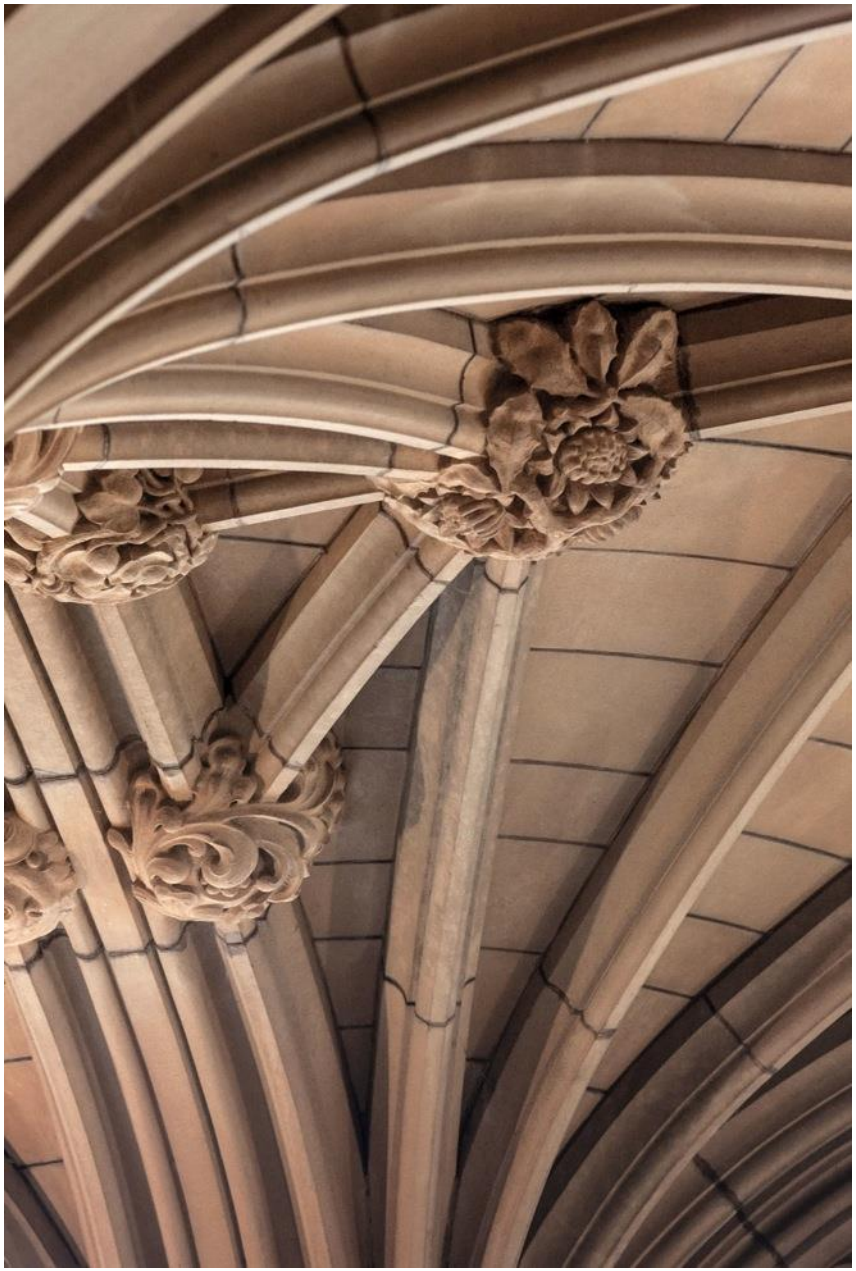
INFO3315 Human-Computer Interaction

Lecture 3 – Introduction to Interaction Design

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Recap

- Human Perceptions
  - Visual
  - Auditory
  - Tactile
- Memory
- Attention
- Emotions
- Mental models
- Norman's Gulfs: Gulf of Execution and Gulf of Evaluation
- Cognition

Interaction Design

- Designing interactive products to support the way people communicate and interact in their everyday and working lives (Preece, 2019)

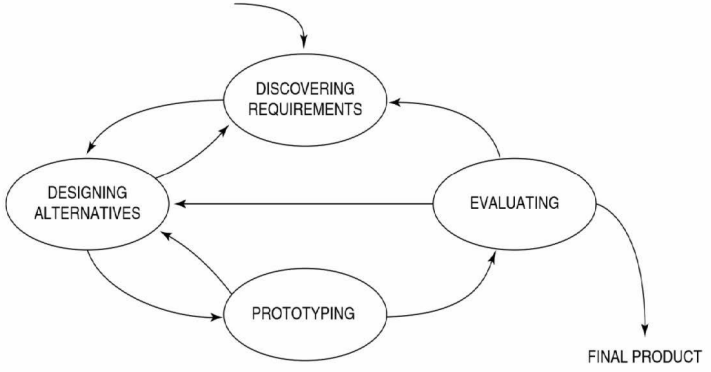
- The art of facilitating interactions between humans through products and services (Saffer, 2010)

- Different ways of designing:
  - IDEO – understand, observe, visualise
  - Design council (UK)

What is involved?

- It is a goal-directed, creative, problem solving activity informed by intended use, target domain, materials, cost, and feasibility.

- It is a process:
  - Focused on discovering requirements, designing to fulfil requirements, producing prototypes and evaluating them
  - Focused on users and their goals
  - Involves trade-offs to balance conflicting requirements



Approaches to Interaction Design

Approach	*Overview*	*Users*	*Designer*
User-centered design	Focus on user needs and goals	The guides of design	Translator of user needs and goals
Activity-centered design	Focus on the tasks and activities that need to be accomplished	Performers of the activities	Creates tools for actions
Systems design	Focus on the components of a system	Set the goals of the system	Makes sure all the parts of the system are in place
Genius design	Skill and wisdom of designers used to make products	Source of validation	The source of inspiration

Saffer, D. (2010)

Key Principles of User-Centred Design (UCD)

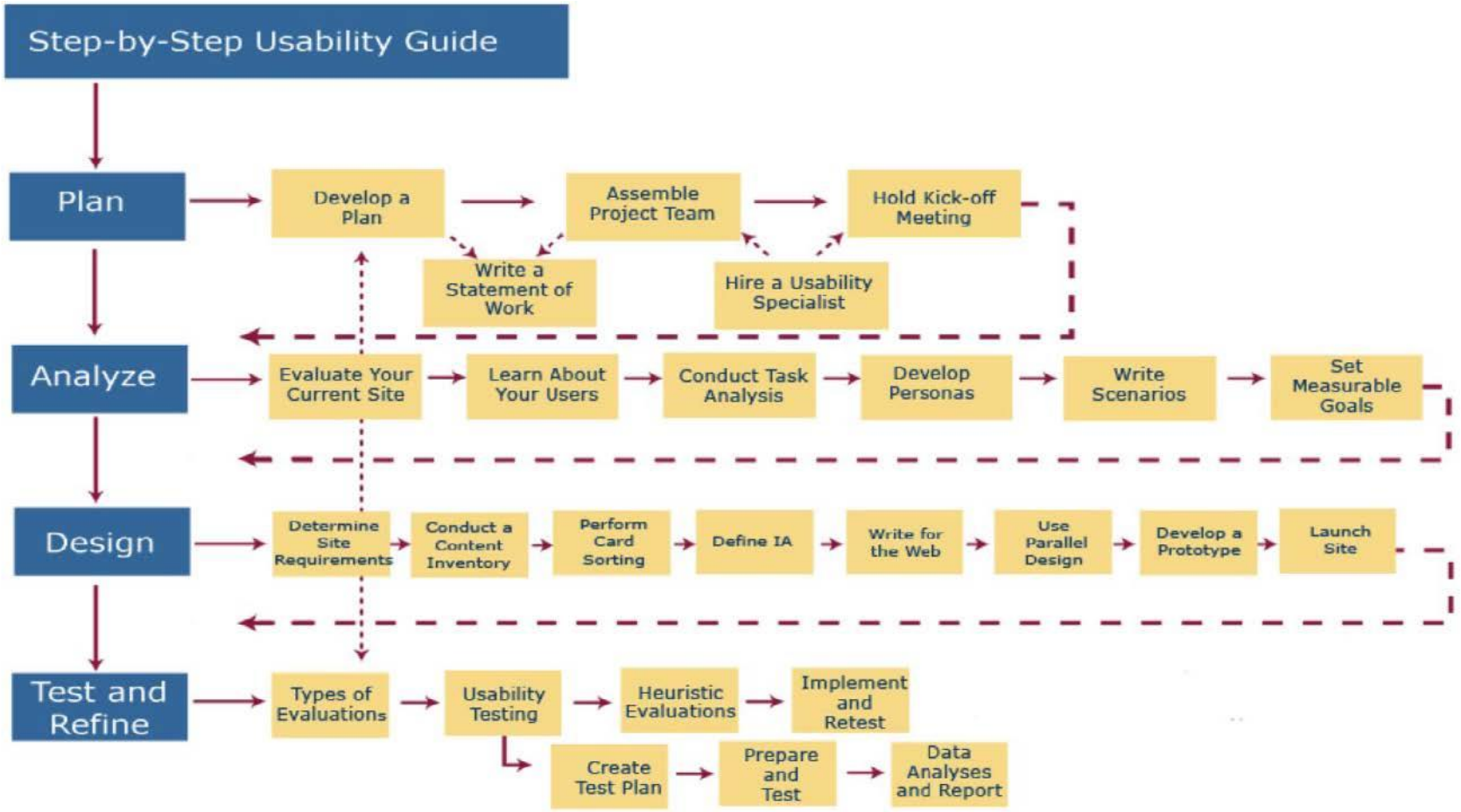
John Gould and Clayton Lewis (1985)

- **Early focus on users and tasks**
  - Who is the user? How they do normal tasks?
  - Get the user involved in design.

- **Empirical measurement**
  - The reactions and performance of intended users are observed and measured
  - E.g. simulations and prototypes

- **Iterative design**
  - When problems are found in testing, fix and do more tests

User-Centered Design Process Map



https://www.usability.gov/how-to-and-tools/resources/ucd-map.html

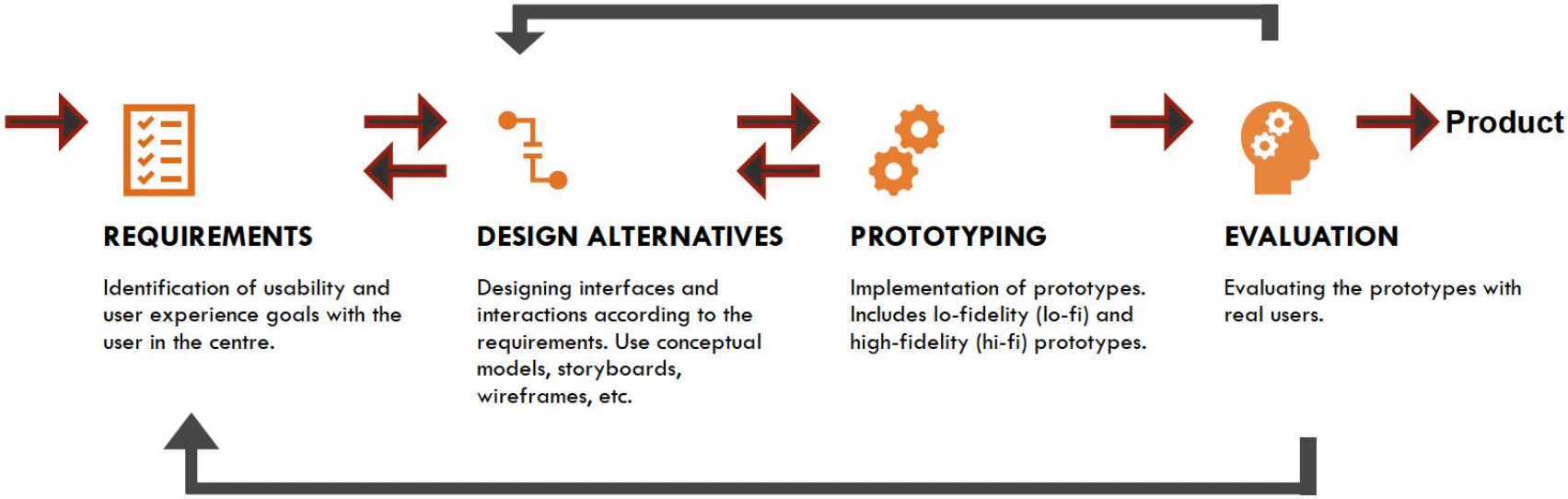
Importance of Involving Users

- Best way to ensure that the product is usable and will be used indeed
- Sense of ownership that will lead to supporting the product
- Important to involve the target users of the system throughout the development cycle
- Important to ensure that the users' expectations of the new product are realistic – Expectation management. If users feel they have been cheated by promises that have not been fulfilled, this will cause resistance and rejection
- Involving users throughout the development helps with expectation management

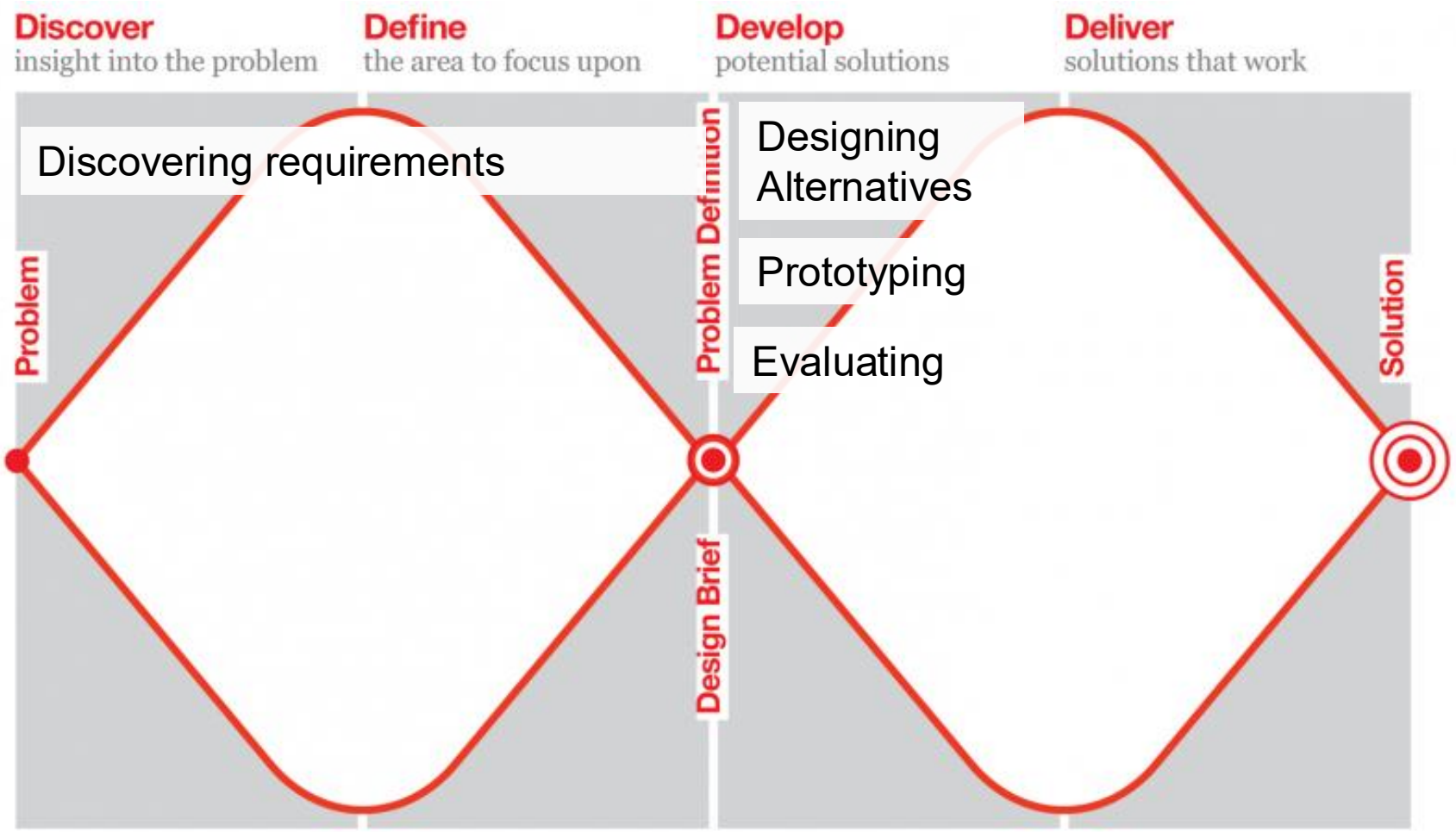
Importance of Involving Users

- User involvement has a positive effect on user satisfaction and system use (Abelein et al., 2013)
- For new products, developer satisfaction increased as user satisfaction increased (Subrayaman et al., 2010)
- User satisfaction was higher if participation was low (Subrayaman et al., 2010)
- User satisfaction was lower if participation was high (Subrayaman et al., 2010)
- High participation can generate conflicts and increase reworking (Subrayaman et al., 2010)
- Involving users at earlier stages lead to more creative ideas, whereas involving users at later stages lead to service improvement in transport design projects (Richard et al., 2014)

Basic Activities

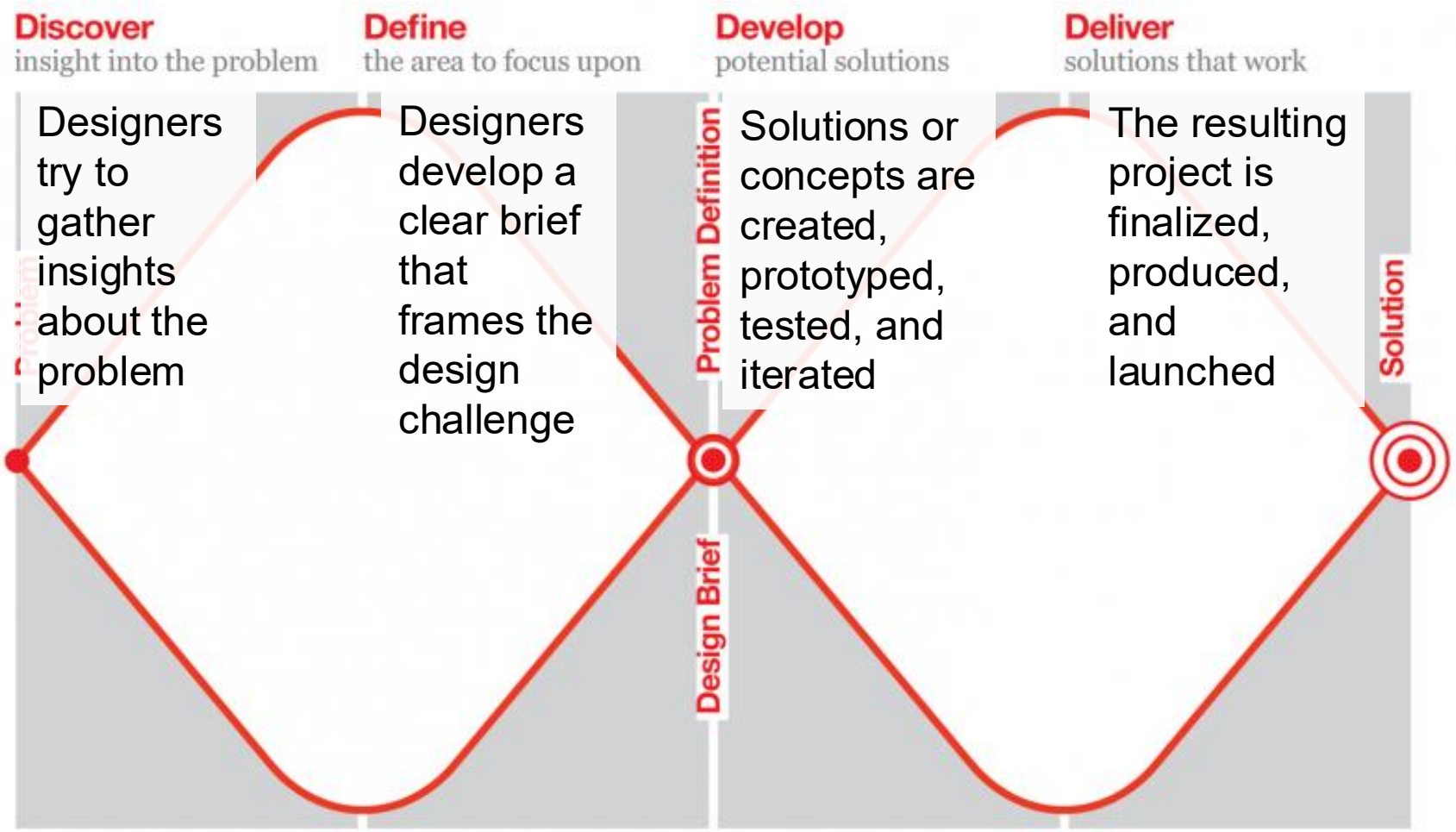


UX Design Process: Double Diamond Model



https://uxdesign.cc/beyond-the-double-diamond-thinking-about-a-better-design-process-model-de4fdb902cf

UX Design Process: Double Diamond Model



https://uxdesign.cc/beyond-the-double-diamond-thinking-about-a-better-design-process-model-de4fdb902cf

In-class activity – work in pairs or groups of 3

- You need to design a mobile app that helps you organize your expenses
- Using the first three phases of the Double Diamond Model, produce an initial design using a sketch or two, showing its main functionality and its general look and feel

- **Reflection:**
  - What did you do first?
  - Did you have any particular artifacts/experiences on which you based your design?

Integration with Lifecycle Models

- Many other disciplines contribute to interaction design.
- Integrating interaction design activities in lifecycle models from other disciplines requires careful planning.
- Each discipline has lifecycles of their own e.g. software development lifecycle (SDLC)
- Software development lifecycle (SDLC) models:
  - Waterfall model
  - Spiral model
  - Agile model – iterative process.
- Challenge: Integrating interaction design activities into existing SDLC models.

Lifecycle Models

- Lifecycle – structured framework consisting of series of stages and corresponding activities that characterize the full evolution of an interaction design or a complete system or product (Hartson & Pyla, 2012).
- Lifecycle template – The Wheel.

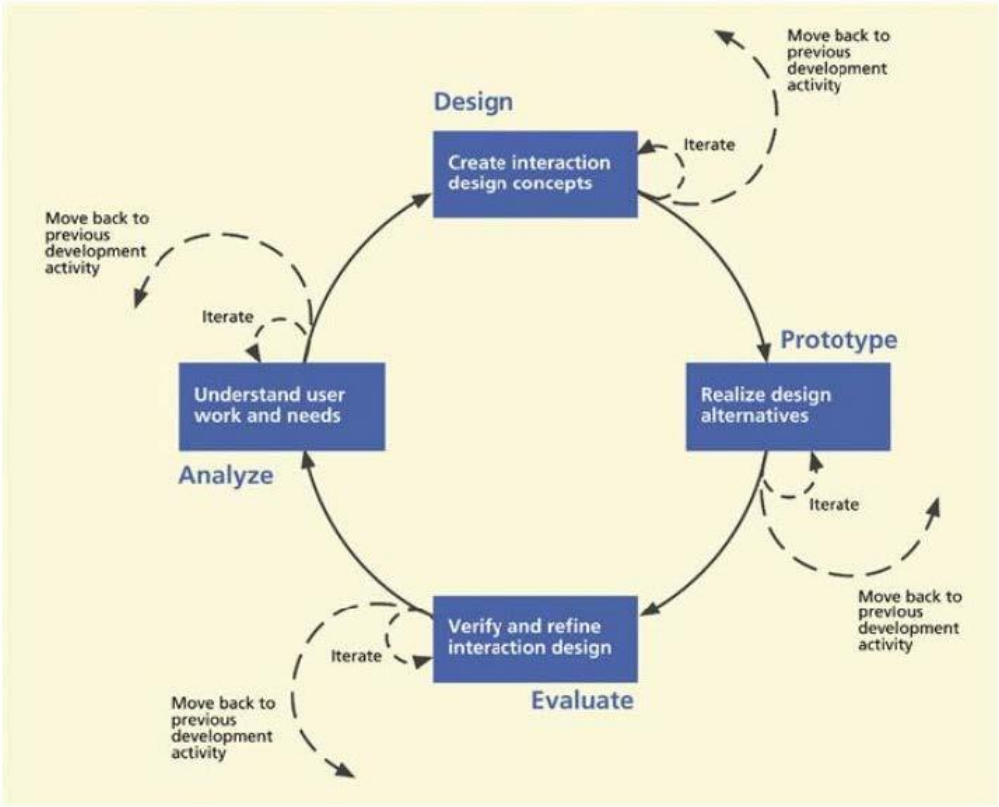
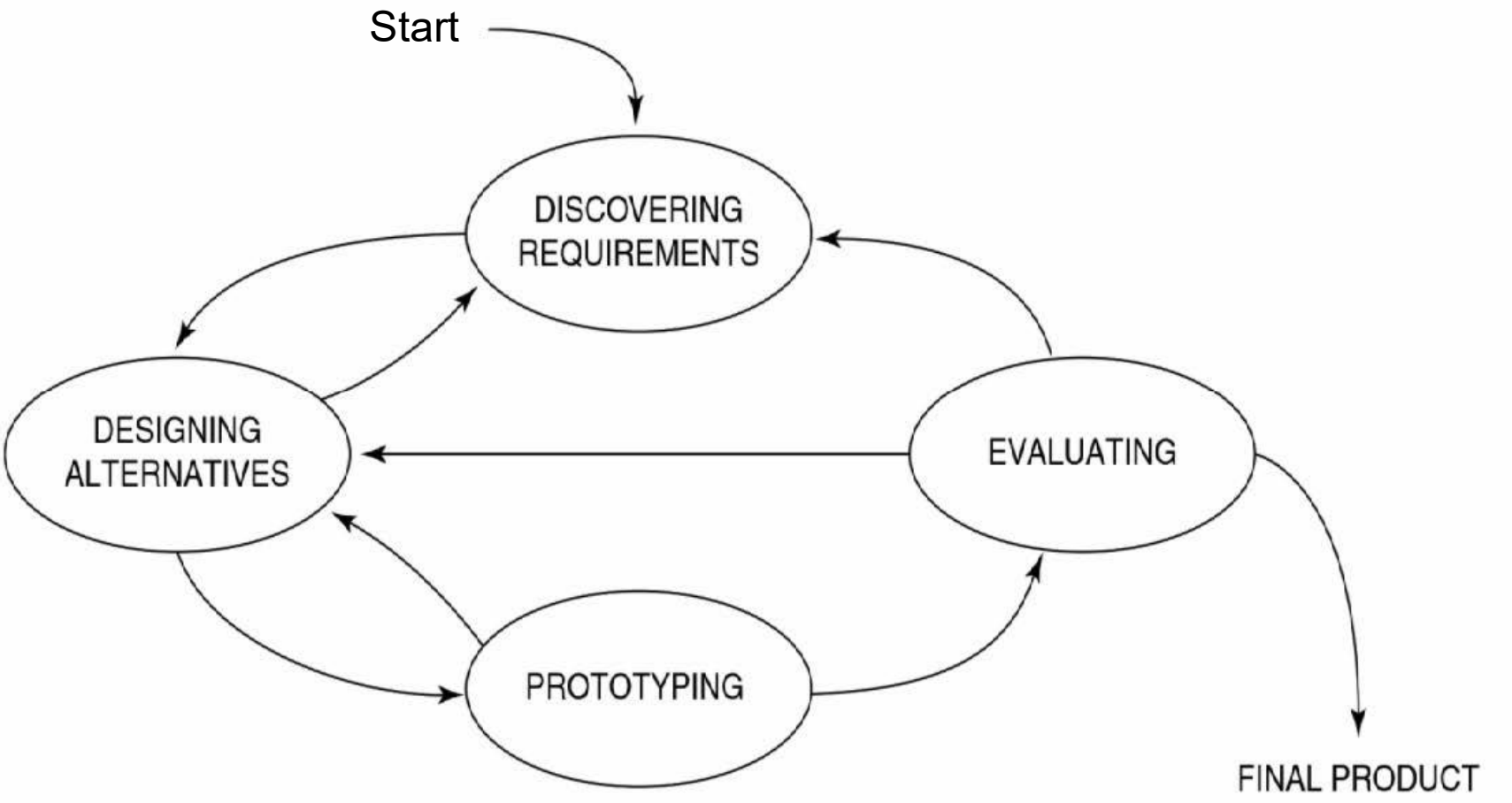


Image credit: Hartson, R., & Pyla, P. S. (2012). *The UX Book: Process and guidelines for ensuring a quality user experience*. Elsevier.

Simple Interaction Design Lifecycle Model



Preece, Rogers, Sharp (2019)

Agile Development

- Short (one to three week) timeboxes of iterative development (sprint, iteration, cycle)
- End of each iteration, a working product is delivered.
- Early and repeated customer/user feedback
- Re-prioritization of work based on customer or user so that emergent requirements can be handled
- Many approaches: eXtremeProgramming (XP), Scrum, Kanban, and Dynamic Systems Development Method (DSDM)

AgileUX

- Integrating interaction design activities with agile software development is promising because:
  - It incorporates tight iterations
  - It champions early and regular feedback
  - It handles emergent requirements
  - It aims to strike a balance between flexibility and structure
- Three practical areas to consider:
  - What user research to conduct, how much and when?
  - How to align UX design and agile working practice?
  - What documentation to produce, how much and when?

Practical issues

- Who are the users?
- What are the users' needs?
- How to generate alternative designs?
- How to choose among alternatives?
- How to integrate interaction design activities with other lifecycle models?

Who are the users?

- A user is _____.
  - A. Someone who interacts directly with the system to achieve the task
  - B. Those who make purchasing decision on the system but does not use the system
  - C. Those who receive products from the system

Who are the users?

- Identifying users can be a difficult activity.
- Many products are intended for use by large sections of the population, so user is “everybody”.
- Stakeholders are people who will be affected by the system and who have direct or indirect influence on the system requirements.
- Identifying the stakeholders helps to decide who to involve as users.

What are the users' needs?

- Users can't tell you what they 'need'.
- Need to:
  - Explore the problem space
  - What information is needed to complete a task?
  - Who collaborates to achieve the task?
  - Why is the task currently done that way?

- Try out ideas with potential users to see if they work
- Focus on peoples' goals, usability, and user experience goals, rather than expect stakeholders to articulate requirements

User Research

- User research – data collection and analysis activities necessary to characterise the users, their tasks and the context of use before product development begins.
- Agile's timeboxing approach does not support long periods of user research.
- Some user research can be performed in iteration 0 (zero), before implementation starts.

Align Work Practices

- Designing a complete product upfront causes problems because of re-prioritisation
- Some upfront work is needed (technical and UX)
- Use a parallel tracks approach:
  - create product vision before development starts
  - do design work one iteration ahead of development
  - some teams work on two iterations ahead

Parallel Task Approach – Advantages

- No design time wasted on features not implemented
- Usability testing and contextual inquiry could be done on the same customer visit, saving time
- Timely feedback on the designs was received from developers and customers
- Agile flexibility supports schedule changes if a problem is found

Documentation

- Agile encourages minimal documentation so more time can be spent on design and discussion
- Minimal documentation does not mean “no documentation”. However, the key principle in AgileUX: documentation should not replace communication and collaboration
- Example documentation:
  - User research results
  - Personas
  - Detailed interface sketches
  - Wireframes

Documentation

- Documentation is needed to
  - Convey information
  - Evidence of conclusion of activity
- Only use documentation where needed.
- Questions to ask:
  - Who will read it?
  - Who will use it?
  - What is the minimum needed?
  - Is there duplication anywhere?
  - How polished does it need to be?

Group Project Deliverables

- Review the project brief.
- Identify example documentations that will be created during the project.
- Is it possible to create a lifecycle model to describe your group's actions during the project?

My Team's Journey

- Manage artefacts during the project.
  - Shared drive for team members to deposit work
  - Discuss work and summarize key findings (Meeting Minutes)
- Every activity and artefact must have a purpose
  - Identify purpose of each activity executed by the group
  - Link artefacts produced to consequence of actions
- Put it all together
  - List out process stages
  - Match activity done to stages
  - Add arrows to indicate flow and link



How to generate alternatives?

- Humans tend to stick with something that works
- Considering alternatives helps identify better designs
- Where do alternative designs come from?
  - 'Flair and creativity': research and synthesis
  - Cross-fertilization of ideas from different perspectives
  - Users can generate different designs
  - Product evolution based on changing use
  - Seek inspiration: similar products and domain, or different products and domain

How to choose among alternatives?

- Choosing means making design decisions.
- Consider the technical feasibility of the idea:
  - External factors – visible and measurable features
  - Internal factors – internal mechanics of the system
  - Example – Photocopy Machine
    - External: Speed and quality of copying, physical size of machine
    - Internal: Choice of materials used within the machine

How to choose among alternatives?

- Evaluation with users or peers
  - Observe users or peers use the design
  - Design must be in interactable form (prototypes)
  - Documentation is traditional way of communicating design but not tangible

- A/B Testing
  - Often used for alternative web designs
  - Online method to inform choice between two alternatives
  - Users are unaware they are contributing to an evaluation
  - Nontrivial to set appropriate metrics and choose user group sets

How to choose among alternatives?

- Quality thresholds
  - Different stakeholder groups have different expectations.
  - Usability engineering – process of writing down formal, verifiable (measurable) usability criteria and assessing the product against these measures.
  - Usability and user experience goals lead to relevant criteria.
  - Example:
    - Learnability – How long does it take for a novice user to be able to do a series of set tasks?
    - Memorability – If the product is not used for a month, how many functions can the user remember how to perform?

In-class quiz

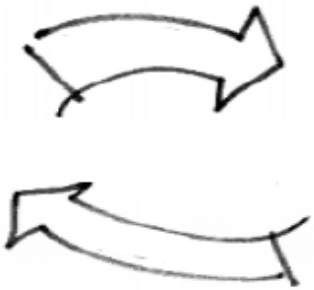
- Week 3 – In-class quiz
- *5* min

PACT Framework

- **P**eople **A**ctivities **C**ontexts **T**echnologies
- People use Technologies to undertake Activities in certain Contexts



People



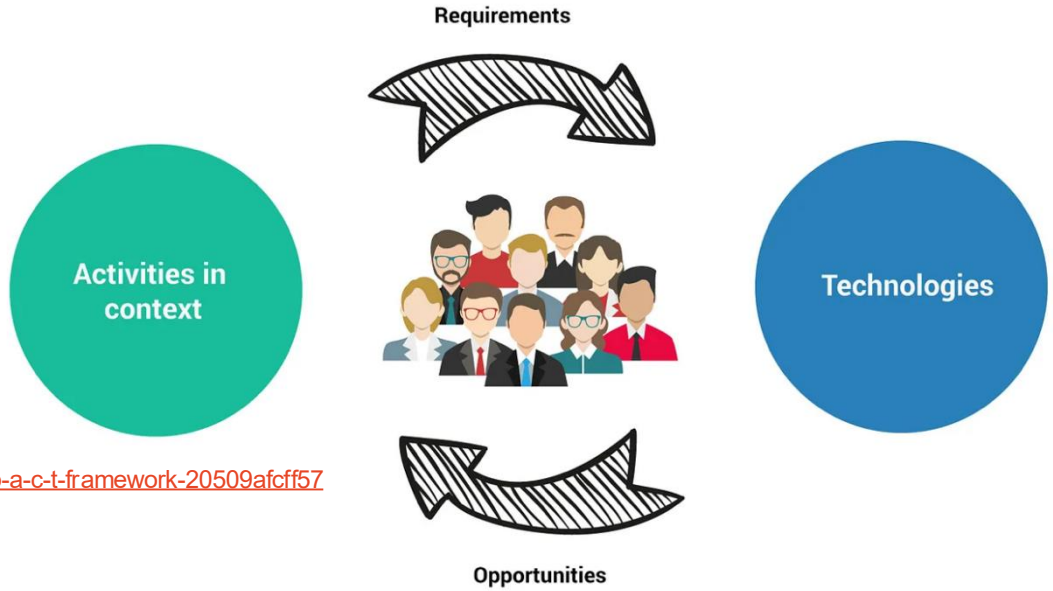
Activities in Contexts



Technologies

PACT

- A framework to think about the design problem:
  - **People** – Who are they? What are their characteristics?
  - **Activity** – What task are people performing?
  - **Context** – Where and under what circumstances does the activity occur?
  - **Technology** – What do you need to consider in your design?
- Series of questions to ask yourself
- Identify areas for investigation or to focus the design.



https://uxplanet.org/usability-for-designers-p-a-c-t-framework-20509afcff57

People



https://stock.adobe.com/au/images/faceless-community-of-people/196873357

- Everyone is different:
  - Physical differences
    - Physical characteristics
    - Variation in five senses?
  - Psychological differences
    - Spatial awareness
    - Different attention span and memory
    - Language and cultural differences
  - Experiences and personalities
- Different goals, needs, reasons and motivations for using systems.

Activities

- Start by focusing on the overall purpose of the activity.
- Flesh out the details of the activity from the following perspectives:
  - Temporal (how frequently task is carried out?)
  - Cooperative or not (does it involve other people?)
  - Complexity (how complex is the task?)
  - Safety-critical (what problems happen if something goes wrong?)
  - Data and content (what information and media are needed?)
- Need to investigate to verify information and to understand activity.

Activities – Temporal

- How regular or infrequent are the activities?
- When do they perform these activities?
- Is the activity a single continuous set of actions or can it be done with interrupted actions?
- What is the expected response time from the system?

Important Notes:

- Activities that are frequent should be easy to do while infrequent activities should be easy to remember
- If activities are an interrupted set of actions, design to allow users to 'find their place' again when they pick it up

Activities – Cooperation and Complexity

- Can the task be done alone? If negative, who is involved?
- How complicated is the activity? Does it follow defined steps or is it a vague activity?

Important Notes:

- Issues of awareness of others and communication and coordination is important for collaborative activities.
- Vague activities requires a different design compared to well-defined activities.

Activity – Safety-Critical

- Are people allowed to make mistakes?
- What are the critical consequences of making a mistake?

Important Notes:

- Must consider the consequence of errors.
- Need to be careful when designing systems where safety is an issue, i.e., errors put lives at risk.

Activity – Data and Content

- What type of information is needed to complete the activity?
- Does this data change with time?
- Where does the data come from?

Important Notes:

- Affects choice of interface technology (input and output devices) and communication technology.

Contexts

- All activities happen in context. Must analyse both activity and context together.
- Context can be a difficult term.
- Three useful types of context are distinguishable:
  - Organization context: An organization rules and procedure affects the activity.
  - Social context: Social setting that the activity takes place.
  - Physical context: Physical circumstances under which the activity takes place.

Technology

- Input
  - How people enter data and instructions into a system securely and safely.
- Output
  - To display contents to people primarily using three perceptual abilities – vision, hearing and touch.
- Communication between people and between devices is an important part of designing interactive systems.
  - Consider bandwidth and speed
  - Depends on data and type of contents to be communicated

Technology – Input

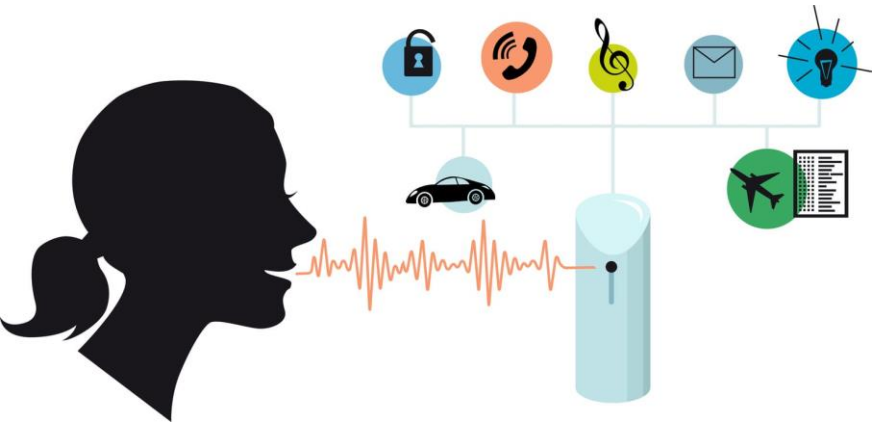
- Alphanumeric data
  - QWERTY keyboard (physical/virtual)
  - Handwriting (see direct-pointing device)
- Numeric data only
  - Keypads
- Selections
  - Indirect pointing devices
    - Mouse
    - Joystick
    - Pointing stick
  - Direct pointing devices
    - Touch-sensitive screen
    - Stylus



https://mycomputernotes.com/what-is-input-device/

Technology – Input

- Speech input
- Motion, air pressure, vibrations using sensors
- Eye tracking
- Brain activity (the future?)
  - Watch: https://www.youtube.com/watch?v=jXpjRwPQC5Q



https://www.aiperspectives.com/speech-recognition/



https://www.iqsdirectory.com/resources/gaze-your-way-through-eye-tracking-technology/



https://husale.2023cheapstore.com/category?name=rapael%20smart%20glove%20review

Technology – Output

- Screen or monitor
- Multi-touch surface
- Printers
- Sound
  - Earcons – audible alerts by the computer to convey events
  - Speech output e.g. satellite navigation
  - Text to Speech (TTS)
- Haptics
  - Force-feedback in game consoles
  - Vibrations of a mobile phone during ‘silent alert’ or when keys are pressed

PACT Analysis Outcome

- What you think your users do to complete their goal.
- Ideas for what you think your application should do to help users achieve their goal.
- Unanswerable questions – investigate!
- Revisit analysis again (if needed).

In-class Activity 2 – Work in pairs or groups of 3

- You need to design a mobile app that helps you organize your expenses
- Do PACT Analysis on the task and identify:
- People (users)
- Activities (tasks)
- Contexts (under which circumstances will the users be performing tasks)
- Technology (input, output, other technical details)

Required Reading

- Preece, Rogers, Y., & Sharp, H. (2019). Interaction Design: Beyond Human-Computer Interaction. Wiley-Blackwell. Chapter 2 & Chapter 13.2

- Benyon, D. (2019). Designing user experience a guide to HCI, UX and Interaction Design (Fourth edition.) Pearson. Chapter 2.