# Designing Interactive Systems I

## DIA Cycle, Observing Users, Brainstorming, Storyboards, and Sketching

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# Review

- What are different phases of the technology lifecycle?

- What were the key advances of

  - Put That There?

  - Apple Knowledge Navigator?

  - Starfire?

- What are PARC's Ubicomp device classes?

- What were the lessons learned from producing the Starfire video?

# Roadmap

## Human ✓

- Performance
- Models of interaction
  - Affordances
  - Mappings
  - Constraints
  - Types of knowledge
  - Errors
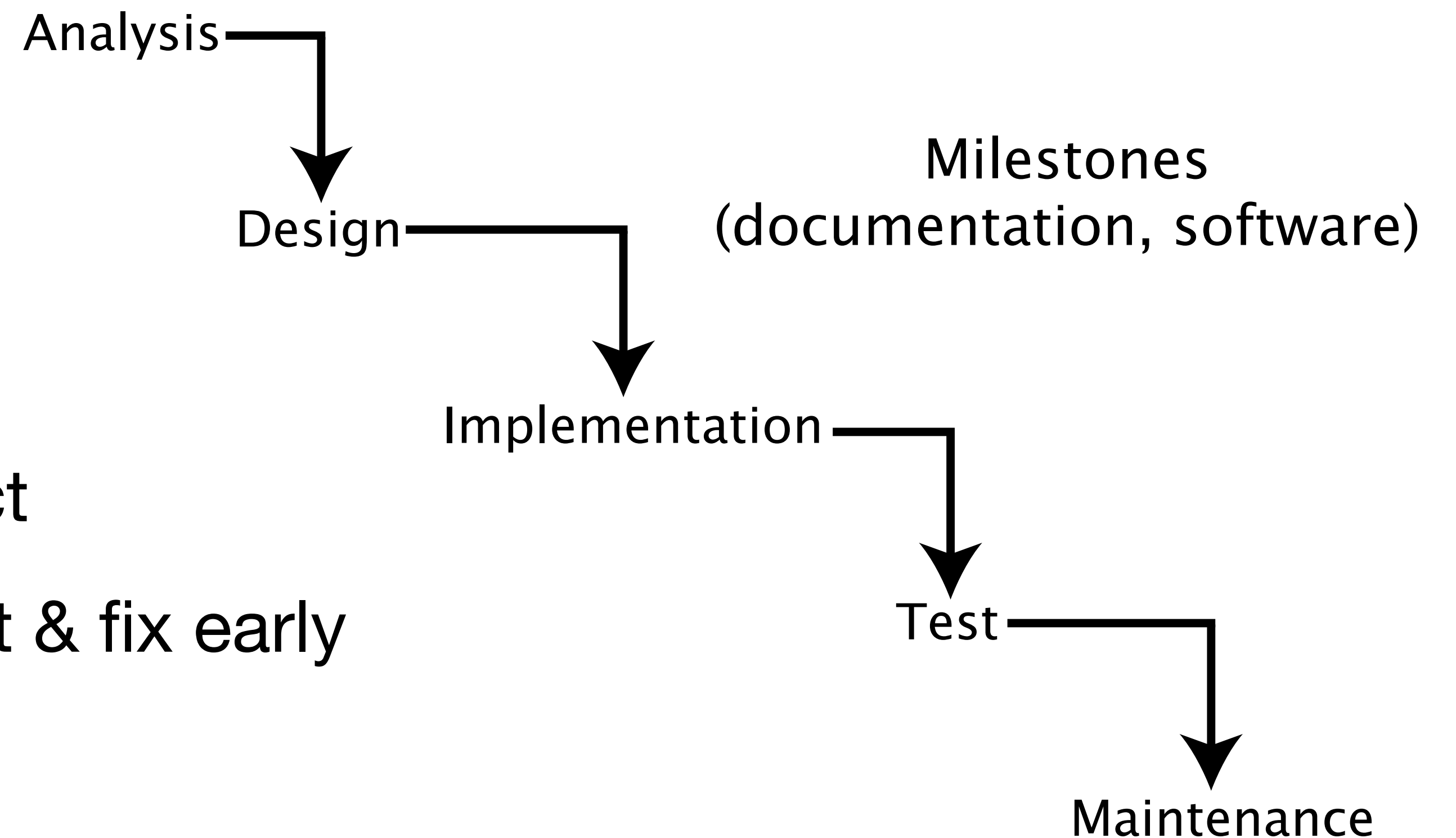- Design principles
- Visual Design

## Case Studies ✓

- History of HCI
- HCI Visions
- Technology Phases
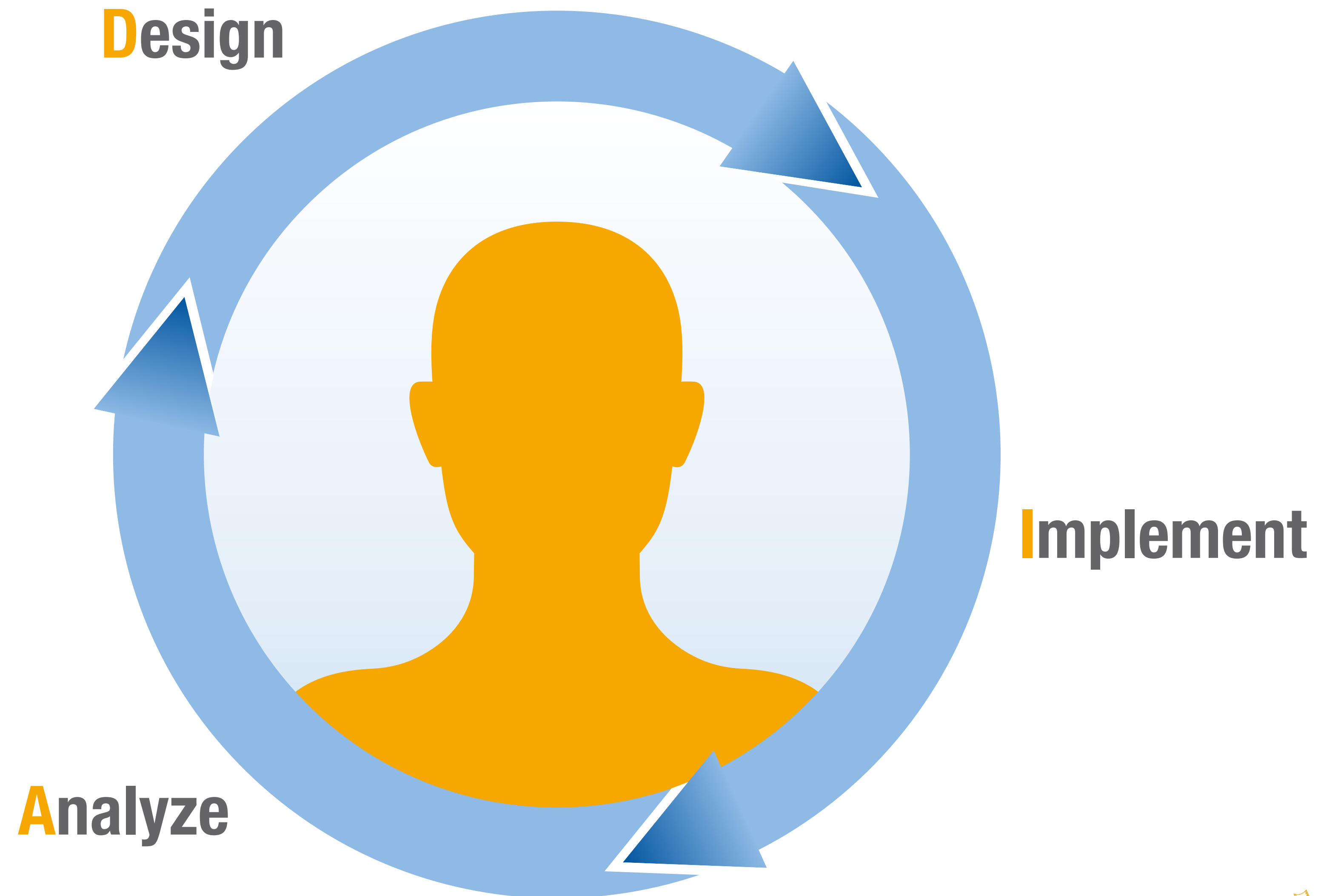
## Development Process

- Iterative design
- User observation
- Ideation
- Prototyping
- User studies and evaluation
- Interaction design notations

# The Wrong Way: Waterfall Model (1956)

- Widely used in software development, but

  - Phases idealistic, reality requires backtracking (insights grow, plans change)

  - Usage scenarios often too abstract

  - Wrong assumptions hard to detect & fix early

- Since the 80s, we know better…
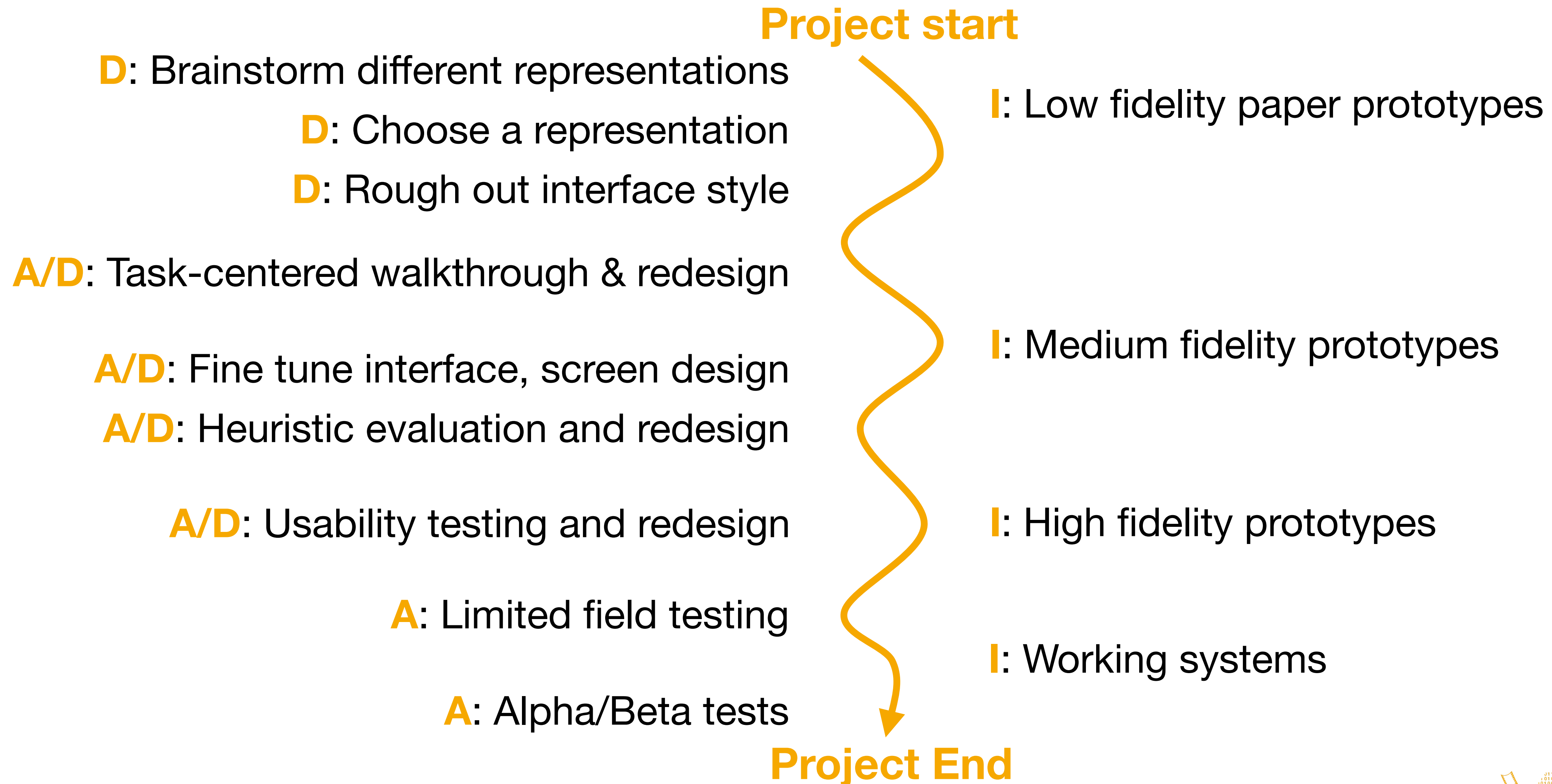
Analysis → Design → Implementation → Test → Maintenance

Milestones
(documentation, software)

# The Right Way: DIA Cycle



**Design**

**I**mplement

**A**nalyze

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# DIA Cycle

- Usually many iterations necessary

- With each iteration:

  - Design becomes more concrete & precise

  - Analysis and user feedback focuses on smaller and smaller problems

  - Implementation (prototype) gets more detailed and technically complex
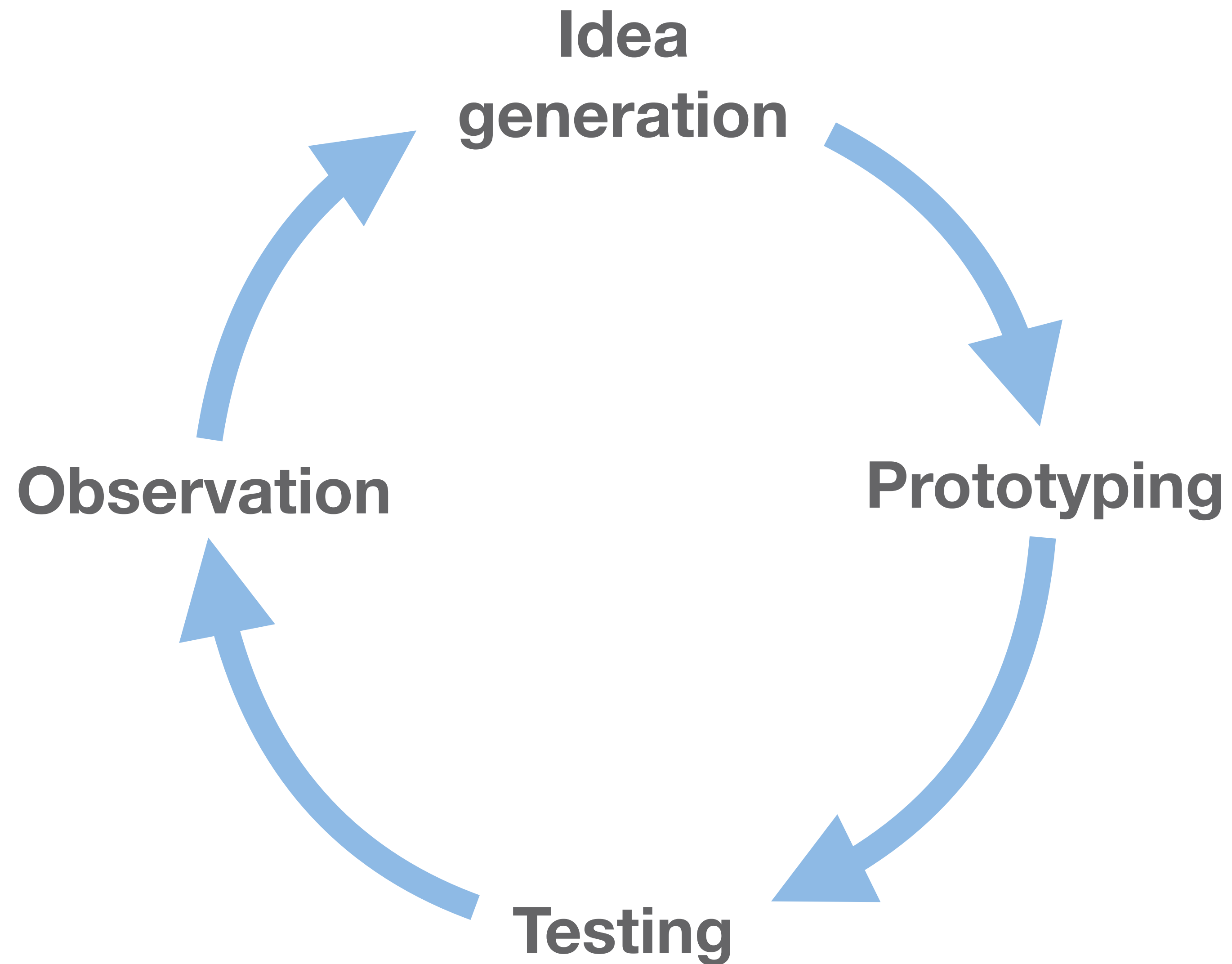
- Fix big design bugs first, small ones later

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# Unrolling the DIA Iterations

**Project start**

**D**: Brainstorm different representations

**D**: Choose a representation

**D**: Rough out interface style

**I**: Low fidelity paper prototypes

**A/D**: Task-centered walkthrough & redesign

**A/D**: Fine tune interface, screen design

**I**: Medium fidelity prototypes

**A/D**: Heuristic evaluation and redesign

**A/D**: Usability testing and redesign

**I**: High fidelity prototypes

**A**: Limited field testing

**I**: Working systems

**A**: Alpha/Beta tests

**Project End**

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# DIA Cycle in Our Projects

- Milestones for brainstorming, storyboarding, prototyping, user observation, and testing

- Feeding back into project design

- Real projects would require many more iterations

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# DIA Cycle in Norman's Book: Human-Centered Design Process



Idea generation → Prototyping → Testing → Observation → (Idea generation)

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# "One of my rules in consulting is simple: never solve the problem I am asked to solve."

# — Donald Norman

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# Root-Cause Analysis

- In the real world, problems need to be *discovered*

- We rush to solving a given problem without questioning if it is the *correct* problem to solve.

- Instead:

    A. Find the right problem (*root-cause analysis* to find the *root problem*)

    B. Find the right solution to it

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# In-Class Exercise

- Think about a daily problem people face. Use root-cause analysis to identify the actual root problem behind it!

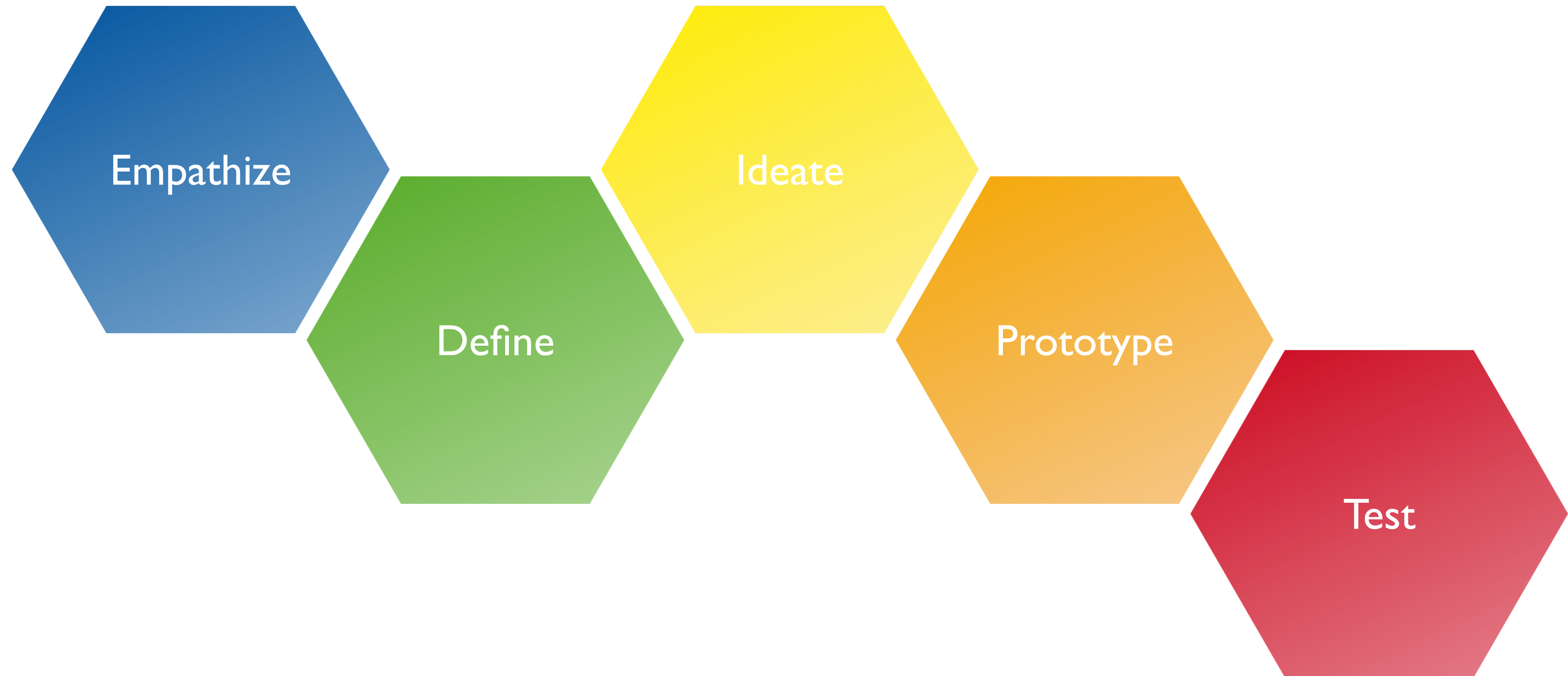- Keep asking why until you discover the root problem.

# Double-Diamond Model of Design

**Finding the right problem**

**Finding the right solution**

Amount of Alternatives

Discover     Define     Develop     Deliver

**Time**
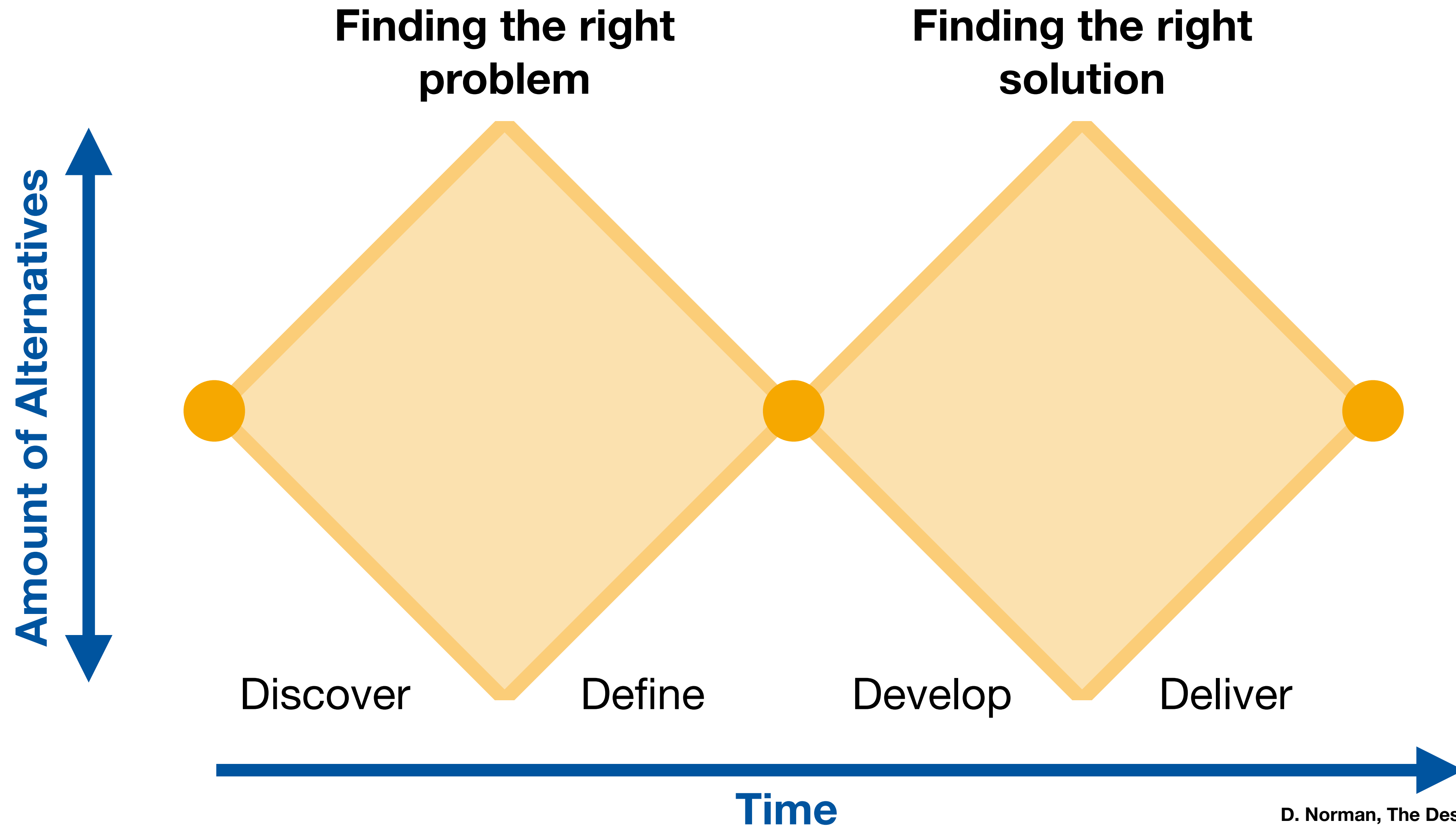
**D. Norman, The Design of Everyday Things, p. 220**

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# Design Thinking



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# The First Three Questions

- Whenever designing an interactive system, ask the following three questions first:

  **1. Who are the users?**

  **2. What do they want to do with the system?**

  **3. What is the context?**

- Many projects fail because these questions have not been answered!

- All three questions requires asking!

# Classifying Users

- Experience: Most central criterion

  - **Newbies** (no task knowledge) / first-time users (task knowledge): don't know UI, anxiety

    ➡ simple UI, few features, small consistent vocabulary, extensive feedback, help, and documentation

  - **Average** experienced users: know task well, UI so-so, forget functions

    ➡ clear menu structures, consistency, see & choose instead of remember & type, continued error protection

  - **Experts**, regular users: know task & UI well

    ➡ speed, efficiency, short nonintrusive feedback, shortcuts, macros, customizability, extendability

# More Dimensions to Classify Users

- Background

  - Name, age, nationality, education, income

- Computer experience

  - Particular apps, duration, depth (see before), special functions (printing, …)

- Task experience

- Personality

  - Introvert/extrovert, systematic/spontaneous, risk threshold, early/late adopter

# Observing Users

- Setting goals

  - How will you analyze the data from the observation?

- Identifying users

  - Who will you observe?

- Triangulation

  - Use multiple sources and methods (interviews,…) to confirm your observations

- Pilot observation

  - Do a small-scale observation to debug the process

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# Simple Observation Framework

- **People:** Who is using the technology at any particular time?

- **Places:** Where are they using it?

- **Things:** What are they doing with it?

Preece et al., Interaction Design, 3rd ed., 2001

# Detailed Observation Framework

- **Space:** What is the physical space like and how is it laid out?

- **Actors:** What are the names and relevant details of the people involved?

- **Activities:** What are the actors doing and why?

- **Objects:** What physical objects are present, such as furniture?

- **Acts:** What are specific individual actions?

- **Events:** Is what you observe part of a special event?

- **Time:** What is the sequence of the event?

- **Goals:** What are the actors trying to accomplish?

- **Feelings:** What is the mood of the group and of individuals?

Preece et al., Interaction Design, 3rd ed., 2001
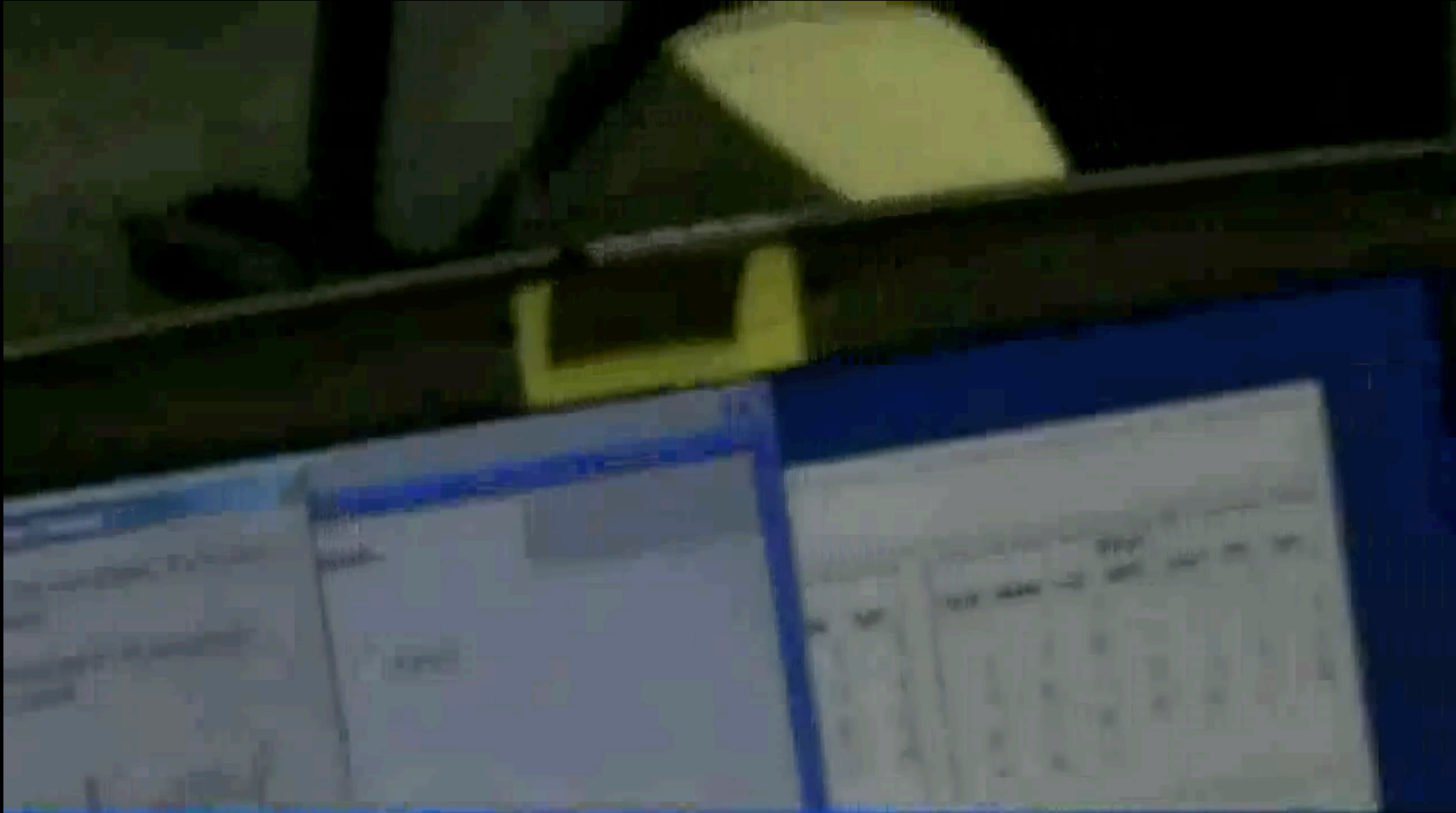
A study of
Projector Use

# Interview: Preparation

- Create interview protocol: What will you ask?

- For initial input, do not focus on presenting your design ideas, but on learning about the **task**

- Pilot interview

  - Interview one student inside/outside your group

  - A separate observer to note the pitfalls

# How to Ask Questions

- Clear and simple, not too broad

  - "How do you like the UI?" is too general!

- Users don't always answer truthfully

  - Lack of knowledge, bad estimates, embarrassment

  - So formulate questions carefully, maybe indirectly

- No leading questions!

  - E.g., Want to ask: Do we need to add audio playback to an ebook reader?

    - "Do you want audio playback in an ebook reader?" ←**Leading question (bad)**

    - "Do you listen to audio while you are reading an ebook?" ←**Better question**

# Interview Results

- User profile

- Task profiles

- If system involved:

  - Problem areas with the system

  - Ideas for improvement

- In our case: an idea of the task our system should support

# Personas: Who Are the Users?

- Precise description of hypothetical users

- Act as stand-in for real users

  - Guide design decisions

- Fictitious, but based on knowledge of real users from observations

- Personas are not elastic

  - Avoids stretching users' assumed abilities, instead of creating a good design



**Preece et al., Interaction Design, 3ed., 2011**

# Ginnie

## BACKGROUND

- 15, Female
- Ongoing Private Education
- Ambitious
- Comfortable using technology to communicate

## MOTIVATIONS

- Keeping in touch with her network
- Fashion/street cred
- Keeping up with peers.

## FRUSTRATIONS

- Sad people trying to be 'friends' on Facebook
- Having to be in bed @ 11pm
- Being swamped in friends update
- Missing important status updates

Receives private tutoring in Maths and English as these are not her strong subjects. Enjoys playing for the school's 2nd teams for netball and Lacrosse and is good at art.

She loves recording her favorite shows: ER and Sun Valley High on Sky+ and spends some of her time on her laptop that Daddy bought her watching videos on YouTube, downloading music, keeping up to date with her friends on Facebook and chatting via MS IM to her cousin who is at University in Leeds.

She loves Ugg boots and Abercrombie & Fitch and uses the Internet to shop and find the cheapest prices.

"I want to easily hook up with my friends whilst watching TV"

# Brainstorming: An Initial Design Technique

- Goal: Collect as many ideas on a given topic as possible

- Relax, have fun, invite good brainstormers

- Defer judgment, don't criticize or argue

  - Instead, leapfrog on each other's ideas

- Quantity, not quality; include crazy ideas

  - Go for a certain number of ideas, say, 100

- Scribe collects ideas visible for all

- Limit to 5–10 minutes

# To Help You Brainstorm

- Think of habits

  - Positive

  - Negative

- Think of physical gadgets and how the habits can be linked to the them

- Stick to a particular domain (e.g., diet, exercise, drinking, smoking, hygiene, etc.)

- Try to answer: "Who?" "What?" "Where?"

# In-Class Exercise: Brainstorming

- Problem: **How to motivate people to clean their rooms?**

- Create as many (crazy!) design ideas as possible

  - One person creates sticky notes

- Go for quantity not quality

- One idea per sticky note (write or sketch)

- Duration: **5 mins**

# Structuring Brainstorms: Concept Mapping

- Used since 1500s by Spanish monks

  - Mind Mapping trademarked by Tony Buzan in 70's

- Uses both brain sides, structures note-taking for overview, planning, learning… with a visual "gestalt"

  - Use A3 landscape, subject in middle, aspects on branches, subtopics on subbranches (software?)

  - Connect additional relationships with arrows

  - Use images/icons for keywords where they work

  - Use color for branches & connections (after pencil version becomes stable)

- Grows over time, combine individual maps

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# INTERACTIVE LARGE PUBLIC DISPLAY

## Socializing
- Interactive help
- making compliments
- flirting
- automatic partner search
- chatting
- giving presents
- dating
- finding bars/restaurants/parcs
- finding authors tips
- making a party in the usalion

## Online meeting
- Video conferencing
- Whiteboarding
- file sharing
- talking to people in different institutions
- establishing relationships
- multi-user games

## Map/orientation
- sightseeing
  - ideas for
  - finding locations that you have not known before
- finding restaurants close to the station with special offers
- Navigation
- news

## Information
- Sport news
- weather forecast
- change it
- traffic
- find out if train is late
- tell the time in different countries
- Cinema or even watch previews
- concert info/schedule
- descriptions
- Sport
- politics
- commercials
- TV program
- parties
- life view info parties
- event schedule
- advertisements
- blackboard
- message board
- tourist information
- book hotel
- tour guide
- Note

## Emergency case
- alarm
- help calls
- Pacification
- slow escape route
- emergency exit

## Entertainment
- art & design
- virtual museum tour
- decorating & improvement of environment
- foto manipulation
- design your own commercial
- drawing & painting
- interactive aquarium
- conduct an orchestra
- virtual worlds
- try life of someone else
- another century (eg 1200)
- comic world
- airplane simulation
- make-over
- make-up
- hair
- clothes
- type advisor (ladies)
- play an instrument
- Super stars
- shopping
- gambling
- Graffiti
- reproduce moves & gestures
- acting
- decorate a room
- Single or multi-user Games
- jigsaw Puzzle
- chess
- Sport games
  - skiing
  - soccer
  - basketball
  - football
  - tennis
  - golf
  - frog
  - pong
- the throwing at the garbage collector game
- singing/karaoke/dancing
- be the dj of the usalion

# In-Class Exercise: Concept Map

- Create a concept map for the problem:
  **How to motivate people to clean their rooms?**

- Use first-level branches for different aspects of your idea

- Note how the graphical layout helps you to organize your thoughts

- Use color + graphics to increase visual impact and uniqueness

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# Storyboard: What do they want to do with the system?

- **What?**

  - Sequence of single images, like visual outline of a film

  - Visual representation of a script, illustrates interaction

- **Why?**

  - Describes task showing environment, user, and computer

  - Or describes UI as series of screen images (but include user representation)

  - Helps working out interaction details

  - Great at-a-glance overview of interaction

  - Helps developing usage scenarios, tasks, and tools

- **When?**

  - After describing a task, storyboard it, take it back to the user. Did you get the story right?
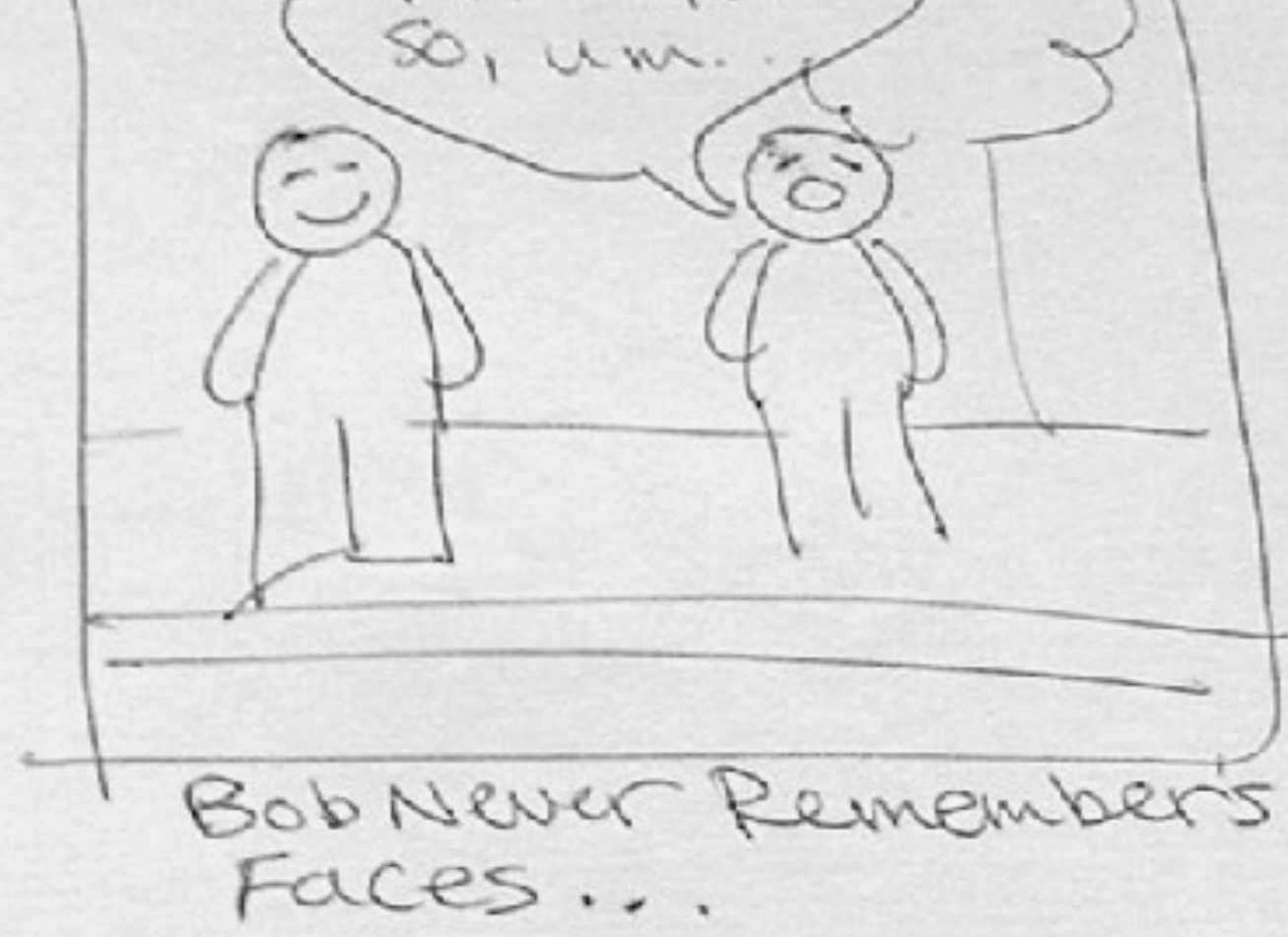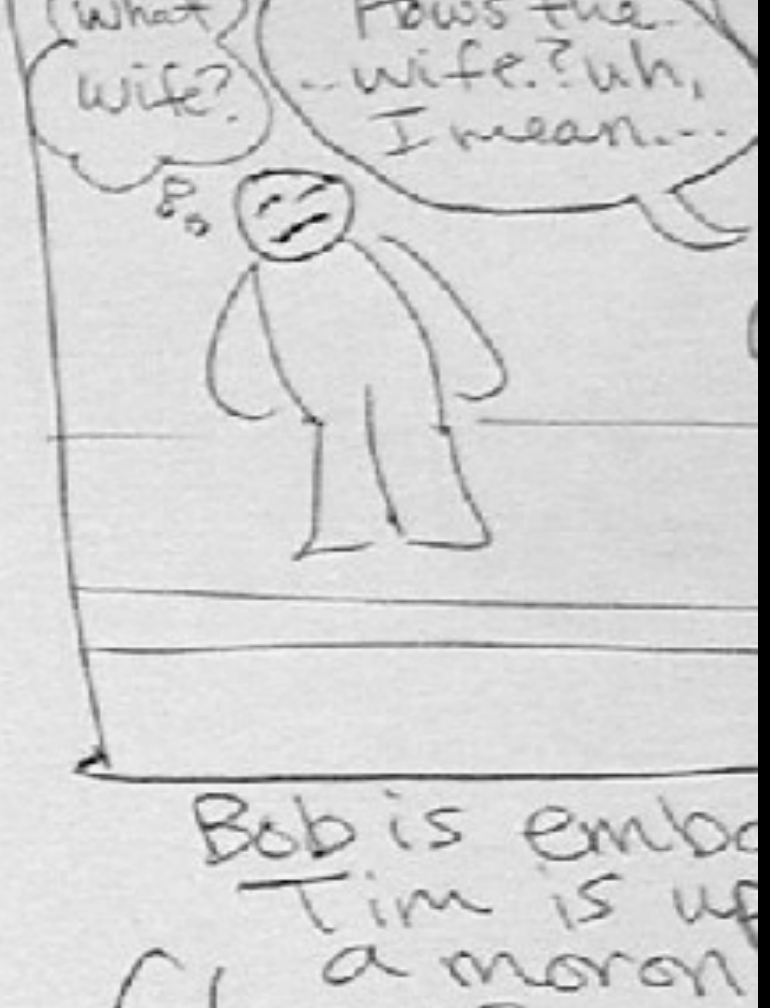
# How To Draw Users

- Star Man and friends (interactive blackboard interlude)

  - Stick Man (bad)

  - Star Man

  - Sad, happy Star Man

  - Star Man pressing a button

  - Star Trek Man, Simple Star Trek Man

  - Family, users around an exhibit

  - Architect Man, Suits

  - A hand, a face

# Learning About Users

- Providing useful functions is not enough

- Functions also need to fit seamlessly into users' task environment, otherwise it won't be used (cost/benefit)

- So: **Know The User!**

- Find real people interested in your planned system
(otherwise there's a problem)

# References on Storyboarding

- Full version of Bill Verplank's sketching guest talk:
http://hci.rwth-aachen.de/verplank

- More examples:
Brenda Laurel, "The Art of Human-Computer Interface Design"

- Learning to draw:
Betty Edwards, "The New Drawing on the Right Side of the Brain"

- Digital storyboards: http://www.storyboardthat.com/

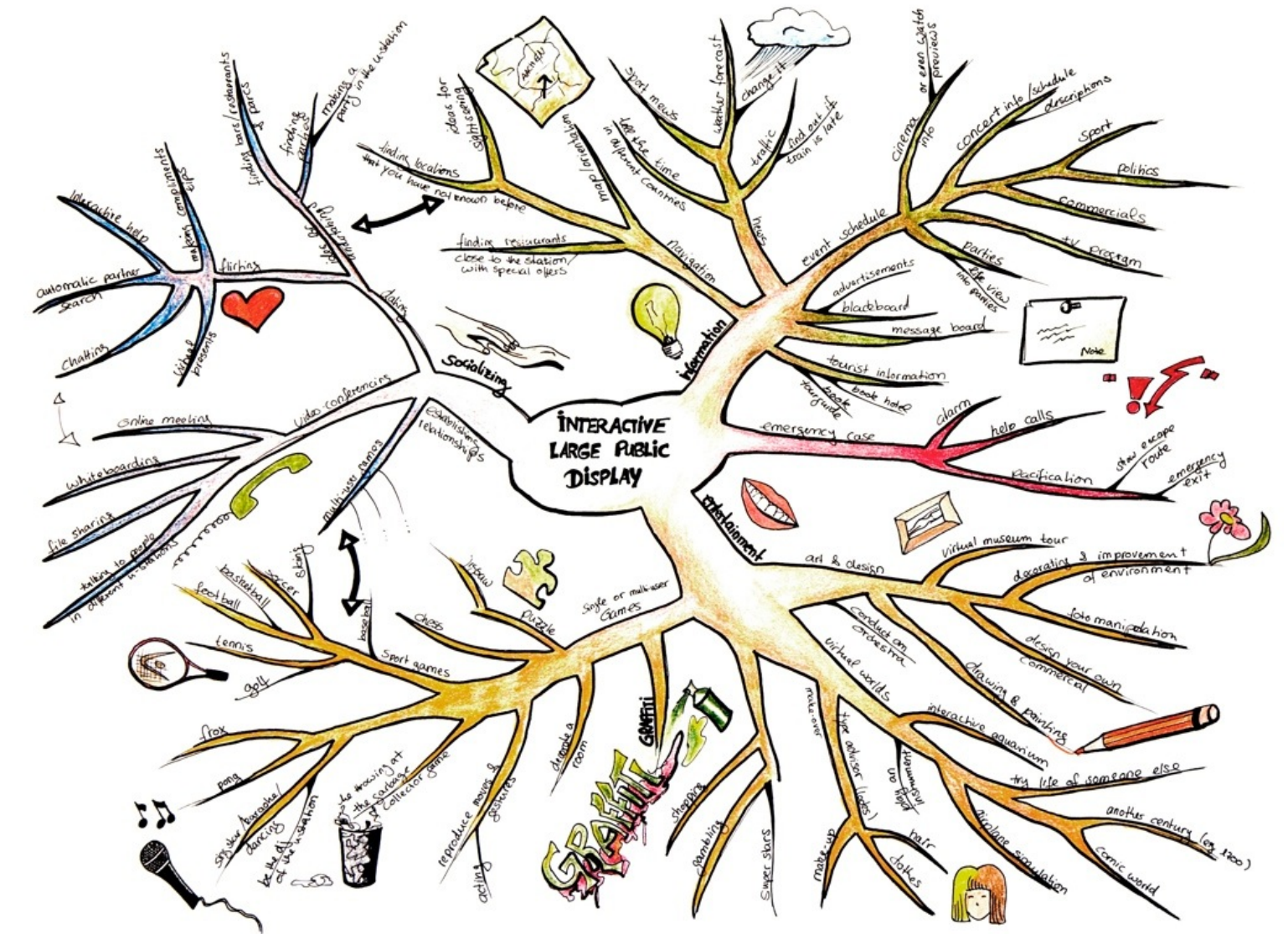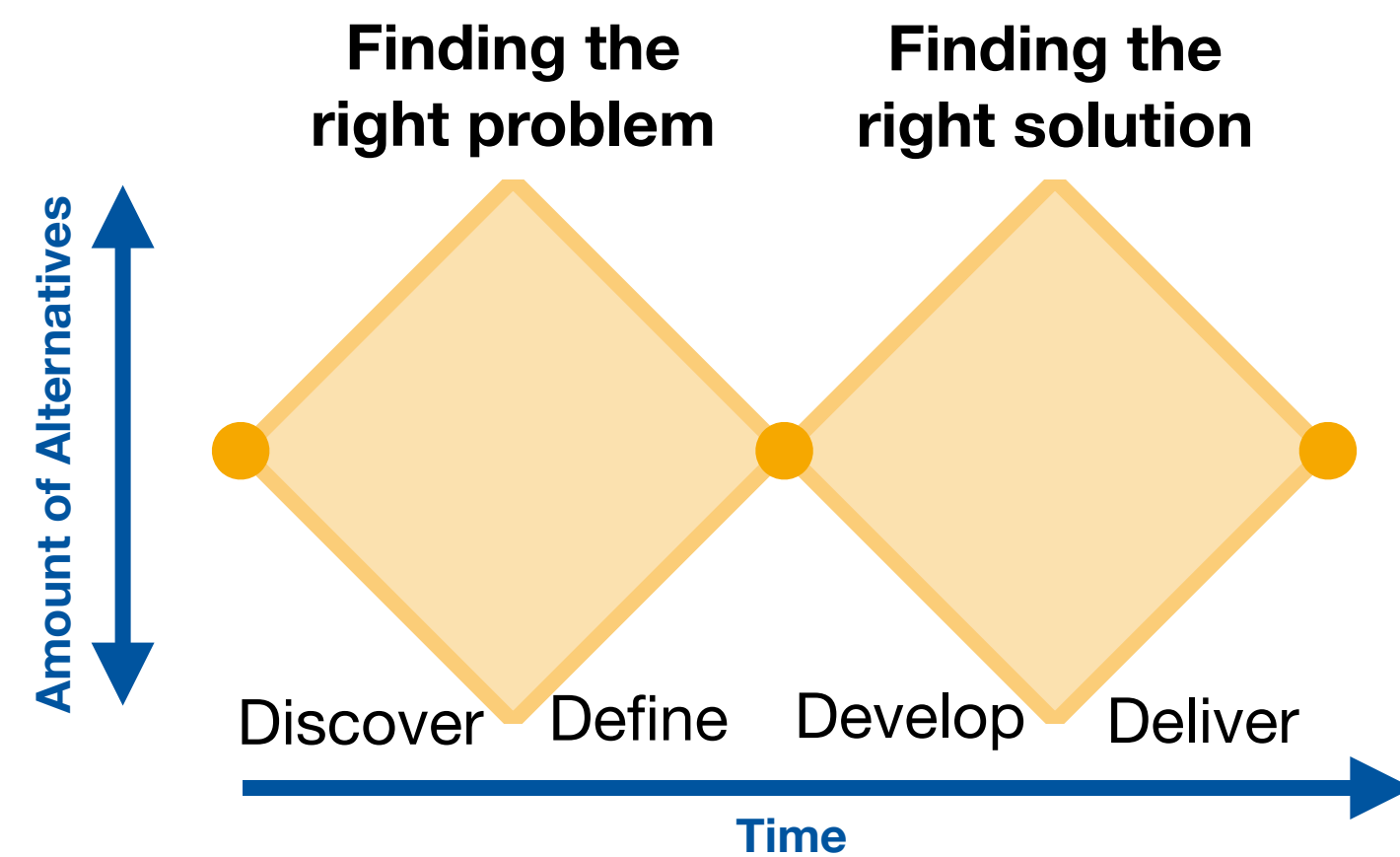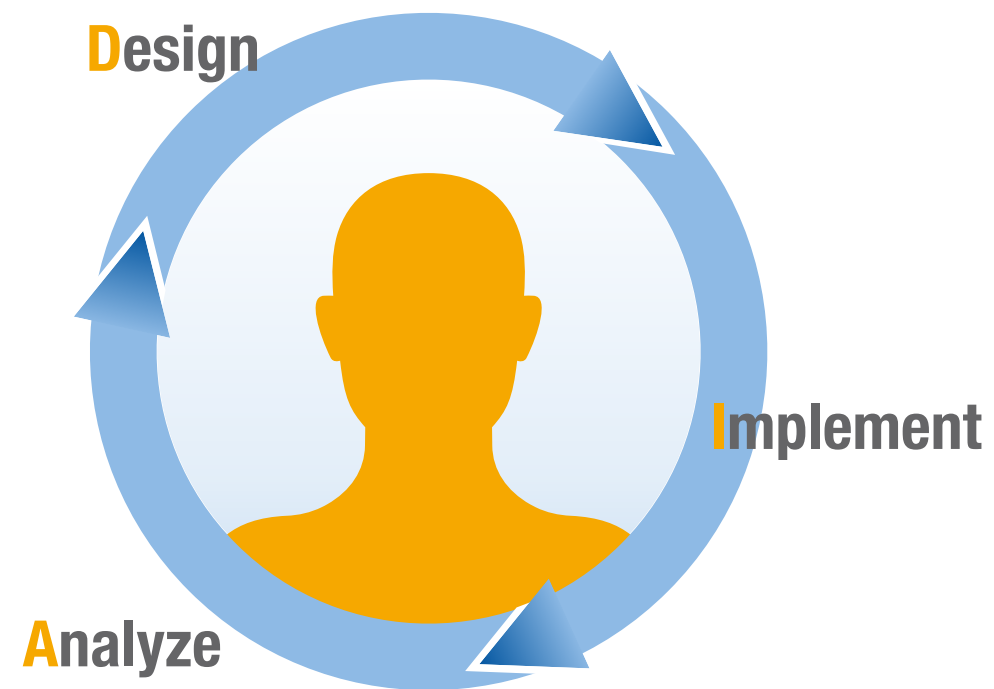  - But: Manual sketching is essential in design meetings!
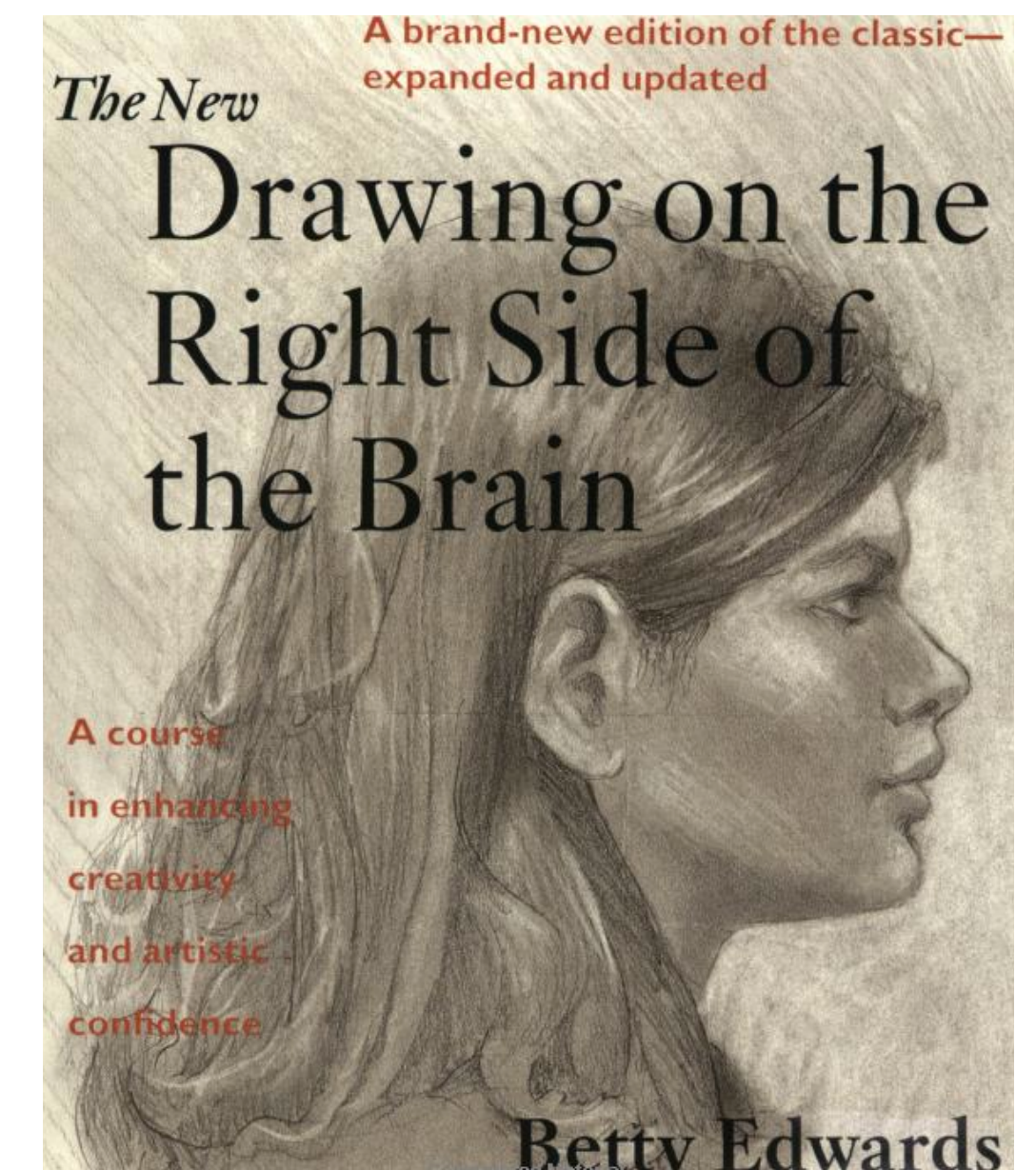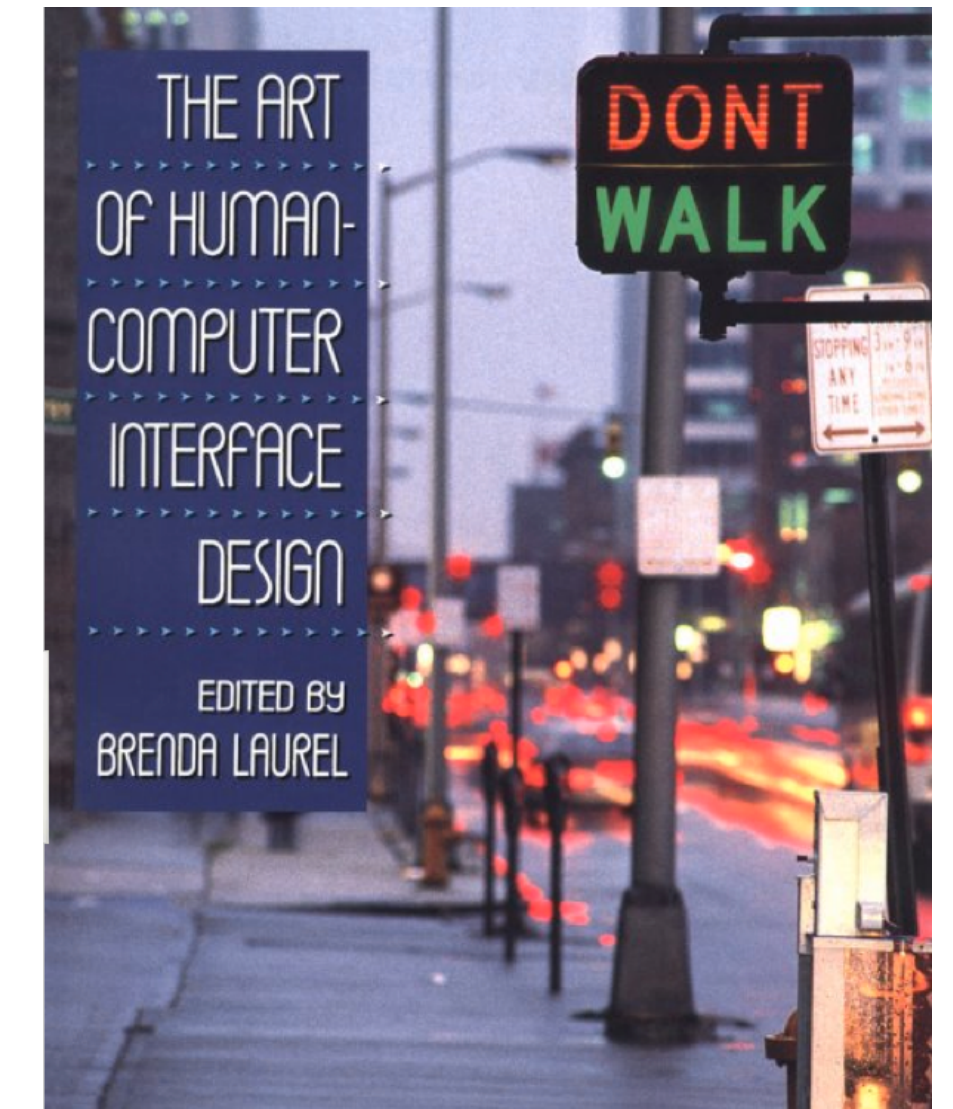
# In-Class Exercise: Storyboard

- Draw a simple storyboard for your preferred brainstormed idea

- Show how it helps users with a task in three pictures

- Make it readable from 2 m distance

- Walk-around idea fair

- Upload a photo of your storyboard to the Miro board.

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# Summary





Finding the right problem — Finding the right solution

Discover · Define · Develop · Deliver



- The three questions:

  - Who are the users?

  - What do they want to do with the system?

  - What is the context?

- Storyboards:

  - What? Why? When?



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