**Block 1**

Interaction design occurs through repeated design --> evaluation --> redesign cycles, involving users.

Interaction Design – creating the means by which users communicate with different forms of computing technology in order to perform some activity.

The Digital Divide – gap between those who have access to interactive technology, and those that have little or no access.

Good interaction design supports users activities and enables them to be done quickly, easily and correctly.

ID is about creating interfaces, a means by which users interact with digital products and services. Good interfaces fit the characteristics of the intended users, characteristics interaction environment and the activity that needs to be performed. Reduce negative aspects of use (frustration, annoyance) and enhance positive ones (enjoyment, engagement).

Design context

* Users – how user senses, understands, remembers and reasons about information that comes through the senses. User background (experience, education, culture). Capabilities
* Activities – active or stationary, individual or group
* Environment – distractions, urgency, device used, physical, social, economic

Good interaction consists of

* Usability – how easy interactive product is to use and learn
* User Experience – how good the experience of using the product is

Interactive design activities:

* Establish requirements – what the user needs to do. Depend on user, activity and environment.
* Designing alternatives –
* Prototyping designs – make a rough model of the most promising ideas so they can be tried out.
* Evaluating prototypes – assess limitations of a particular design. Check requirements are met.

Characteristics of interactive design process

* Iteration – Evaluate a prototype and redesign as necessary
* Usability and UX – evaluate what makes a product usable and what users might experience during use.
* User involvement – involve prospective users through design process.

**Usability goals** are specific qualities an interface should achieve to have good usability. Measurable qualities of the interface:

* Effectiveness - are the users' tasks easily accomplished?
* Efficiency – can user complete tasks quickly (fewest number of steps). Can productivity be sustained once interface is learnt?
* Utility – does product offer the functionalities needed for a particular task? Are set of functions provided adequate enough to complete required tasks?
* Learnability – easy to learn how to use the product?
* Memorability – easy to remember how to use the product?
* Safety – minimise risk of user making errors, and allow them to recover from errors quickly. Protect from dangerous or hazardous conditions and undesirable situations.

Some goals will be more important than others, depending on the situation. Various questions are used to evaluate aspects of the product, in terms of usability goals.

User experience goals ensure the product not only allows a user to do what the need to do, but allows them to do it in an enriching and ‘feel good’ way. Based on user’s emotions and felt experiences.

Usability goals are fairly easy to assess by measuring the user’s performance when using a product or prototype. It’s harder to objectively measure UX goals as they relate to user’s feelings rather than performance.

Design principles aid thinking when considering user experience. Do’s and Don’ts of interactive design.

* Visibility/Perceivability – the more visible functions are, the more likely the user is to be able to use them and what to do next. Knobs, buttons, switches vs sensors. Shows what functions are available. Our experience of any interactive product begins with our senses.
* Feedback – sending information back about action that has been done and results of action. Allows users to continue with the activity. Can be visual, audio, tactile etc. Conveys success of actions as well as failure. Feedback is an acknowledgment of an action, whereas the outcome of an action is a resulting change in the system’s status.
* Constraints – restricting kinds of user interaction when necessary. Eg grey out unusable menu options, navigation restriction. Reduces mistakes.
* Consistency – designing interfaces to have similar operations and use similar elements for achieving similar tasks. Inconsistency can lead to users making mistakes. Consistent interfaces are easier to learn and use. Consistent design and navigation.
* Affordance – attributes of an object allow a user to determine how to use it. Physical objects are said to have ‘real’ affordance, whereas virtual interfaces have ‘perceived’ affordance, which are learned conventions. Attributes include size, colour, texture, shape and location. Special form of consistency.

When designing interfaces, we must consider user (abilities, impairments) the activity taking place and where the interaction is taking place.

The user:

* Physical capabilities – what physical dexterity do they have to operate the interface
* Sensory capabilities - how well can users perceive input to their senses?
* Cognitive capabilities – is user likely to be able to process level of information required?

Background and experience are relevant, do they have any special skills or knowledge relevant to the task?

User capabilities should be considered in the context of the activity being carried out, some may not be relevant in that situation. Also, the physical environment in which the user is will affect their ability to interact with the product. Physical, social, technical and economic considerations

Production context – the setting in which the interactive product is developed, both at project level and as part of company’s product strategy. This includes the following considerations

* Domain of application – the general area the interactive product is meant to support. Set of concepts, methods, vocabulary, standards, regulations, rules.
* Data requirements – all interactive products must handle data. Type of product dictates how long data might need to be stored, how extensive data is, how often it needs updating etc. How sensitive is the data? Data affects usability if it’s incorrect, or has to be entered repeatedly.
* Stakeholders -
  + Beneficiaries – People who may benefit from the project, or who may be impacted negatively. Users.
  + Contributors – people who have to provide their time, energy or other resources for project to proceed.
  + Decision makers – people who may control the resources needed for the project.
* Sociocultural, organisational and economic settings
  + Sociocultural - culture of company (freedom of staff to be autonomous, use the tools they want,
  + Organisational – product may be part of a portfolio of product, standards that must be adhered to. Compatibility with other products.
  + Economic – size and wealth of the company. Funding for the project. Priorities of the company. State of national economy, government initiatives

Gathering data about design context

* Ask users – questionnaires and interviews.
* Observe users - either directly, in natural environment like work or home(naturalistic), or a laboratory(controlled) or indirectly by asking them to keep a log of activity.
* Matching methods to questions

Data used by designers to come up with ideas, often as sketches and prototypes. Low or high fidelity depending on how close to final product they are.

Prototypes:

* Allow designers to evaluate and articulate design choices.
* Help uncover new requirements
* Allow exploration of design alternatives
* Allow evaluation of designs

Core design activities

* Gather requirements
* Design alternatives
* Design prototypes
* Evaluate prototypes

The design lifecycle is the iterative movement between these 4 activities.

**Users**

Do not assume everyone is like me.

Physical capabilities

Cutaneous sense – touch, sensation resulting from pressure or contact on the skin

Kinaesthetic sense – awareness of static or dynamic body position

Sight – seeing the controls and receiving visual feedback.

Hearing – Feedback as well as audio output

Taste and smell hard to recreate digitally

Cognitive capabilities – mental skills we need to carry out activities.

Cognition – Experiential and reflective cognition, fast and slow thinking. Experiential is perceiving and reacting to events around us intuitively. Reflective cognition is mental effort, judgment, decision making and attention. Cognitive processes:

* Attention – process of selecting things to concentrate on. Auditory and/or visual senses. Depends on our goals, whether we know what we’re looking for or not. The way information is presented influence how like we are to pay attention to it. Multitasking an affect attention depending on how demanding the tasks are.
  + Interface considerations – make salient information obvious, avoid clutter, simple and clean
* Perception – how sensory information is acquired from the environment via senses. Affected by lack of certain senses.
  + Interface considerations – icons and graphical representation, bordering and spacing for grouping, legible and distinguishable text.
* Memory – recalling various kinds of knowledge to allow us to act appropriately. Interpretation and attention affect how it’s represented in memory and retrieved. Memory aids searching. Recall-directed memory vs recognition-based scanning.
  + Interface considerations – don’t overload users’ memories with complicated procedures, promote recognition rather than recall.
* Learning – easier to learn through doing. Learn from mistakes, allow undoing. Cognitive prosthetics – relying on things like smartphone to provide information rather than learning it ourselves.
  + Interface considerations – encourage exploration, constrain and guide user when needed.
* Reading, speaking and listening – ease with which user can do either of these depends on person, task and context.
* Problem solving, planning, reasoning and decision making – what to do, what are the options, what are the consequence? Choice means weighing up costs and benefits of courses of action.
  + Interface considerations – simple and memorable functions.

Embodied knowledge is that which the body acquires through practise that one might use without being aware or without thinking. Eg riding a bike.

Background and experience – accumulated experience, education and exposure. Experience influences people’s preferences and interests. Familiarity affects usability and UX.

**Activity and environment**

What does the user need to do, how do they do it and why do they do it that way.

Simple or complex? Has user had any kind of training eg driving?

***Type environment notes***

Accessibility – making interactive products usable by people with varied capabilities.

W3C principles for accessible web design:

* Perceivable – available through sight, hearing or touch
  + Provide alt text for non-text content
  + Make content easy to see by separating from background.
* Operable – compatible with keyboard or mouse
  + Functionality available with keyboard
  + Provide enough time to read content
  + Do not induce seizures
* Understandable – easy to comprehend
  + Content readable and understandable
  + Make pages operate in a predictable way
  + Help users avoid and correct mistakes
* Robust – works across browsers, assistive technologies, mobile devices, old browsers, follows standards.
  + Maximise compatibility with current and future user agents.

Trade-offs and priorities - hearing not just down to capabilities, also affected by environment and activity. ‘Cocktail party effect’ focus on sounds we are interested in and cut out surrounding noise.

Functional requirements – what the product must do.

Non-functional requirements – qualities of product rather than behaviours. UX and usability are non-functional requirements.

**Gathering requirements**

User-centred techniques help avoid designers making ‘educated-guesses’ about requirements.

Gather data to be able to extract requirements, or to capture feedback from a prototype.

Key issues with data gathering:

* Setting goals – identify goals of the study. This will influence the techniques used to gather data and how data will be analysed.
* Identifying participants – Goals influence the people you want to collect data from. Choosing participants is called sampling. Probability and non-probability methods. Convenience sampling is that of subjects who were available rather than being specifically selected. Probability sampling allows statistical tests and can be generalised to the whole population.
* Relationship with participants – clear and professional relationship. Informed consent form generally explains purpose of data gathering and how it will be used. Protects interests of data gatherer and data provider. Not always necessary with requirements gathering activities.
* Triangulation – investigating a phenomenon from at least two different perspectives. Collect data at different times, from different people, with different observers, using different theoretical methods or with different gathering techniques. Combining techniques for requirements gathering.
* Pilot studies – small trial run of main study, aims to make sure proposed method is viable.

Data recording:

* Notes plus photos – can be slow, biased, illegible, concentration could have been lost.
* Audio plus photos – Allows observers to focus on activity rather than words. Transcribing can be time consuming.
* Video – visual and audio data. Intrusive. Camera position.

**Interviews** – conversation with purpose.

* Unstructured - exploratory and more like a conversation around a topic. Probing. Agenda of things to be discussed should still be set. Generates rich data. Unstructured data so difficult to analyse across participants.
* Structured – predetermined questions. Same questions used for every participant. Questions should have a predetermined set of possible answers.
* Semi-structured – use both open and closed questions. Start with pre-planned questions then probe for more information. Body language and phrasing can influence answers given.
* Focus groups – interviewing people in groups, led by facilitator. Participants are representative sample of target population. Good for exploring community issues rather than individual experiences.

Planning and conducting – develop set of questions or topics to be covered. Check any equipment being used. Questions may be open or closed, open are more exploratory, closed if possible, answers are known in advance.

Running the interview – introduction and explanation. As easier questions first with more probing ones at the end.

Other forms of interview – skype, phone, email.

**Questionnaires** – suitability over interviews depends on participants motivation to participate. Interviews offer more supervision.

Structure – generally start with demographic questions, allows for context to be applied to responses. Order of questions matters

Question and response format: depending on whether question is open or closed depends on how question can be answered. Closed will provide possible answers. Makes answering easier.

* Check boxes and ranges – yes/no or an answer within a range without needing to be too specific(age).
* Rating scales – Likert and semantic differential scales. Likert used for measuring opinions, attitudes and beliefs, like user satisfaction (agree, strongly agree etc).

Administering questionnaires – must reach representative sample of participants and get a reasonable response rate to be useful. Web based questionnaires have been shown to received better completion than paper. Immediate validation, interactivity with videos and popups can be included. Faster to respond as instantly submitted, quicker analysis as straight to a database.

**Observation –** can be used at multiple stages, early in design to understand context, tasks and goals, or later to evaluate a design. Can occur in natural environment or in controlled environment like a lab.

* Direct in the field – allows discovery of nuances that can’t be discovered with other techniques. Should have a focus as lots of data is generated from observation. Focus on the who, where and what as basics of observation. Passive observation or participant observation. How will data be recorded? Enthrography. Can be virtual (via camera)
* Direct observation in controlled environment – may occur in purpose-built lab. More formal than in the field. Scripted. Photos, notes, videos record findings. Think aloud technique – participant says aloud everything they’re thinking, processes are externalised.
* Indirect observation –
  + Diaries – user keeps diary of activities. Don’t take up researcher time, no special setup or expertise, suitable for long-term studies.
  + Interaction logs and web analytics – software installed on a device to record users' activity. Unobtrusive. Web analytics tracks user's behaviour when interacting with a website. Measures web traffic, used for optimisation.

Techniques can be combined depending on goals. ID book p. 270 for info on selecting techniques.

Ethics -gain informed consent. Don’t push your own opinions, take due care of privacy and safety.

Put participants at ease

Duty of care underpins all computing and professional codes of conduct. This is the obligation of an individual to take reasonable care while performing any acts that could foreseeably harm others.

Code of Professional Conduct for Usability Professionals

* Act in the best interest of everyone
* Be honest with everyone
* Do no harm and if possible, provide benefits
* Act with integrity
* Avoid conflicts of interest
* Respect privacy, confidentiality and anonymity
* Provide all resultant data.

Data gathering and requirements – data gathering used to extract requirements, or to expand, clarify and confirm existing requirements. Needs to cover the tasks they currently perform and their goals, the context of these tasks.

Methods for gathering requirements:

* Interviews – used to elicit scenarios.
* Focus groups – gain consensus view and highlight areas of conflict or disagreement. Collaboration and facilitation
* Questionnaires – could help whittle down interviewees or get wider perspective on issues. Elicit opinions and suggestions.
* Direct observation – understand tasks and context.
* Indirect observation – not really used for new products, more in iterations of product or when existing product is evolving.
* Studying documentation – studying manuals, could be regulations governing task. Should be used in conjunction with real life practises as documentation can be an idealised account of tasks. Good as doesn’t involve stakeholder time.
* Researching similar products – may elicit requirements that have not have not been considered.

Contextual inquiry – technique of collecting and interpreting data from fieldwork with the intention of building a software product. Particularly good for requirements regarding context of use.

Data gathering guidelines for requirements:

* Focus on discovering stakeholders needs.
* Involve all stakeholder groups.
* Involve multiple representatives from each stakeholder group.
* Use artefacts to stimulate discussion, such as prototypes

Not all requirements gathering techniques may be applicable to all types of user, consider the information that could be obtained using specific techniques with certain types of user (eg. hospital receptionist)

**Establishing requirements**

Personas – a description of a fictitious person, who is in some way representative of a group of the users of the interactive product. Aim of these is to represent data that has been collected in a way that can be useful used to think of solutions. Allows for a more tangible representation of the data collected from interviews/focus groups/questionnaires etc.

User characteristics capture the key attributes of the intended user group, which leads way to knowledge about their abilities and skills. Characteristics can also include the users’ nationality, educational background, personal circumstances, physical/mental disabilities etc. Novice, expert, casual or frequent user. A user profile is a collection of these characteristics. User profiles then bought to life as personas.

Personas include list of goals, skills, attitudes, tasks and environment. They include a name, photograph, and background information, as well as detailed description of their skills.

Scenarios are a form of task description. Short imaginary situations which are used to explore situations, and can help extract requirements. Allow understanding of constraints, frustrations, contexts, facilitators. Allows understanding of the goals the user is trying to achieve, without necessarily being concerned with how they achieve them.

Scenarios used for requirements gathering should emphasize the context, usability and UX goals, and tasks the user is performing. They’re often generated during workshops, focus groups or interviews to help or explain a user’s goals. Very personalised so only offer one perspective.

Task analysis – used to investigate an existing situation, not to envision new products. What people are doing and why they are doing it.

HTA – hierarchical task analysis – step-by-step understanding of a task. Break tasks int sub tasks, and then break those down to further subtasks and so on.

Right requirements -

**Design and prototyping**

The **design space** for a particular product is the range of possible conceptual models for the product, given the requirements, together with their rationales.

A **conceptual model** is a high-level model which avoids diving in to implementation details. A high-level description of how a system is organised and operates. Outlines main functionality. It’s not a user interface or look and feel, it only describes what people can do with a system and what concepts they must understand to operate it. A UI is only one implementation of a conceptual model. Including:

* Metaphors and analogies conveying what the product is for and how it’s to be used.
* The concepts people are exposed to, task-domain objects and operations e.g saving.
* Relationships between these concepts.
* Mappings between concepts and the UX the product is designed to support.

Conceptual model can be represented as a textual description, diagram or sketch, depending on what the team prefer to work with.

Need to understand and conceptualise current UX and product and how it’s going to be improved or changed.

Discussing assumptions and claims to gather variety pf perspectives (Box 2.1 ID)

Design team should ask:

* Are there problems with an existing product and UX, and what are they?
* Why do you think there are problems?
* How do you think your proposed design ideas might overcome problems?
* If for new product, how does new design ideas support, change or extend current ways of doing things?

Conceptualising the design space allows:

* Orientation - enables design team to ask specific kinds of question about how conceptual model will be understood by users
* Open-mindedness – preventing design team from becoming narrowly focused early on
* Common ground – allow establishment of common terms that are all understood, reducing chance of misunderstandings.

Conceptual model has these components:

* Metaphors and analogies
* Concepts and tasks that can be carried out by product
* Interrelationships between concepts
* Mappings between concepts and user experience

Benefits of conceptualising design:

* Ensure focus is not too narrow, and commitment to particular implementations is avoided.
* Establish a set of common terms that are agreed upon, less chance of misunderstanding
* Clarify priorities.

Once formulated and agreed upon a conceptual model becomes a shared blueprint. Could be textual, diagrammatic or a sketch.

Conceptual models can be created for different levels of design. Top level abstractions consider what the main idea of the interactive product. At a lower level a model can represent how the interaction will work. Consider **environment, actions, concepts/objects and UX goals**.

Mental models help to describe what is in the minds of the user about what an interactive product is meant to do, how to use it and how it works. The users only source of information on these things is the product itself. The user's mental model does not need to be complete, but sufficient enough to allow the user to interpret the controls, the products behaviour and the feedback.

Donald Norman -gulfs of execution and evaluation: challenge of mapping between the designer’s idea of the system and user’s idea of the system. Gap between user’s goals and what the interactive product does. Block 3 P25.

**Cognitive frameworks**

*Internal*

* Mental models – knowledge developed about how to interact with a system. Used to reason about a system, try to fathom what to do if something unexpected happens with the system, or when encountering unfamiliar systems. More-is-more – the more you press or turn something the quicker your goal is achieved.
* Gulfs of execution and evaluation – gaps between the user and the interface.
* Information processing – viewing the brain as an information processor. Information enters and exits mind though series of ordered processing stages.

*External*

* Distributed cognition: cognitive system involving interactions among people, external artefacts and internal and external representations.  How is information propagated between different media?  How information is represented and re-represented as it travels across individuals and across artefacts.  Not focussing on how individual processes data.
* External cognition: explaining the cognitive processes involved when we interact with different representations.  Explicate cognitive benefits of using different representations for different cognitive activities
  + Externalising to reduce memory load: externalise things we find hard to remember.
  + Computational offloading: use a tool or device in conjunction with external representation to aid computation.
  + Annotating and cognitive tracing: modifying representations to reflect changes (e.g crossing item from tod-do list).  Annotating involves modifying external representations.  Cognitive tracing involves externally manipulating items into different orders or structures
  + Embodied interaction: understanding interaction in terms of practical engagement with social and physical environment.

Future technologies are imagined by conceptual and technological leaps.

ContraVision is an approach that gets users to watch and discuss futuristic videos of an imagined technology in use.  Carefully crafted to show two opposing views of the scenario, one negative and one positive.

MVP – Minimum Viable Product – product launched as quickly as possible, without all bells and whistles, but works at a minimal level that achieves the idea.  This gets the product into the users hands sooner, allowing feedback, and determining whether the gap between the designers understanding and the users understanding of the product requirements.

**Interface types**

Key interface concepts:

* Symbolic vs direct manipulation
* Embodied interaction
* Multiple platforms
* Context awareness
* Integration into wider human activities

Symbolic vs direct manipulation – Command line (CLI) vs Graphical User Interface (GUI)

CLI – user issues commands by entering symbols which are displayed as lines of text. Users must rely on memory to remember commands, as typically no menus to cue them. Interaction is direct and uncluttered and facilitates scripting for automation. Better for experts.

GUI – user interacts with programs and devices using graphical elements, WIMP (Windows, Icons, Menus and Pointing)

Symbolic manipulation vs direct manipulation – direct manipulation allows users to manipulate graphical objects, corresponding loosely with how they’d manipulate physical objects. Symbolic as in entering symbols that form commands.

* Continuous representation of the objects and actions of interest
* Rapid reversable incremental actions with immediate feedback
* Physical actions and button pressing rather than issuing commands with complex syntax

Embodied cognition – problem-solving by interacting with our environment.

Embodied interaction – term for kinds of interaction that take advantage of the body’s contributions to cognition, and of its situation in an environment.

Virtual reality, typically relies on specialised controllers and 3D graphics. It uses computer-generated graphical simulations to create the illusion of participation in a synthetic environment rather than external observation of such an environment. Interacting with an artificial environment.   
Embodied cognition – exploring, understanding, problem solving and acting by interacting with surroundings. Embodied interaction – interaction that takes advantage of the body’s contributions to cognition, and of its situation in an environment.

Realism vs abstraction – is it best to truly represent real life object, or use an abstraction eg a real desktop does not look like a virtual on, virtual one is an abstraction.

Multiple platforms – in the case of a GUI it can be safely assumed the screen size and inputs such as mouse or keyboard, as it is run locally on a computer. In the case of web interface these assumptions cannot be made, and so the interface must accommodate several platforms. Also, not much can be assumed about user’s environment or connectivity. Inputs may vary, could be keyboard, touchscreen etc.

Web interfaces –

Tips for designing for tablets:

* Go 100% touch friendly
* Use bigger font (min 16px) and increase line-height
* Make elements easy to touch and leave enough room between elements to improve touch accuracy.
* Make sure contextual keyboards are enabled (use type attribute on inputs)
* Use font-based icons so they are scalable.
* Ensure it’s performant. Compress images and minify CSS and JS.

Context awareness – computation has been moved off the desktop. Interactive design including things that are not initiated directly by the user, basically the use of sensors within the mobile device.

* Accelerometer – senses phone movement, whether the user is walking or running, orientation of the phone (whether it’s horizontal or vertical)
* Gyroscope – senses rotation and orientation and turns and gestures
* Magnetometer – orientation and rotation with respects to north
* GPS – Location, speed and direction of travel
* Proximity sensor – knowing if device is close to face or in pocket
* Microphone
* Camera
* Wi-fi
* Bluetooth
* Finger print sensor

Privacy and security

Integration into wider human activities - wearable interfaces take computation into users’ environment and activity. Wearable computers, small electronic devices worn on the body. Must be unobtrusive to all activity to be carried out unhindered. Use of sensor input and discreet output like vibrations allows seamless integration into user’s activity. Hygiene issues, can clothed be washed if contain technology? Are they comfortable? Power source? How does use input data? Buttons? Speech? Visual displays are restricted.

* Speech - speech-to-text. Useful for disabled users. Commonly used to direct calls. Phone assistants. Translation apps. Concerns over making interaction seem natural like normal speech. Environment dependent, e.g probably not appropriate in public due to noise or privacy. Not appropriate for hearing impaired, but good for the blind.
* Touch – allows flexibility with digital content, zooming, scrolling, moving items. Can be more cumbersome than the precision of using a mouse. A broadly accessible means of interaction, not hard to learn, young children more than capable of using touch interfaces. If screen size is limited then touch interaction can be challenging.
* Haptic – interfaces that provide tactile feedback by vibrating or pressure. Games console controllers. How intense should vibration be? Needs to be perceivable but not annoying. Perceivability design principle considerations.

New types of interface should be considered in terms of:

* Their demands on human capabilities (senses, cognitive abilities)
* Activities and environments in which they are to be used
* The extent to which they meet design principles.

**Prototyping**

Prototypes give shape to initial design ideas, represent a design idea concretely. Don’t necessarily have to look like finished product or work, just need to convey the design and spark discussion with users and stakeholders. Helps try out idea for feasibility. Can help designers choose between alternatives.

Two kinds of design – conceptual and concrete. Conceptual is what design will do, concrete concerned with details of the design.

Low-fidelity prototypes – don't look much like final product, simple, cheap and quick to knock together. Limited functionality.

* Storyboarding – often used in conjunction with scenarios. Series of sketched showing how user might progress through task.
* Sketching – hand-drawn sketches. Convey actions and emotions of task
* Index cards – each card can represent a screen of a website.

High-fidelity prototypes – looks like final product and provides more functionality than low-fidelity prototypes. Useful to sell ideas to people and test out technical issues.

Horizontal prototyping provides wide range of functions with little detail. Vertical prototyping provides a lot of detail for a few functions.

Prototypes can lead to tunnel vision about final product.

Scenarios are informal stories about user tasks and activities. Used for expressing proposed or imagined situations.

A storyboard represents a sequence of actions that user and product go through to achieve a task.

Card based prototypes for screens are useful as they explore users end-to-end experience. Each screen is turned into a card. Can focus too much on specific implementation.

Different kinds of views in storyboards – wide shot, long shot, medium shot, over-the-shoulder shot, point-of-view shot, close-up-shot

Scenario storyboards help designer and user form a concrete idea of the design.

When creating a storyboard, first identify the main steps in the interaction, then represent each action in an image.

Interface storyboards focus on the interface itself. Help answer questions like where user will input their data, how feedback will be conveyed, what’s visible and hidden. Demonstrate each key frame and how interface looks at that point in interaction.

Conceptual design:

Conceptual model – main concept/metaphors, type of activities or tasks, important aspects of user experience.

Bill Verplan interaction design model – framework to remind designers of the important elements to address in a conceptual design

* Idea – main underlying idea for the interaction design
* Error – The problem it seeks to address, or outcome to avoid
* Metaphor – Embodies the basic idea of how the users will understand and experience the interaction
* Model – how the users will understand the working system
* Task – Specifies what action they will actually perform with the interactive device
* Display – how the device will look
* Control – how user can manipulate the display

Why evaluate? - necessary at every stage of development in user centred design, so their needs are understood and satisfied. User studies, requirements gathering techniques, prototypes.

* Business reputation – don’t want user errors after launch. Bad reviews are easy to leave online.
* Financial success – evaluation through process can help avoid costly errors and highlight important issues that might hamper product.
* Being relevant in the complex, real world – can pick up cultural aspects of product use that might not have been anticipated
* Keeping up with technology – allows experimentation with new, cutting edge prototypes to gain fresh insights.

Evaluation focuses on usability of system (how easy to learn and use) and users’ experience when interacting with it (how satisfying, enjoyable or motivating the interaction is)

Evaluation entails observing users and measuring performance. Field studies, usability tests, experiments.

Why evaluate? – to produce a product that has good usability, is elegant and joyful to use. Focus on needs of different user groups.

What to evaluate? – depends on the product.

Where to evaluate? – depends on what is being evaluated. If control needed then laboratory is good. UX aspects are better in natural environment as mirrors everyday use. Remote studies and living laboratories to simulate in the wild but in lab.

When to evaluate? – Depends on type of product, whether brand new or improvement for existing product. Evaluation of early prototypes and storyboards from requirements can determine whether these requirements are correct. Formative evaluations are those carried out during design to ensure user needs are still being met through process. Summative evaluations are those that are carried out to assess success of finished product.

Neilson Norman Group NN/g – best evaluation results are found using just 5 users. This is enough to find most flaws and usability issues.

User testing – do users need the app. Usability testing – can users use the app.

Types of evaluation

* Controlled settings involving users – laboratories or living labs. Users’ activities are controlled, allows measurement or observation of certain behaviours. Usability testing and experiments. Good for usability issues, poor for capturing context of use. Evaluators can reduce outside influences and distractions, so they can tell whether issues were caused by extraneous factors like distraction or instructions given, or by the interface.
  + Usability testing – experiments, observation, interviews and questionnaires. Determining how quickly users can recover from errors, and what errors the make. Interaction can be videoed, or tracked with logging software.
* Natural settings involving users – little or no control over users’ activities. Good to determine how product used in real world. Field studies. Expensive and difficult to conduct. Observation, interviews, focus groups. Aim to be unobtrusive and not steer interactions. Can be difficult to anticipate when something worth observing may happen, as unpredictable. Can rely on participants completing diaries which may not be don’t completely or thoroughly.
* Setting not involving user – use of consultants and researchers to critique, predict and model aspects of interface in order to identify obvious usability issues. Analytics, models, walkthroughs. Cheap and quick but can miss unpredictable usability problems. Researcher has to imagine or model how it’s likely the interface will be used. Use of google analytics to analyse user behaviour.

Benefits of controlled setting are being able to test hypotheses about features of the interface, where results can be generalised to further population. Uncontrolled settings allow for discovery of unexpected data.

Can be difficult to measure user experience aspects, how do you quantify?

Crowdsourcing – A web-based method to allow a great number of people to evaluate the product. May be asked to carry out a certain evaluation task, or comment/rate the product.

Heuristic evaluation – an evaluation method in which knowledge of typical users is applied to apply usability problems.

Participants in evaluation studies have to be informed what they will be asked to do, the conditions under which data will be collected and what will happen to their data when they finish the task. Data must be anonymised. They must also be informed of their rights, that they can withdraw at any time.

Method of evaluation used determines the type of data that will be collected. Need to consider whether method is reliable and will it measure what you want it to? Could biases creep in?

Reliability is determined by whether the same results would be achieved if the experiment were run again under the same circumstances. Highly controlled experiments will have high reliability, whereas more natural experiments are harder to recreate.

Validity is concerned with whether the experiment method measures what it’s supposed to. Ecological validity is concerned with how the environment in which the experiment is conducted influences or distorts the results. Lab experiments have low ecological validity as results are unlikely to be representative of real-life interactions. Also, if participants are aware they are being studied, then ecological validity is affected.

Bias occurs when the results are distorted for some reason. Can be down to the observer or researcher only being sensitive to certain aspects of the interaction and focusing on them. Unconscious influencing by interviewers.

Remember there is no one correct method of evaluation, iterative process based on goals of study.

Analytics are good at providing real time overview of behaviour, but not the reasons for the behaviour or how to solve it.

Opportunistic feedback is gathered informally and quickly from users. Early in design and requires few resources.

The 5-Second Test – based on evidence that users were arriving at sites from a search engine and leaving after only 5 seconds. Led to creation of test where someone is shown a mock-up of home page for 5 seconds, then asked questions like:

* What do you think the site is about?
* What is the purpose of the website?
* Would you trust the website?
* What was the first thing you noticed?

Very useful for websites rather than desktop applications where users have already made a commitment to use the application.

Ethical issues with user involvement -

Damage to reputation of company if data mishandled.

Diversity of participants – adapt interviews and instructions depending on user capabilities. Adapt time allowances for those with disabilities. Adapt physical arrangements, e.g lab might need to include assistive technology, or be rearranged for people with limited mobility. Helper, interpreter or advocate might be needed. Considerations when evaluating with children., such as attention span, child safety.

Informed consent – providing participants with all the information they need to decide whether or not to participate. At very least need agreement from participant to take part, permission to record evaluation, and permission to use and store data. can withdraw and have data deleted at any point.

Consent form ensure relationship between information gatherer and information giver is clear and professional.

Aggregating different collections of data can lead to privacy issues.

UK Data Protection Act – ethical behaviours extend to data, how it’s collected, handled and stored. Act controls how personal data is used by businesses, organisations and government. Everyone responsible for using data must follow data protection principles. Information must be

* Used fairly and lawfully
* Used for limited, specifically stated purposes
* Used in a way that is adequate, relevant, not excessive
* Accurate
* Kept no longer than necessary
* Handled according to people’s data protection rights
* Kept safe and secure
* Not transferred outside of EEC without adequate protection.

Evaluation will provide data. Purpose of analysing and interpreting collected data is to transform it into information that’s relevant and useful to the design process, and answers evaluation questions.

Generalisability – whether findings from sample users of evaluation can be generalised to the user population at large. To be generalisable, evaluation must be reliable (repeatable), valid (findings truly represent claim) and should involve representative sample of participants.

Data analysis typically starts with identifying patterns such as mean, ratios or percentages.

Investigators existing beliefs or biases may influence the interpretation of the results.

Qualitative – not expressed in numerical terms, descriptions, quotes, images, observations. Qualitative analysis focuses on the nature of something. Themes, patterns, stories.

tive – takes the form of numbers or can be easily translated to numbers. Percentages can be misleading if not being applied to a large no. of datapoints. E.g 2 in 4 vs 50%. In observation could be amount of time it takes to perform a task. Quantitative analysis aims to find magnitude, amount or size of something.

Data must be processed before it’s analysed.

Interviews – raw interview data is as recording or notes. Transcription, could be section or whole recording.

Questionnaires – cleaning out erroneous answers. Could be written or in a database if online questionnaire. Can be filtered for certain demographic analysis or subsets. Closed questions quantitative, open questions qualitative.

Observation – can lead to lots of raw data, notes, photos, video, audio.

Quantitative analysis – averages and percentages. Three different types of average, mean, median and mode. Median is middle number, mode is most common number. Likert scale – agree, neither agree nor disagree, disagree. Spreadsheets commonly used for analysis as freely available and easy to use. Consider outliers and remove if necessary. These also may be an area of further investigation. Interaction log data.

Qualitative analysis – any data analysis starts with trying to find patterns and get overall impression of the data. Trying to find some structure in the data.

* Identifying recurring patterns or themes – need to find confirming and disconfirming evidence in the data. Grouping notes that are similar. Groups not predefined, but emerge from the data.
* Categorising data – data separated into elements, and elements then categorised. Categories largely determined by goal of study. Categories should not overlap.
* Looking for critical incidents –

3 stages of making sense of data – analysis & summary, interpretation, presentation.

Analysis – turning evaluation data that’s collected into information on which decisions can be made.

1. Collating the data – Gather together all the data that’s been collected, and organise for processing.
2. Analysing and summarising – extract patterns or other observations, by applying statistical tests or qualitative analysis.