a new luxury sports car. He or she doodles a few designs on paper and shows them to other designers on the team. They make some comments and criticisms and as a result changes are made. Finally, the designer is satisfied with one of the designs and draws up detailed blueprints that are given to the firm's model maker. Scale models are produced and sent to Marketing and Sales for customer reaction. The scale models are also subjected to wind tunnel experiments to investigate the aerodynamics of the design and the results are used in a computer program that will calculate the car's speed and fuel efficiency.



# Car design example

The designer is using four different representations in different ways:

- The **original representations** focus on clearing the mind. In this case, they are doodles (sketches) that are used to generate new ideas – ideation – , examine possibilities and prompt for questions.
- The **blueprints (detailed designs)** are given to the model maker
- the **scale models** are given to the Marketing and Sales departments, suitable for accurately expressing ideas to others.
- The scale models are also used in wind tunnel experiments to test aerodynamics.
- The **computer model** is used to make performance predictions.

# An outline of design through envisionment process

- Review the **design brief, any constraints and requirements and conceptual scenarios**.
- Develop representations of your design ideas. This is the process of ideation. **Sketching** is central to the process. The aim is to generate many ideas to explore the spaces of possible experiences.
- If your product is a new one, experiment with different **metaphors** and **design concepts** through your representations
- Develop the **'look and feel'** of the product, sketch out the **touchpoints, channels of interaction** and **navigational structure** of the whole UX. Develop **wireframes** to provide more detail on the proposed structure and navigation (discussed next).
- **Explore design ideas with the people** who will be using the system wherever possible (using discovery techniques, focus groups, interviews, etc., discussed last week)
- Iterate and gradually formalize the design (making it more concrete) through **prototypes** and further **evaluations** (see evaluation unit, next week).

# 2. sketching

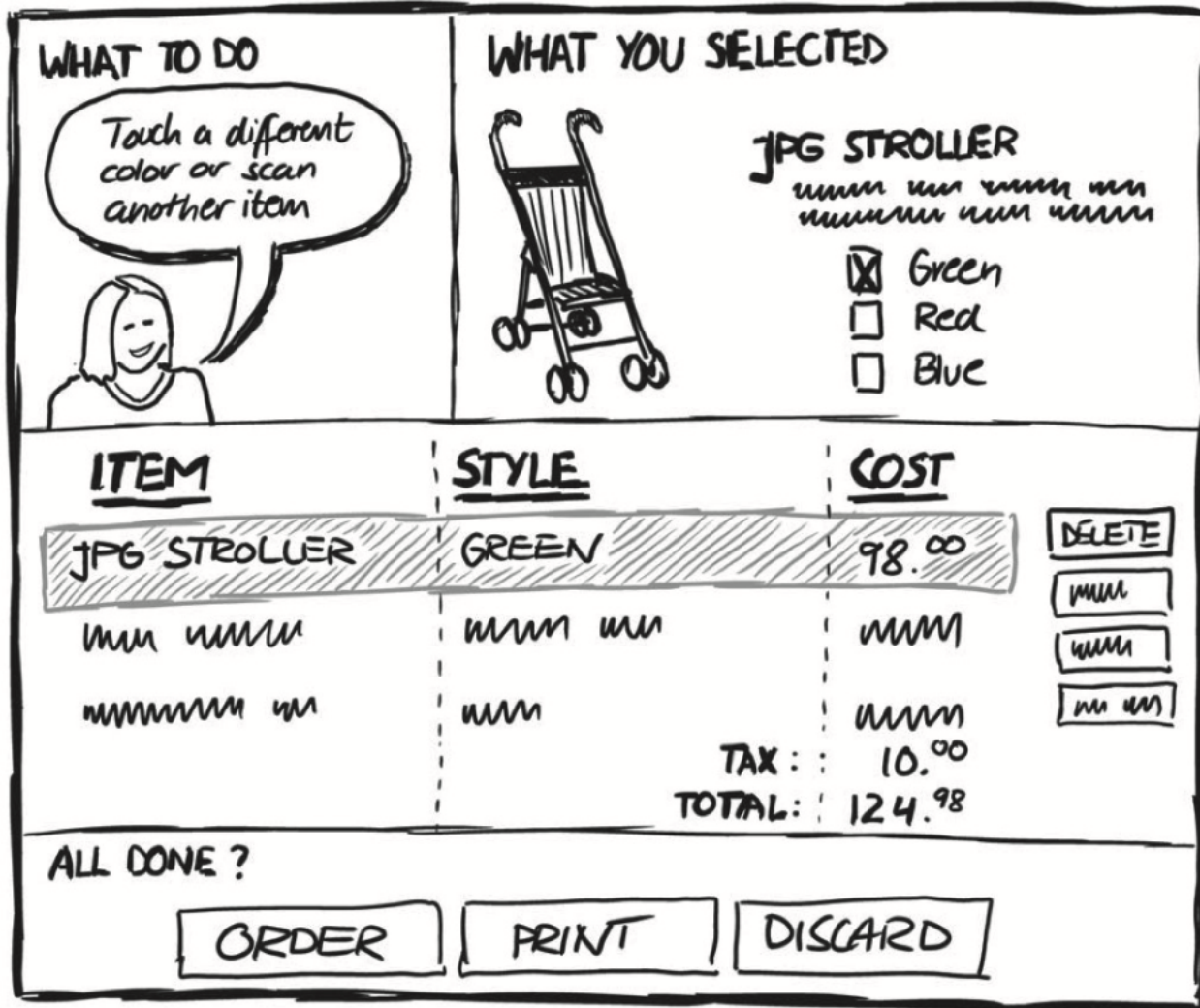
# Sketching for ideation

- Envisionment is about bringing abstract ideas to life. It is easy to have great ideas but by envisioning them (sketching them) the flaws and difficulties will be exposed. Sketching will also help generate ideas.
- The Millennium Bridge across the River Thames in London was reputedly designed on a paper napkin in a restaurant.
- Designers should carry a sketchbook with them so that inspiration can be quickly captured and preserved.

# Sketching user experiences

- Bill Buxton, a UX designer at Microsoft, has promoted the importance of sketching in his book *Sketching User Experiences*, and Greenberg, et al. (2012) provide an excellent workbook providing practical advice on sketching for UX.
- Buxton argues that sketches are quick, timely, inexpensive, disposable and plentiful.
- The UX designer should be **happy to throw away sketches** and so not get too committed to particular design features.
- Buxton continues by identifying that sketches need a clear vocabulary, have 'distinct gesture' (fluidity), minimal detail and an appropriate degree of refinement.

# Sketching



example of a sketch for the interface to an **interactive shopping service**

# Sketching user experiences

Greenberg *et al.* (2012) emphasize the perspectives shown here, and in addition, that sketches can include annotations, arrows (to show movement or to highlight particular areas of the sketch) and notes about issues that the designer has yet to resolve. Snapshots can be single sketches or **frames from a storyboard**.



**Extreme long shot (wide shot)**  
A view showing details of the setting, location, etc.



**Long shot**  
Showing the full height of a person.



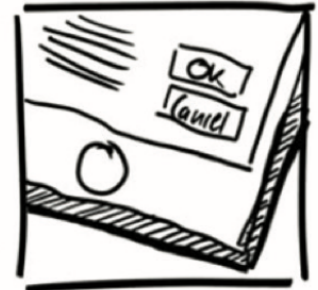
**Medium shot**  
Shows a person's head and shoulders.



**Over-the-shoulder shot**  
Looking over the shoulder of a person.



**Point of view shot (POV)**  
Seeing everything that a person sees themselves.

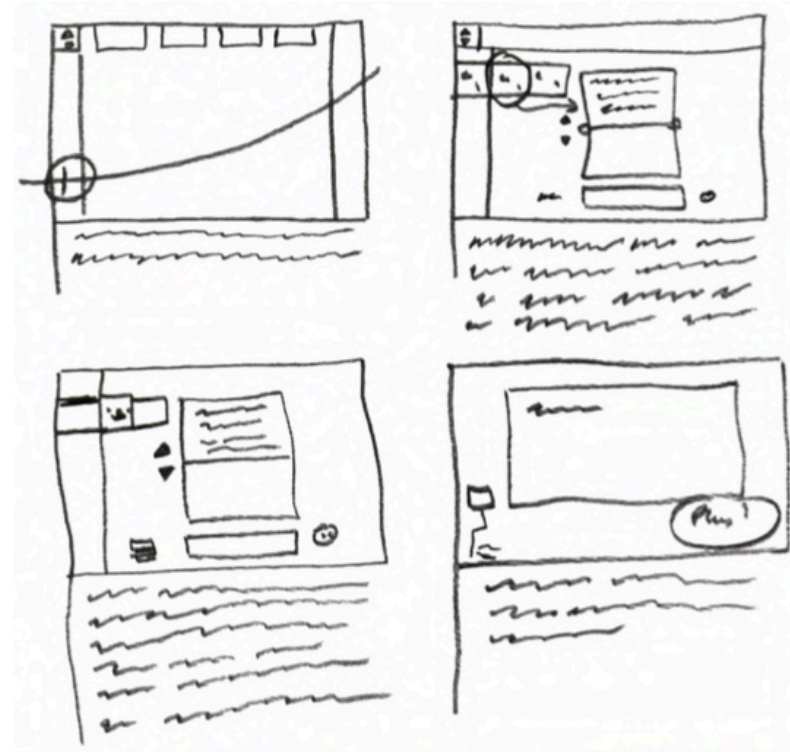


**Close-up**  
such as showing details of a user interface a device the person is holding.

# Storyboarding

A storyboard for a film would usually have some **notes attached to each scene** expanding on what will happen. This helps overcome the limitations of representing a dynamic experience in a static medium.

In UX design, notes below each sketch usually contain the relevant steps from a scenario. A sketch can be annotated with appropriate notation and notes about, for example, type, colours, images, sound and other issues attached underneath (**scored storyboard**).

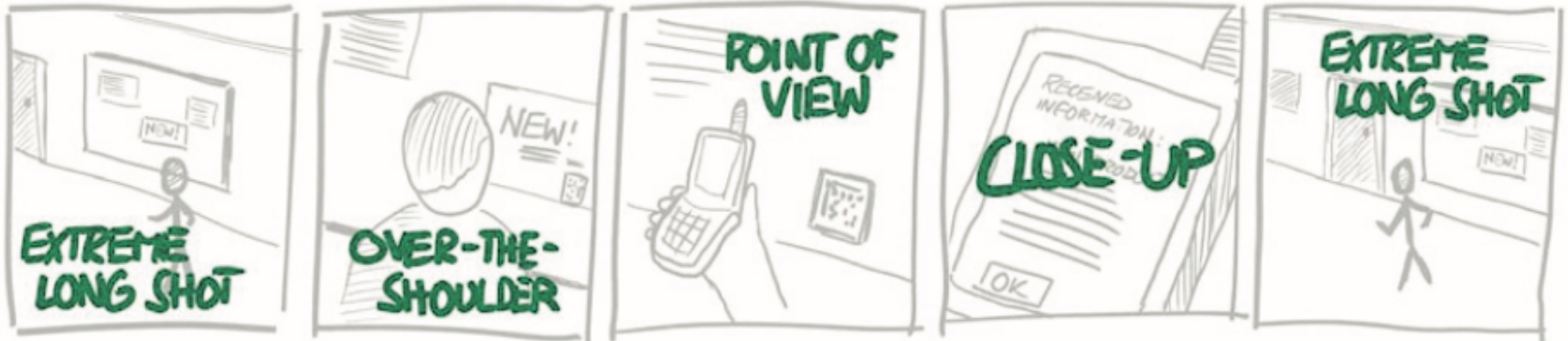




# Narrative storyboards

- Greenberg *et al.* (2012) recommend developing narrative storyboards for key moments of a proposed user experience.
- They use five scenes to describe a typical UX.
- The structure has a beginning scene, two scenes showing the story developing, the climax of the story and the ending scene.
- A key difference between sketching snapshots and sketching narratives is to capture some more of the context of the UX.
- With narrative storyboarding, the designer can show more of the whole UX that is being designed.

# Storyboard example



1. Person passing by an advertisement board



2. Notices one announcement and is interested in more information



3. Taking a photo of a barcode on the poster.



4. The mobile phone downloads detailed information about the new product.



5. The person puts away the phone and turns around.

In the example, a user is attracted by advertisement, scanning the advertisement with an app on her smartphone, getting some information and moving on.

# Storyboard example

This sketch uses different shots at different stages.

An extreme long shot to set the scene, an over the shoulder shot to illustrate what happens next and a close up to show what the user sees.

Adding arrows and annotation to the sketch results in the more fluid and expressive sketch of this particular UX as shown in the example.

# Narrative storyboards

- Greenberg *et al.* (2012) provide examples in their book on how to sketch and how to get the idea of flow and movement into sketches.
- They identify the different types of ‘shot’ that sketches can use to show the whole user journey through an experience from an opening long shot to a close up, creating a representation like a film storyboard.
- They also provide a vocabulary of familiar objects, people and activities that are frequently used in UX design.

## Hints and tips for sketching Greenberg *et al.* (2012)

- Sketching can be a collaborative experience where **two or more designers work together to develop the ideas** and of course sketches can be critiqued by a design team or focus group to explore design issues.
- Designers **can take photos of different scenes** rather than draw them and put the photos together into a sketch.
- Designers can **annotate these photo-sketches** with arrows and notes to add more detail and explanation.
- Another alternative is to use **sketching software**. For example, Microsoft PowerPoint has a wide range of objects, arrows and other ways of helping designers to sketch out ideas and there are a number of specialist sketching apps.
- However, designers should not lose sight of the power of sketching by hand. The more fluid nature of the representation, the speed of production and the ability to throw away sketches that do not quite work help designers explore the problem domain in a way that software sketching does not encourage.

## Example: express an idea though storyboard

Imagine we're thinking of developing a new way for people to pay for train tickets at train stations using an electronic payment service, like PayPal, on their mobile phone (a "mobile wallet").

Our initial idea is that people will start the task by using a kiosk at the station where they can choose their ticket. At the payment stage, they will scan a QR code that's generated on the kiosk screen. Scanning the QR code takes the user to a payment site where they can pay and get the tickets delivered to their phone.



1  
User arrives at station, sees kiosk and long queues for the ticket office



2  
User goes through kiosk



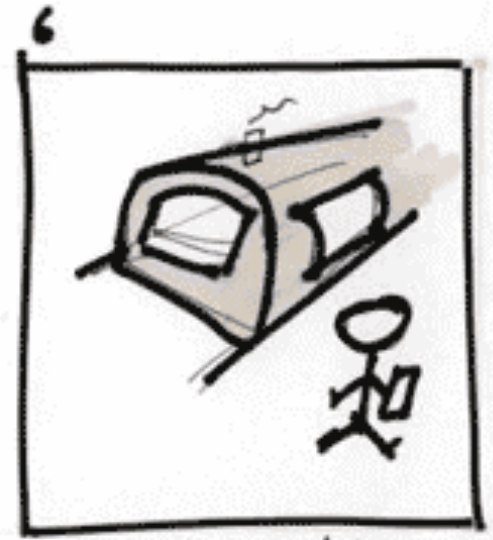
3  
On payment screen, he chooses mobile phone



4  
He scans the QR code



5  
Follow instructions to pay, and his ticket is delivered



6  
Gets a train with ticket delivered to his phone. Speedy!



USER ARRIVES AT STATION, SEES KIOSK AND LONG QUEUES FOR THE TICKET OFFICE



USER SELECTS DESTINATION



ON PAYMENT SCREEN, HE SELECTS 'MOBILE WALLET'



HE SCANS THE QR CODE



HE FOLLOWS INSTRUCTIONS TO PAY AND HAS TICKETS DELIVERED










GETS ON TRAIN WITH TICKETS DELIVERED TO HIS PHONE. SPEEDY!

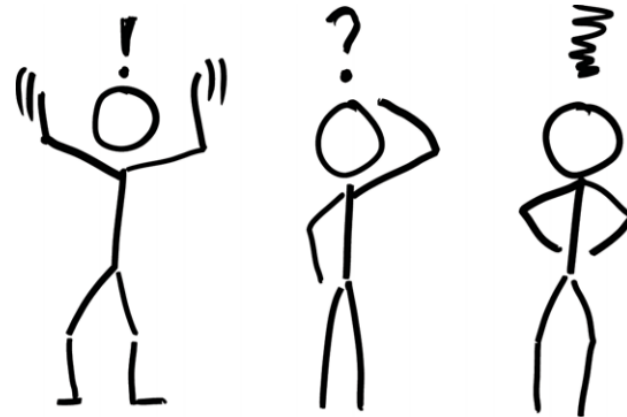




## MAIN PARTS OF A STORYBOARD

-  MAIN CHARACTER:  
PERSONA
-  USER GOAL (TASK TO COMPLETE),  
MOTIVATION
-  VILLAINS (PAINPOINTS, PROBLEMS,  
FRUSTRATIONS)
-  LOCATION, SETTING  
(CONTEXT OF USE)
-  SOLUTION (PROVIDED BY THE PRODUCT  
OR SERVICE)
-  OTHER RELEVANT OBJECTS,  
CHARACTERS, RELATIONSHIPS
-  SCRIPT

# Sketching Vocabulary

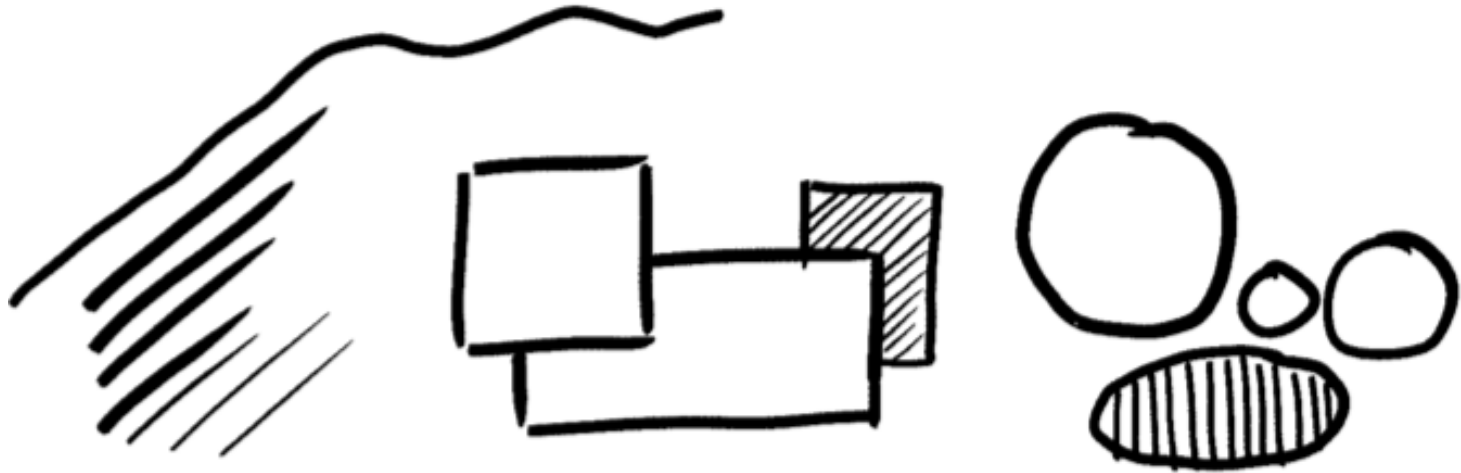


Chapter 3.4 in Sketching User Experiences: The Workbook Drawing objects, people, and their activities

from presentations accompanying the book 'Sketching User Experiences, the Workbook', by S. Greenberg, S. Carpendale, N. Marquardt and B. Buxton

# Basic sketch elements

- Lines, rectangles, and circles will be essential visual elements for many of your sketches
- Become familiar with this variety of shapes (play with line thickness and hatching styles)



# Composing objects

Combine basic sketch elements to compose a variety of shapes and objects



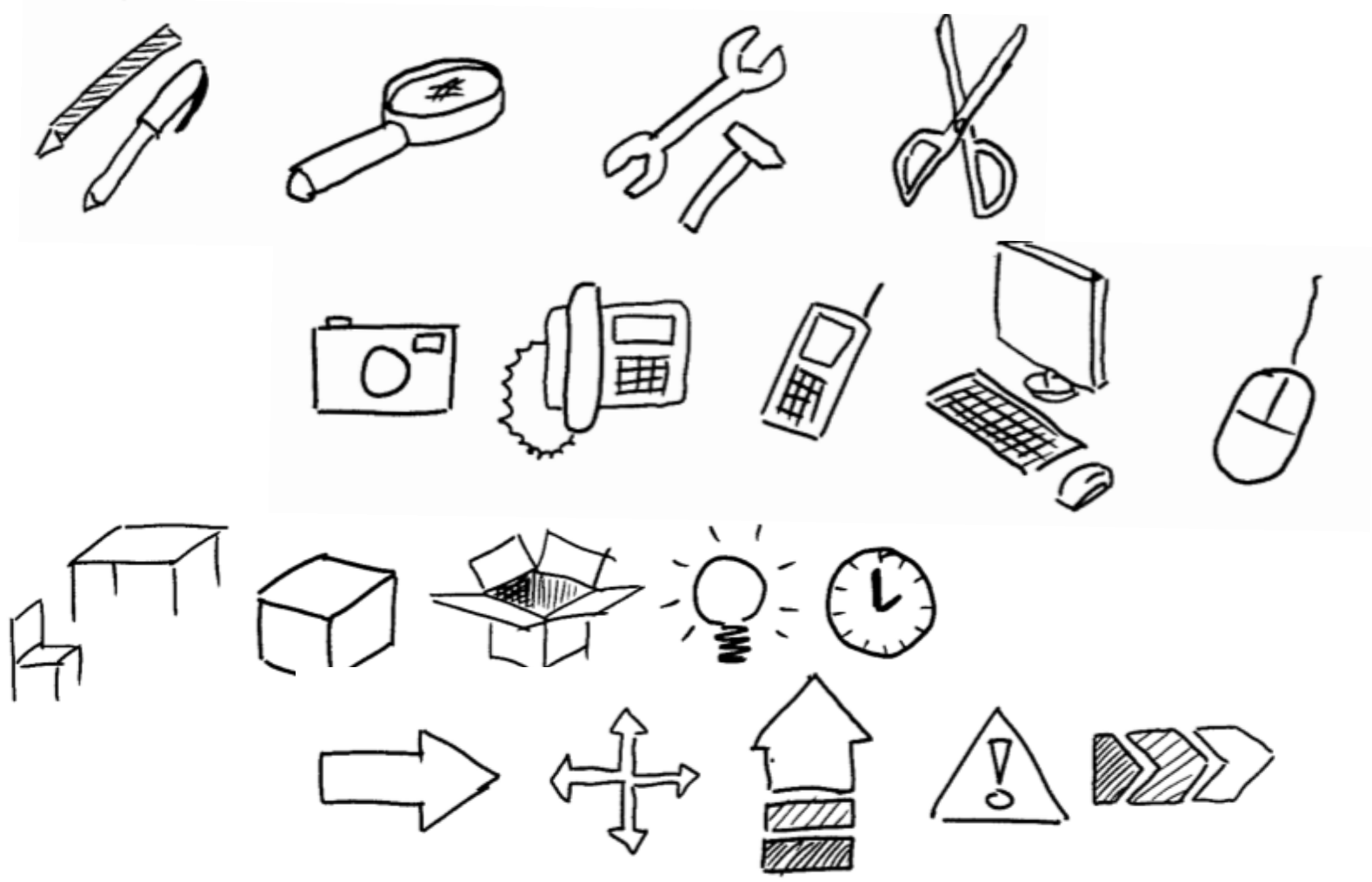
# Sketching vocabulary: best practices

- Simplicity is key: try to simplify sketched objects to the minimum necessary detail
- Icons can be a good source of inspiration for simple shapes representing objects
- 3D is not necessary (most of the time)
- Sketch with fast, long strokes

# Try it

- Sketch the following basic objects:
  - Photo camera
  - Desktop computer
  - Telephone

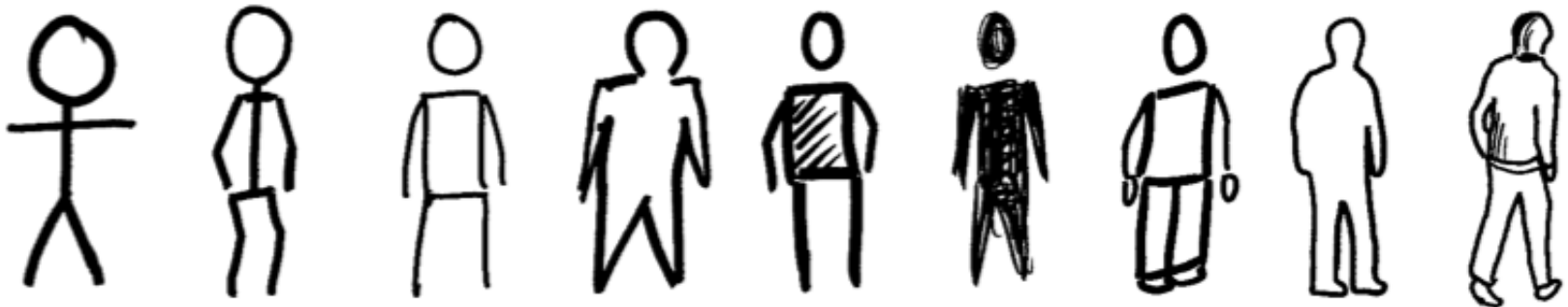
# Try it



from presentations accompanying the book 'Sketching User Experiences, the Workbook', by S. Greenberg, S. Carpendale, N. Marquardt and B. Buxton

# Drawing people

- Sketches of interactive systems often include people
- Many possible techniques for drawing a person:





# Drawing people

Comic-like sketches can also represent people



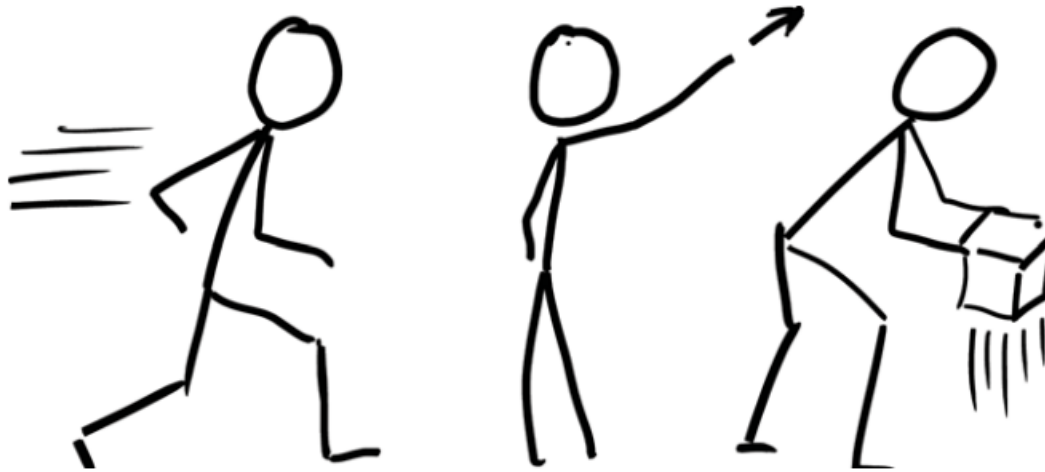
# Drawing people

- Comic-like sketches can also represent people
- Chose drawing style to match the kind of sketch you are creating



# Activities

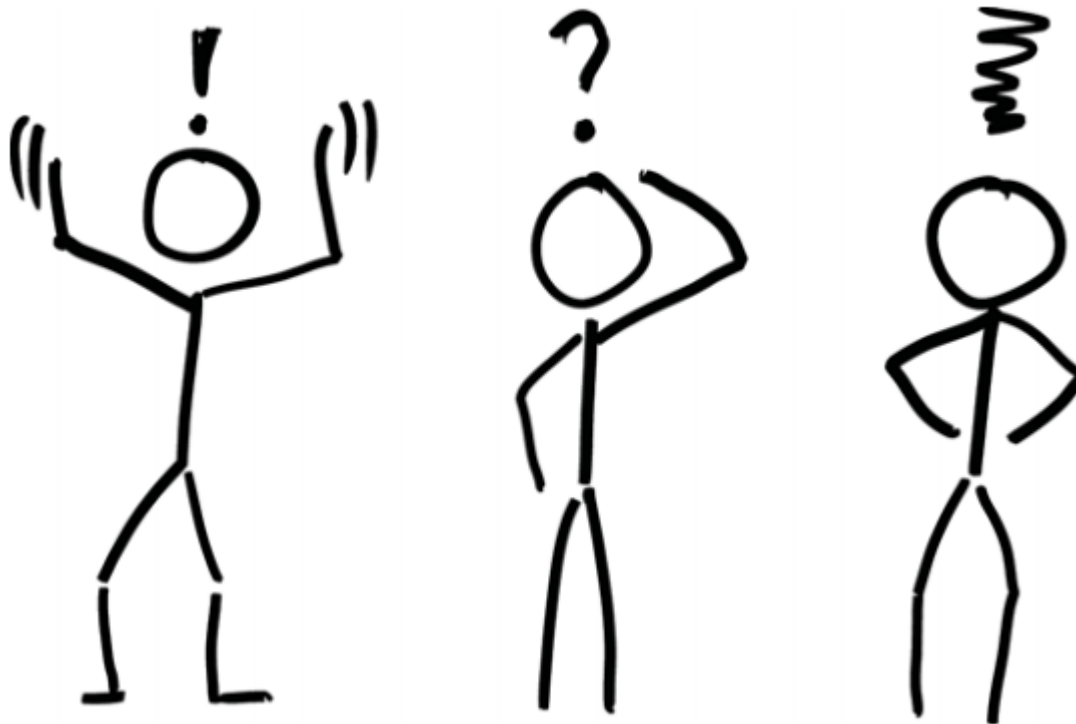
By varying people's poses you can express a variety of activities



Action lines can emphasize a person's movements

# Bodies and emotions

- Postures can express the emotional state of a person.
- Symbols next to the person can emphasize this effect



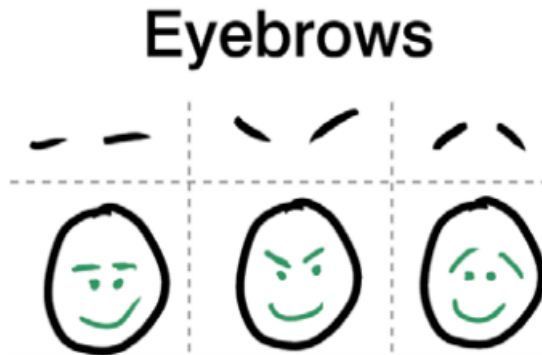
# Faces and emotions

Express people's emotions through simple variations of how you draw a face



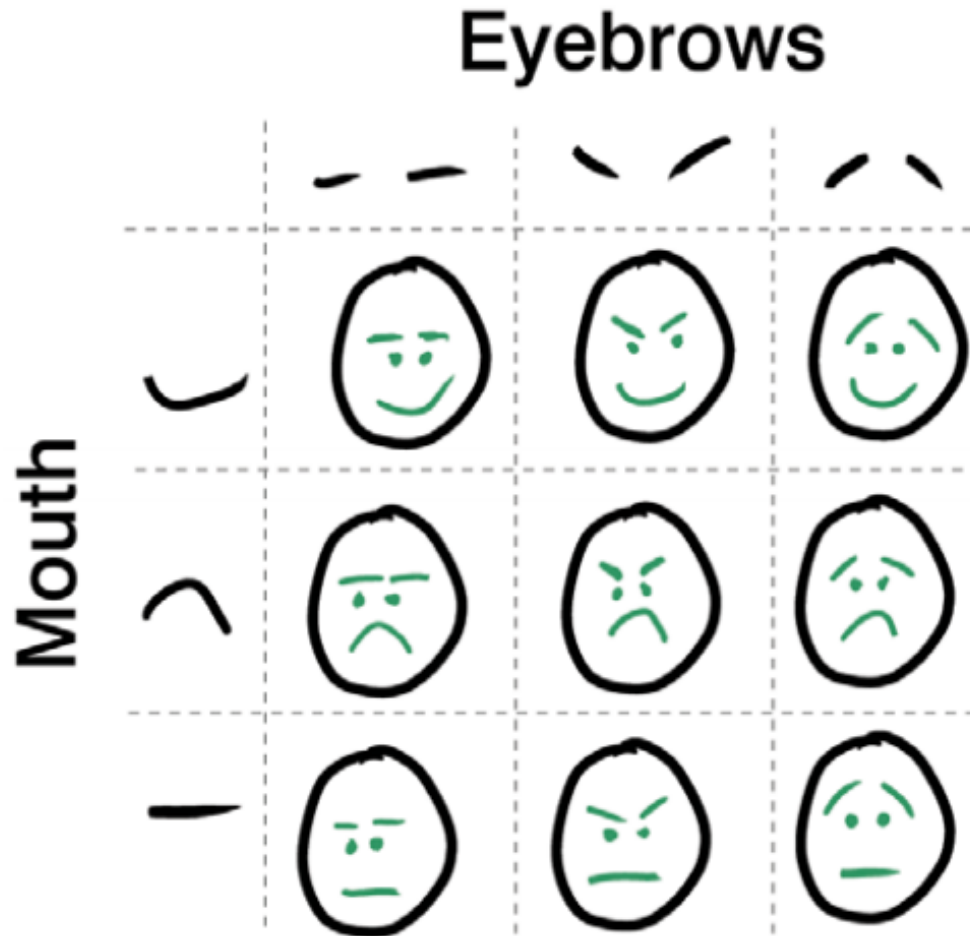
# Faces and emotions

Express people's emotions through simple variations of how you draw a face



# Faces and emotions

Express people's emotions through simple variations of how you draw a face



## Combining postures + faces



from presentations accompanying the book 'Sketching User Experiences, the Workbook', by S. Greenberg, S. Carpendale, N. Marquardt and B. Buxton



# Combining sketched elements

Combine the postures of people, facial expressions, and other sketched elements to illustrate specific situations and actions.



# Summary: sketching vocabulary

- Sketching vocabularies are your basic toolset for sketching
- Simplicity is key
- People's postures and emotions can be expressed through simple line sketches
- Learning a basic sketching vocabulary lets you sketch more efficiently

# 3. visualizing "look and feel"

# Visualizing look and feel

- Designers need to envision the various interaction elements so that they can establish a **common look (how things are represented)** and **feel (how things behave)** for the whole UX. The *look and feel* should have some **consistency across the different media channels** and should reflect the overall brand that the UX is aiming to establish.
- In the case of a large organization, this branding will be very carefully controlled by the marketing department, but even for a smaller organization, there needs to be a recognizable style that crosses channels such as an app, a website, a promotional video and any paper-based media contribute to the overall UX.

# Aesthetics and UX

- UX is inherently concerned with emotion and feelings of engagement. Designers should aim to bring about those key aspects of experience design – **identity, adaptivity, narrative, immersion and flow** –evoking the different types of pleasure and product attachment.
- Designers need to establish the **aesthetics of the product** they are developing. To do this, they need to find some way to envision the feelings and sense of presence that users will have when they experience a service or product. They must do this in a way that provides some **consistency across channels and interaction elements**.
- The ultimate aim of this part of the envisionment process is to arrive at the **design language** that will characterize the service or product designed.

# Mood boards

- Mood boards are widely used in advertising and interior design.
- Quite simply designers gather visual stimuli that capture something of the feeling about the design.
- Photographs and other images, colours, textures, shapes, headlines from newspapers or magazines, quotations from people and pieces of fabric can all be used to contribute to this.
- The stimuli can be attached to a physical pinboard or designers can make use of an online tool such as Pinterest.
- Designers can put pages from websites they like on mood boards, video clips or snippets of animations that capture a certain aesthetic.
- Andreas Lucero (2012) argues that mood boards are useful for '*framing, aligning, paradoxing, abstracting and directing*' designers in their work on the look and feel of a product or service.

# Example



# Example

- Lucero (2009) gives an example of a mood board that includes a picture of a ripe melon that was used to evoke a **sense of smell** that in turn suggests the **experience of eating ripe fruit**.
- A picture of shower introduced the **sense of fresh and clean experience of having a shower**.
- This produced a physical object that could be used in workshops with stakeholders to help them frame the design space, align it with other objectives of the product and raise paradoxes that lead to discussions and resolutions.
- Ultimately, the process leads to a more abstract idea of the service that can direct the next stage of work.



# Use of mood boards

- The point of the mood board is not to formally represent some aspect of the design, simply to act as inspiration – perhaps promoting a particular line of thought, or providing inspiration for a **colour scheme**.
- One technique is **to ask the stakeholders to create a mood board**. This can give the designers an insight into the kinds of aesthetics that are likely to appeal to them.

# Descriptive adjectives

- As a variation on the mood board concept, writing down adjectives that describe some aspect of the system can be useful.
- Designers can envision the look of a service by writing down what emotions they want it to evoke in the users.
- For example, you want the users to feel that this is a **serious app**, providing content that has been well researched and well-written but still retain some sense of **adventure** and **intrigue**.
- Listing descriptive adjectives for a project will lead to a set of semantic scales that can subsequently be used for evaluation through semantic differentials.

# Design workbooks

- Design workbooks (Gaver 2011) 'are collections of design proposals and other materials drawn together during projects to investigate options for design'.
- The workbooks help designs that evolve slowly over time and capture lessons learnt from previous design activities.
- One important aspect of Gaver's approach is that he proposes methods for ambiguity in design (Gaver and Benford, 2003).
- These envisionment methods (similar to technology probes) complement methods focused on requirements generation by raising issues, posing paradoxes and aiming to resolve them in a team.

# Example: Explore Scot

- We were working on an app for a competition run by TravoScotland to ‘provide a compelling interactive experience for visitors to Scotland’ in the year that they had designated the year of Innovation, Design and Architecture.
- After several brainstorming sessions, we arrived at the concept of an interactive treasure hunt.
- Tourists would be guided to particular location in Scotland and would then explore the area to find information about a famous person and what they had achieved.
- When we looked at similar products and services, we found that the ‘treasure hunt’ look was generally aimed at children with pirate type characters, treasure chests and a cartoon like feel (go to Pinterest.com and see). This was not what we wanted.
- We wanted to attract tourists as well as locals who were interested in discovering stories about the famous architects, designers and innovators of Scotland.
- Creative architects and designers such as Charles Rennie Mackintosh and William Henry Playfair were to be celebrated along with examples of their work. The homes of innovators such as John Logie Baird (inventor of the television) and Alexander Graham Bell (inventor of the telephone) were to be highlighted along with details of their work.
- With this general idea, we split into four groups of three people each to develop more of the look and feel that our service would have.

# "Great Scot" workshops /1

- In the workshops, one group suggested that the overarching colour should be dark blue, with a white type face and yellow buttons.
- The adjectives used were exciting, exhilarating, engaging, intriguing, vivid and modern.
- One group suggested that the Forth Bridge would be a good logo, an iconic image that was itself a great example of innovation.
- A polygon art interface brought these ideas of modernity.
- Another group at the workshop focused on a previous app she had worked called 'Go Scottie' that used a small Scottie dog as its logo.
- This led to the idea of calling the app Great Scott in order to capture the idea of great Scottish innovators but also as a reference to the Back to the Future films where 'Great Scot' was a phrase frequently used by Doc Brown to express amazement.
- This group wanted a brighter palette for the design, with more colour. They wanted a feel more like the film Minority Report with its high-tech user interface.

# "Great Scot" workshops /2

- Another group used the Holocaust Museum in New York as inspiration for a sensitive guide through history.
- A fourth group drew inspiration from a Pokemon advert that was running at the time along with ideas from the Braveheart and Highlander films, historic battles and Scottish Kings and the Harry Potter films many of which were filmed in Scotland.
- We put all these ideas together on flip charts and came together to discuss.
- Finally, we arrived at the logo shown in Figure 6, using the purple colour (the same as the Scottish flag), and also quite a serious colour as used by The Guardian newspaper, the concept 'Explore Scot' because the content was to be about the innovation and architecture in Scotland with the 'O' looking like a pin on Apple or Google maps to illustrate the idea of finding interesting locations.
- The logo and design would be central to a smartphone app that would guide people around areas of interest in Scotland.
- The logo would also figure on the TravoScotland website where it would link to a video and on promotional material that would be available at the chosen sites.

# 4. mapping the interaction

# Mapping the interaction

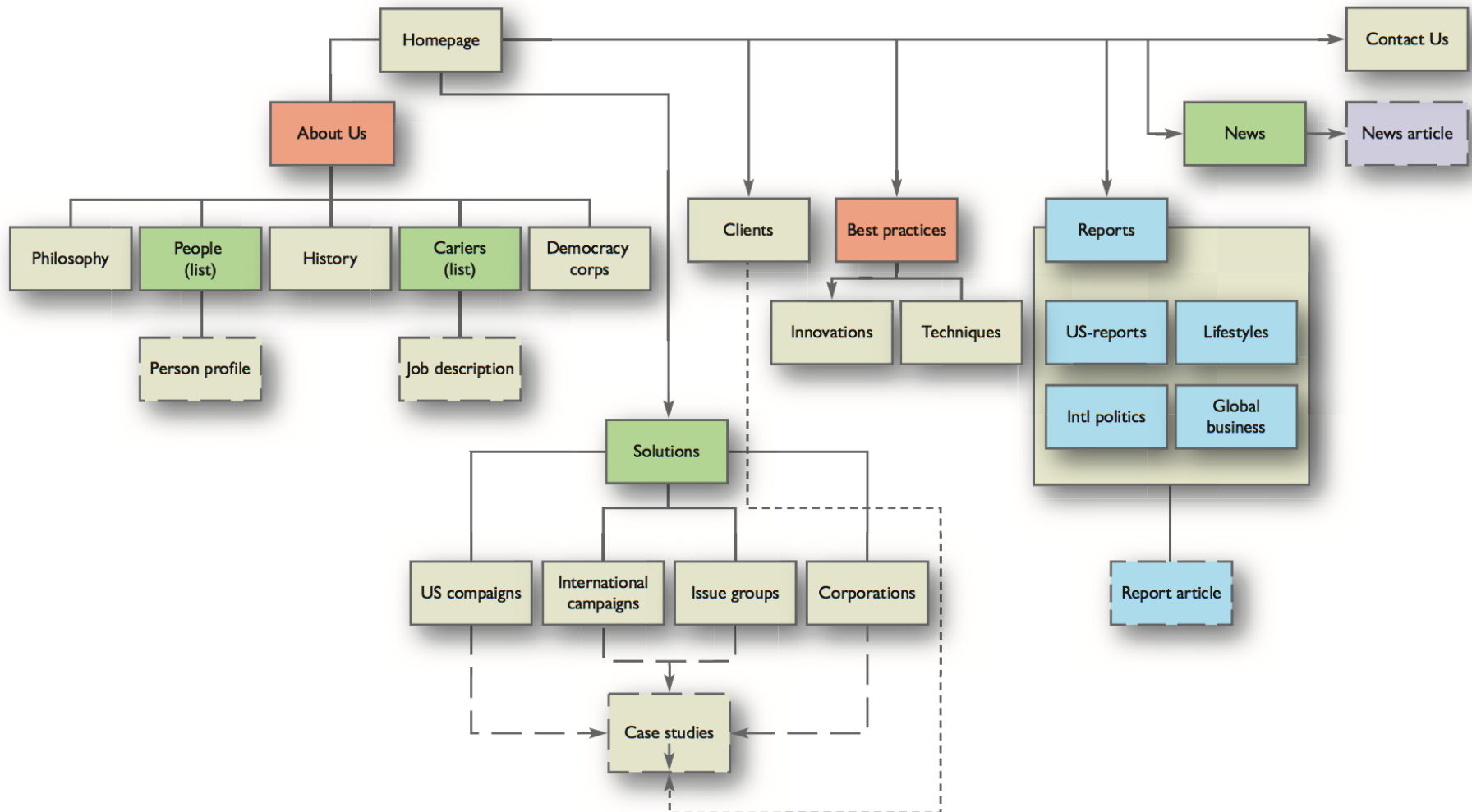
- Sketching and mood boards focus on exploration of the design space; ideation, look and feel.
- As the process of design continues, designers will want to look at how the information space is structured and the paths that users can take through the space.
- **Maps** are forms of envisionment that focus on these aspects of interactive experiences.
- **User experience in interactive and information spaces shares many characteristics with user experience in physical spaces.** Here the use of maps to help people find their way around towns and cities is well known.
- So, for the interaction designer, there are methods for envisionment that focus on mapping different aspects of the overall UX.



# Navigation maps

- Navigation maps focus on how people move through the site or application. Each page in the site, or an app, is represented with a **box** or heading and every page that can be accessed from that page should **flow** from it.
- In a navigation map we should include all flows possible (i.e. back and forth from a page) as this will highlight sections where people might get stranded.
- The maps can be used with **scenarios** to **‘walk through’ particular activities** and are a very good way of spotting poor aspects of design such as **‘orphan pages’** (not accessible), dead ends or **paths that are too long or too obscure**.

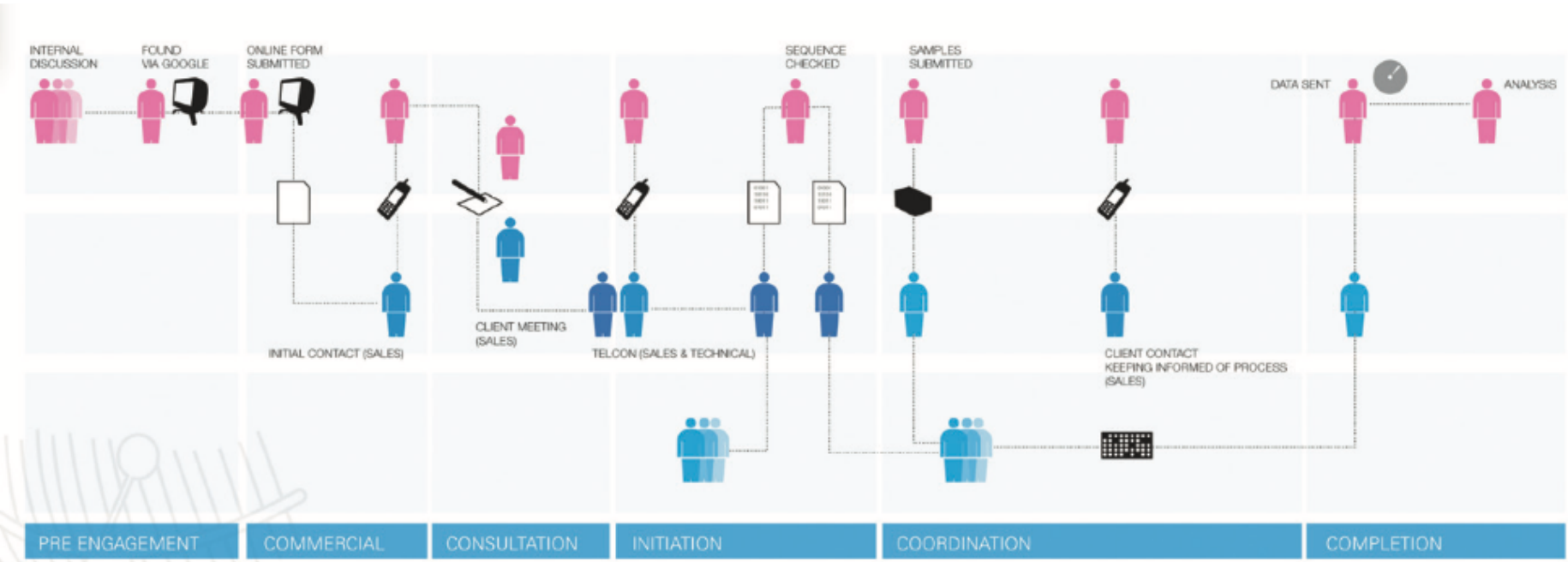
# Navigation map for a website



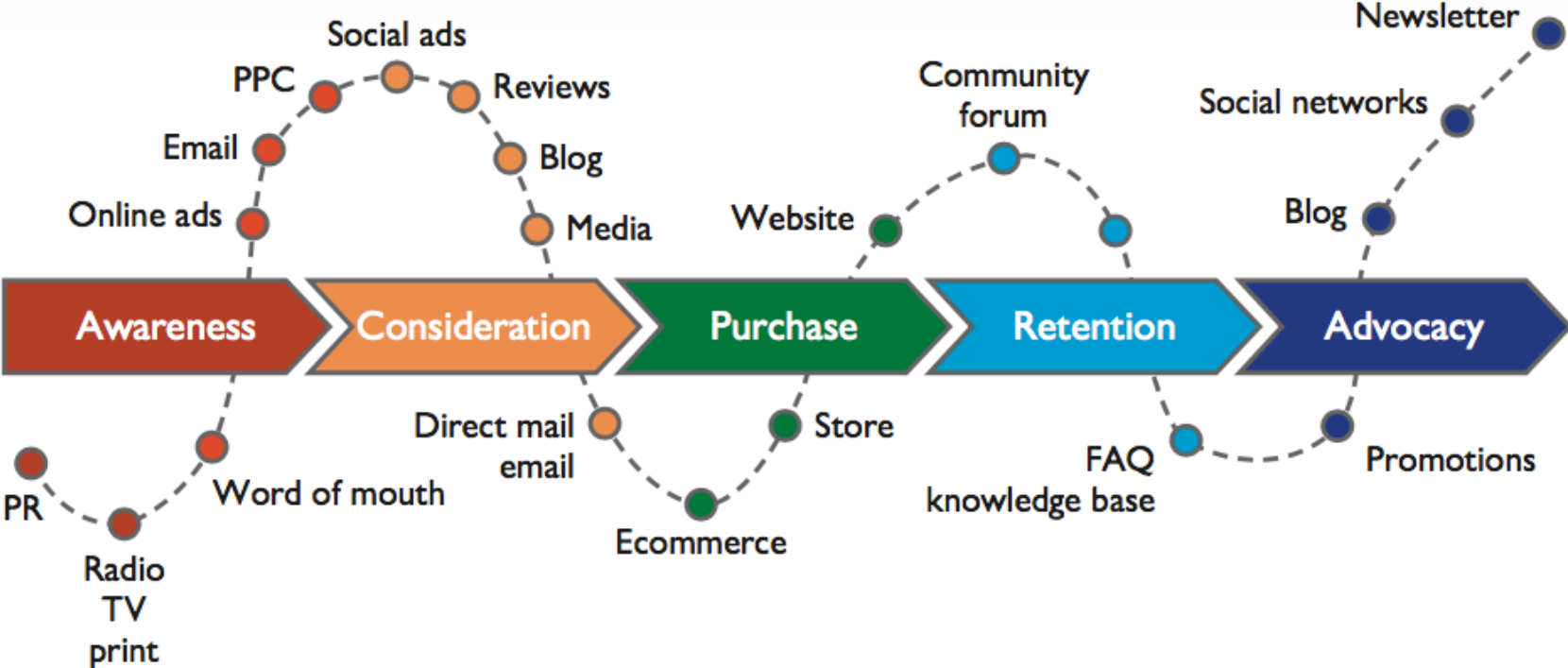
# other types of maps

- Navigation is important in all manner of applications and products, not just websites.
- Different notational conventions are used to show different types of content.
- Maps are useful for highlighting organizational structure, for example the organization of functions on a mobile phone.
- An example is a **user journey map** focusing on particular aspects of the interaction with an organization.

# Journey maps

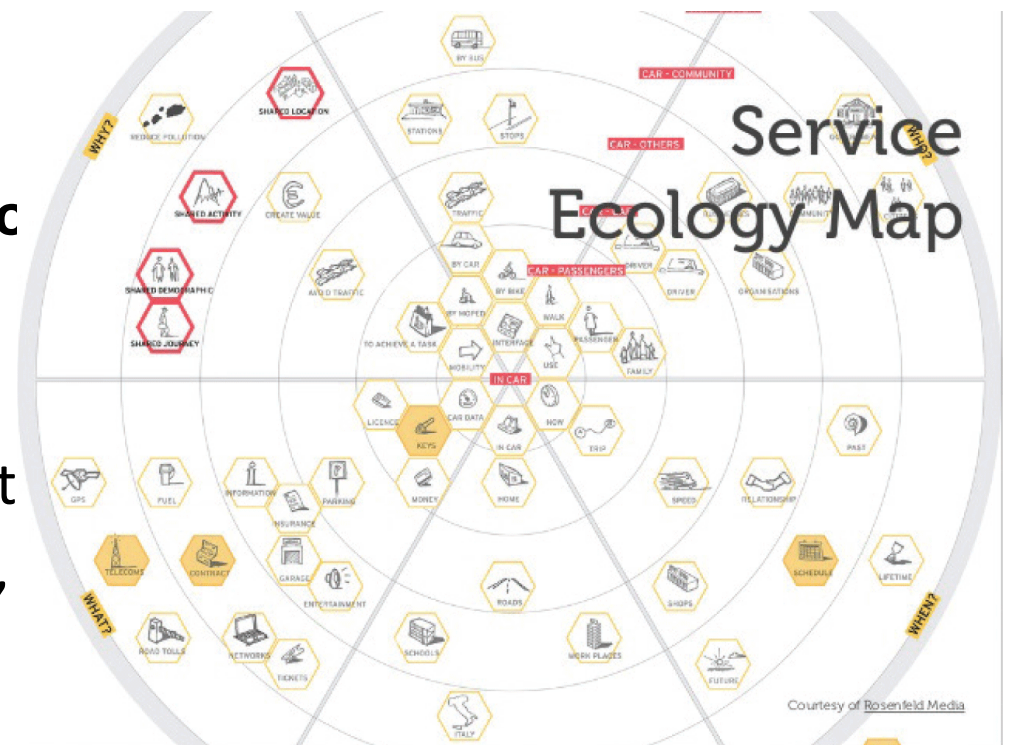


# Journey maps



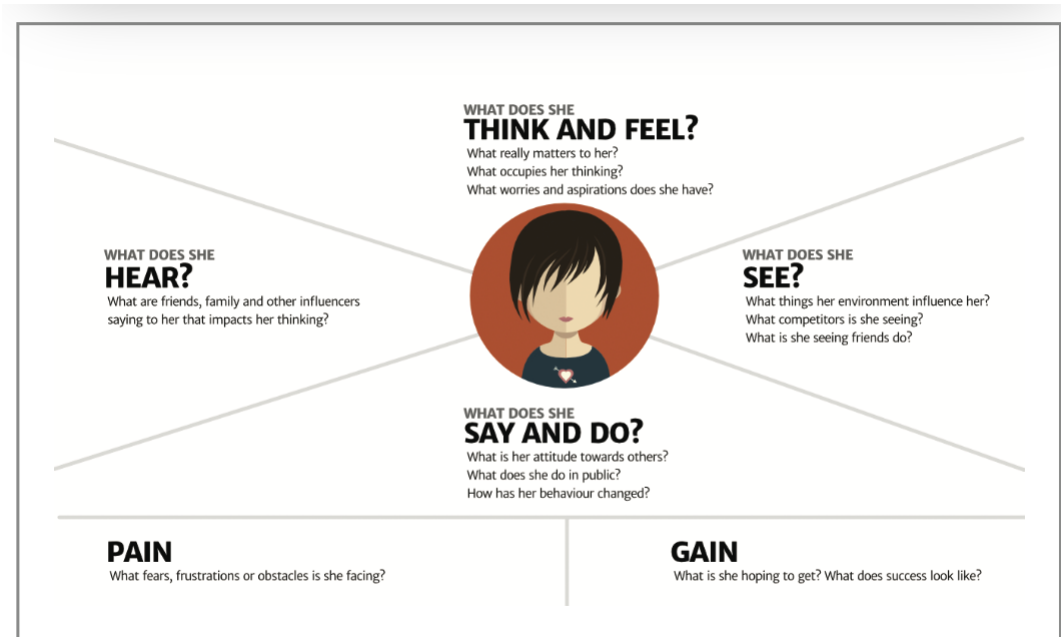
# Actor map

- Designers will often find themselves inventing new types of map to envision different aspects of the interaction. This is an **actor map** from the design company Live Work.
- This illustrates a map that shows survey knowledge, rather than focusing on paths through the interaction.



# Persona - Empathy map

- Personas, are a form of visualization that focuses on mapping out the different users of the system or service under investigation.
- An **empathy map** can be a good way of mapping the key aspects of your personas.



# 5. wireframes



# Wireframes

- Wireframes are representations that outline the structure of a software system focusing on the **interaction design** and the **information architecture**.
- Just as navigation maps focus on how pages are structured and linked together, so wireframes focus on **the structure of particular types of pages** and on the **navigation between them**. Using the two together we can create a more detailed representation of an app or website design.
- They used to be concerned principally with website design, today wireframing has become a mainstream technique applied in apps for handheld devices,.

# Wireframes

- Wireframes focus on the general elements of a design without paying attention to the final details. For example, in a mobile phone app, the buttons, menu items and selections. These generic design features allow through wireframes generation of quick designs suitable for quick evaluation.
- Software packages like Axure ( [www.axure.com](http://www.axure.com) ) are available to help with developing wireframes. These provide templates that constrain the design to the particular size and style of a particular delivery platform such as iPhone. They also take mocked-up screenshots and add clickable links.

- <https://www.youtube.com/watch?v=J2BDVM6Qw5s>

# Wireframes for a 'design your tour' application



TITLE	PAGE I.D.
Bath & Bed - Home	
DATE	VERSION

NOTE

No.	ELEMENT	TYPE	DESCRIPTION
1	Logo/ search engine	Drop down list	search by brand drop list
2	Navigation Buttons	Navigation	Direct links to relevant page
3	Navigation Buttons	Main Navigation	
4	Content	Area	Seasonal special offers
5	Special Offer	Text entry	
6	Content Link 1	Link	Link to New Release page
7	Content Link 1	Link	Link to Clearance page
8	Content Link 1	Link	Link to Bridal Registry page
9	Help	Link	
10	Shopping Information		
11	Footer		

# Wireframes

LOGO
Company Name

Month, year

Image

Monthly Update

1

Image

**Headline of Content #1**

Article .....

..... (More...)

---

2

Image

**Headline of Content #1**

Article .....

..... (More...)

---

3

Image

**Headline of Content #1**

Article .....

..... (More...)

In This Issue

This Issue's topic 1  
topic 2  
topic 3  
topic 4  
topic 5

More News

More News

Contact Us

Company Name  
Address  
Phone

Address@email.com

Copyright

TITLE	PAGE I.D.
E-mail Newsletter	
DATE	VERSION

NOTE

No.	ELEMENT	TYPE	DESCRIPTION
1	Content	Area	Link to a Full-length article
2	Topics	List	Direct Link to each full-length article
3	More News	List	
4	Contact		Contact Information

< Plan your tour

- 
**CHURCH**  
 Edinburgh  
 STAGE 1
  YES
  NO
- 
**CASTLE**  
 Edinburgh  
 STAGE 2
  YES
  NO
- 
**NATIONAL PARK**  
 Edinburgh  
 STAGE 3
  YES
  NO
- 
**MUSEUM**  
 Edinburgh  
 STAGE 4
  YES
  NO

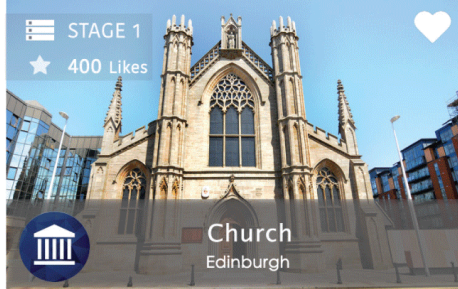
BEGIN THE TRIP >


You Travel Inbox Find

< Attractions

STAGE 1

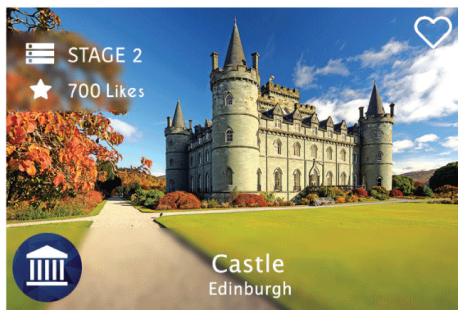
★ 400 Likes




 **Church**  
Edinburgh

STAGE 2


★ 700 Likes




 **Castle**  
Edinburgh

You Travel Inbox Find

Castle




 **Castle**  
Edinburgh

122 Likes

STAGE 2

EARN POINTS

Cost **N £10**

 Buy ticket

★ Rank    ⓘ More    📍 Location

You Travel Inbox Find

# 6. prototypes

# Prototypes

'Prototypes are tools for traversing a design space where all possible design alternatives and their rationales can be explored ... Designers communicate the rationales of their design decisions through prototypes. Prototypes stimulate reflections and designers use them to frame, refine and discover possibilities in a design space' (Lim *et al.* (2008), p. 72).

- A prototype is a **concrete but partial representation** or implementation of a system design. Prototypes are used extensively in most design and construction domains.
- Prototypes may be used to demonstrate a concept (e.g. a prototype car) in early design, to test details of that concept at a later stage and sometimes as a specification for the final product.
- A prototype may be made of something as simple as paper, cardboard or other suitable material or it may be developed using a sophisticated software package.

# Prototyping

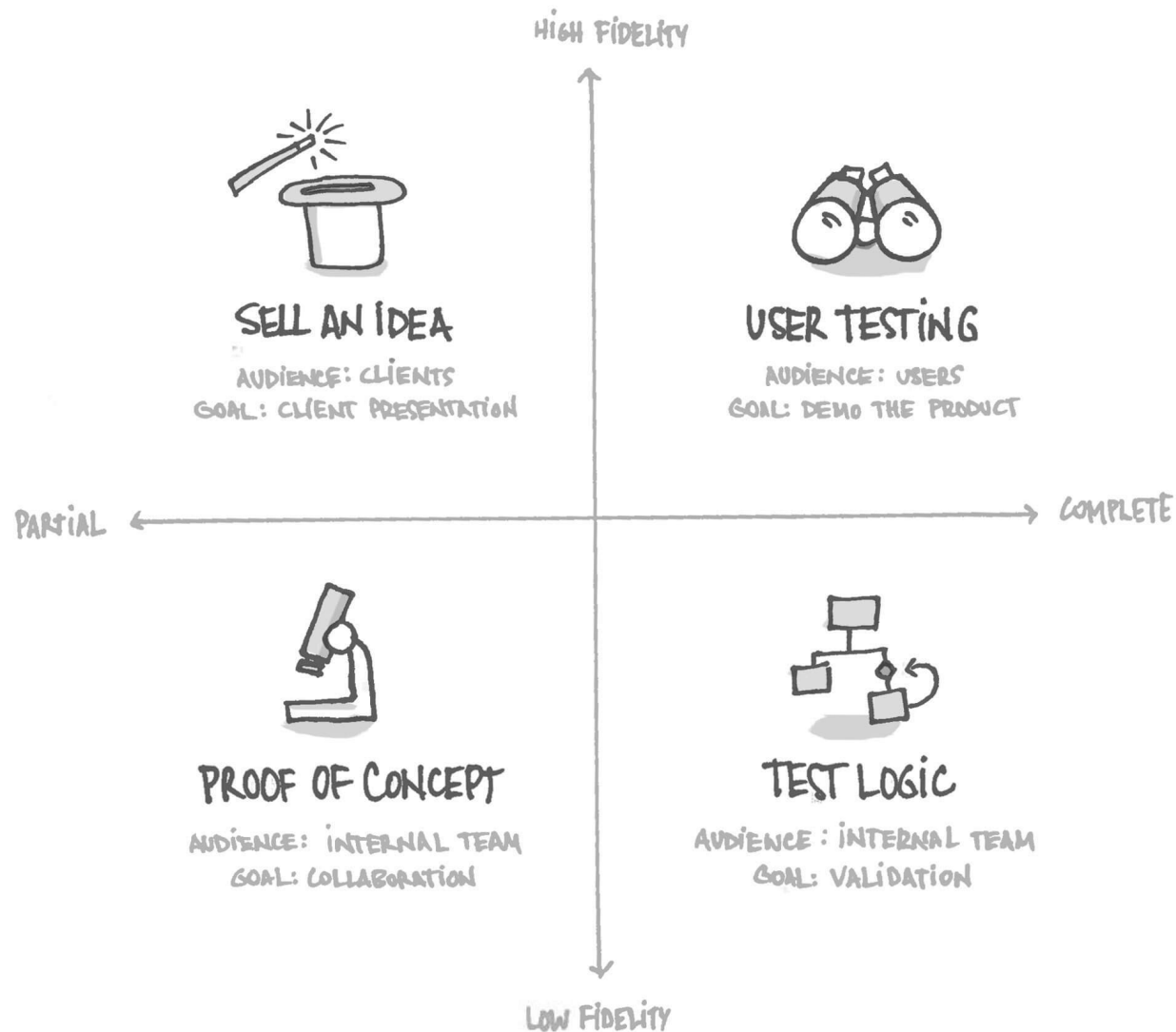
- The engineers in the Apollo space missions built a full-size cardboard prototype of the lunar landing module to test the position and size of the windows in relation to the field of view of the astronauts. This experimentation led to the design decision that the astronauts would stand (not sit) inside the lander – thus allowing windows to be smaller and saving crucial weight.
- In our domain of interactive systems design, representations such as screen sketches and simple early prototypes blend into each other. But the main characteristic of a prototype is that **it is interactive**. Something happens when a person ‘presses’ a ‘button’ – even if the button is drawn on paper and the action consists of a menu on a Post-it Note being added by the designer.



# Prototyping

- For the design team, representations like navigation maps and flow charts might be meaningful, but for clients and users, some form of prototype is crucial for capturing the outcomes of the envisioning techniques we have discussed so far.
- Prototypes are first and foremost **way of involving users** in evaluating design ideas.
- The prototype might seek to highlight just the interface or **some crucial aspect of the functionality**.
- There are two main kinds of prototyping – **low-fidelity** (lo-fi) and high-fidelity (hi-fi), as well as **video prototypes**, common in UX design.

# hi-fi vs lo-fi prototypes



# Hi-fi prototypes

- Hi-fi prototypes are similar in look and feel, if not necessarily in functionality, to the anticipated final product.
- They are produced in software, whether **in the development environment** which will be used for implementation or **in prototyping packages** that will allow interactive effects to be mocked up easily.
- Hi-fi prototyping has the following features:
  - It is useful for **detailed evaluation** of the main design elements (content, visuals, interactivity, functionality and media) – for example, hi-fi prototypes can be used in usability studies to establish whether people can learn to use the system within a specified amount of time.
  - It often constitutes a crucial stage in **user acceptance** – as a kind of final design document which the user must agree before the final implementation.
  - It is generally developed fairly **well into the project** when ideas are beginning to firm up, unless there is some crucial issue that needs to be resolved before any other work can proceed.

# Hi-fi prototypes

- A problem with developing hi-fi prototypes is that **people believe them**. This is dangerous if the designer has not checked details and thought through ideas clearly beforehand.
- Another problem is that hi-fi prototypes **suggest that such a system can be implemented**.
  - *We have found it impossible to implement in Java some effects that were prototyped using specialist prototyping software, for example.*
- Inevitably, a degree of **effort and time is consumed** in producing the prototype. If this is in the eventual development environment, developers can be understandably reluctant to discard work on features rejected in exploring the prototype.

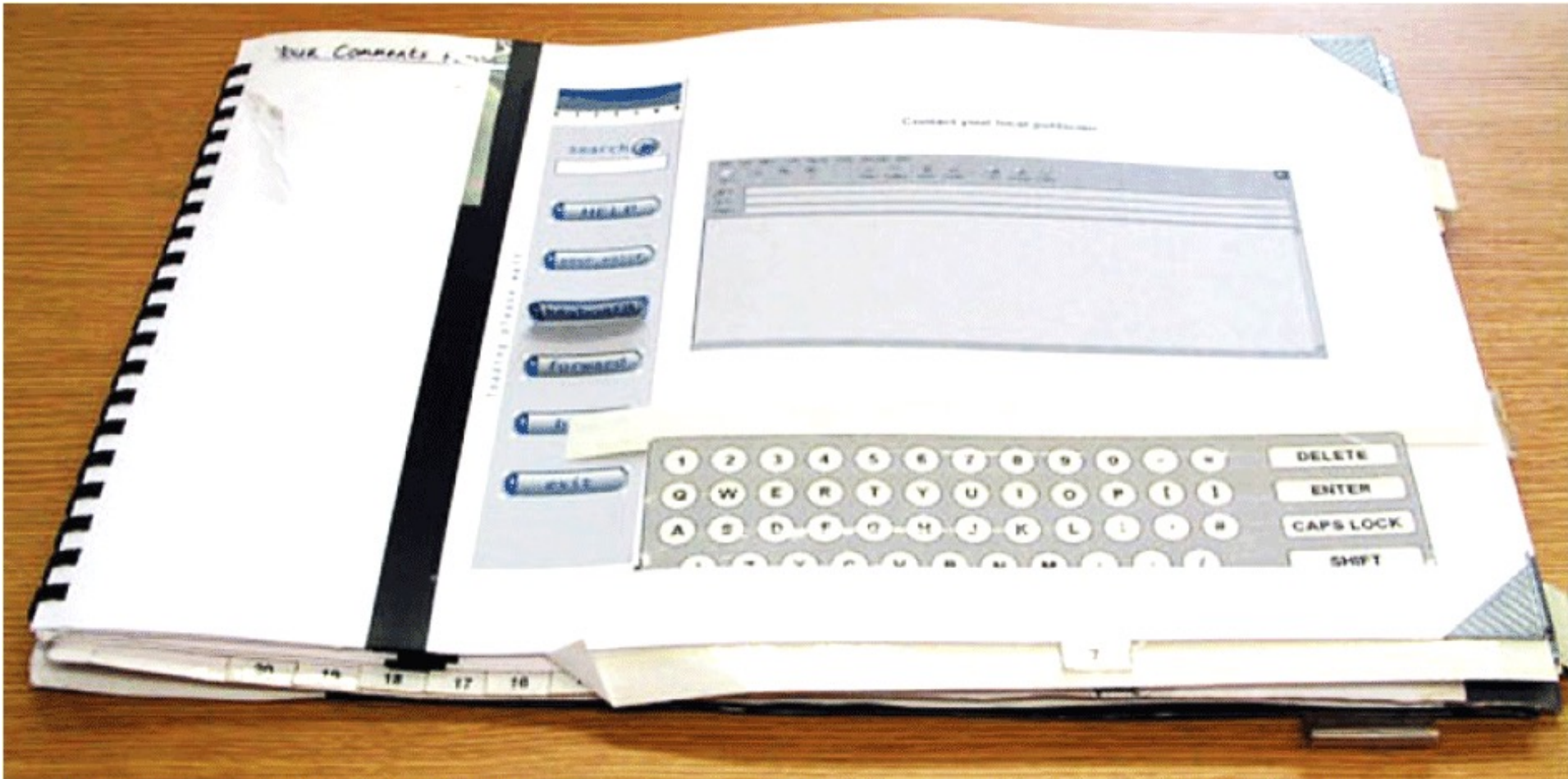
# Lo-fi prototypes

- Lo-fi prototypes, – often termed **paper prototypes** since that is what they are usually made from – on the other hand, have the following features:
  - They are more focused on the broad underlying design ideas – such as content, form and structure, the ‘tone’ of the design, key functionality requirements and navigational structure.
  - They are designed to be produced quickly and thrown away as quickly.
  - They capture very early design thinking and should aid, not hinder, the process of generating and evaluating many possible design solutions.

# Lo-fi prototypes

- The products of some of the envisioning techniques (**sketching**, etc.) are kinds of lo-fi prototypes in some respects. However, the most usual form of this sort of prototype is a series of ‘screenshots’ that people can ‘walk through’ (for example, a button on screenshot 1 can be ‘clicked’ and this is followed by screenshot 6, etc.).
- **Wireframes** implemented with a suitable software package can constitute a lo-fi prototype.
- Very flexible prototypes can be produced simply and quickly using screen-sized pieces of **stiff paper** and **cards** or **post-its** in different colours. Permanent features of each screen are drawn on the card; dynamic items such as dialogue boxes or menus use the cards or Post-its, cut to size as necessary.

# Lo-fi prototypes



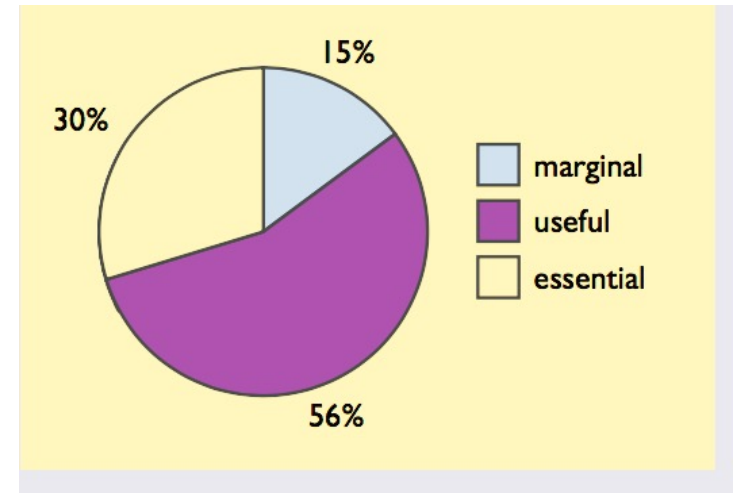
Source: David Benyon

# Paper prototypes

Paper prototypes are widely used in practice.



- A survey of 172 usability professionals conducted in 2002 asked how important they considered the technique to be in their work (Snyder, 2003).
- The responses are shown in the chart below – a ‘useless’ option was included but no one chose it. (The percentages do not sum to 100 per cent because of rounding.)





# Paper prototypes design

- The main practical issues with designing paper prototypes are as follows:
  - Robustness. If a paper prototype is to be handled by lots of people, it needs to be tough enough to survive.
  - Scope. Focus on broad issues and key elements; if you are trying to tell too detailed a story, it can be hard for users to understand.
  - Instructions. There is a trade-off between adding enough detail for someone to be able to use the prototype without the designer helping and obscuring the design with too much detail.
  - Flexibility. Have parts of the paper prototype adjustable so that people viewing it can 'redesign it' on the fly, for example by using sticky notes to represent parts of the screen where the user can move elements around or add new items.

# Video prototypes

- Researchers have highlighted the potential of video as a tool within the participatory design process, from initial observation, through ideas generation and design exploration, Mackay *et al.* used the terms ‘video brainstorming’ and ‘video prototyping’ (2000).
- Vertelney’s method (1989) involves the creation of a physical mock-up model of the product; a video is then shot with **an actor interacting (or ‘acting’) with the model as though it were fully functional**. The product’s display dynamics are simulated in an animation program and are superimposed (or composited) on the video, ensuring synchronization to give the appearance that the product is actually responding to the person’s actions.

# Example



- An example of video prototyping comes from a project investigating embodiment issues of the concept of a companion based on the following conceptual scenario:
  - **Lexi is a 3D projected figure** that helps its guardian, Tom, by scheduling his personal and work life, keeping him up to date with relevant news articles and being first point of contact for emails, phone calls, text messages and the like. Lexi is a mobile companion who can ‘leap’ from technology to technology as necessary but is most fully realized when projected as a 3D figure on Tom’s tablet.
- Using a modelling application such as e-Frontier’s Poser , it is possible to compose different characters onto the baseline video of the companion’s owner (actor) Tom, all of which behave identically but look completely different – in this example, a penguin, a man and a woman.

# Wizard of Oz prototypes

- The Wizard of Oz method is a powerful way to prototype as yet underdeveloped technologies. The method is so-called because in the 1953 film *The Wizard of Oz*, the seemingly powerful wizard with his booming voice is revealed to be a less terrifying character when Dorothy's dog pulls back a curtain.
- In UX design, the Wizard of Oz technique replaces some part of the technology with human intervention, so when a user interacts with the system, a person plays the role that the technology would do in the final operational system.

# Different approaches to functionality in prototypes

- A **full prototype** provides full functionality but at a lower performance than the target system.
- A **horizontal prototype** aims to go across the whole system but deals only with top-level functions and so much of the detail is omitted.
- In contrast, a **vertical prototype** implements the full range of features, from top to bottom, but is applied to only a small number of functions of the overall system.
- Combinations of these are common.
- **Evolutionary and incremental** (a more step-wise version of evolutionary) **prototypes** eventually develop into the full system.

# 7. envisionment in practice

# Envisionment in practice

- In using prototypes, designers may sit alongside the people who will use the final system to make the prototype ‘work’ if it is a lo-fi version.
- It helps having two designers, one to ‘play computer’ and one to make notes.
- Whatever the type of prototype, record comments and design issues as they arise.
- Video can sometimes be useful if there is likely to be a substantial quantity of detailed feedback for other members of the team.

# Prototyping guidelines

- People find it difficult to react to a prototype if it is just placed in front of them devoid of any context. Some sort of **structuring narrative** is required. The most common strategy is to have people step through a scenario using the new application or to try carrying out one of their current tasks if the application is to replace an earlier system.
- For interface design details, set the scene by suggesting what someone **would be trying to do with the prototype** at that particular point, for example 'You are interested in buying the shirt shown on this screen but want to know more about the material – show me what you would do now'.



# Prototyping guidelines

- It is always best if people **interact with the prototype themselves**, even if only by pointing to a paper button. This promotes engagement with the questions to be explored and avoids any danger of the person running the prototyping session misinterpreting responses. But there will be cases where this is not feasible.
- Perhaps the prototype software is fragile, or the prototype is at a very early stage with very little genuine interactivity. Here designers can run a **video prototype** produced in software such as Keynote or PowerPoint. The movie can be paused for discussion as appropriate.

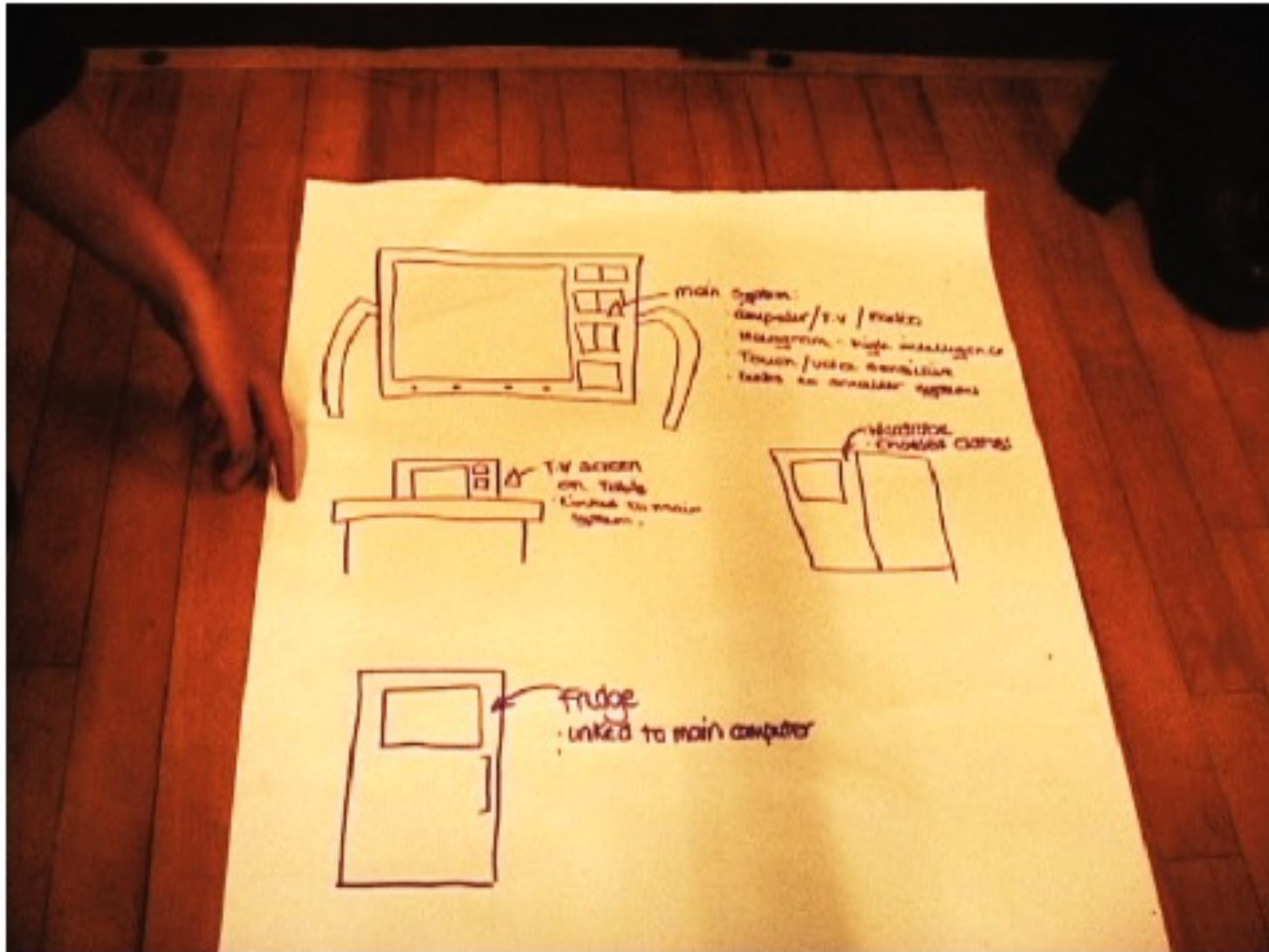
# Prototypes and participatory design

- Lo-fi prototypes are an essential part of participatory design because people cannot always understand formal models or abstract representations but they can explore and evaluate ideas through engaging with prototyped systems.
- People can also be **directly involved in prototype design**. During the development of a prototype travel app, we ran a workshop with schoolchildren from a school. Using a 'what will we do tonight' scenario as a basis. The students may be asked to imagine that they and a group of friends had won a trip to the city for the day and had to plan their activities.
- We may ask participants to use a range of **supplied craft materials and information examples** to create a mock-up of how they thought the app would look and operate. A number of lo-fi prototypes may be quickly produced.

# Prototypes: mockup in clay



# Prototypes: storyboard



# Prototypes: mockup of a remote control



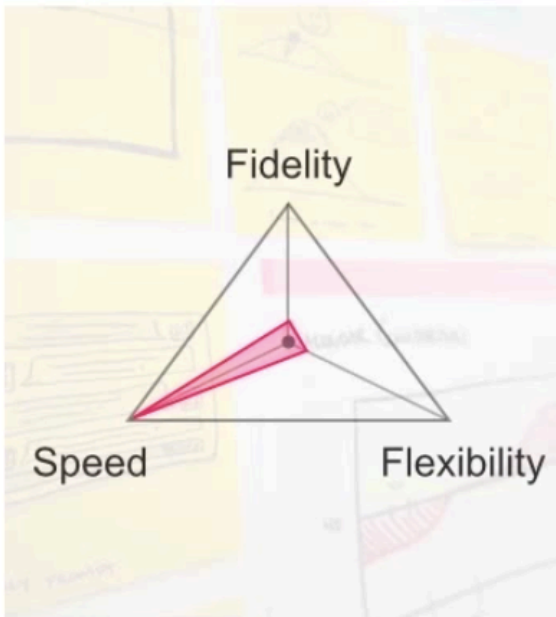
# Trade-offs in prototyping

- When reflecting on how and what to prototype, the designer should think in terms of the PACT elements – people, activities, contexts and technologies.
- Who is the prototype aimed at? What is the designer trying to achieve with the prototype?
- What stage of the project are things at and what is the context for the use of the prototype?
- What technologies (hi-fi or lo-fi) are appropriate?

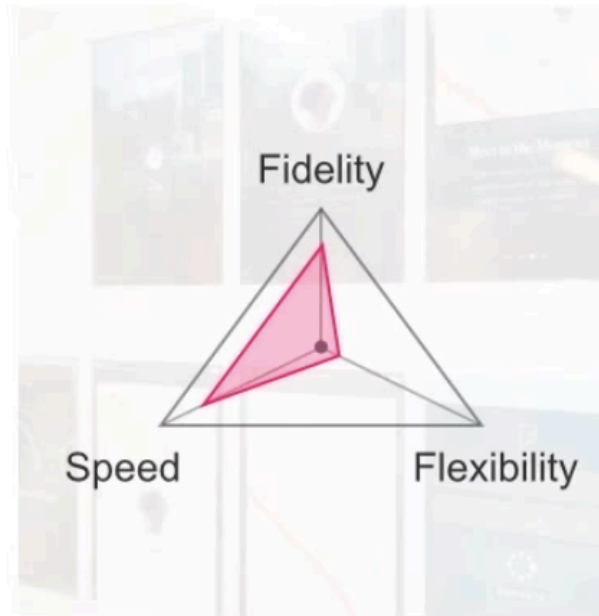
# Trade-offs in prototyping

- High-quality graphics and animation can be used to create convincing and exciting prototypes but may also lead to premature commitment to some design decision.
- Detailed special-purpose prototypes help answer specific questions about a design but building a meaningful prototype for each issue is expensive.
- Realistic prototypes increase the validity of user test data but may postpone testing or require construction of throwaway prototypes.
- Iterative refinement of an implementation enables continual testing and feedback but may discourage consideration of radical transformations.

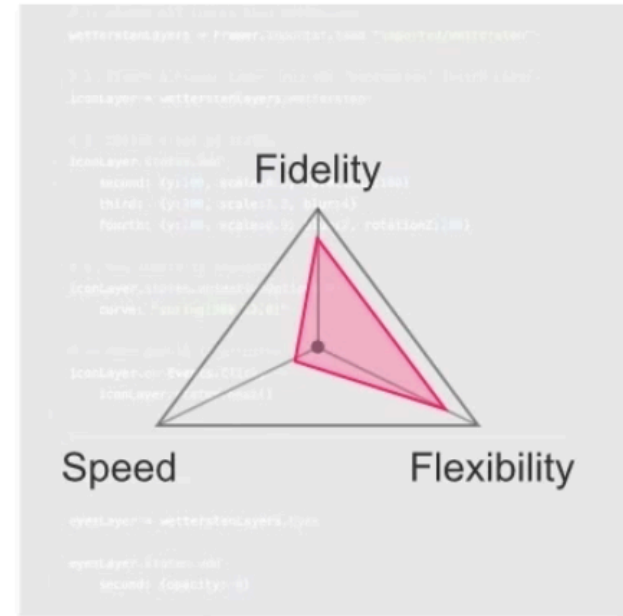
# Trade-offs in prototyping: speed vs fidelity vs flexibility



Vision



Scenario



System

<https://www.youtube.com/watch?v=s6Htel3hRus>



# Prototyping throughout the design process

- **‘Requirements animation’** is a term used to describe the use of prototyping to illustrate requirements. Used at an early stage, a quick prototype can be developed and shown to the client/users for comment on the general design.
- **Rapid prototyping** (also known as ‘throw-it-away’ prototyping) is common in user interface design where software such as PowerPoint or Keynote is used to illustrate concepts. The prototype will be ‘thrown away’ because implementation will be in a different development language.
- However, as one famous quotation in software development has it, ‘You will throw away your first few designs, so you might as well plan to throw them away in the first place’.
- **Use case prototyping** is when a ‘polished’ video is produced to disseminate to a wider audience and also to the software and hardware development teams whose job is to bring the product into existence. The power of this type of video to communicate design requirements in product design as well as service design is extremely strong (Mival, 2004).
- In certain designs, this use case will employ a technology beyond what is possible (in the Lexi example, a 3D projection smart pad); we have coined these **‘Future Now’ movies**.

# Challenge

- Imagine you are presenting your ideas for a **diary tool** on a smartphone to a small team of developers from the smartphone manufacturer. What type of prototype would you use?

# Prototyping tools

- Given the wide range of uses for prototyping and the large number of occasions when it is used, it is not surprising that there are a wealth of software 'tools' that can be used. A good prototyping tool should:
  - Allow easy, rapid modification of interface details or functionality.
  - For designers who are not programmers, allow direct manipulation of prototype components.
  - For incremental and evolutionary prototypes, facilitate reuse of code.
  - Not constrain the designer to default styles for interface objects.

Useful tools for requirements animation include paper, PowerPoint (e.g. for illustrating main screens) and specialized packages. web based (e.g. Marvel), or downloadable (e.g. Adobe XD)



# Challenge

- What are the advantages and disadvantages of prototyping software at the very early stages of development?

# Key points on envisionment

- Envisionment and prototyping bring designs to life for both designers and the people who will use the new designs.
- Envisionment – the making of concrete design ideas – is a key feature of UX design. All aspects of the system can and should be envisioned: concepts, functions, structure, interactions and people. Envisionment aids the generation, communication and evaluation of ideas.
- People should take an active part in envisionment wherever possible – the process allows essential feedback from customers and clients.
- Basic techniques include storyboards, different forms of sketch, mood boards, maps, wireframes, lo-fi and hi-fi prototypes.
- Prototyping may focus on a vertical or horizontal slice through the system, or cover the whole system and may evolve into a final product or be thrown away and re-engineered.

# 8. UX design

# the problem of design

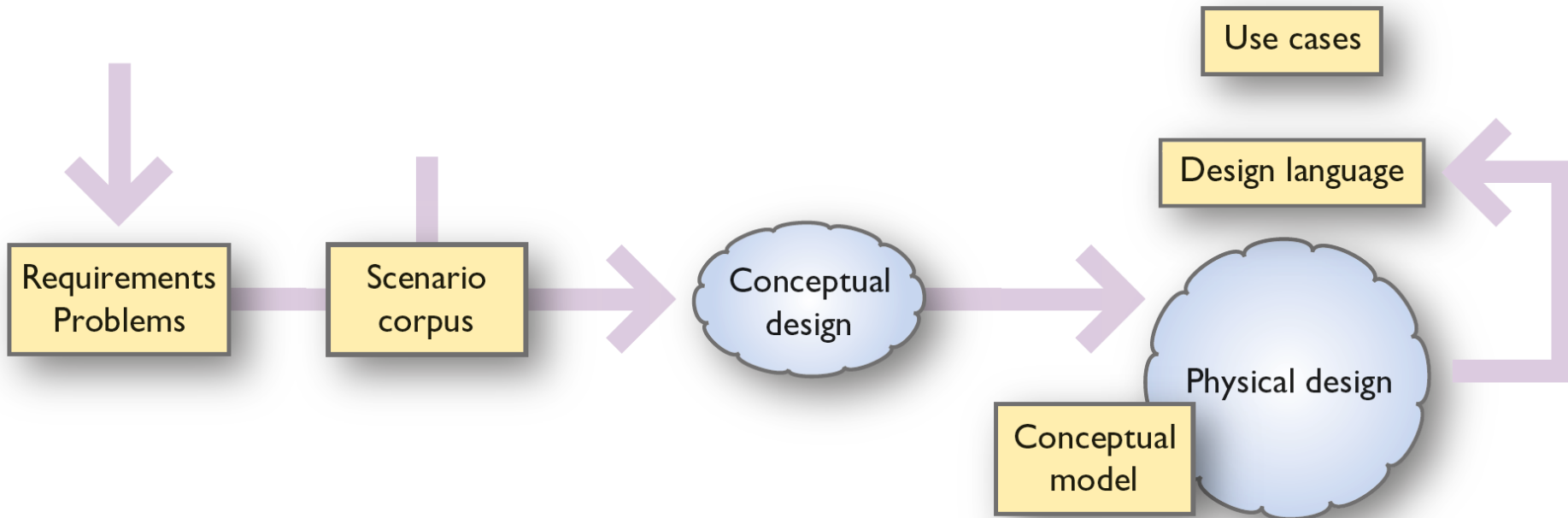
- Design problems are usually poorly formed and continue to evolve as solutions are suggested. This results in more ideas, more problems and more solutions.
- In design, we distinguish **conceptual design** – design in the abstract – from **physical design** – where ideas are made concrete.
- We need **methods and techniques** to help designers deal with design situations.

# Aims

- We need to understand the nature of **conceptual and physical design**.
- Understand how **metaphor** works in design.
- Undertake an **object–action analysis** to inform design and to produce a conceptual model of a new system.
- Describe how the system will look and behave through specifying the **design language** and interaction patterns.
- Specify a design in a form that can be implemented by programmers using **use cases**.

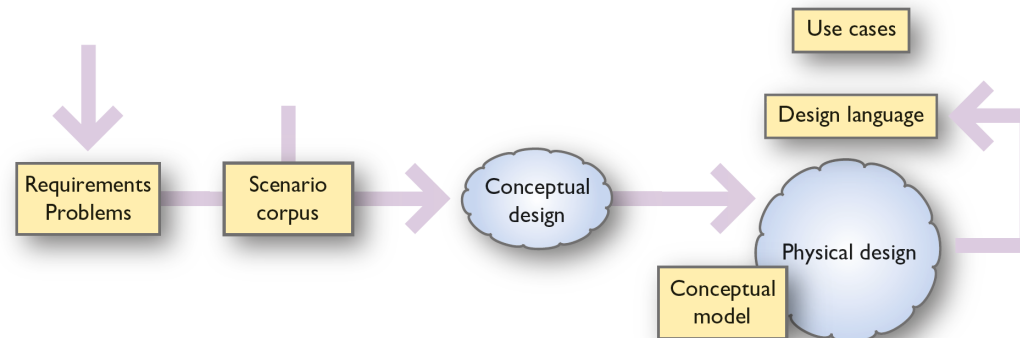


# Introduction



# Introduction

- The processes of conceptual and physical design and the products of design that are produced at this stage are:
- The minimum system specification is a **conceptual model**, a set of **use cases** and a **design language**.
- A statement of **requirements** and a **scenario corpus**, constitutes a system specification that could be implemented by a development team.



# Conceptual-Physical design

- **Conceptual design** is concerned with arriving at an abstract description of the system – its logic, functions, structure and content – but not with how the structure and functions are to be physically realized.
- **Physical design** is concerned with
  - who does what in terms of the allocation of functions and content between people and artefacts,
  - what media channels will be used, how they relate to each other and what the touchpoints will be and
  - how the artefacts and devices will look and how they behave.

# Conceptual and physical design

- Conceptual design does not need to be finished before physical design starts.
- Analysts and designers will **iterate between these two levels of design description** and will fix on some physical design decisions in order to understand the conceptual level better. So, some early physical design happens during the envisionment process (conceptual design).
- This iteration will involve various kinds of **evaluation with people** so that we can check that the design really does meet their needs.
- The advantage of designing at the conceptual level before details of the physical design are fixed, however, is that it avoids the **problem of 'design fixation'** and maintains a wide design space in which alternatives can be considered

# Exploring the design space

- A design space constrains a design in some dimensions whilst allowing exploration of alternatives in others (Beaudouin-Lafon and Mackay, 2012).
- Designers always work within **constraints**, whether these are financial or functional, but they need to take care not to impose too many constraints too early in the process.
- Constraining the design space too soon can result in **design fixation** – settling on a design idea or a design constraint that prevents designers from exploring possible alternatives.

# Exploring the design space

- There are a number of techniques and methods to help designers explore possible designs. For example, **brainstorming** is a good way of expanding the design space.
- Methods of envisionment will also help designers to explore the design space. **Sketching** is a method of ideation.
- It is important to develop an **information architecture** for the whole UX that will often cross media channels.
- Thus, it is important to consider all the **channels and points** of interaction.
- During conceptual UX design, designers need to keep open to radical solutions to issues and problems and they will do this using the various methods such as **service blueprints, customer journey mappings, wireframes and navigation maps.**

# Exploring UX design concepts

- UX involves people acting, feeling, sensing, thinking and meaning-making through interactions with technologies in contexts.
- Many of the techniques described can help UX designers explore the feelings that different designs will cause in users.
- Bill Verplank (2007) focuses on three main things, which he characterizes as:
  - How do **you do**? This concerns the acting part of UX.
  - How do **you feel**? This concerns the sensing and feeling aspects of UX.
  - How do **you know**? This concerns the thinking and meaning-making in UX.

# How do you do?

- ‘How do **you do**’ ? is concerned with the ways in which we affect the world.
- For example, one distinction is between handles and buttons.
- **Handles** are better for continuous control (e.g. a trombone) but **buttons** are better for discrete control (e.g. a piano keyboard).
- Handles leave you in control (e.g. opening a car door) whereas buttons are more likely to trigger something automatic (e.g. opening an elevator door).



# How do you feel?

- ‘How **do you feel**’ ? concerns how we make sense of the world and the sensory qualities that shape media.
- One distinction is Marshall McLuhan’s ‘hot’ versus ‘cool’.
- Marshall McLuhan wrote *Understanding Media* in 1964 and is famed for coining the phrases ‘global village’, ‘age of information’ and ‘the medium is the message’. The book, reprinted in 1994, is a tour through the media of his time and has much insight into how media would develop in our time.

# Understanding media

- McLuhan introduced a distinction between '**hot media**' which are more authoritative and exact and 'cool media' which are fuzzy and incomplete.
- Cool media invite more participation; they require the audience to fill in the gaps to interpret. Hot media extend a single sense in high definition; they are filled with data.
- **Photography** is a hot medium because it is high-fidelity, whereas a **cartoon** is a cool, low-definition medium where we fill in the gaps.

# How do you know?

- ‘How do **you know**’ ? concerns the ways that people **learn and plan**; how designers want people to think about their system.
- For example, Verplank suggests that one choice is between maps and paths. Paths are good for beginners as they provide step-by-step instructions on what to do. Maps are good for understanding alternatives.
- They take longer to learn but are more robust and are good for expert skill.
- Very often, we have to accommodate both.

# Challenge

What characteristics do you feel belong to the text message as a medium? Be creative!

# Places for experience

- UX designers need to consider in their design, four different spaces (*Spaces of Interaction, Places for Experience*, Benyon, 2014)
- The **physical space** has a huge impact on UX and designers need to consider what opportunities or what constraints they have to work with. For example, if they are developing a mobile app to work outdoors, what connectivity issues are there. Alternatively, if they are developing a new in-store service for a retail store, what can they change in the physical space or what use can they make of physical touchpoints such as labels.
- The **digital space** concerns all the various devices that users may bring to the device and service ecology and how this impacts the overall UX.
- The **information space** includes digital and physical content and the software to manipulate it, including physical signage, physical objects such as tickets and receipts and embedded displays.
- The **social space** for the UX concerns connectivity between people, how people can share experiences and how social media will be included in the UX.

# Describing the UX

- UX designers can describe the UX through semantic differentials (a set of descriptive adjectives that aim to capture the nature of the UX and that can be used for evaluation)
- A tourist application may focus on the nature of the experience we are trying to achieve which may be described as **engaging, authoritative and modern.**

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EXPLORE SCOT IS AN APP WHICH HELPS YOU FIND PLACES BY SPENDING LESS AND IS VERY USER FRIENDLY AT THE SAME TIME, MAKING IT ACCESSIBLE, CONVENIENT AND ROBUST.

EXPLORE SCOT IS FOR TREASURE HUNTERS TO EXPLORE PLACES WITHIN SCOTLAND AND FOR ENTREPRENEURS AS WELL (LARGE OR SMALL) TO TAG THEIR FIRM'S LOCATION FOR MARKETING PURPOSES. THE APP PROVIDES AN INTERACTIVE PLATFORM TO USERS AND MAKES THE EXPERIENCE WORTHWHILE.

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<ul style="list-style-type: none"><li>• Deciding On Itinerary</li><li>• HD Maps With Interactive Design</li><li>• 360° Panoramic View</li><li>• Save Location</li></ul>	<ul style="list-style-type: none"><li>• Navigate Between Points Of Interest</li><li>• Mark Locations</li><li>• XIM Enables Content Look More Enhanced, Vivid And Clear</li><li>• Explore Virtual-Reality Based Environment</li></ul>	<ul style="list-style-type: none"><li>• Record Your Travel As A Video</li><li>• Take Screenshots Of The Route Or Tag Your Own Photos On The Map</li><li>• Share Recordings And Photos On Social Media With Friends And Family</li></ul>

**EXPLORE SCOT – DESIGN OVERVIEW**

**BEFORE THE JOURNEY—VISIT INTERACTIVE SCOTLAND MAP ON THE WEBSITE (TRAVOScotLAND.COM)**

ars

# 9. Metaphors and blends in design

# Metaphors and blends in design

- Metaphor is generally seen as taking concepts from one domain (called the source domain, or the vehicle) and applying them to another (the target, or tenor).
- Metaphors in literature are very common but often very culturally specific. In a ground-breaking book written in 1980, George Lakoff and Mark Johnson discuss *Metaphors We Live By* (Lakoff and Johnson, 1980), showing how popular metaphors such as ‘He was climbing the ladder of success’ shape the way we think about things.



# Blended spaces

- Blended spaces bring together **physical, digital, informational and social spaces** and establish new conceptual spaces where people form intentions, make meanings, have sensations and feelings and take actions.
- People navigate these spaces moving through the different channels and across the device ecologies, producing and consuming information content.
- Conceptual design for UX is about considering the wider issues of experiences and how any new service, product or system will fit in with existing structures.

# Metaphors and blends in UX

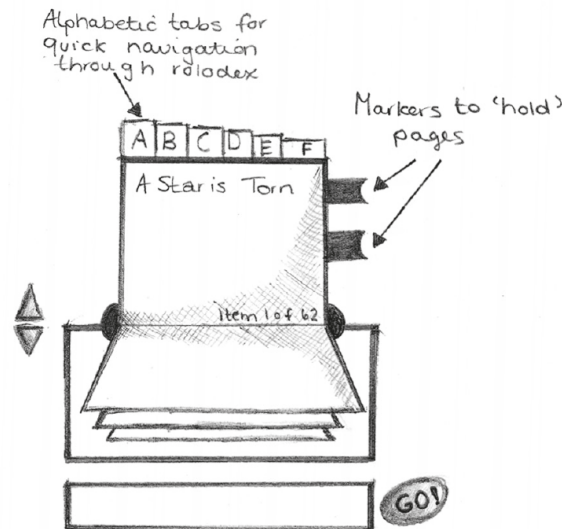
- In the development of interactive systems, we are constantly trying to describe a new domain (a new application, a different design and new interactive facilities) to people.
- So, we have to use **metaphor** to describe this new domain in terms of something that is more familiar. Blackwell (2006) gives a comprehensive treatment of the role of metaphor in interactive systems design. After a while, the metaphorical use of a term becomes entrenched in the language to such an extent that people forget it ever was a metaphor.

# Metaphors and blends in UX

- **Paths** and **maps** may be thought of as metaphors for the design of interactions.
- Think of the idea of navigating an interactive system, for example. Many people immediately think that navigation is trying to get somewhere specific but this is only one view (often called '**wayfinding**').
- We also **browse around** and explore.
- If we think of navigation as in a city, then we think of **roads** and **signposts**, **metros** that take us invisibly from one part of the space to another, **taxis** to transport us or **buses** that we have to learn about.

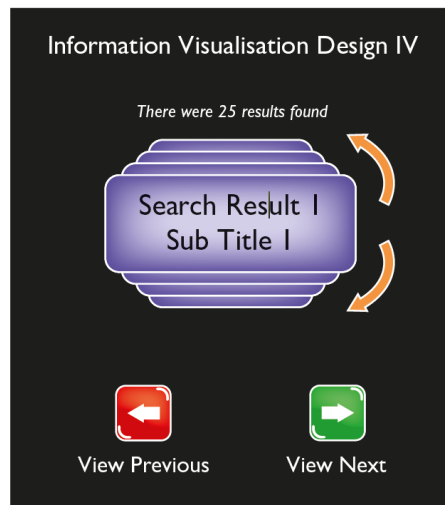
# Metaphors and blends in UX

- Considering one metaphor can stimulate creative leaps into other ways of thinking.
- For example, during a collaborative design meeting to look at the interface to a search mechanism, we considered the interface as a 'Rolodex', a manual card index device that allowed people to rapidly flip through standard-sized cards.



# Metaphors and blends in UX

- A 'gun barrel' design emerged alongside a more common design for search results.
- Although the gun barrel idea was rejected, the Rolodex concept seemed to capture the idea of searching and retrieving results with an intuitive navigational style of flicking through the search result 'cards'.



# Navigation metaphors

- Metaphors that might be useful for thinking about navigation have different associations.
- A **wilderness**, for example, is frightening, confusing and enchanting.
- A **desert** is intimidating and beautiful but has no landmarks.
- Such metaphors might encourage forging a path, enjoying the scenery and getting out.
- Wilderness and desert can be included in an overall landscape metaphor where different types of terrain represent different types of information.
- These metaphors encourage exploration by the user; the system provides a high-level metaphor, but users provide the more detailed structure themselves.

# Navigation metaphors

- The **night sky** offers a different kind of space. To the human eye, it contains objects, clusters and patterns and it is very big. It supports the activities of mapping and identifying objects.
- However, there are relatively few types of object in the night sky (galaxies, stars and planets). It is the configurations and subtypes of these objects that are of interest.
- The **open sea** is another metaphor. It encourages a distinction between surface and depth. Thus, it is natural to think of a lot of information as being hidden beneath the surface and only available for viewing if the user dives down.
- **Currents** can link continents and **islands** and take people to unexpected places. People can look for islands of information; **archipelagos** provide clusters.

# Navigation metaphors

- A **museum** has been structured to allow free roaming yet is also structured to facilitate learning.
- A **library** is suitable for finding specific information. It is well organized and structured.
- These metaphors are not meant to suggest that the interface to a particular product looks like a desert, wilderness or library (though sometimes such explicit interface metaphors can be useful); the idea here is to think about activities in different ways.



# Challenge

- Consider some of the familiar computing concepts: ‘windows’, ‘cut and paste’, ‘bootstrap’, ‘open’ a ‘folder’ and ‘close’ a ‘file’. Make a list of these metaphors. Try to write down where they came from.

# Metaphor

- A metaphor is much more than a simple mapping from one domain to another. It is a much more complex affair.
- Take the idea of a *window* as it appears in a computer operating system. We know a computer window is different from a window in a house.
- It shares the idea of looking into a document, as you might look into a house, but when you open it, it does not let the fresh air in. It is only ever a window into, or onto, something.
- Moreover, it has a scroll bar, which a window in a house does not.

# Blends

- The contribution that Fauconnier and others have made (e.g. Fauconnier and Turner, 2002) is to point out that **what we call ‘metaphors’ in design are really blends.**
- A blend takes input from at least two spaces, the characteristics of the domain described by the source and the characteristics of the target that we are applying it to.
- So, a computer window takes elements from the domain of house windows and elements of the functioning of a computer trying to get a lot of data onto a limited screen display.
- The metaphor of a folder is a blend from the domain of real folders that you keep papers in and the domain of computer files which have a physical location on a disk.

# Correspondences

- For metaphors and blends to work, there must be some correspondences between the domains that come from a more generic, or abstract, space.
- This process works its way back until we reach the fundamental image schemas that are core to our thinking.
- These include the **container**, **path**, **link** and others such as **colours** (red is hot, blue is cool, red is stop, green is go, up is good and down is bad) and those bodily schemas that come from experience and perception (**up**, **down**, **in**, **out**, **central**, **peripheral**, etc.).

# Thinking figuratively

- Thinking figuratively is fundamental to both the design and use of interactive systems.
- One job of the UX designer is to come up with a good metaphor that will help people in learning and using the system and in understanding the content.
- Metaphor design works as follows:
  - The source domain has some features (concepts and functions).
  - The target domain has some concepts and features.
  - So it is important to analyse the relationship between these.
  - Too many features in the source domain results in ‘conceptual baggage’ of the metaphor.
  - Too few features, or too many inappropriate features, may lead to confusion.
  - Aim for people deriving appropriate expectations.

# Principles of metaphor design

- Note that the design of metaphors and blends does not imply a physical resemblance. The important thing is to get a good conceptual correspondence. Sometimes, it is appropriate to carry through a conceptual metaphor to a physical metaphor but not always.
- Principles for good metaphor design:
  - **Integration.** This is to do with coherence and not mixing metaphors. The aim here is to manipulate the whole blend, maintaining the web of relationships. The blend has its own structure and it is this that needs to have consistency maintained.
  - **Unpacking.** People should be able to unpack the blend and understand where the inputs have come from and why they work. Of course, this will often be a case of interpretation. With consideration, reflection and evaluation, the designer can achieve this. Designers should only have things in the blend for a good reason.
  - **Topology.** The different spaces should have a similar topology. The structures of waves and furrows have a similar topology, whereas waves and trees do not. Topology is about how the concepts are organized and structured.
  - **Analysis.** When undertaking an analysis, the designer should concentrate on getting the appropriate functionality and concepts, exploring the ramifications of the metaphor and evaluating how people will interpret it.
  - **Design.** At the design level, designers should consider how to represent objects and actions. They do not have to be realistic visual representations (e.g. names of menu items are often metaphorical).

# Designing with blends

- Designers cannot avoid metaphors in interaction design, so they need to consider them explicitly.
- Metaphors are really blends between two or more input spaces and have their own emergent structure.
- Using metaphors that exploit the fundamental domains such as bodily and perceptual schemas may help people to understand them and to form an accurate mental model.
- Bodker and Klokmoose (2016) also provide an analysis of what makes a good blend, emphasizing the fact that interactions are now so cross channel that simple one-to-one blends are difficult to achieve.

# Challenge

- Think of three different metaphors (or ways of thinking about) that could be used for a diary function on a tablet.



# 10. Conceptual design

# Conceptual design

- The aim of conceptual design is to arrive at conceptual models of the domain under investigation.
- Representations like blueprints, user journey mappings, entity models, object models are conceptual models used to explore and generate ideas as well as document them once they are designed.
- How this model is presented will underlie the information architecture of the system or service and help or hinder users in developing their own mental model.

# Conceptual design

- Conceptual design concerns **user needs** (both **removing pain** and **delivering gain**), the objectives of the service or system, the **requirements for content and functions** that the service or system will have and the **information architecture and interaction design**.

# Scenarios and conceptual design

- Scenarios can be used throughout the design process.
- **Stories** aid understanding and conceptual scenarios abstract from stories to provide generic activities.
- Fixing certain design constraints leads to **concrete scenarios** that may finish up as functional specifications expressed as **use cases**.
- A scenario corpus is developed that should be discussed and evaluated at design team sessions and with the participation of stakeholders.

# Scenarios and conceptual design

- Complement the scenarios with some of the more visual envisioning techniques (**storyboards**).
- In a large design team, include **real data and materials** so that people not directly involved can appreciate concrete details.
- Think hard about underlying assumptions.
- Include good characterization and develop a number of **personas**. If this is done well, members of the team start talking about the characters – ‘If you design it like that, what will happen when the grandmother tries to use it’?
- Provide a rich **contextual background** – this grounds design decisions in real life, forcing the designer to think about practicality and acceptability.
- Team members can write their own concrete version of a conceptual scenario that reflects their particular concerns.

# Scenarios and conceptual design

- The aim is to come up with a collection of scenarios that covers all the major uses and functionality of the service or product.
- It would be impossible to write scenarios for all possible variations in use but those produced should cover the following:
  - **Interactions** that are typical of a number of similar use situations
  - **Design issues** that are particularly important for the focus of the project
  - Areas where **requirements are unclear**
  - Any aspects that are **safety-critical**.

# Object–action analysis

- A good way of doing conceptual design is to undertake an **object–action analysis** of the scenario corpus.
- For each of the scenarios in the corpus, the analyst works through the scenario descriptions, identifying the various objects that are mentioned and the various actions that are performed.
- Objects are often indicated by nouns or noun phrases and activities and actions by verbs.

# Challenge

Look through the following paragraph from a scenario about services for the Edinburgh Festival. list the main nouns and verbs and hence the main objects and actions.

The Edinburgh Festival is a large arts festival that takes place in the city for three weeks in August. It consists of two arts festivals – the Edinburgh International Festival and the Edinburgh Fringe – a book festival, a film festival, a jazz festival and a variety of related events. The International Festival is the original, and up until the mid-1980s was the bigger of the two. This is the official festival, which features prestigious performers from around the world, world-class orchestras, composers, ballet troupes, etc. The Fringe, on the other hand, started as an unofficial adjunct to the festival, traditionally more informal and adventurous. It featured new theatres like the Traverse, or the work of artistic mavericks like Demarco. Gradually over the years, it has become larger than the official International Festival. In total, the Edinburgh Festival consists of some 1200 distinct events that take place at 150 different venues spread throughout the city.



# Scenario corpus

- Working with a corpus of scenarios in this way requires four stages:
  - Analyse the individual scenarios, distinguishing between specific actions and more general, higher-level activities.
  - Summarize objects and actions from each scenario, merging similar or identical actions where necessary.
  - Bring together the analyses from the individual scenarios, collating them into summarized objects, actions and more generic activities.
  - Merge actions and objects where they are identical and give them a single name.

# Objects and actions in a music player example

## Scenario:

- P1. Anne is a freelance arts journalist who works mainly from home. She's writing a piece for a national newspaper about singer-songwriters and is irritated to find she can't remember the lyrics of a particular well-known song she wants to quote in her article. She knows the name of the singer and the song title, but beyond that, her memory is failing her.
- P2. She leaves her desk, hoping a break and a cup of coffee will dispel the block. While in the kitchen, she realizes that the music player can help her out. She remembers she has downloaded the song she needs at some time in the past two months or so and knows it's still in the music player's storage area.
- P3. She selects the 'play' function to where she can see 'music search'. She selects this and the interface comes up, asking her to enter some search details. She can search by entering an artist name, track title or music genre – these are all elements of the music's metadata which the player can recognize. She is about to enter the artist's name but realizes she has stored several of this singer's tracks, so she enters the track name instead.
- P4. The player quickly finds the track and asks her if she wants to play it now. She does and selects this option by touching the screen. The music player controller appears on the screen, with the selected track already loaded and ready to play.

# Analysis

activity	Consists of sub-activities	Action	Object	Comments
Search for MP3 track by name [P3]	Go to Search function [P3]	Go to	Search object	'Search object' may need revision?
	Enter query (track name) [P3]	Enter (user input) Confirm	Search object Query	= MP3 track. There is no 'browse search result formula here, as it is specified that search result contains only one object (track)

# Analysis

- In the analysis, activities are shown in the far left column referencing the paragraph number. Where these appeared to be made up of a sequence of individual sub-activities, these are identified in column 2.
- Actions and objects derived from these appear in columns 3 and 4.
- Comments are included in column 5.
- Note that this is only a fraction of the analysis of the music player scenario analysis used here to illustrate the idea.
- A tally of the number of occurrences of each action (column 1) and object (column 2) is kept.
- Various notations are used to indicate questions, slightly different views or uses of the terms and so on.
- The aim of this analysis is to understand the objects and actions in a domain.
- It is vital to note that there is no definitive or 'right' answer here.
- The object–action analysis is just another way of exploring the design space.

# Analysis

- Actions that could be thought of as generically similar can now be grouped together, prior to the final distillation stage.
- This requires careful attention to avoid mistakenly merging together slightly different actions.
- The guiding principle is to look for conceptual or functional parallels amongst the actions, indicating likely candidates for grouping.
- The table is annotated with comments, documenting the criteria applied in making the groupings.
- Here, each grouping of actions is merged and given a single name.
- In each case, this is the generic term that will be used from this point on.

# Object/action analysis

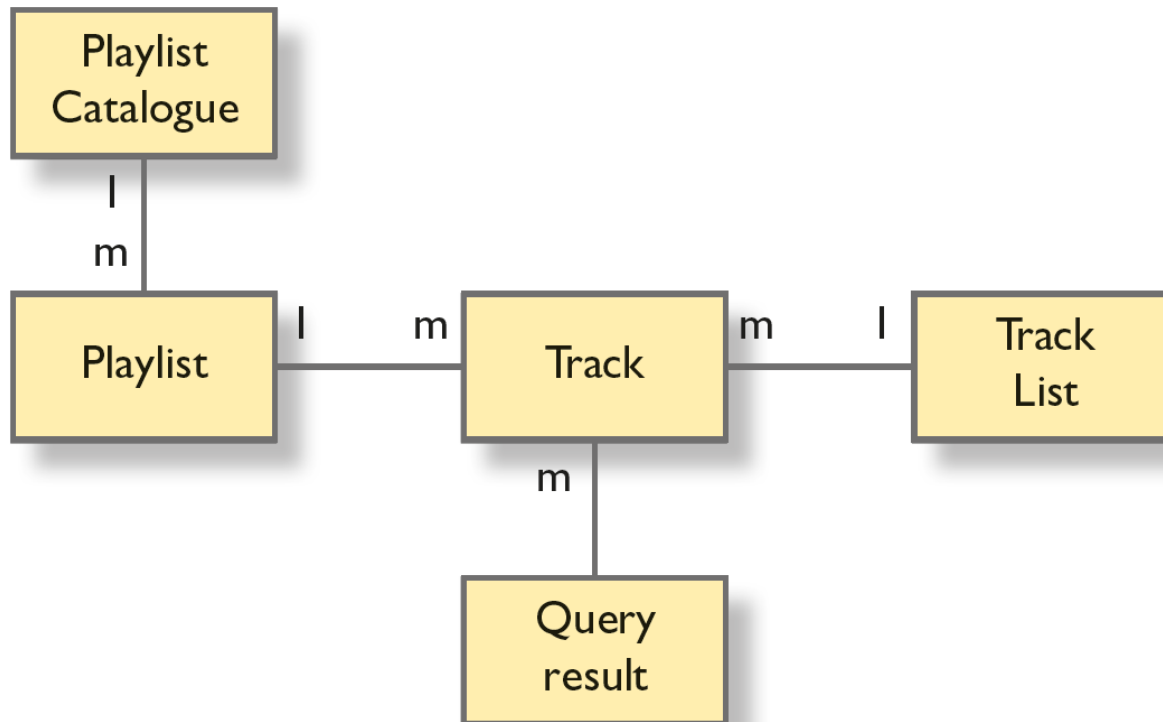
actions of 'select' and 'choose'.

[Select] (1)	7 'Select', '(specify)', 'Choose' all describe a user's action of
Select ( <i>specify</i> ) (1)	<ul style="list-style-type: none"><li>• selecting an item or group of items from a list or other display object</li></ul>
[Select ( <i>specify</i> )] (3)	<ul style="list-style-type: none"><li>• selecting an option from a menu of other actions.</li></ul>
	Here, the HIC has determined the list of possible options/interactions available to the user, and is presenting it to the user (in a number of possible forms and modalities).
Choose (1)	1
Choose ( <i>specify</i> ) (1)	1

# Object–action analysis example

- The object–action analysis has resulted in a generic action of **select** and an understanding of the various objects that can be selected: Track, Playlist, Playlist Catalogue and Query result.
- The result of the object analysis could be represented as an object model or entity–relationship model.
- This may be read as a Playlist Catalogue consisting of many Playlists, though each Playlist is on just one Playlist Catalogue.
- A Playlist consists of many tracks.
- Each track is on just one Playlist and one Tracklist.
- A Track may be the result of a Query.
- Notice how, by developing a conceptual model, we are able to raise and discuss design issues.

# Conceptual model

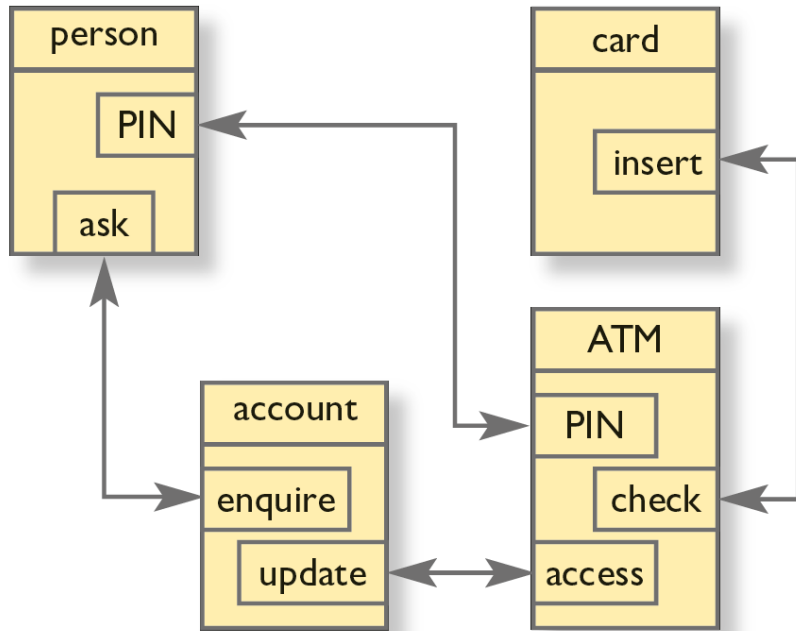




# Conceptual model representations

- Designers will often represent the conceptual model of a system using a diagrammatic technique such as an **entity–relationship model** or **object model** that represent the main objects of interest in a domain and the relationships between them.
- Relationships between objects are expressed in terms of how many instances of an object can be related to how many instances of another object. The conceptual model is annotated with a 1 if an instance can be related to only one other instance or an m if it can be related to many.

# Conceptual model of an ATM: object model



## Entity definitions outline

User (Card, PIN)

Owner (Name, Address...

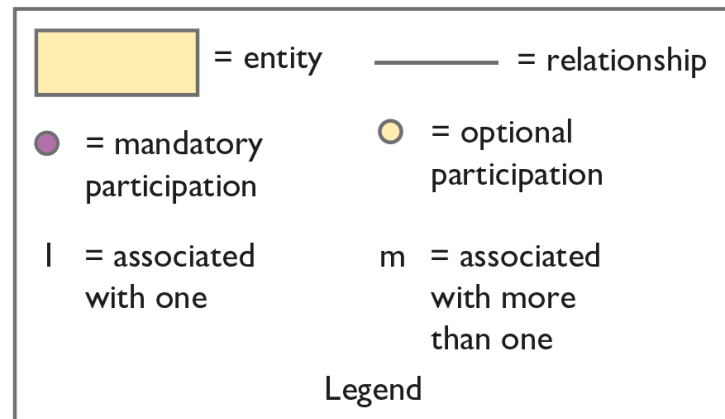
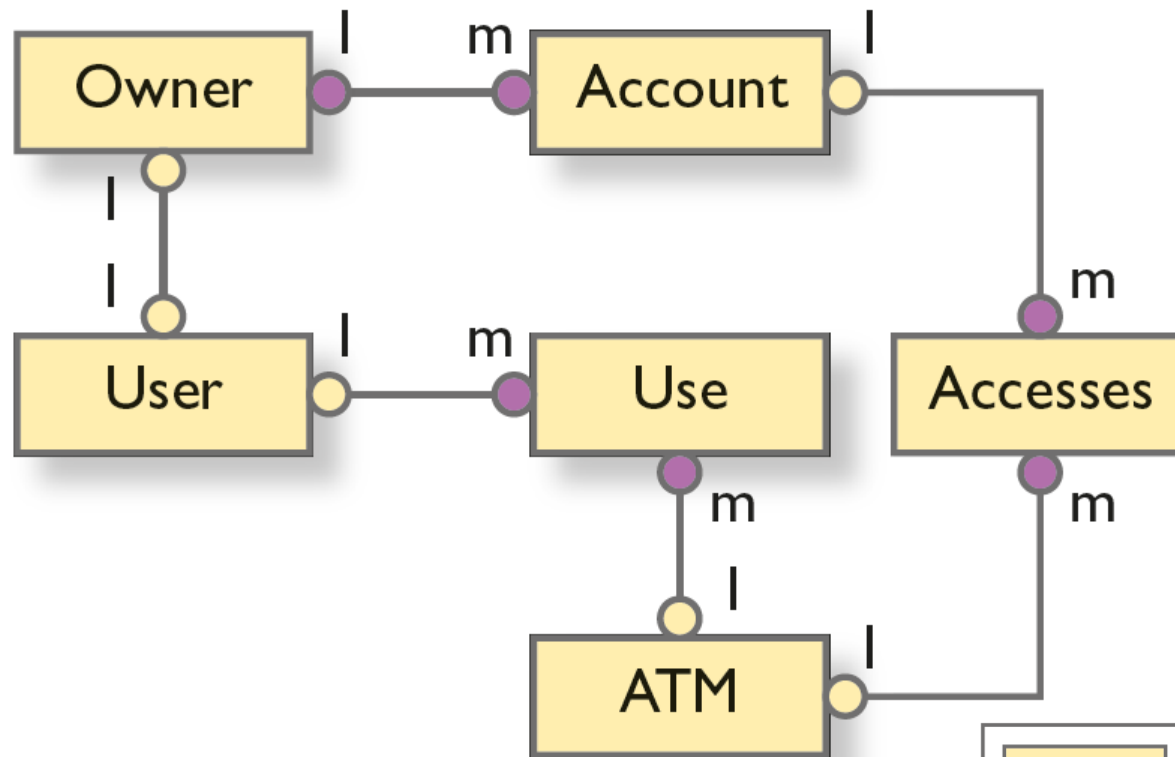
ATM (ATMnumber, address...

Use (Card, PIN, ATMnumber, Amountwithdrawn...

Account (Accountnumber...

Accesses (Card, PIN, ATMnumber, Accountnumber...

# Conceptual model of an ATM: entity–relationship



# Conceptual models example

- In the upper part is an object model that shows the relationships amongst the concepts person, card, account and ATM.
- A person may ask about an account, the card is inserted into the ATM and so on. In the lower part is an entity–relationship model.
- This is more complex but captures more of the semantics of the situation.
- The model distinguishes between the concept of a user and the owner of the card. It distinguishes a usage of the ATM and the accounts that may be accessed.

# Conceptual model

- Such diagrams rarely exist without some further explanation, and entity–relationship diagrams in particular can become quite formalized.
- For example, the entity–relationship diagram includes a notation showing the participation conditions (optional or mandatory) of entities in relationships and some outline definitions of the entities in terms of the attributes that they contain.
- Attributes can be shown on the diagram as ovals if required.
- It is not the intention to explore all the details of conceptual modelling techniques here but rather to make designers aware that they exist.
- Books are available on object modelling (e.g. van Harmelen, 2001) and on entity–relationship modelling for interface design (Benyon *et al.*, 1999).
- Some approaches to information architecture also include formal models.
- The point to note is that such techniques can be very useful in externalizing the conceptual structure that underlies a design.

# Conceptual model

- In website design, it is usual to produce a ‘site map’ – a conceptual model of the site’s structure.
- Conceptual modelling using a formalism such as an object model can be a very powerful tool in helping the designer to think about the details of a design.
- By externalizing the objects and relationships in a system, the designer can see more clearly whether the logic of a design works.

# Elements of interaction

Dan Saffer (2009) suggests six key elements of interaction design that need to be considered:

- **Motion** – objects that don't move and don't interact. Motion as a trigger for action. Behaviour as motion coloured by attitude, culture, personality and context
- **Space** – movement happens in space and interaction design involves a combination of physical and digital space
- **Time** – movement through space takes time and all interactions take place over time. Time creates rhythm
- **Appearance** – proportion, structure, size, shape, weight and colour
- **Texture** – variables such as vibration, rough, smooth etc.
- **Sound** – pitch, volume and timbre.

# 11. Physical design



# Physical design

- Physical design is about structuring interactions into logical sequences and about clarifying and presenting the allocation of functions and knowledge amongst people, channels and devices. Decisions about interfaces, navigation and how content is presented will also need to be consistent.
- Even though we think of the skeleton and surface planes of the elements of UX as physical design, there is still a conceptual design element to these and the representations we discuss in this section, design languages and design patterns, are still quite abstract.
- For example, decisions about the colour palette and visual style will need to reflect the strategy and scope of the system or service.

# Three components to physical design

- **Operational design** is concerned with specifying how everything works and how content is structured and stored.
- **Representational design** is concerned with fixing on colours, shapes, sizes and information layout. It is concerned with style and aesthetics.
- **Interaction design** in this context is concerned with the allocation of functions to humans or to technology and with the structuring and sequencing of the interactions.
- Much of the detail of physical design is covered in the Unit on the visual aspects of interface design and multimodal design.

# Design languages

- A design language consists of the following:
  - A set of **design elements** such as the use of colour, styles and types of buttons, sliders and other widgets
  - Some **principles of composition** (i.e. the rules for putting them together)
  - Collections of **qualifying situations** – contexts and how they affect the rules.
- A consistent design language means that people need only to learn a limited number of design elements and then they can cope with a large variety of different situations.
- A design language is how designers build meaning into objects, enabling people to understand what things do and to make distinctions amongst different types of object.

# Microsoft's design language

Starting with Windows 8, Microsoft introduced a new design language for their products. Originally called '**Metro**', the inspiration for the language is described on their website as being Swiss influenced print and packaging and railway signage with the focus on motion and content over chrome. The language has evolved further in Windows 8 and Windows 10. The main features of the design language were as follows:

**Motion.** A system is created to bring the interface to life by developing a consistent set of motions or animations which provide context for usability.

**Typography.** Aiming for the right balance of weight and positioning can help lead users to more content.

**Content** not Chrome. Extra chrome is removed so that in the UI, the main focus becomes the content.

**Honesty.** Design specifically for a hand-held device, incorporating a high resolution screen and using touch. Interaction is expedited and made simple.

# Microsoft's design language

New version of design language is called **Fluent Design System**. Fluent's key principles, or "blocks" (**Light, Depth, Motion, Material, and Scale**) turn away from the flat concept Metro had defined, and while preserving the clean look and feel Metro introduced, Fluent renews the visuals of [Aero](#), a design approach that was introduced in Windows 7, including blurred translucency, parallax animated patterns, drop shadow, highlight effects following mouse pointer or input gesture movements, and "faux materials" Metro once dumped.

# Microsoft's design language principles

## **Light**

The purpose of light is to draw attention and illuminate information. Upon hovering, the Reveal highlight illuminates nearby hidden borders on objects.

## **Depth**

The addition of depth utilizes the z-axis and allows for content differentiation via layering.

## **Motion**

Motion establishes a relationship between UI elements and provides a continuity in experience, e.g. animations for inserting and removing items from a collection.

## **Material**

The Acrylic material creates a translucent, blurred effect with a slight noise effect.

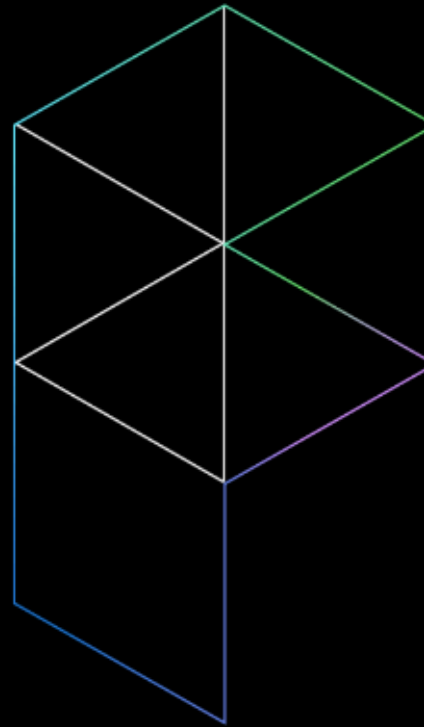
## **Scale**

Apps scale across different form factors, display sizes, and 0D to 3D.

# Fluent Design System

Fluent brings the fundamentals of principled design, innovation in technology, and customer needs together as one. It's a collective approach to creating simplicity and coherence through a shared, open design system across platforms.

Open ecosystem, open design system.



## Web

Create your own web apps and add-ins.

→ Get started



## Windows

Create and publish your own Windows apps.

→ Get started



## iOS

Take your custom apps to the mobile market.

→ Get started



## Android

Take your custom apps to the mobile market.

→ Get started

<https://www.microsoft.com/design/fluent/toolkits/>

# Microsoft's design language



Figma



Sketch



Adobe Illustrator



Adobe Photoshop



Adobe XD



Framer

<https://www.microsoft.com/design/fluent/toolkits/>



# Microsoft's design language

The image displays various components of Microsoft's design language, including:

- Photos App Header:** A navigation bar with a back arrow, tabs for "Photos", "Albums", "People", "Places", and "More", and a settings gear icon.
- Settings Sidebar:** A vertical list of settings categories: "Inbox", "Drafts", "Sent Items", "Deleted Items", and "Settings".
- Color Picker:** A circular color wheel with a central white circle and a horizontal gradient bar below it.
- Calendar:** A calendar grid showing months from October to June, with the date "February 24, 2018" highlighted in blue. Confirmation and cancel icons are at the bottom.
- Confirmation Dialog:** A dialog box titled "Are you sure?" with the message "You're about to delete 23 messages" and "Delete" and "Cancel" buttons.
- Context Menu:** A menu with options: "Edit", "Move", "Share", "Archive", and "Delete".
- Search Bar:** A search input field with the placeholder text "Find an airport" and "Zipcode or airport name".
- Volume Slider:** A horizontal slider with a speaker icon and a volume icon.
- Rich Text Editor:** A toolbar with icons for cut, copy, paste, bold, italic, underline, and a list of actions: "Proofing", "Undo", "Redo", "Cloud clipboard", and "Select all".

UI Fabric for Android is an [open-source](#) native library that provides the Office UI experience for the Android platform

#### **Basic Inputs**

[Button](#)

[Checkbox](#)

[ChoiceGroup](#)

[ComboBox](#)

[Dropdown](#)

[Label](#)

[Link](#)

[Rating](#)

[SearchBox](#)

[Slider](#)

[SpinButton](#)

[TextField](#)

[Toggle](#)

#### **Galleries & Pickers**

[Calendar](#)

[ColorPicker](#)

[DatePicker](#)

[PeoplePicker](#)

[Pickers](#)

[SwatchColorPicker](#)

#### **Items & Lists**

[ActivityItem](#)

[DetailsList](#)

[DocumentCard](#)

[Facepile](#)

[GroupedList](#)

[HoverCard](#)

[Basic List](#)

[Persona](#)

#### **Commands, Menus & Navs**

[Breadcrumb](#)

[CommandBar](#)

[ContextualMenu](#)

[Nav](#)

[OverflowSet](#)

[Pivot](#)

#### **Notification & Engagement**

[Coachmark](#)

[MessageBar](#)

[TeachingBubble](#)

#### **Progress**

[ProgressIndicator](#)

[Shimmer](#)

[Spinner](#)

#### **Surfaces**

[Callout](#)

[Dialog](#)

[Modal](#)

[Panel](#)

[ScrollablePane](#)

[Tooltip](#)

#### **Utilities**

[Announced](#)

[FocusTrapZone](#)

[FocusZone](#)

[Icon](#)

[Image](#)

[Keytips](#)

[Layer](#)

[MarqueeSelection](#)

[Overlay](#)

[ResizeGroup](#)

[Selection](#)

[Separator](#)

[Stack](#)

[Text](#)

[Themes](#)

#### **Experimental**

[Card](#)

<https://developer.microsoft.com/en-us/fabric#/get-started>

# Design languages

- Design languages help ensure transparency, helping people to understand what is going on inside a device.
- They also afford transferability of knowledge from one device to another.
- The user of one Android phone can generally expect to find similar design on another Android phone.
- This also means that people will more readily see opportunities to use a device or function and will expect certain behaviours, structures or functions.
- Finally, people will identify with a style, which helps define their identity; they act through the design language.

# Designing interactions

- The conceptual design should be as independent of an implementation as possible.
- The move from conceptual to physical design requires designers to **allocate functions and knowledge to persons or to devices and hence to create interactions.**

# Designing interactions

- In designing interactions designers need to consider the capabilities of people and the constraints on what they can do.
- People will **forget things over time**. They will forget things in **working memory** in a very short time.
- They are not good at following long lists of instructions, at **carrying out boring tasks repeatedly**.
- On the other hand, people are good at improvising and at dealing with ambiguity and incomplete information.
- On the whole, the capabilities of technology are just the reverse.

# Designing interactions

- The interaction should also be engaging, enjoyable and fulfilling.
- If the system supports **work**, it should help create satisfying and meaningful jobs, while for **home** use has to fit lifestyle and desired image.

# Interaction patterns

- Ideas of patterns – perceived regularities in an environment is common
- Architectural patterns developed by Christopher Alexander *A Timeless way of Building*
- Patterns are at different levels of abstraction.
- For example, double click, right click and so on
- More recently, there are patterns for gestures, interactions with multi-touch displays, etc.

# Challenge

- Look at the interaction patterns on a mobile phone that you have available.
- What combination of buttons and displays does what?
- Identify the 'select' key or select pattern.
- Identify the 'move down' pattern.
- Does it always work in the same way or are there different patterns for 'move down a menu' and 'move down through some text'?
- Compare the existence of patterns in phone design to those in the design of car controls.

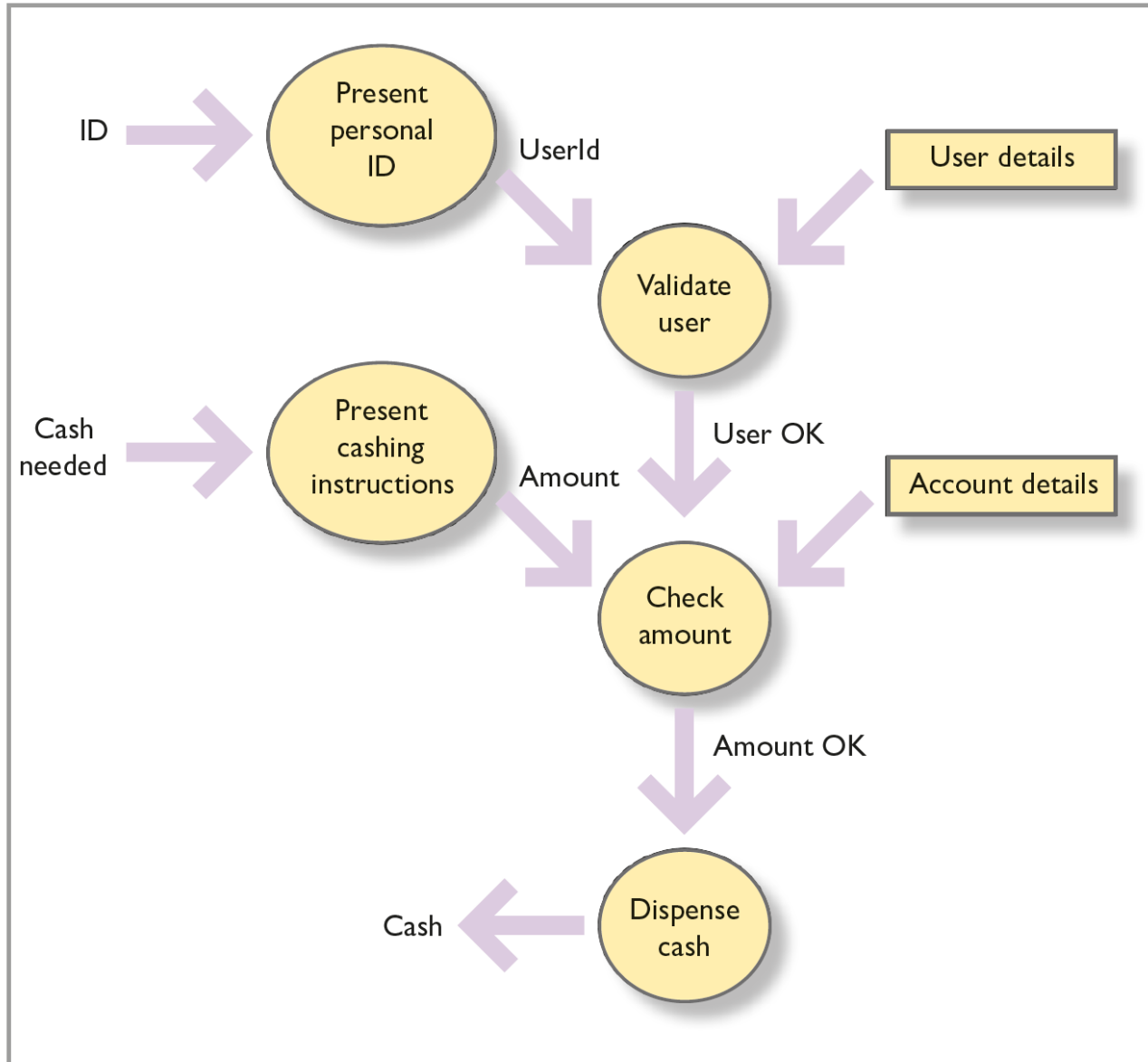


# Diagrammatic techniques

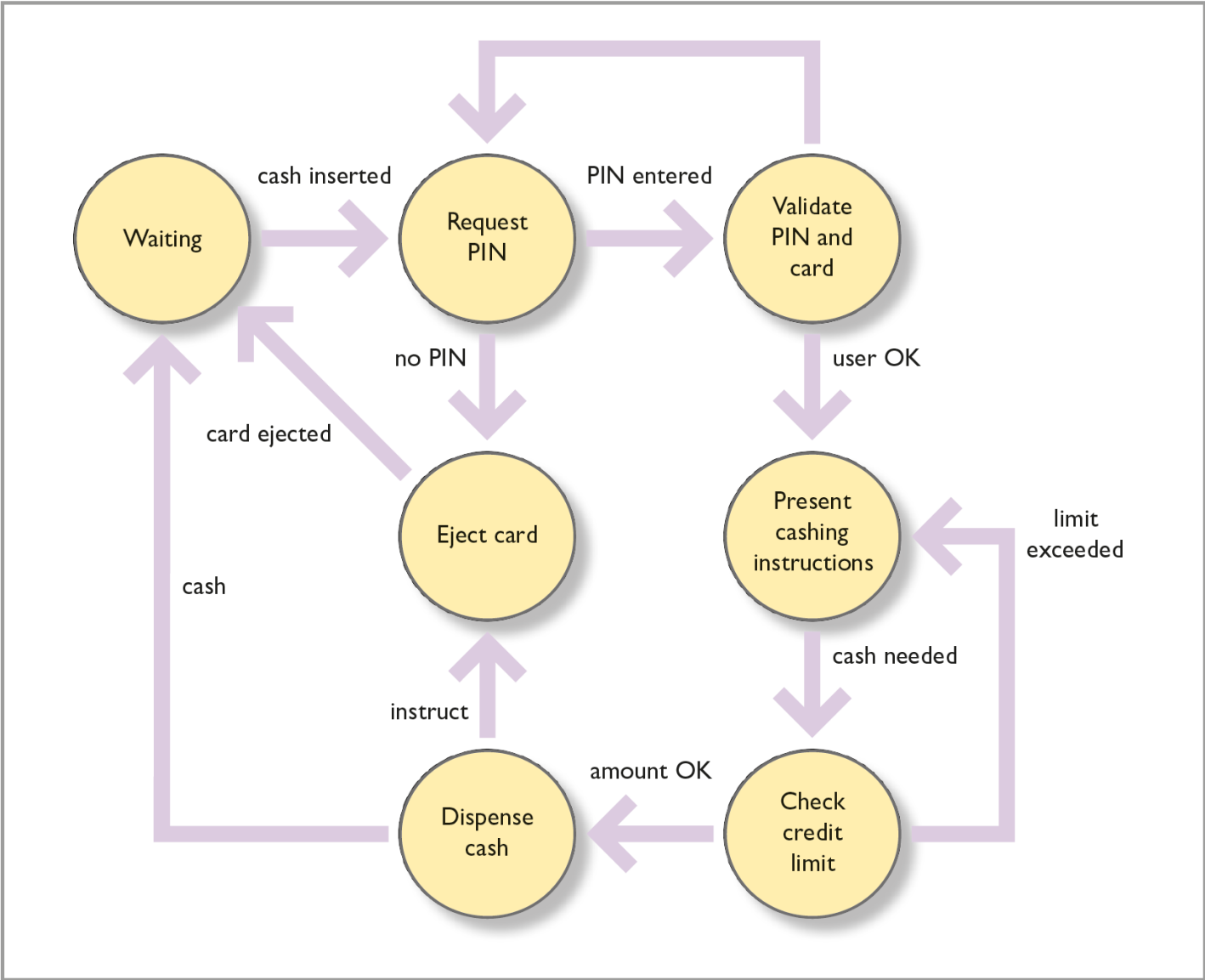
Designers will often represent the conceptual model of a system using a diagrammatic technique such as an entity–relationship model or object model. Object models, or entity–relationship models, represent the main objects of interest in a domain

and the relationships between them. There are many books devoted to such conceptual models and the techniques can be used to explore the conceptual structure, not simply to document it.

# Dataflow



# State transition network



# Summary and key points

- Designers need to explore the **concepts and blends** in their designs.
- Designers can understand **objects** and **actions** in the existing and proposed system by analysing the scenarios.
- Designing interactions is concerned with allocating functions to people or devices and hence arriving at a set of **interaction patterns**.
- Designers should ensure that there is a consistent **design language** in terms of both the patterns of interaction and representational aspects of design.