Mobile Application Development
L03: User-Centered Design

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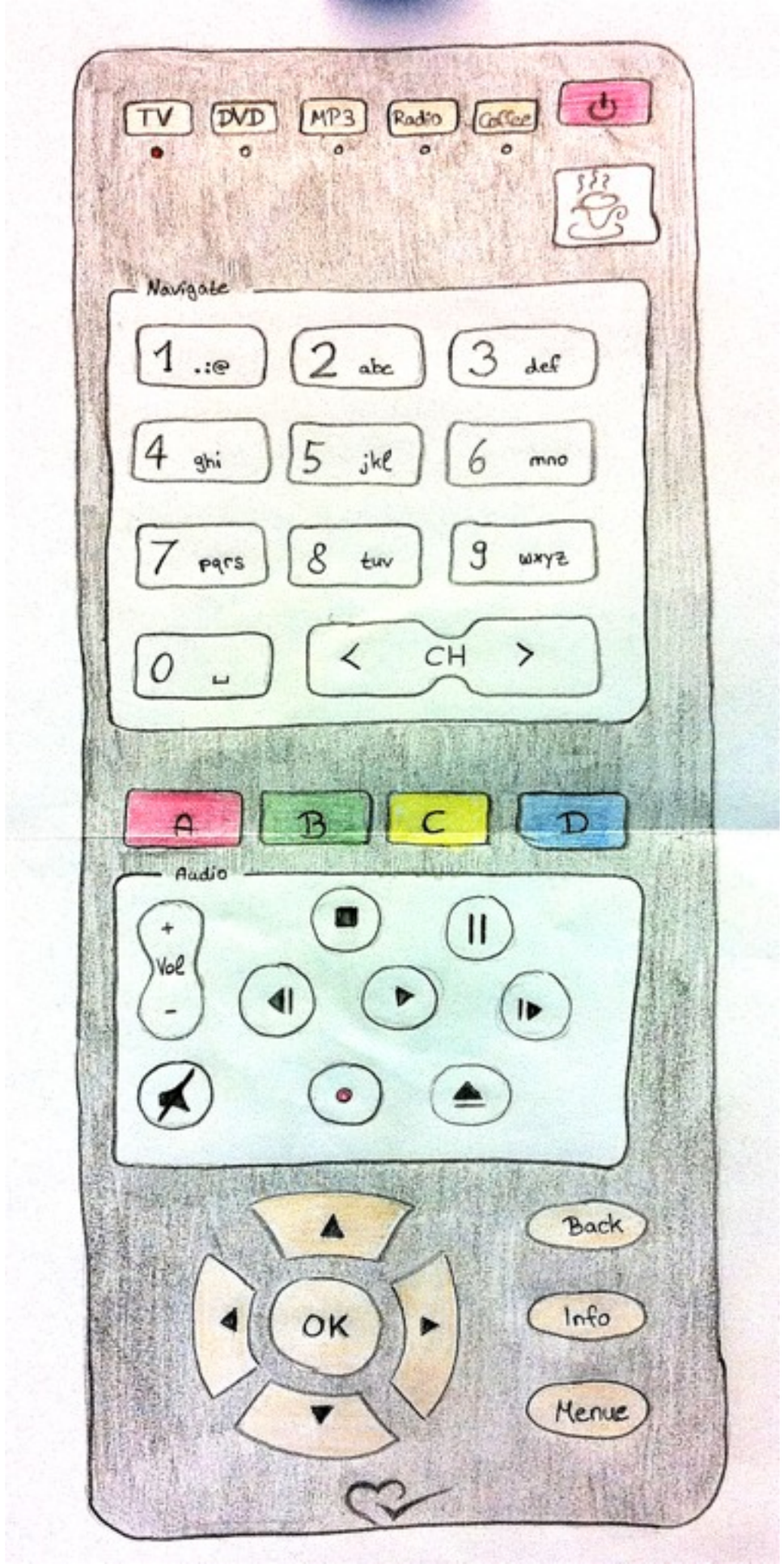
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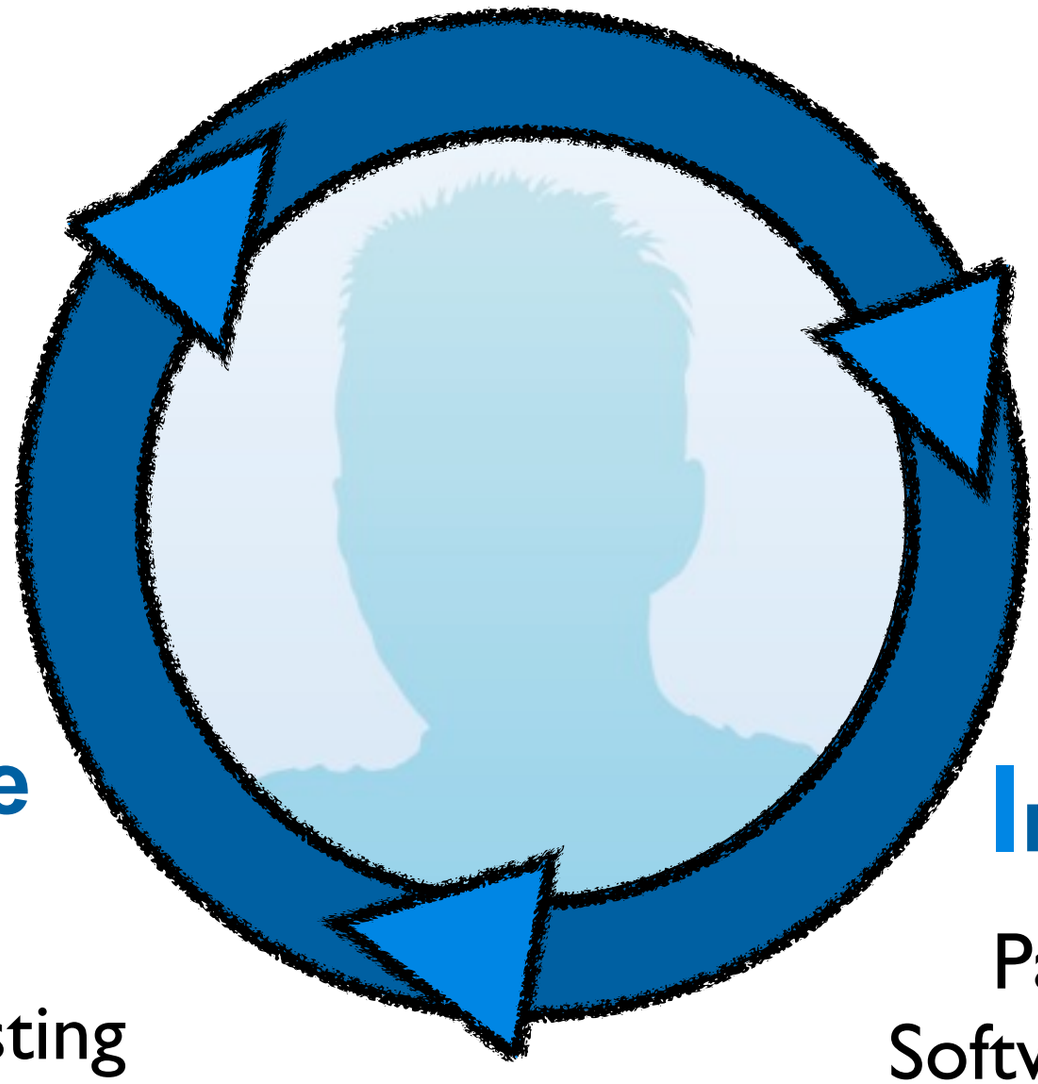
User-Centered Design

Six Hats
Brainstorming
Concept Mapping
Storyboarding

Design



Analyze

User Testing
Heuristic Testing

Implement

Paper Prototypes
Software Prototypes

DIA Cycle

- Usually many iterations necessary
- With each iteration:
  - Design becomes more concrete & precise
  - Implementation (prototype) gets more detailed and technically complex
  - Analysis and user feedback focuses on smaller and smaller problems
- Fix big design bugs first, small ones later

The First 2 Questions

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

1. **Who are the users?**
2. **What do they want to do with the system?**

Many projects fail because these questions have not been answered!

Q1 requires thinking, but Q2 asking!

Design

Brainstorming

Collaborative Idea Generation

- Formulate Problem
  - general (explorative) vs. specific (focussed)
- Recruit participants
  - aim for diversity (expertise, gender, position, ...)
- Organize the session
  - Include the problem statement in the invitation
  - Create a relaxing atmosphere
  - Make sure ideas are captured and visible

Brainstorming Rules

1. No criticism
   Defer judgement and arguments

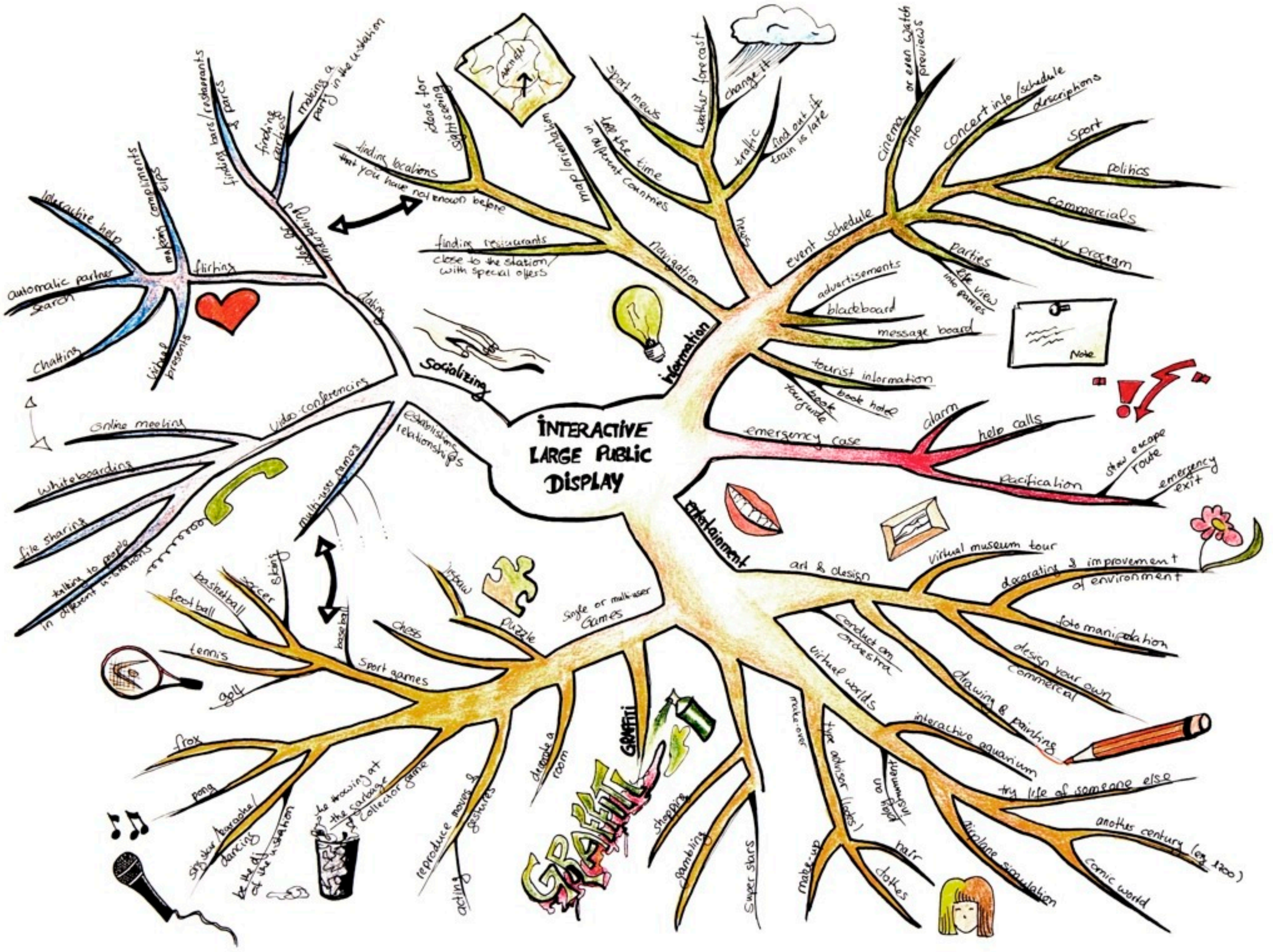
2. "Free-Wheeling" is welcome
   The crazier the idea the better (it is easier to tame down than to think up)

3. Go for quantity
   More ideas means a better chance for good ideas

4. Combine and improve
   Suggest how other ideas can be turned or merged into better ideas ("leap-frogging")

Concept Mapping

- Tree-structure for notes (or ideas)
  - Optimized for understanding, planning, and learning
  - Root: overall topic (in the center)
  - Branches: aspects and connections (hierarchical)
  - Leaves: notes (or ideas)
  - Arrows can visualize additional relationships
- Augment with color (grouping, highlighting) and images (illustration, memory aid)



INTERACTIVE LARGE PUBLIC DISPLAY
Socializing
information
entertainment
dating
flirting
interactive help
making compliments
tips
automatic partner search
chatting
virtual presents
finding bars/restaurants & parcs
finding partners
making a party in the u-station
ideas for the weekend
video-conferencing
online meeting
whiteboarding
file sharing
talking to people in different u-stations
establishing relationships
multi-user games
finding locations that you have not known before
ideas for sightseeing
map/orientation
finding restaurants close to the station with special offers
navigation
tell the time in different countries
sport news
weather forecast
change it
traffic
find out if train is late
news
event schedule
cinema info
or even watch previews
concert info/schedule descriptions
sport
politics
commercials
TV program
parties
life view into parties
advertisements
blackboard
message board
Note
tourist information
book hotel
book tourguide
emergency case
alarm
help calls
show escape route
pacification
emergency exit
virtual museum tour
art & design
decorating & improvement of environment
foto manipulation
design your own commercial
drawing & painting
interactive aquarium
try life of someone else
another century (eg. 1700)
comic world
airplane simulation
virtual worlds
conduct an orchestra
make-over
hair
clothes
make-up
play an instrument
type advisor (looks)
super stars
gambling
shopping
GRAFFITI
decorate a room
Single or multi-user Games
puzzle
jigsaw
chess
Sport games
baseball
skiing
soccer
basketball
football
tennis
golf
frox
pong
dancing
singstar/karaoke/
be the dj of the u-station
reproduce moves & gestures
acting
the throwing at the carbage collector game

In-Class Exercise

- Brainstorm a new interface for the universal remote from assignment 1
  - TV, DVD, MP3, Radio, Coffee Maker
- Collect the ideas in a concept map
- Groups of 5-6 students

Storyboarding

- Sequence of single images
  - Augmented with text (speech bubbles)
- Visual representation of a script = tell a story
- Focus on the interaction
  - Do not get lost in unimportant details
  - Describe the task of a user with a computer in an environment

Storyboarding Goals

- Communicate your idea
- Refine the interaction details
- Develop usage scenarios, tasks, and tools

Two friends watching soccer

Who do you think will win the soccer match?

I think Aachen will

Ok let's bet, if Aachen wins you owe me 2 Beer and the other way around.

Ok, I send you an invitation in 14 Bet Via

Yeah, Aachen did it!

Damn, you won

After several week and a lot of bets later in a bo

So someone over there some beer

I will drink it

Buddy

Bets: 34 Wins: 2

Buddy owe's you 10 beer

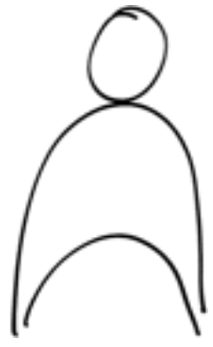
Haha, you owe me 10

Damn, but I bet you are not able to drink them all today!

And so it continues ...

How To Draw Users

Stick Man (bad)



Star Trek Man

Mr. Mac

Star Man

Mr. Architect

In-Class Exercise: Storyboard

- Groups of 2!
- Draw a storyboard that illustrates your favorite feature from the previous brainstorming
- Make it readable from 2 m distance
- Hang the storyboard on the wall
- Open Discussion with the other groups

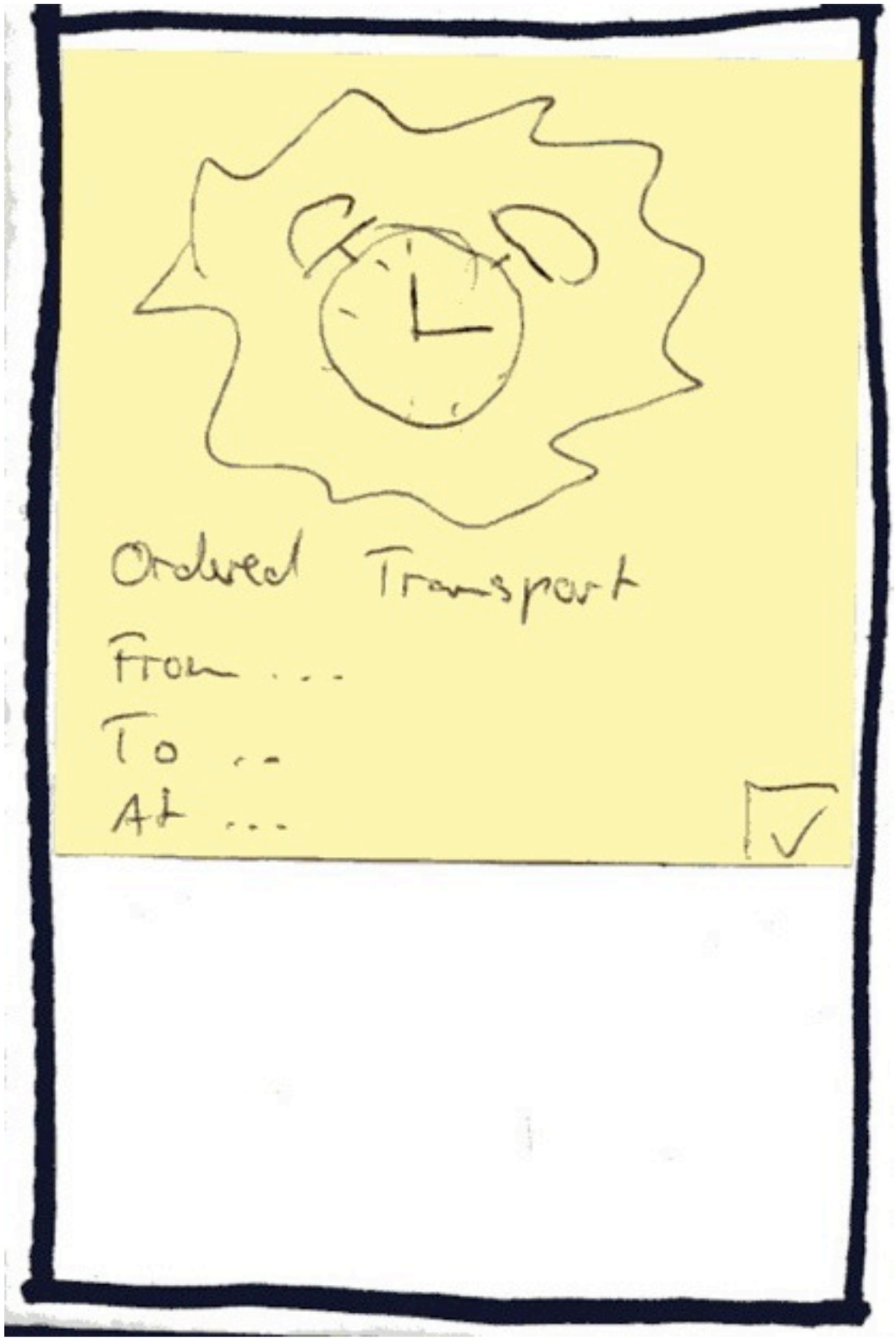
Implement

Paper Prototypes

- Low-fidelity prototype
  - Quick and cheap, good first prototype
  - Affords high-level (generic) feedback
- Rough paper & pencil sketches of the user interface
- Hand-drawn, no ruler, no computer!

Post-It Prototype

- More interactive paper prototype
  - Simulate interacting with dialogs, menus, windows by manipulating the Post-Its
- Quick to change by making new notes
  - Prepare empty templates for dialog objects, then fill in
  - Can be used to refine your prototype while testing!


Ordered Transport
From ...
To ...
At ...

Software Prototype

- Medium-high fidelity prototype
  - More detail, more precise, interactive
  - Create only after initial, simpler (paper) prototypes!
  - Affords low-level (detailed) feedback
- Mock-up (model, illusion) of some (but not all) aspects of the final UI
  - Example: Screenshots, Flash animation
  - Important: UI, not functionality is key!

Window

From | To

Lorem ipsum dolor sit er elit lamet, consectetaur cillium adipisicing pecu, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud

Wed Feb 23	11	45	
Thu Feb 24	12	50	AM
Today	1	55	PM
Sat Feb 26	2	00	
Sun Feb 27	3	05	

led

Library

Objects | Classes | Media

Library

provides an embeddable interface to navigate map content.

Text View – Displays multiple lines of editable text in a scrollable view.

Ad BannerView – Provides a mechanism for displaying banner advertisements to a user.

Scroll View – Provides a mechanism to display content

Text View
UITextView

UITextView displays a region that can contain multiple lines of editable text in a scrollable view. When a user taps a text view, a keyboard appears. Which keyboard appears, how capitalization is handled and other text input traits can be configured. You can specify attributes, such as font, color, and alignment, that apply to all text in a text view.

Filter

Software Prototype Dangers

- Users focus on design details and overlook larger problems
- Users afraid to criticize or suggest changes to "nice" UI design
  - Looks like it was so much work…
- Management may think it's real
  - Looks like the software is almost done
  - Reason: Conceptual models

How to limit prototypes

Scenario

Combination of both

Fixed interaction path

Vertical prototype

Few functions, but those in detail

Testing design ideas by example

Horizontal prototype

Entire UI visible, but no functionality

Simulate each interaction step (nothing “works”)

Analyze

Why Evaluate?

- To ensure that the system matches user needs
  - Judge system features usefulness
  - Judge impression on users
  - Uncover design problems
- Evaluation happens with every iteration
  - Early designs: evaluated by the design team
  - Later prototypes: evaluated with users

Evaluation Techniques

Evaluating Without Users

E1 Literature Review

E2 Cognitive Walkthrough

E3 Heuristic Evaluation

E4 Model-Based Evaluation

Evaluating With Users

Qualitative

E5 Model Extraction

E6 Silent Observation

E7 Think Aloud

E8 Constructive Interaction

E9 Retrospective Testing

Quantitative

E10 Controlled Experiments

+ Interviews, questionnaires,...

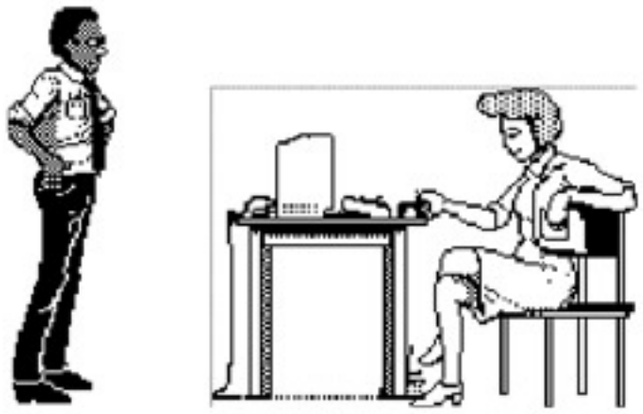
E2: Cognitive Walkthrough

- Expert = designer or cognitive psychologist
- Goal: Judge learnability and ease of use
- Step through each task and ask:
  1. How does the interaction influence the user?
  2. What cognitive processes are needed?
  3. What problems could learning/doing this step have?
- Requires interface description (prototype), task description, and user profiles

✓…
✓…

E3: Heuristic Evaluation

- Variant of the Cognitive Walkthrough
- Choose usability heuristics
  (e.g., 10 Golden Rules)
- Check for each step whether the rules are followed
- Quick and cheap, but subjective
  - Better done by several independent designers



E6: Silent Observation

- Designer watches user working a task
- No communication during observation
- Helps discover big problems
- But: no understanding of the decision process (that lead to problems), the user's mental model, opinions, or feelings

E7: Think Aloud

- As E6, but user is asked to say aloud
  - What she thinks is happening (state)
  - What she is trying to achieve (goals)
  - Why she is doing something specific (actions)
- Good to get some insight into user's thinking
- But: feels weird for most users (can change behavior)

E8: Constructive Interaction

- Two people work on a task together
  - Normal conversation is observed (and recorded)
  - More comfortable than Think Aloud
- Variant: different roles
  - "Trainer and Student": student operates and asks, trainer answers
  - Gives insight into mental models of beginner and advanced users at the same time

Other Evaluation Methods

- Before and during the design, with users:
  - Questionnaires
  - Personal interviews
- After completing a project:
  - Bug reports, hotlines, forums, blogs, ...
  - Retrospective interviews and questionnaires
  - Field observations
- Scientific: Hypothesis Testing

Recording Observations

- Paper & pencil
  - Be prepared: forms, shortcuts for common terms
- Audio recording
  - Often hard to match audio with interactions
- Video
  - Ideal: two cameras (user & screen), but: intrusive
- Software
  - Log interactions and events with time stamps

Dealing with testers

Tests are uncomfortable for the tester

Pressure to perform, mistakes, competitive thinking

Treat testers with respect at all times

Before, during, and after the test

Before the test

- Do not waste the testers' time
  - Be prepared, run pilot tests
- Make sure the testers feel comfortable
  - Stress that the system is being tested, not them
- Guarantee privacy
- Inform tester
  - Explain what is being recorded
  - Answer questions

During the test

- Do not waste the testers' time
  - Do not make them complete unnecessary tasks
- Make sure the testers feel comfortable
  - Relaxed atmosphere: breaks, coffee, sweets
  - Hand out test tasks one by one
  - Avoid interruptions (cell phones, …)
- Guarantee privacy
  - Do not let others watch

After the test

- Make sure the testers feel comfortable
  - Stress that tester has helped finding ways to improve the system
- Inform tester
  - Answer any questions that could have changed the experiment if answered before the test
- Guarantee privacy
  - Publish only anonymized results
  - Publish test recordings only with written consent

Summary

- DIA Cycle = Design, Implement, Analyze
- Design Techniques
  - Six Thinking Hats, Brainstorming, Concept Maps, Storyboards
- Implementation Techniques
  - Paper Prototypes, Post-It Prototype, iPhone...
- Analysis
  - Evaluation without / with users