HUMAN COMPUTER INTERACTION

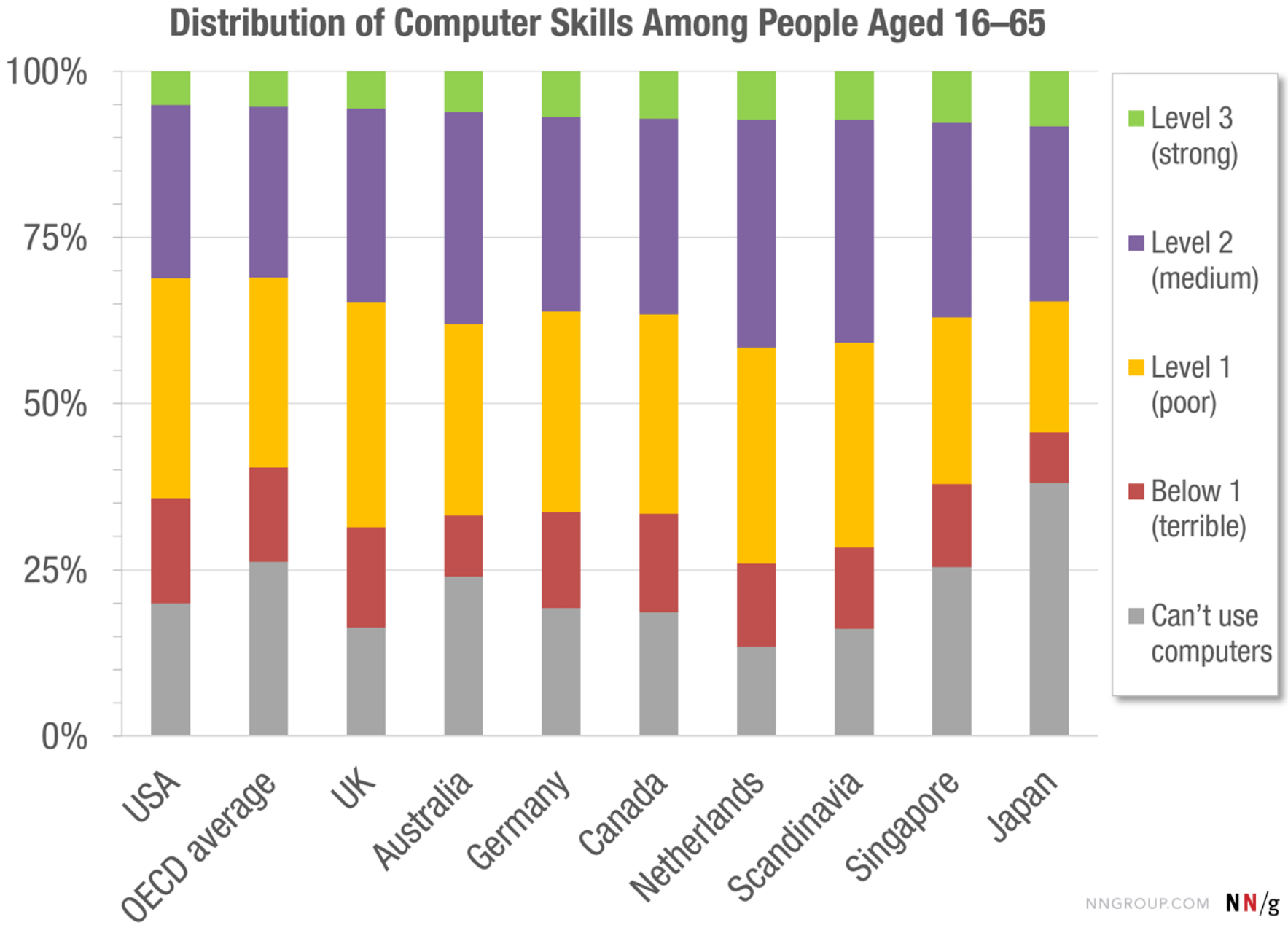
Dr Kami Vaniea

18th September 2017

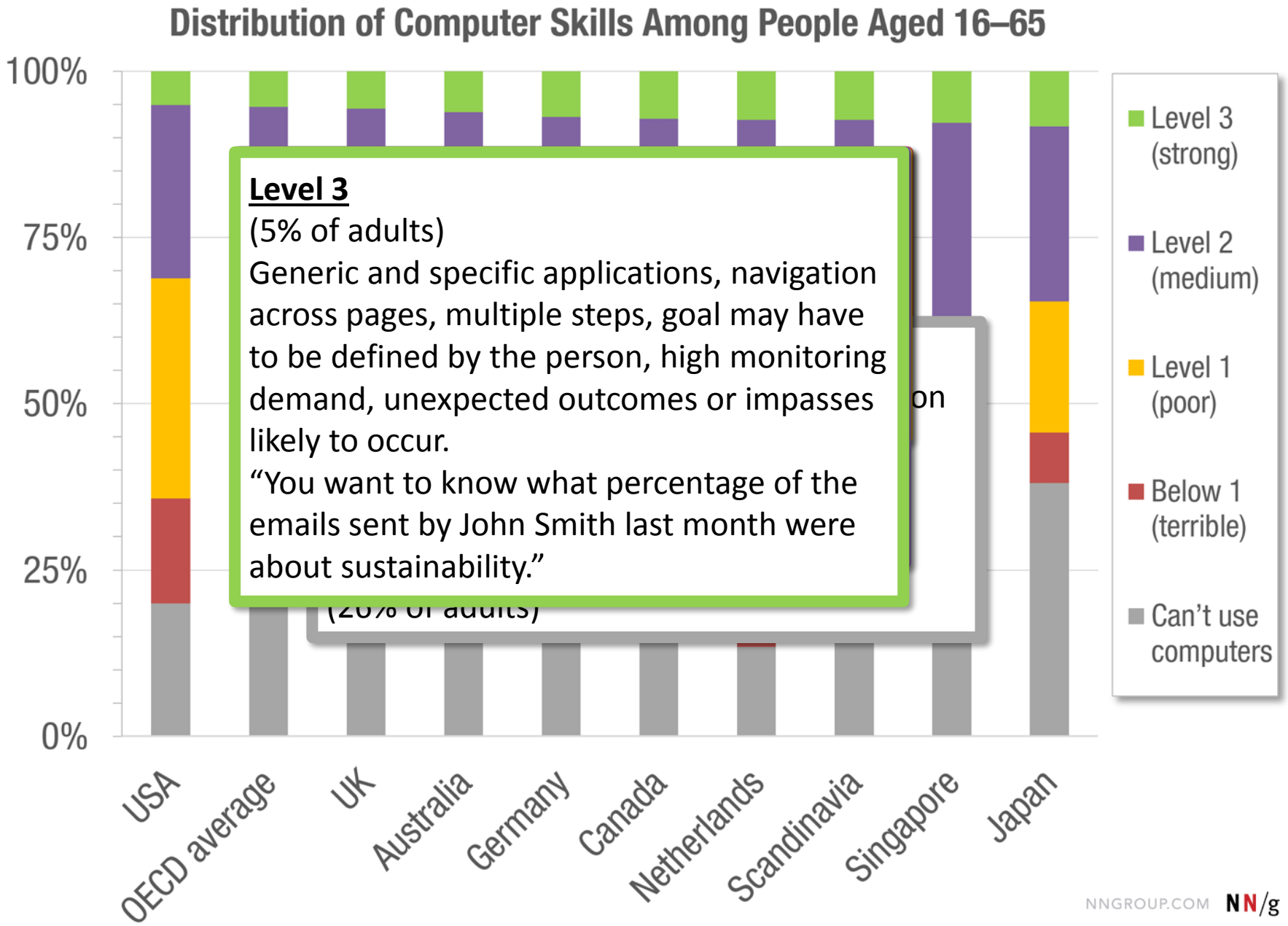
First, the news…

- First 5 minutes we talk about something interesting
- You will not be tested on the news part of lecture
- You may use news as an example on tests
- Why do this?
  1. Some students show up late
  2. Reward students who show up on time
  3. Important to see real world examples

What level of technical skill can we expect out of “average” users?



https://www.nngroup.com/articles/computer-skill-levels/



https://www.nngroup.com/articles/computer-skill-levels/

HUMAN COMPUTER INTERACTION

Dr Kami Vaniea

18th September 2017

Today…

1. Course introduction
2. Design process
3. Two examples:
   - App permissions
   - Evaluating usability of email encryption plugin

Pronouncing my last name:

English: **Van-yay**
French: **Vanier**

Bit of American history:

Computer Security

Kami

Human Computer Interaction

Which course should I take?

- Human-Computer Interaction
  - Practical applied class
  - Emphasis: How do you build and test a user interface
  - Programming experience assumed
  - 30% coursework, 70% exam

- The Human Factor: Working with Users
  - More theoretical with some practical
  - Emphasis: strong knowledge of theory grounding
  - No programming knowledge
  - 100% coursework

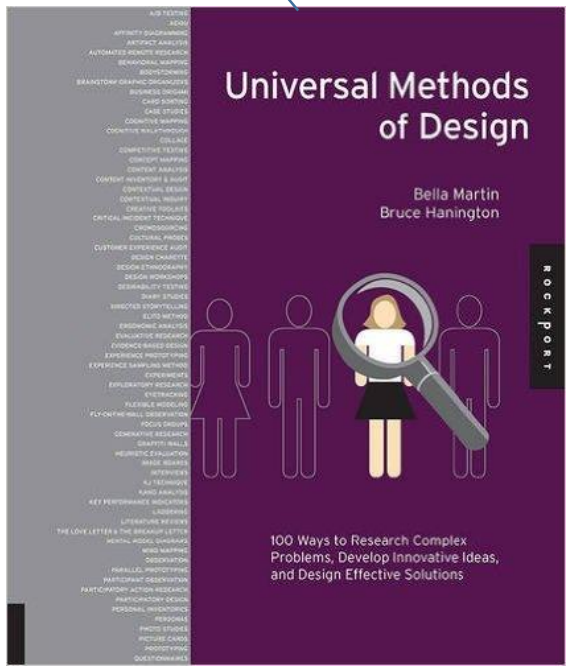
Course Introduction

Modules

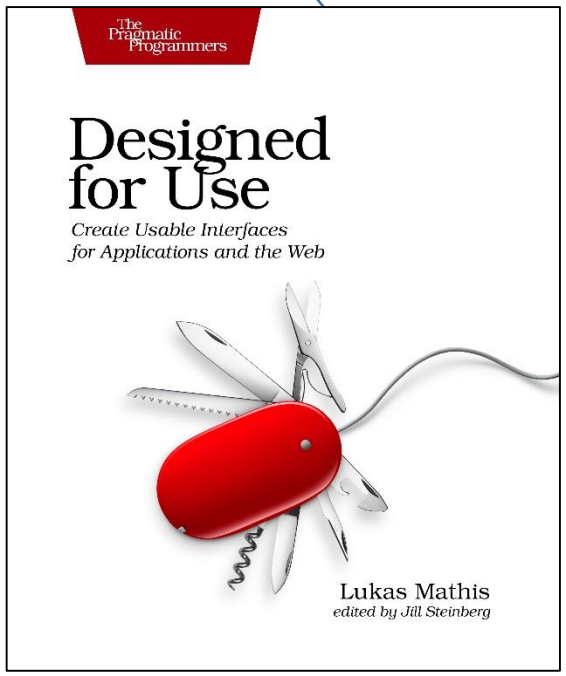
- Design requirements gathering
- Designing an interface
- Evaluating an interface

Books

Quick guide to common methodologies



Practical guide to building and testing usable interfaces



Coursework

CW1: **Prototype a smart refrigerator app**

- Groups of size 2
- Decide on tasks to support
- Create a functional prototype in Processing

CW2: **Evaluate an app**

- Groups of size 2
- Randomly given another group's prototype from CW1
- Evaluate if it is usable

Readings

- Short readings
  - Should take less than 10 minutes to read
  - Typically only 2 pages per methodology
  - I expect you to know this, likely will show up on exam
- Long readings
  - Everything you need to know
  - Further clarification of slide material
- Supplemental readings
  - Extra information for those who are interested

Tutorials

- Starting in the third week
- Focus on hands-on doing of the methodologies
- Work through some sample exam questions

Any questions about the course setup?

Design Process

Design process

Many design processes, we use the Universal Methods of Design one

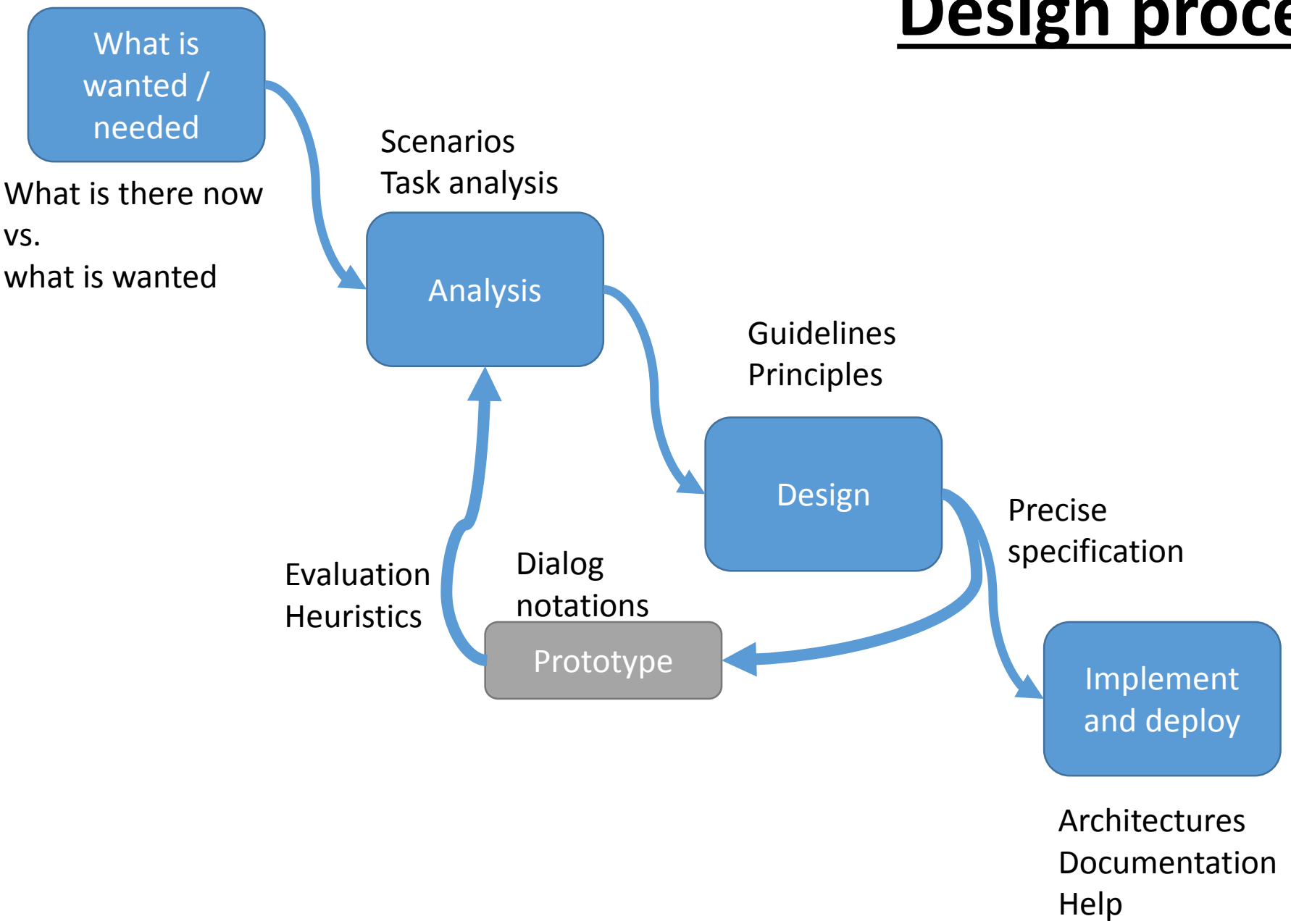
1. Planning, scoping, and definition
   - What do we want to do?
2. Exploration, synthesis, and design implications
   - Would it work? Would it solve the problem?
3. Concept Generation
   - Create a prototype and try it out
4. Evaluation, refinement, and production
   - Build it, test it, fix it
5. Launch and monitor
   - See if it works in the real world and perform ongoing review

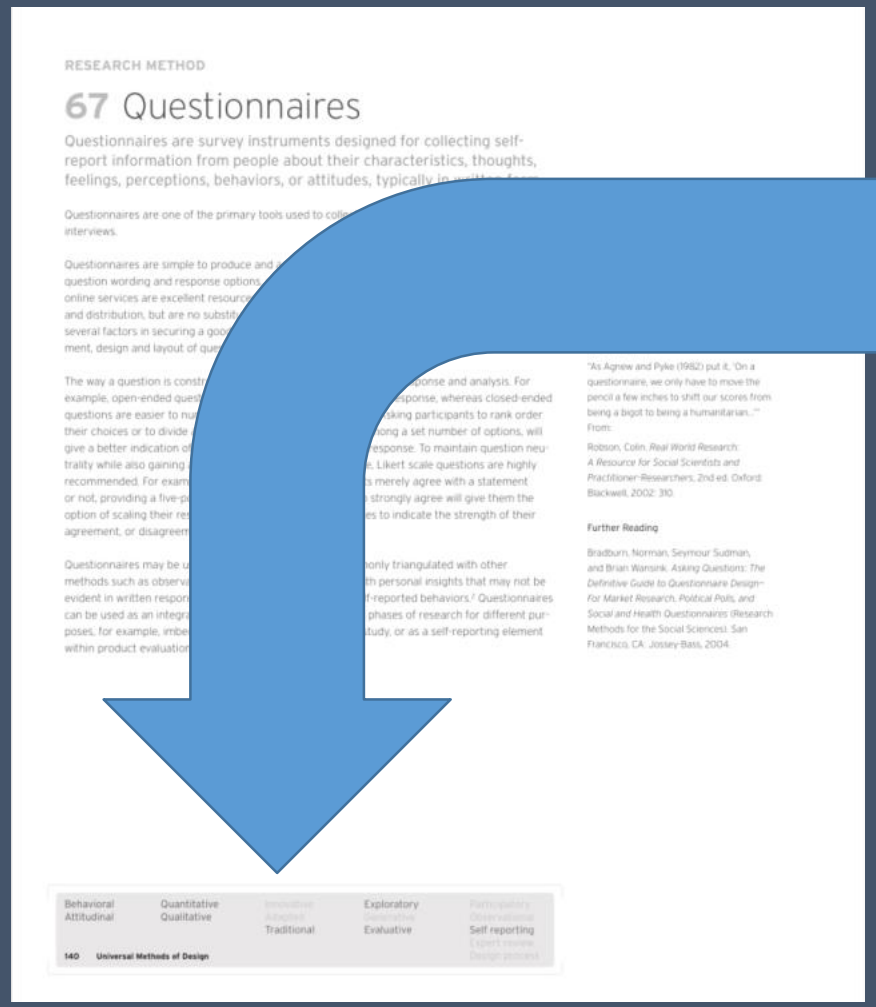
Design process

1. Planning, scoping, and definition
   - What do we want to do?
2. Exploration, synthesis, and design implications
   - Would it work? Would it solve the problem?
3. Concept Generation
   - Create a prototype and try it out
4. Evaluation, refinement, and production
   - Build it, test it, fix it
5. Launch and monitor
   - See if it works in the real world and perform ongoing review

1. What is wanted/needed?
2. Analysis
3. Design
4. Prototyping
5. Implement and deploy

Design process




RESEARCH METHOD

67 Questionnaires

Questionnaires are survey instruments designed for collecting self-report information from people about their characteristics, thoughts, feelings, perceptions, behaviors, or attitudes, typically to

Questionnaires are one of the primary tools used to colle
interviews.

Questionnaires are simple to produce and
question wording and response options
online services are excellent resource
and distribution, but are no substi
several factors in securing a goo
ment, design and layout of que

The way a question is consti
example, open-ended ques
questions are easier to nu
their choices or to divide
give a better indication o
trality while also gaining
recommended. For exam
or not, providing a five-p
option of scaling their re
agreement, or disagreem

Questionnaires may be u
methods such as observa
evident in written respon
can be used as an integr
poses, for example, imbe
within product evaluatio

sponse and analysis. For
sponse, whereas closed-ended
aking participants to rank order
ong a set number of options, will
esponse. To maintain question neu-
e. Likert scale questions are highly
s merely agree with a statement
strongly agree will give them the
es to indicate the strength of their

nly triangulated with other
th personal insights that may not be
f-reported behaviors.[2] Questionnaires
phases of research for different pur-
tudy, or as a self-reporting element

"As Agnew and Pyke (1982) put it, 'On a questionnaire, we only have to move the pencil a few inches to shift our scores from being a bigot to being a humanitarian...'"
From:

Robson, Colin. *Real World Research: A Resource for Social Scientists and Practitioner-Researchers*, 2nd ed. Oxford: Blackwell, 2002: 310.

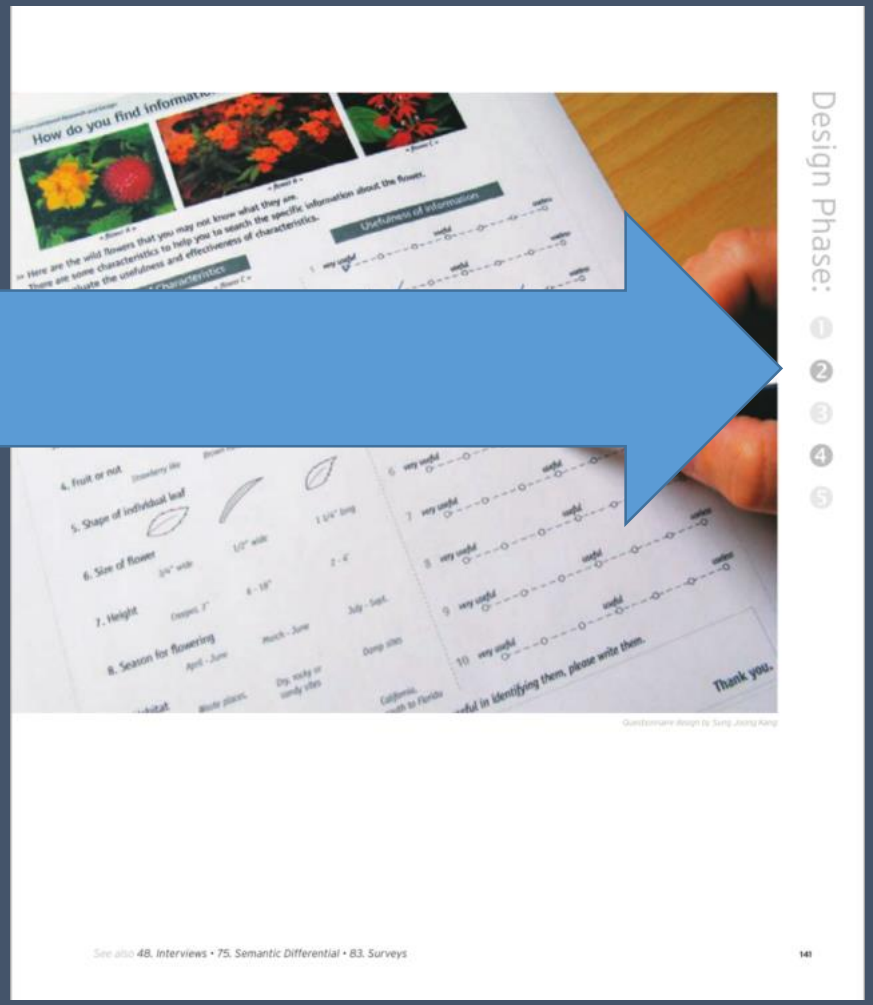
Further Reading

Bradburn, Norman, Seymour Sudman, and Brian Wansink. *Asking Questions: The Definitive Guide to Questionnaire Design—For Market Research, Political Polls, and Social and Health Questionnaires* (Research Methods for the Social Sciences). San Francisco, CA: Jossey-Bass, 2004.

Behavioral Attitudinal	Quantitative Qualitative		Exploratory	
		Traditional	Evaluative	Self reporting

140 Universal Methods of Design

The methods book always lists what design phases a method can be used in

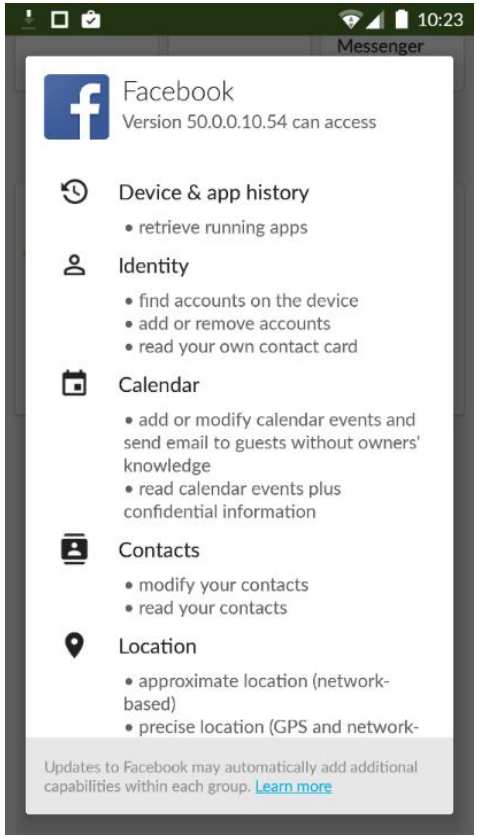


See also 48. Interviews • 75. Semantic Differential • 83. Surveys

141

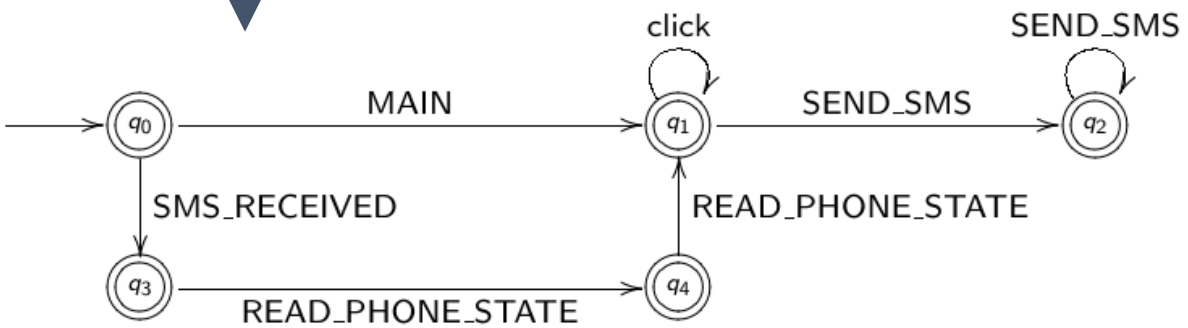
The following is part of a MSc project from 2016 on re-designing permission screens for Android.

Describing how an app uses permissions

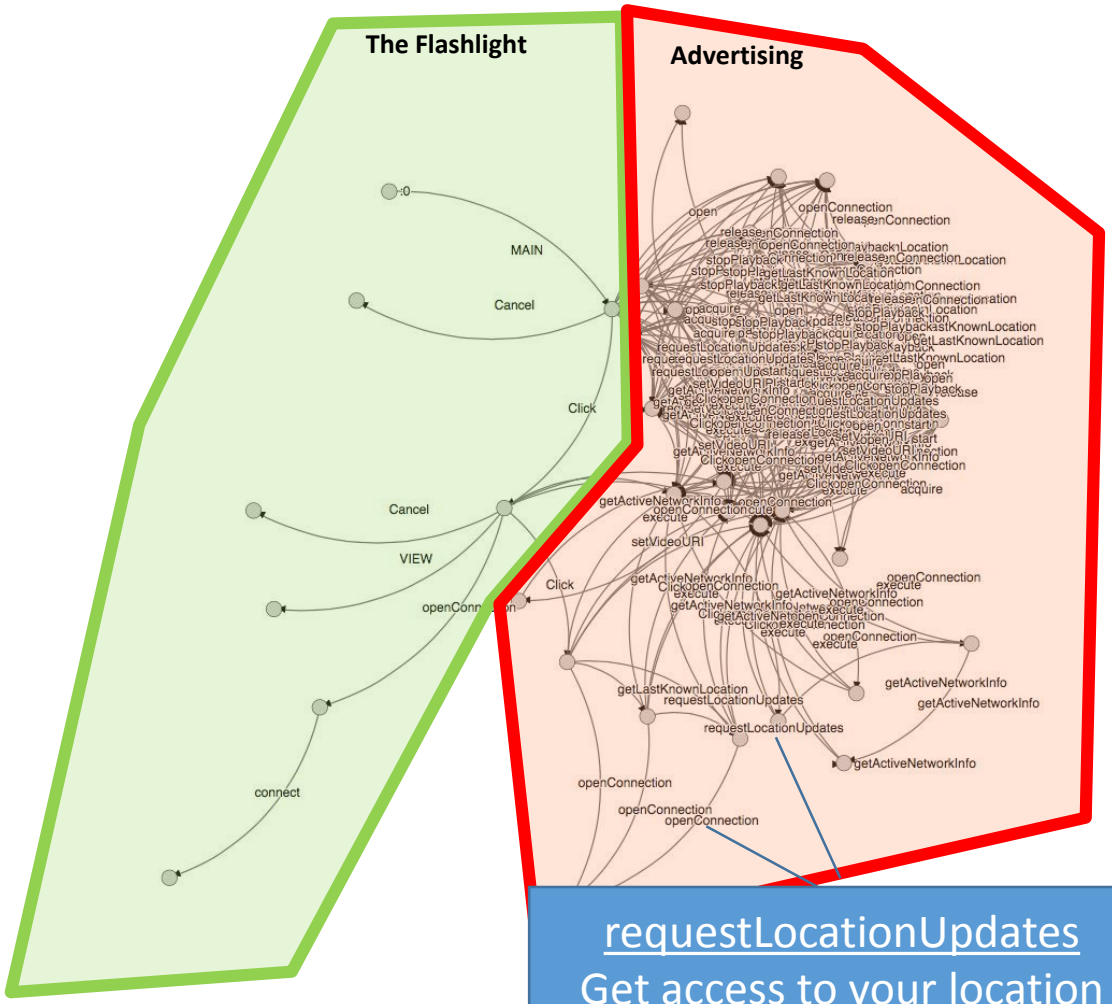


Allowed to do

Actually does



Static analysis: Breaks an app up into a control flow diagram



requestLocationUpdates
Get access to your location probably to send it on using the later openConnection call

The brief:

Create a new permission screen using the output from a static analysis tool that helps people understand the context in which permissions will be used.

Problem 1:

What permissions do people worry about?

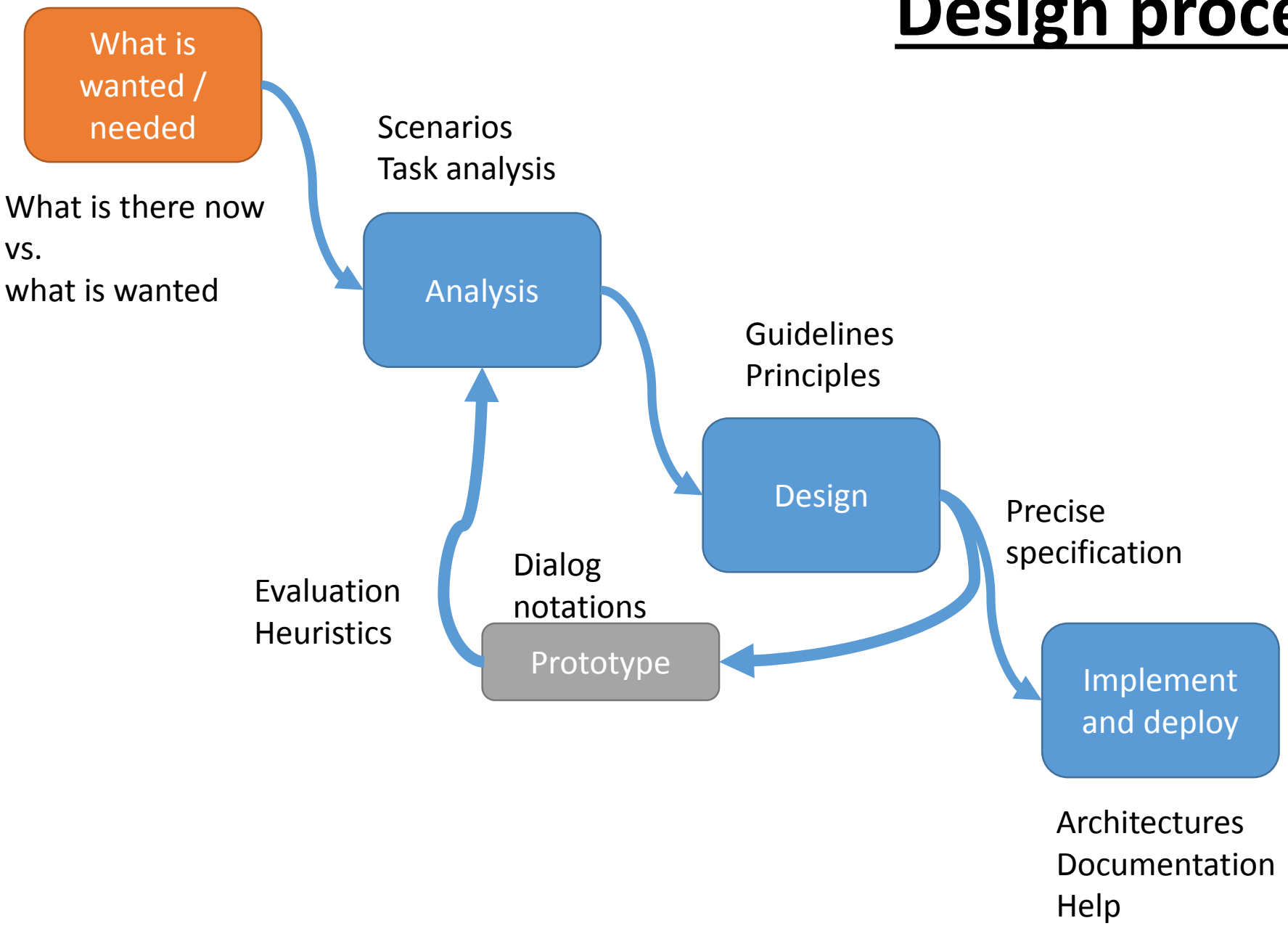
Sub-problem:

Most people don’t understand permissions enough to actually worry about them

Solution:

Affinity diagram using Computer Security MSc students

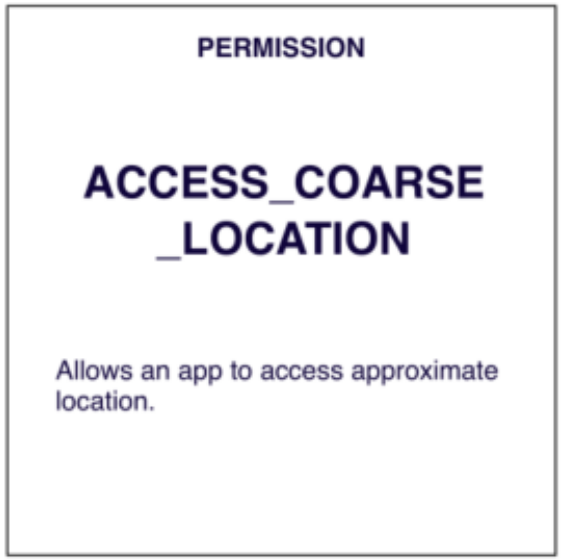
Design process



Affinity diagram study protocol

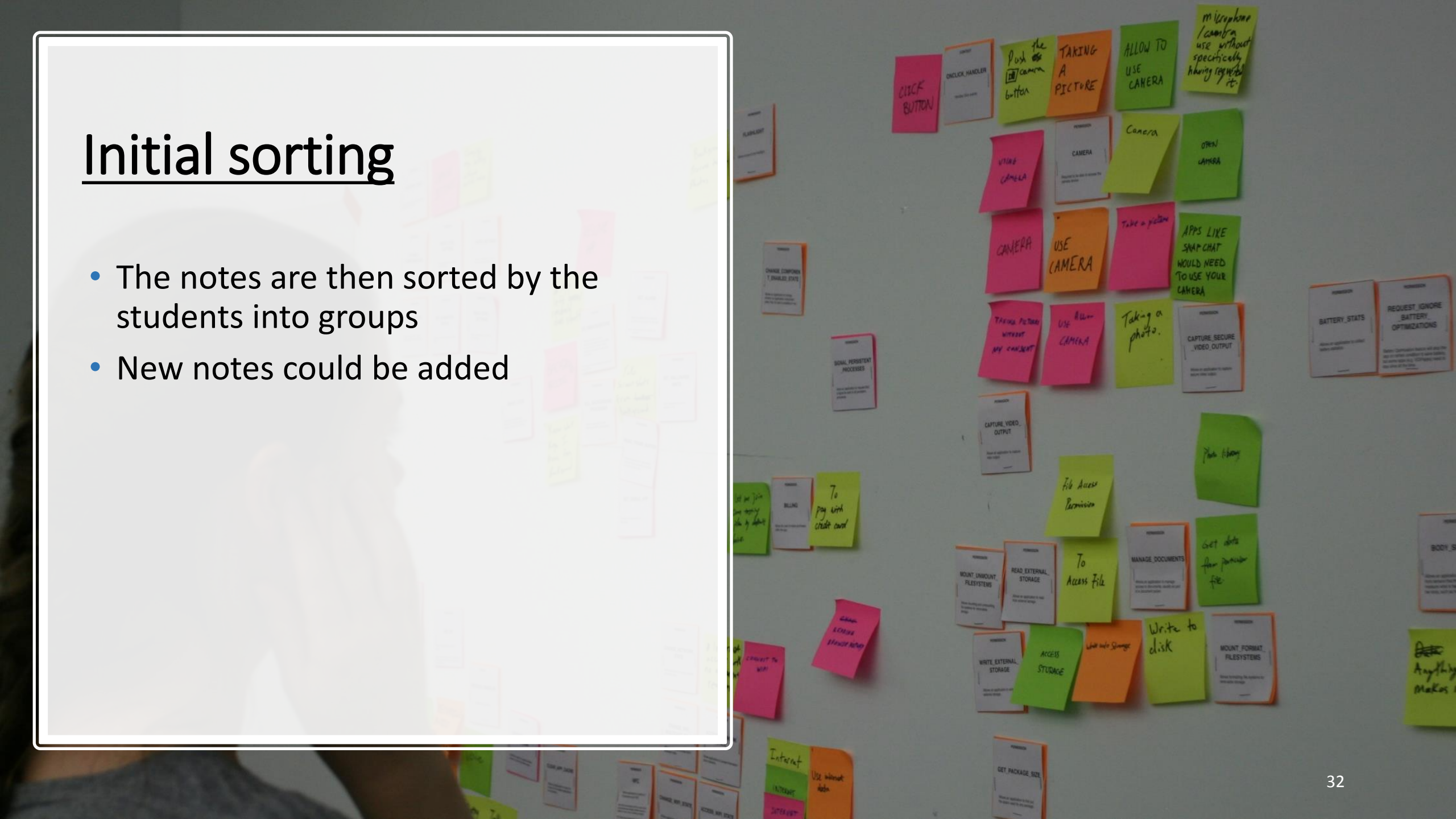
1. Pre-print a list of Android permissions and contexts
2. Have students brainstorm answers to questions onto sticky notes
   A. Name three permissions
   B. App behaviors you are not comfortable with
   C. Situations that would cause a permission to be used
3. Put all notes on the wall and do an affinity diagram
4. Encourage hierarchy design
5. Discuss outcome with participants as a group

Pre-printed contexts



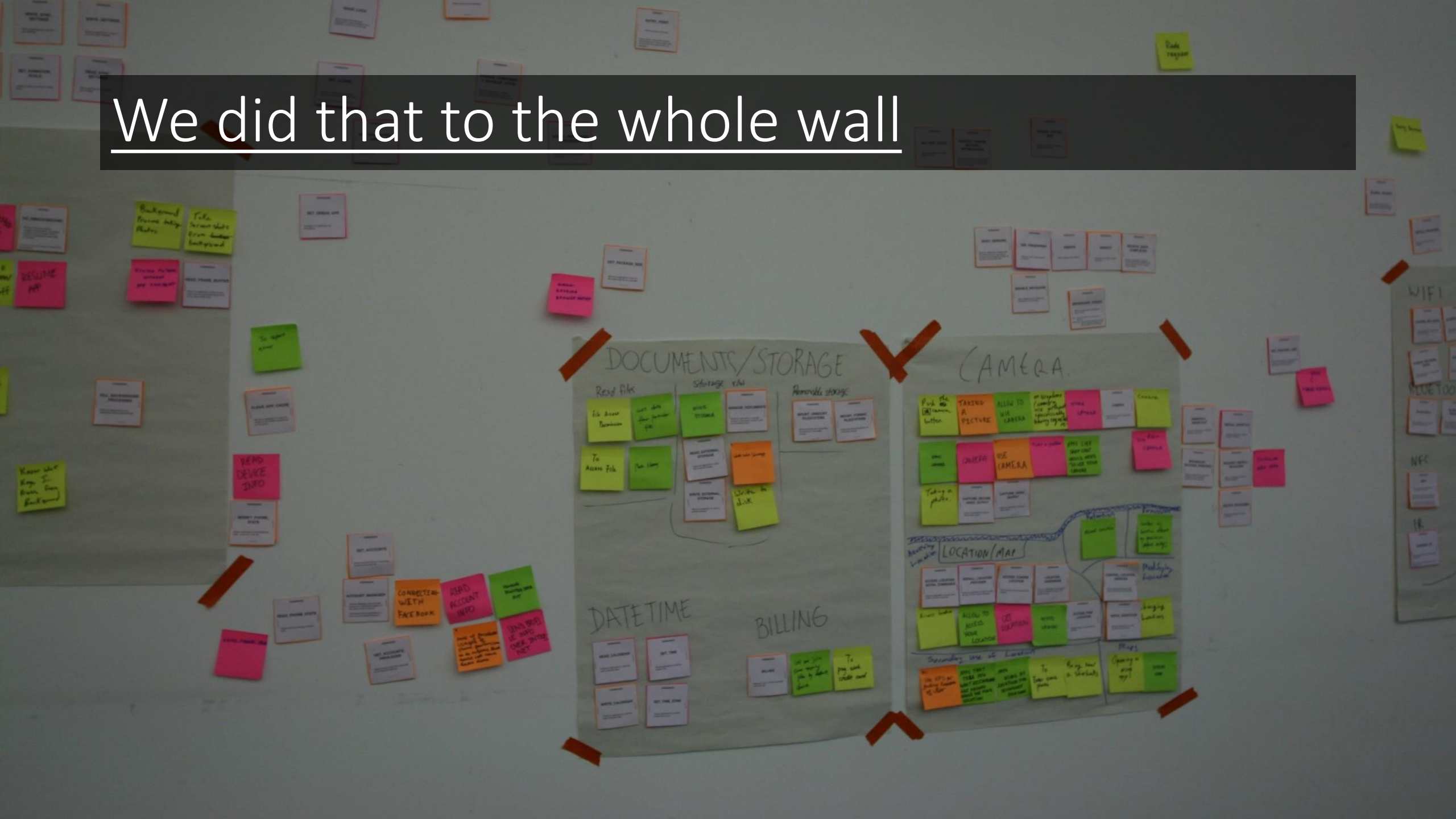
Initial sorting

- The notes are then sorted by the students into groups
- New notes could be added

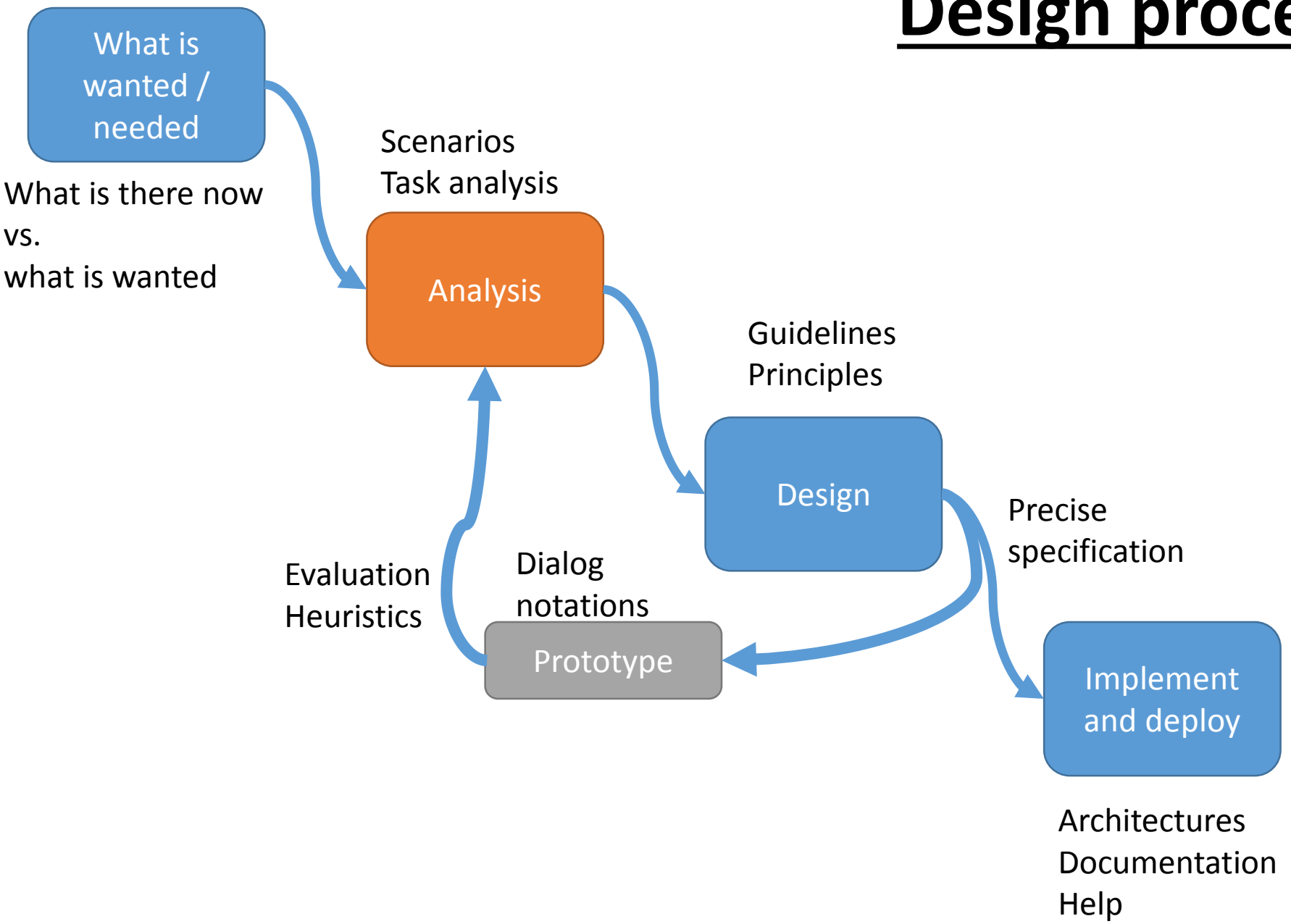


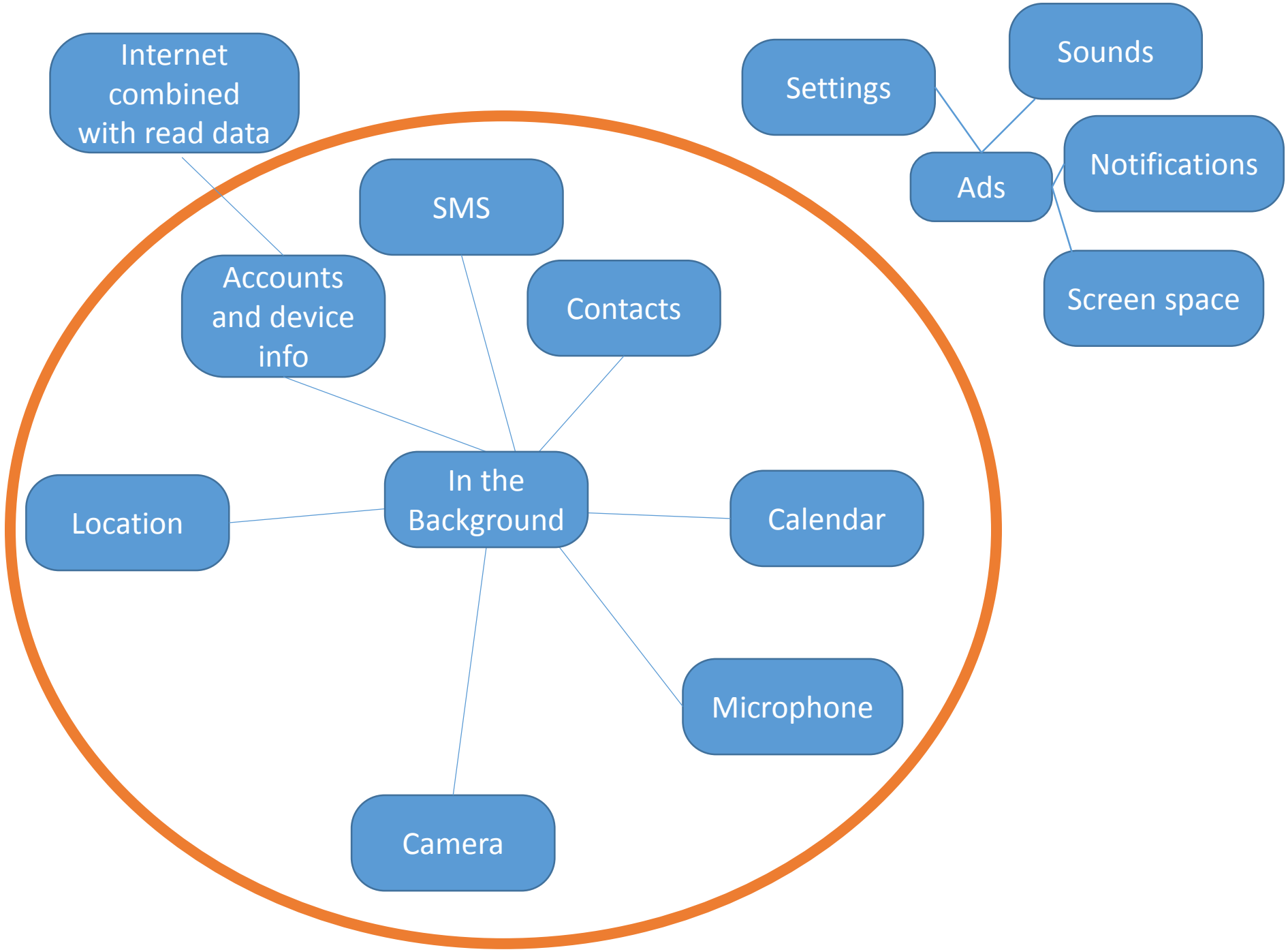

CAMERA.
Push the camera button
TAKING A PICTURE
ALLOW TO USE CAMERA
microphone / camera use without specifically having requested it.
USING CAMERA
PERMISSION
CAMERA
Required to be able to access the camera device.
Camera
OPEN CAMERA
CAMERA
USE CAMERA
Take a picture
APPS LIKE SNAP CHAT WOULD NEED TO USE YOUR CAMERA
USE Allow CAMERA
Taking a photo.
PERMISSION
CAPTURE_SECURE_VIDEO_OUTPUT
Allows an application to capture secure video output.
PERMISSION
CAPTURE_VIDEO_OUTPUT
Allows an application to capture video output.
PERMISSION
UNINSTALL_SHORTCUT
Allows an application to uninstall a shortcut in Launcher.
PERMISSION
INSTALL_SHORTCU
Allows an application to install a shortcut in Launcher.
PERMISSION
BROADCAST_PACKAGE_REMOVED
Allows an application to broadcast a notification that an application package has been removed.
PERMISSION
REQUEST_INSTALL_PACKAGES
Allows an application to request installing packages.
PERMISSION
DELETE_PACKAGES
Allows an application to delete packages.
Accessing Location
LOCATION/MAP
Retention
Permission
Record Location.
Gather my location without my permission. (default setting)
Modifying Location
PERMISSION
ACCESS_LOCATION_EXTRA_COMMANDS
Allows an application to access extra location provider commands.
PERMISSION
INSTALL_LOCATION_PROVIDER
Allows an application to install a location provider into the Location Manager.
PERMISSION
ACCESS_COARSE_LOCATION
Allows an app to access approximate location.
PERMISSION
LOCATION_HARDWARE
Allows an application to use location features in hardware, such as the geofencing api.
PERMISSION
CONTROL_LOCATION_UPDATES

We did that to the whole wall

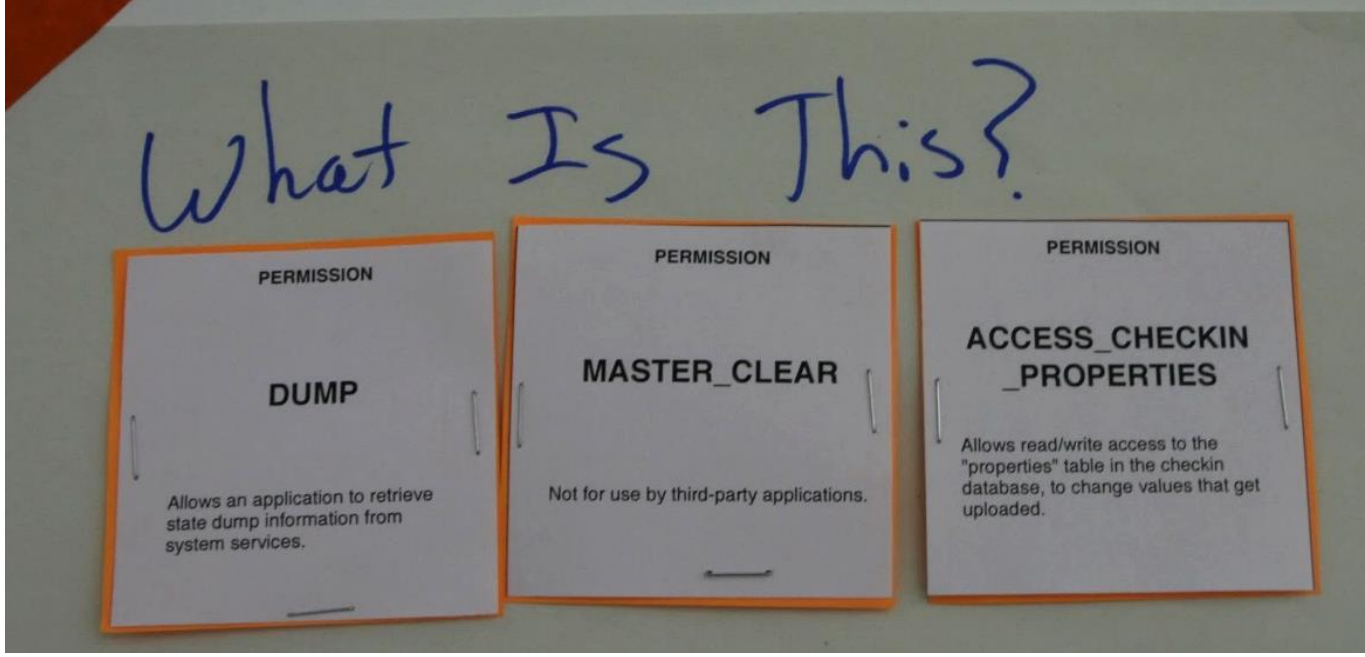


Design process



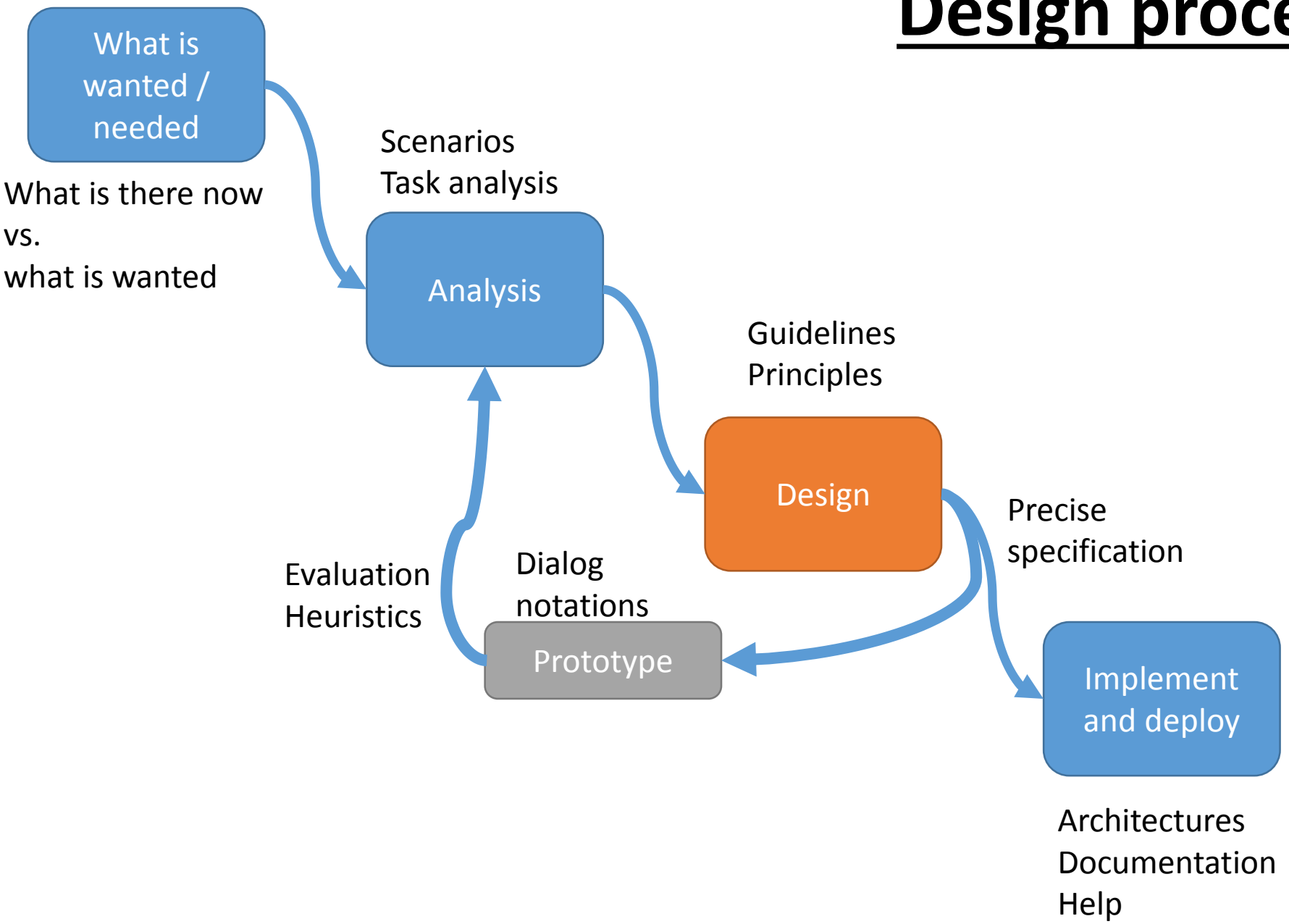

Internet combined with read data
Settings
Sounds
Ads
Notifications
Screen space
SMS
Accounts and device info
Contacts
In the Background
Location
Calendar
Microphone
Camera

Outcomes

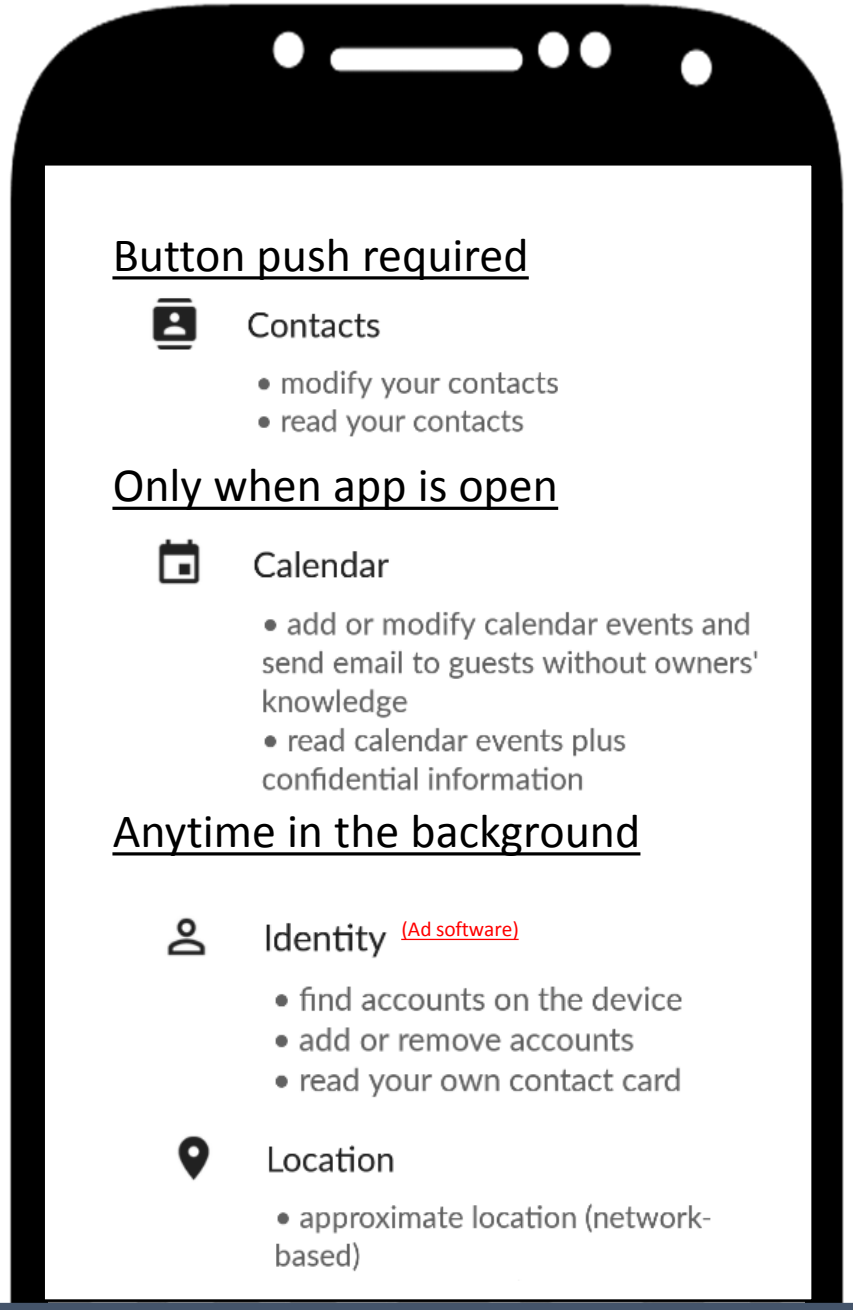


- "with my permission"
  - Button presses
  - Opening an app
- Background vs. foreground
  - When the permission is accessed is important
- Purpose
  - Ads
  - Uploading private data like contacts and device ID
- Sensitive permissions focused on input/output
- Confusing permissions

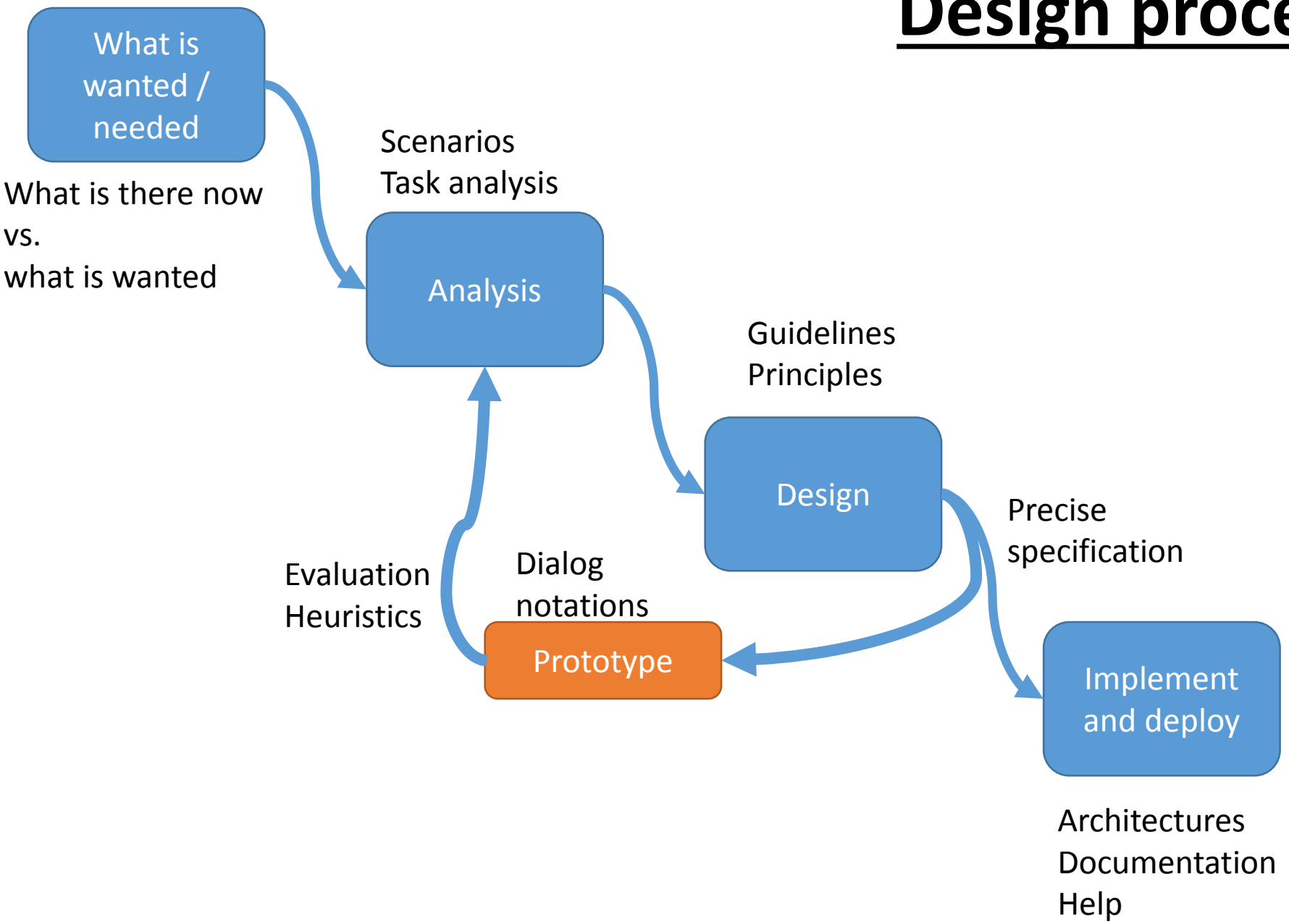
Design process



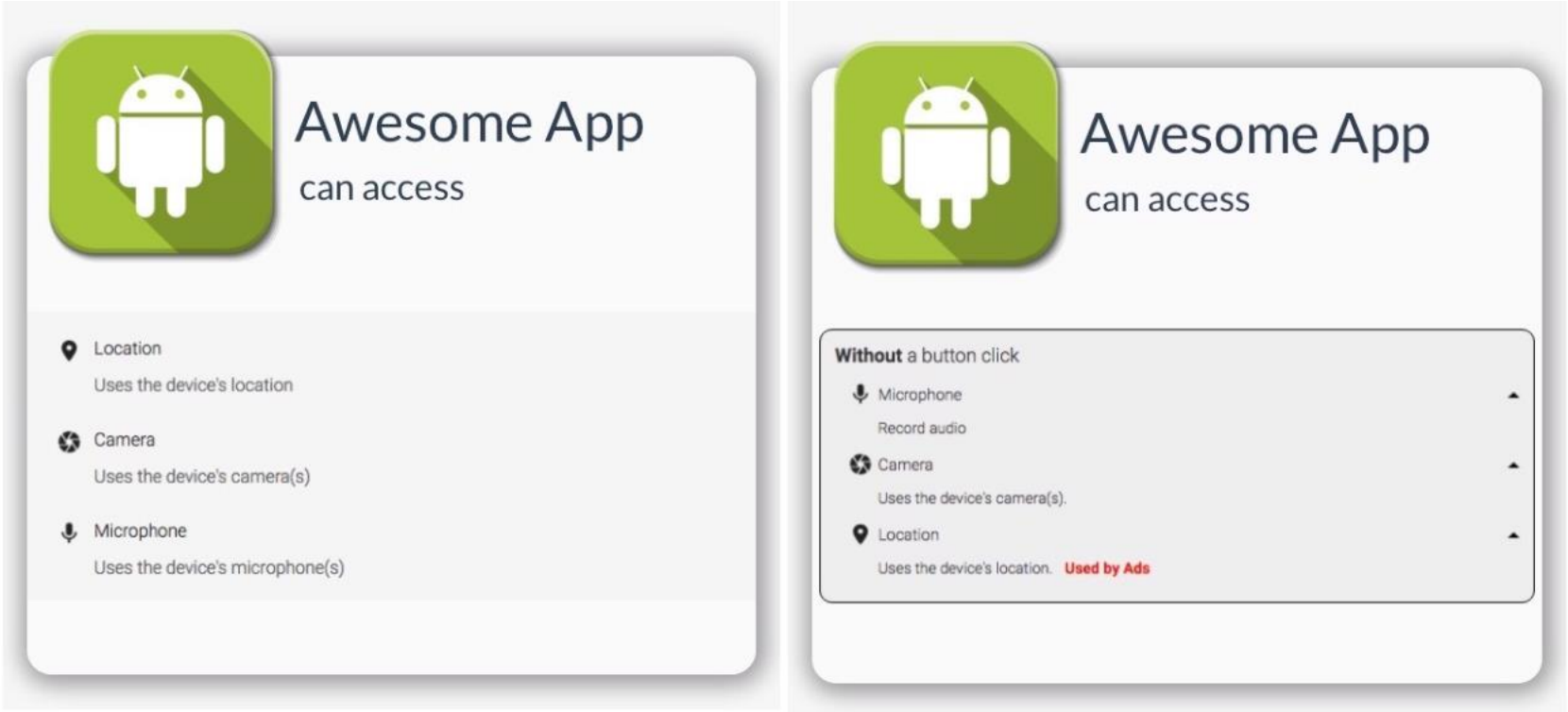
We designed an interface that shows permissions in context of when they can be used.



Design process



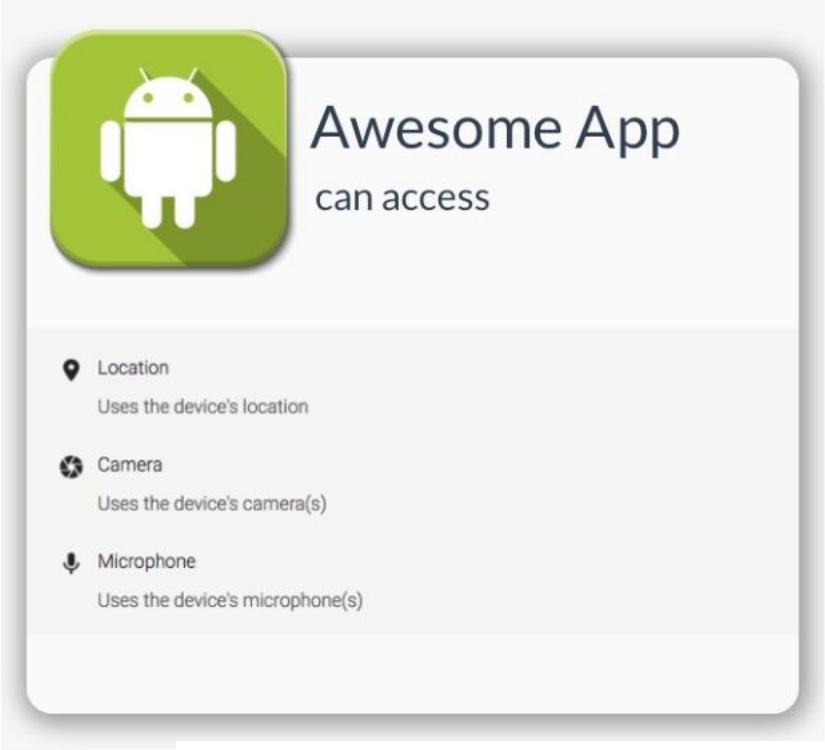
Created two interfaces to A/B test

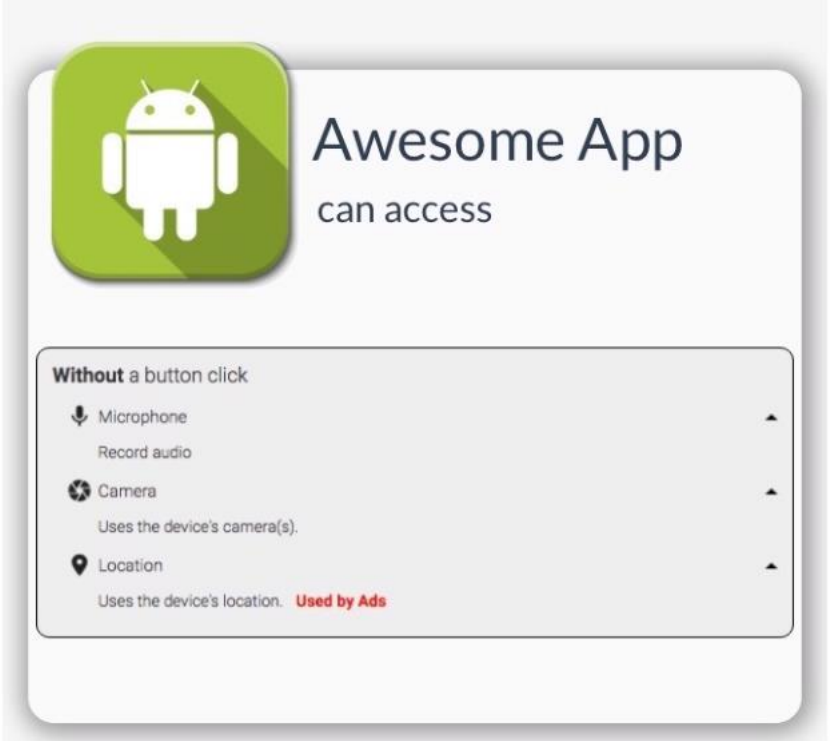


(a) Control group screen

(b) Experiment group screen

Figure 5.1: Survey question screens

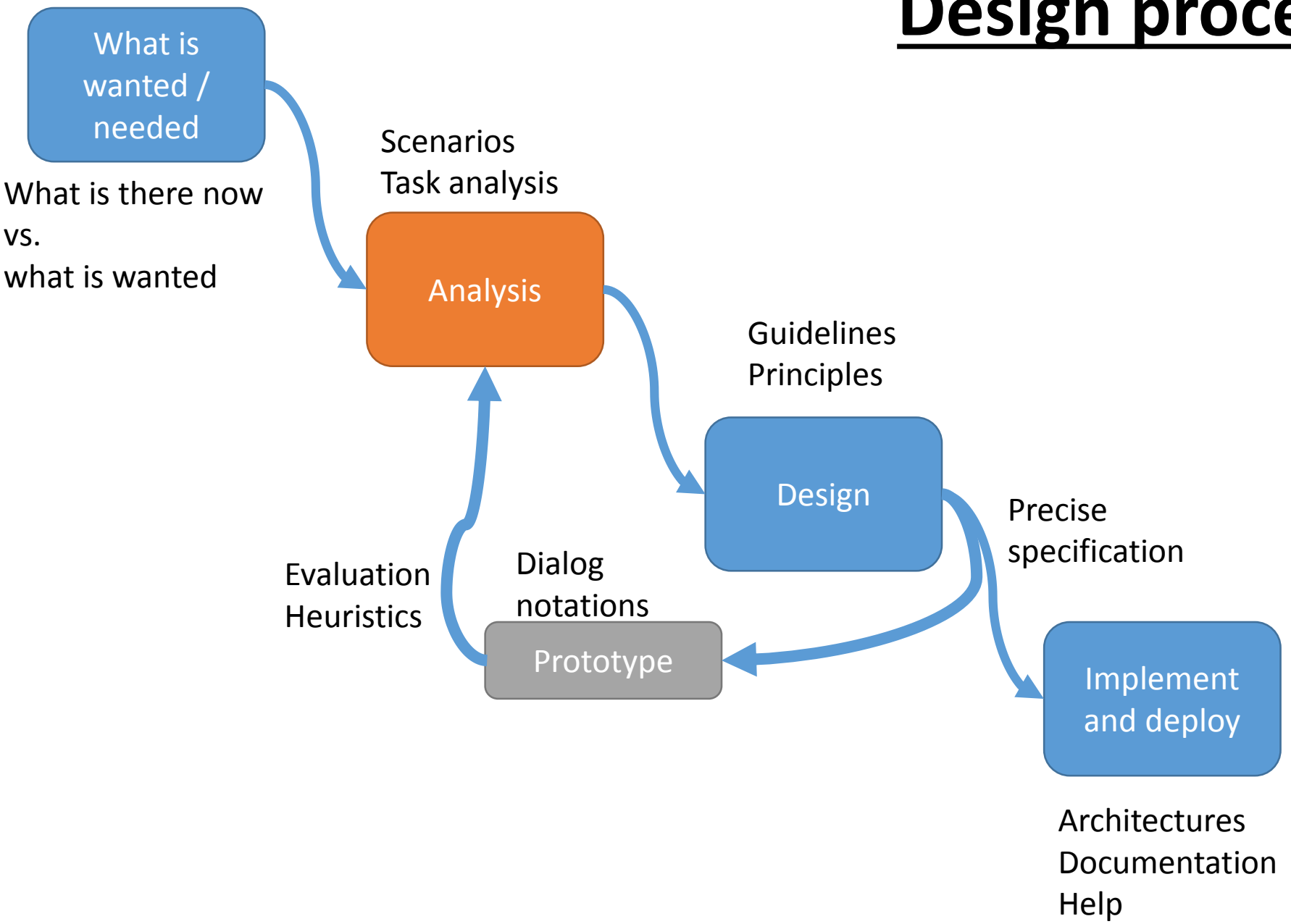




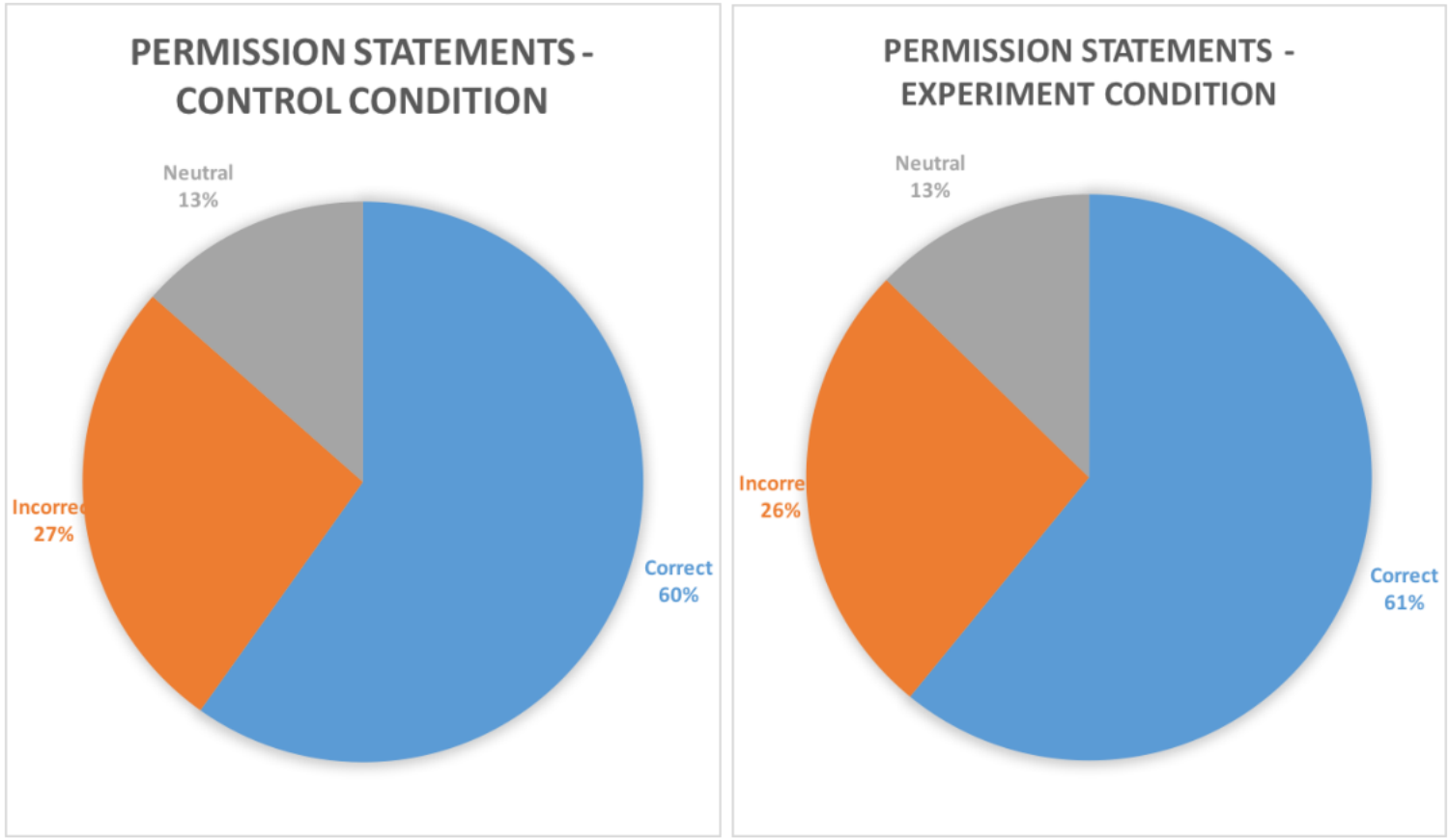
Which of the following can this app do?

	Absolutely Impossible	Impossible	Neutral	Possible	Absolutely Possible
Charge purchases to your credit card at any time.	○	○	○	○	○
Get your location.	○	○	○	○	○
Allow ads to know your location.	○	○	○	○	○
Load ads.	○	○	○	○	○
Write on the SD card					

Design process



The results:

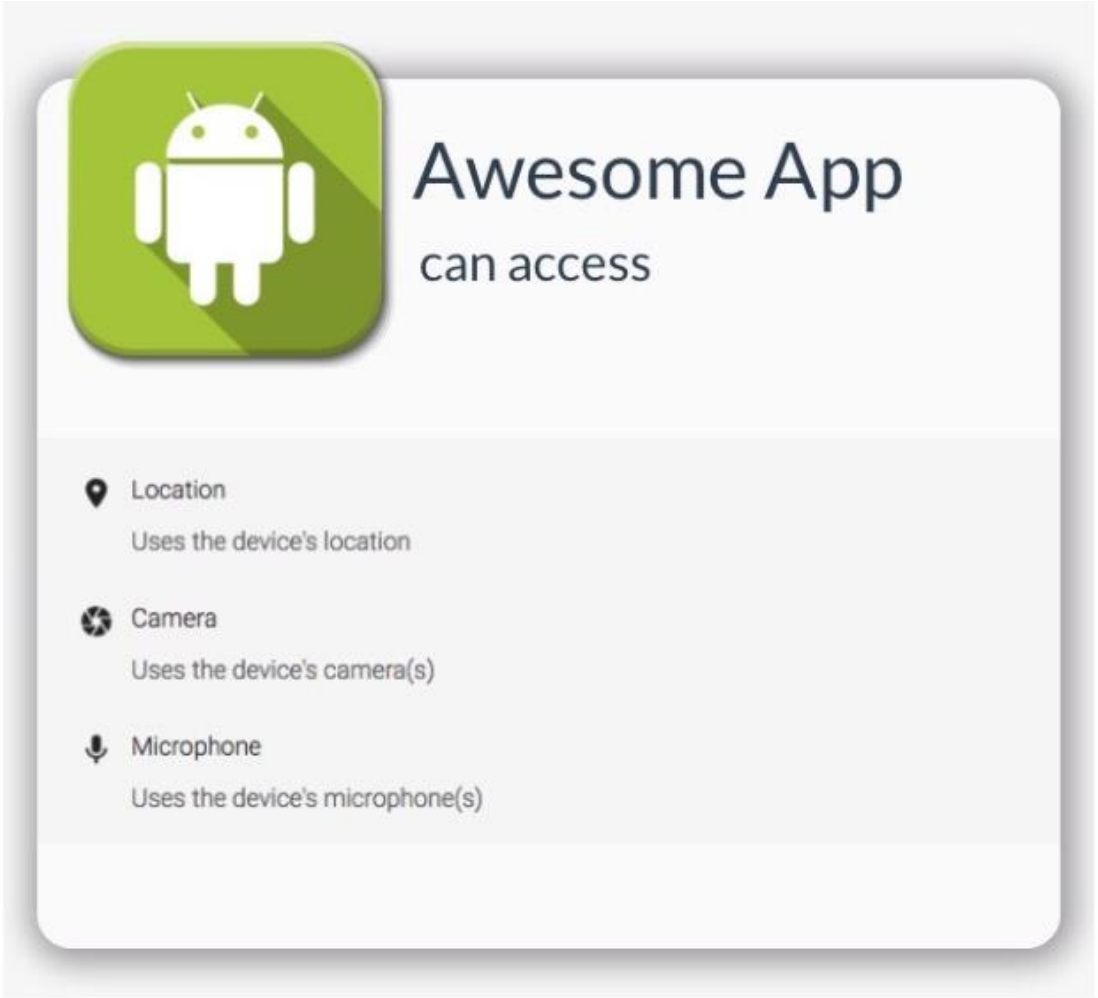


(a) Control Group (b) Experiment Group

Figure 5.2: Permission Statements Results: Correct, Incorrect and Neutral

27% of people think they know what this screen says and are wrong.

13% are uncertain what this screen really

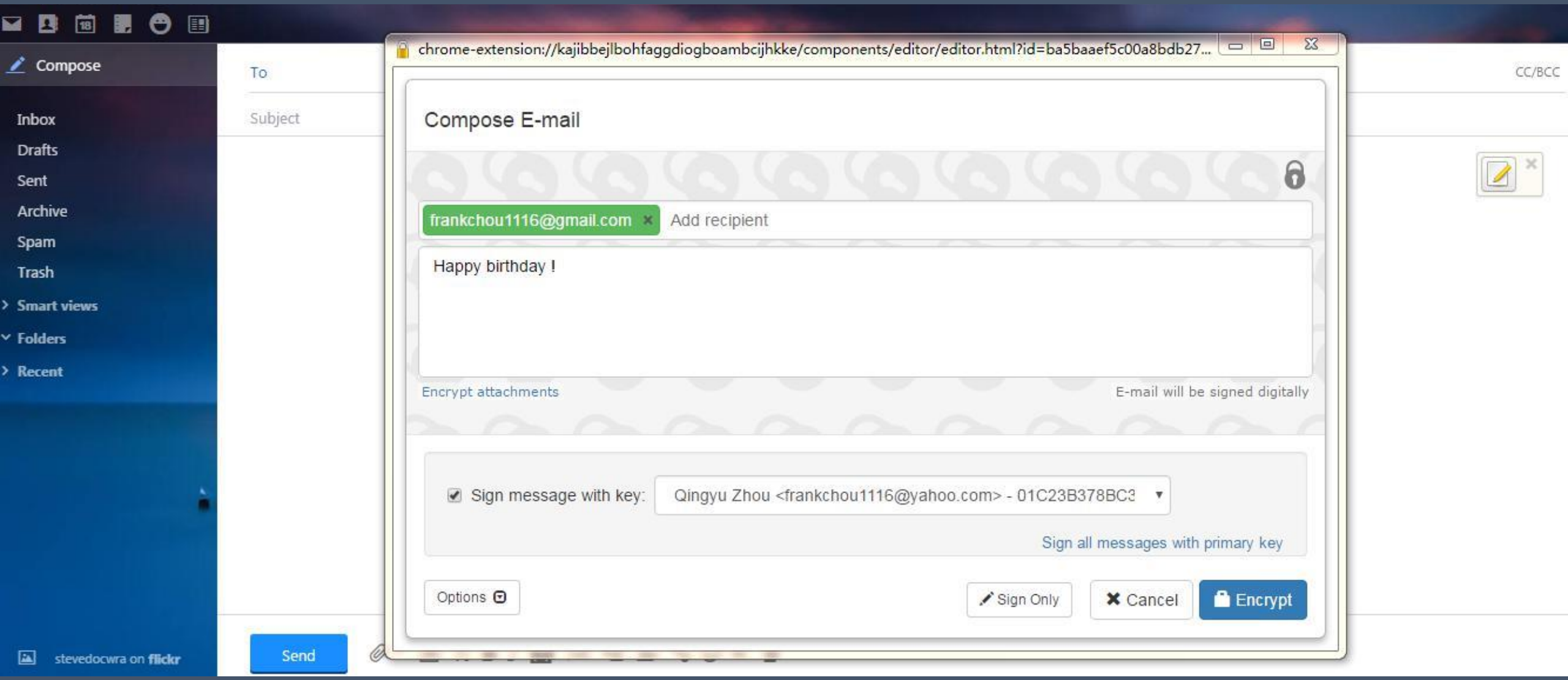


(a) Control group screen

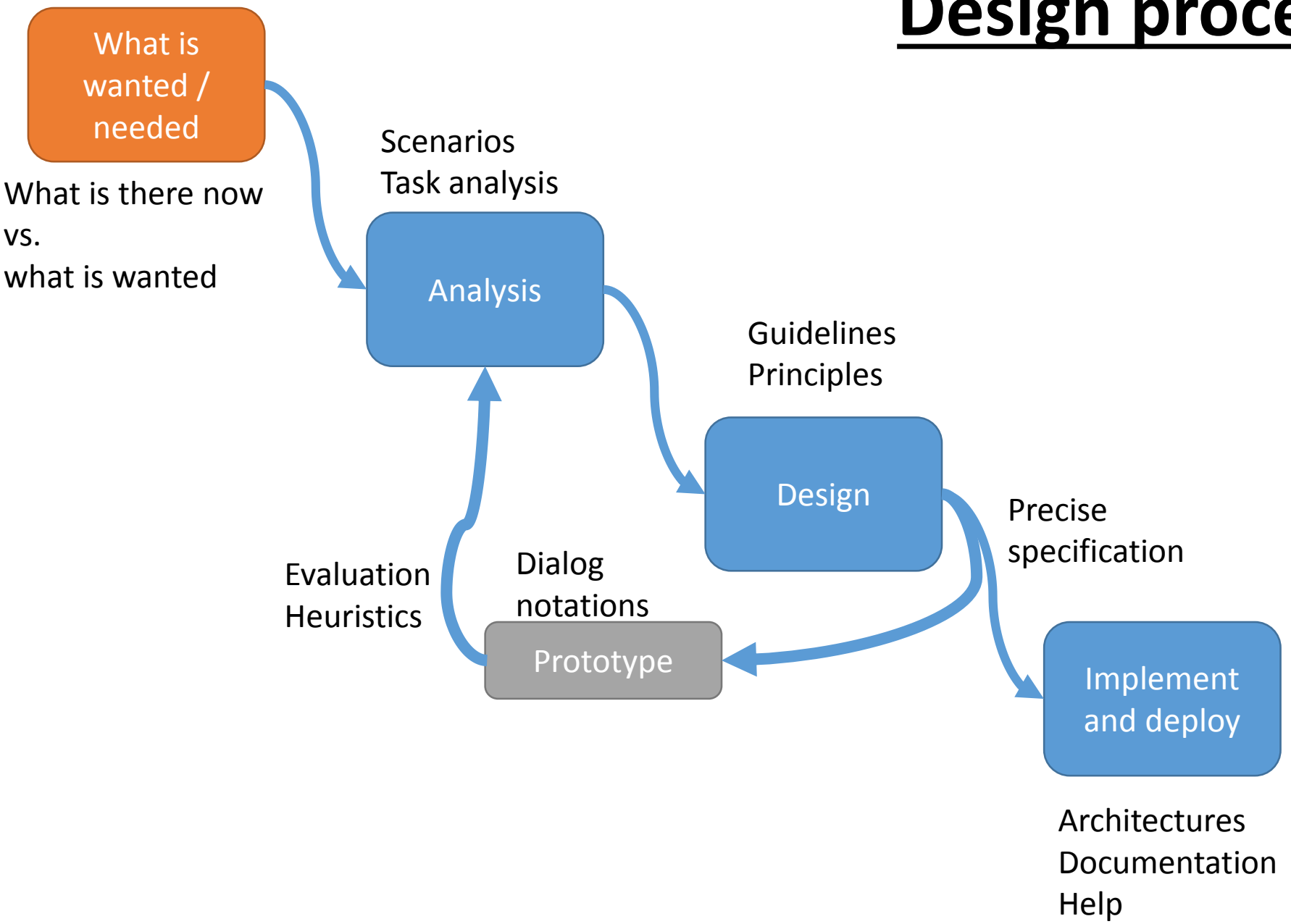
The following is part of a MSc project from last summer on evaluating an email encryption plugin.

The brief:

Google released a new plugin for email encryption called Mailevelop, is it usable?


Compose
Inbox
Drafts
Sent
Archive
Spam
Trash
Smart views
Folders
Recent
To
Subject
CC/BCC
Send
stevedocwra on flickr
chrome-extension://kajibbejlbohfaggdiogboambcijhkke/components/editor/editor.html?id=ba5baaef5c00a8bdb27...
Compose E-mail
frankchou1116@gmail.com
Add recipient
Happy birthday !
Encrypt attachments
E-mail will be signed digitally
Sign message with key:
Qingyu Zhou <frankchou1116@yahoo.com> - 01C23B378BC3
Sign all messages with primary key
Options
Sign Only
Cancel
Encrypt

Design process

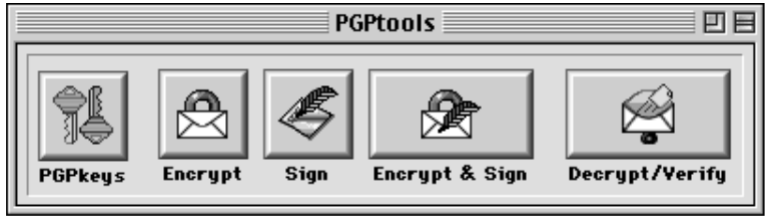


We already know a lot about what people want from email.

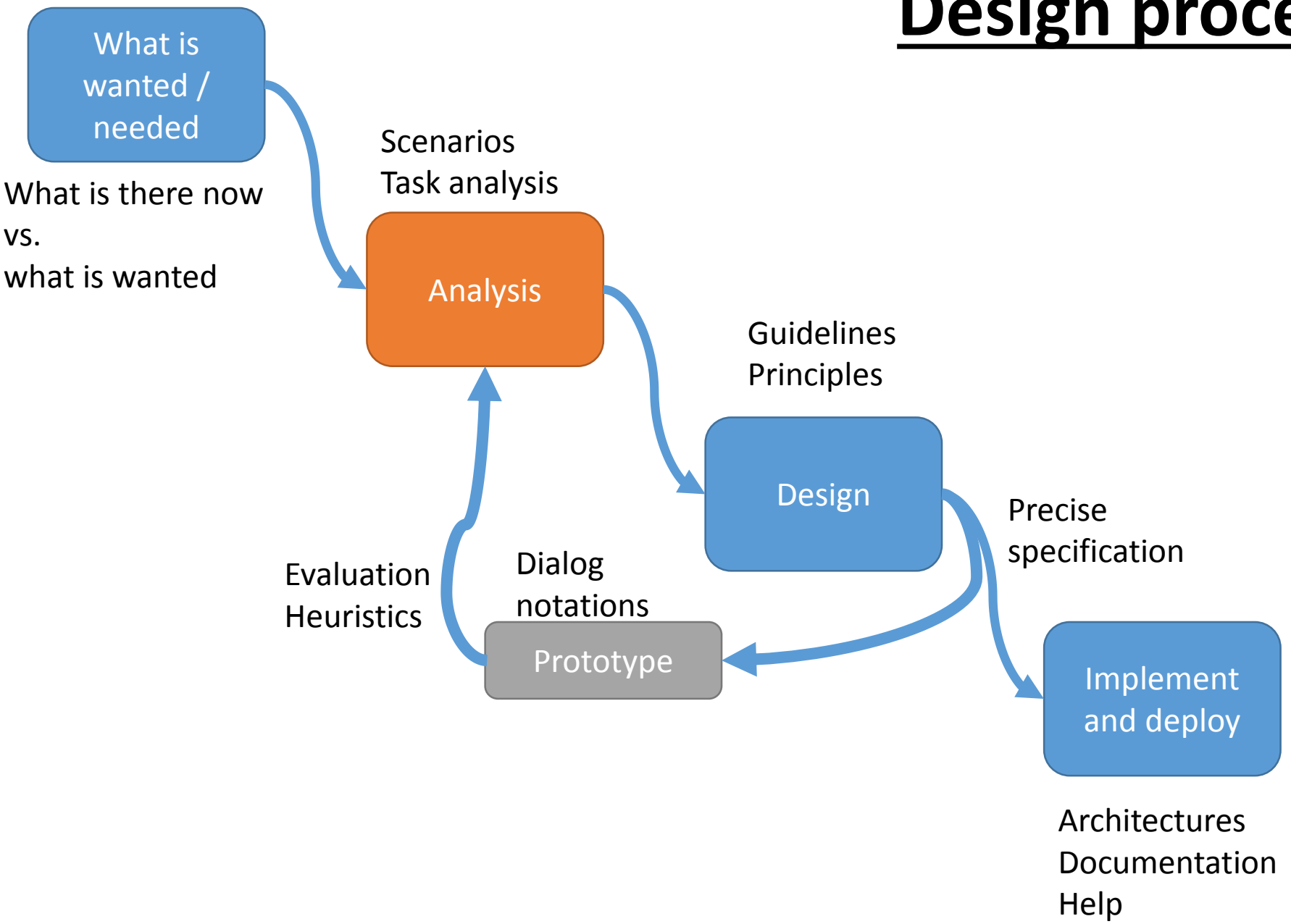
We already know why email encryption hasn’t worked.

Why Johnny Can't Encrypt: A Usability Evaluation of PGP 5.0 by Whitten and Tygar

- Asked 12 Carnegie Mellon Computer Scientists to correctly send an encrypted email using PGP 5.0
- Only 4 managed to accomplish this within 90 minutes
- Dangerous errors
  - Accidentally emailing without encrypting
  - Confusions around key system
  - Giving up



Design process



Cognitive Walkthrough

Scenario 1: User has already installed the Mailvelope plugin and wants to send an encrypted email to another person.

Step1: Open the Mailvelope plugin by clicking on the icon.

Q1. Will users try to achieve the outcome of clicking on this button?

Q2. Will users see this button for the action?

Q3. Once users find this button, will users recognize that clicking on it will produce the effect they want?

Q4. After the action is performed, will users understand the feedback, so they can confidently continue on to the next action?

Cognitive Walkthrough

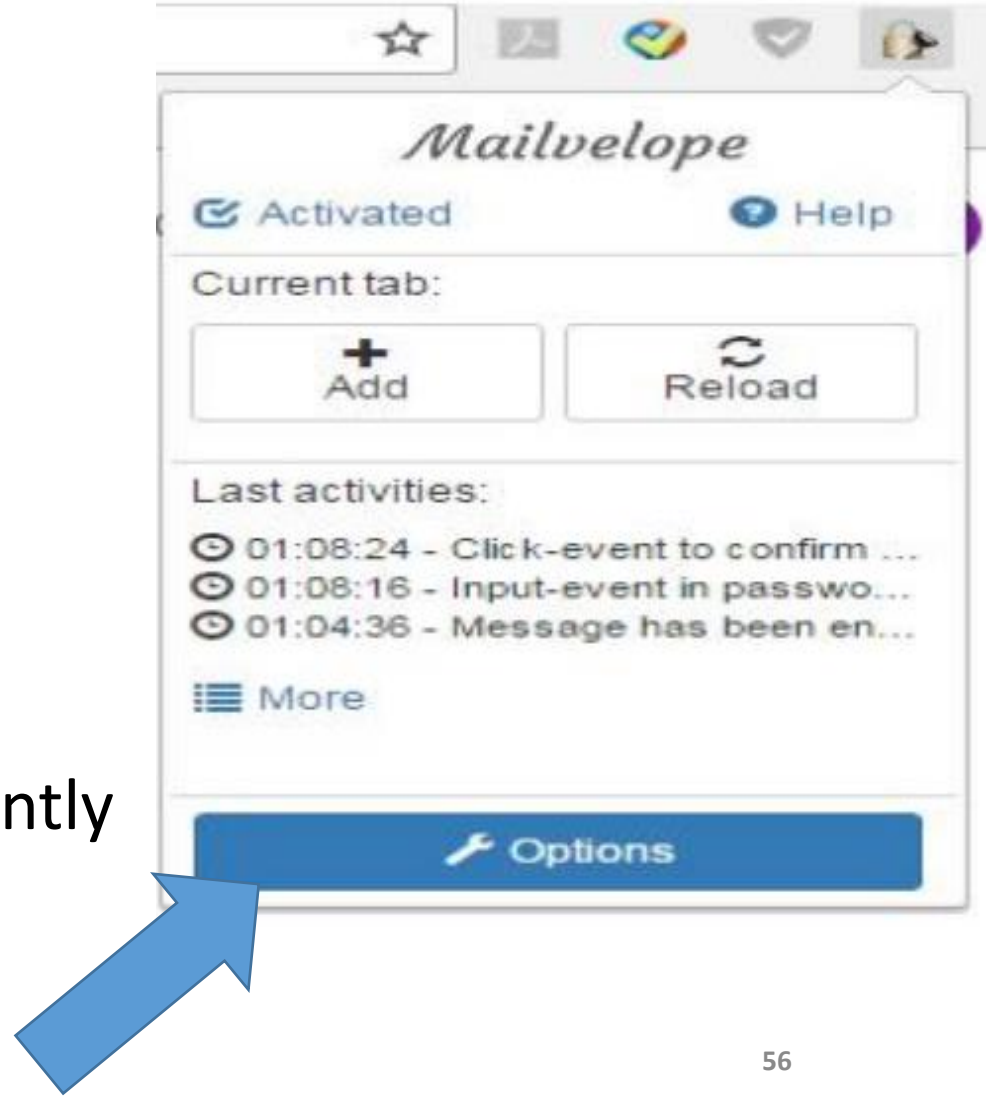
Step2: Click on the "Options" button.

Q1. Will users try to achieve the outcome of clicking on this button?

Q2. Will users see this button for the action?

Q3. Once users find this button, will users recognize that clicking on it will produce the effect they want?

Q4. After the action is performed, will users understand the feedback, so they can confidently continue on to the next action?



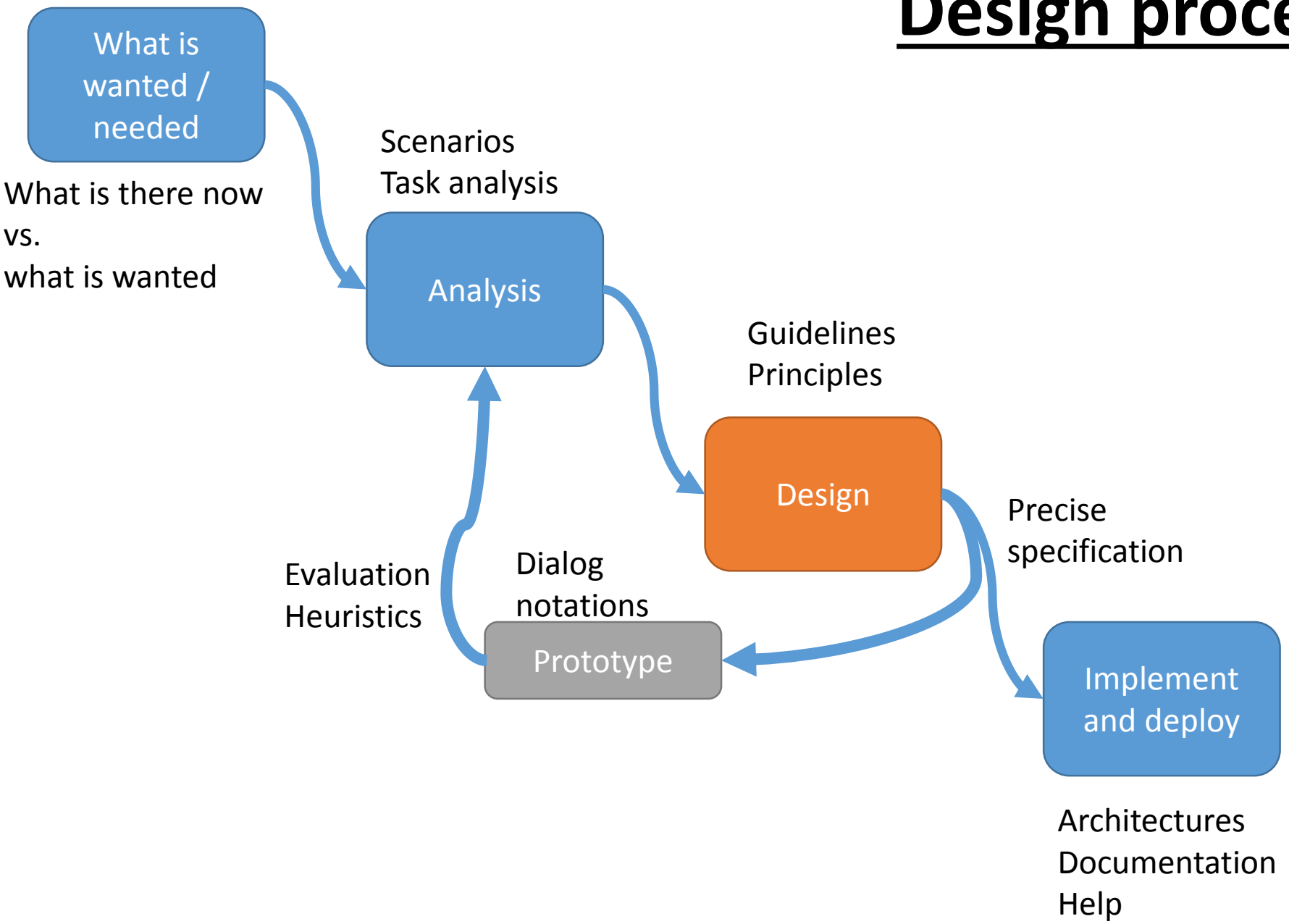
Cognitive walkthrough identified expected areas of failure.

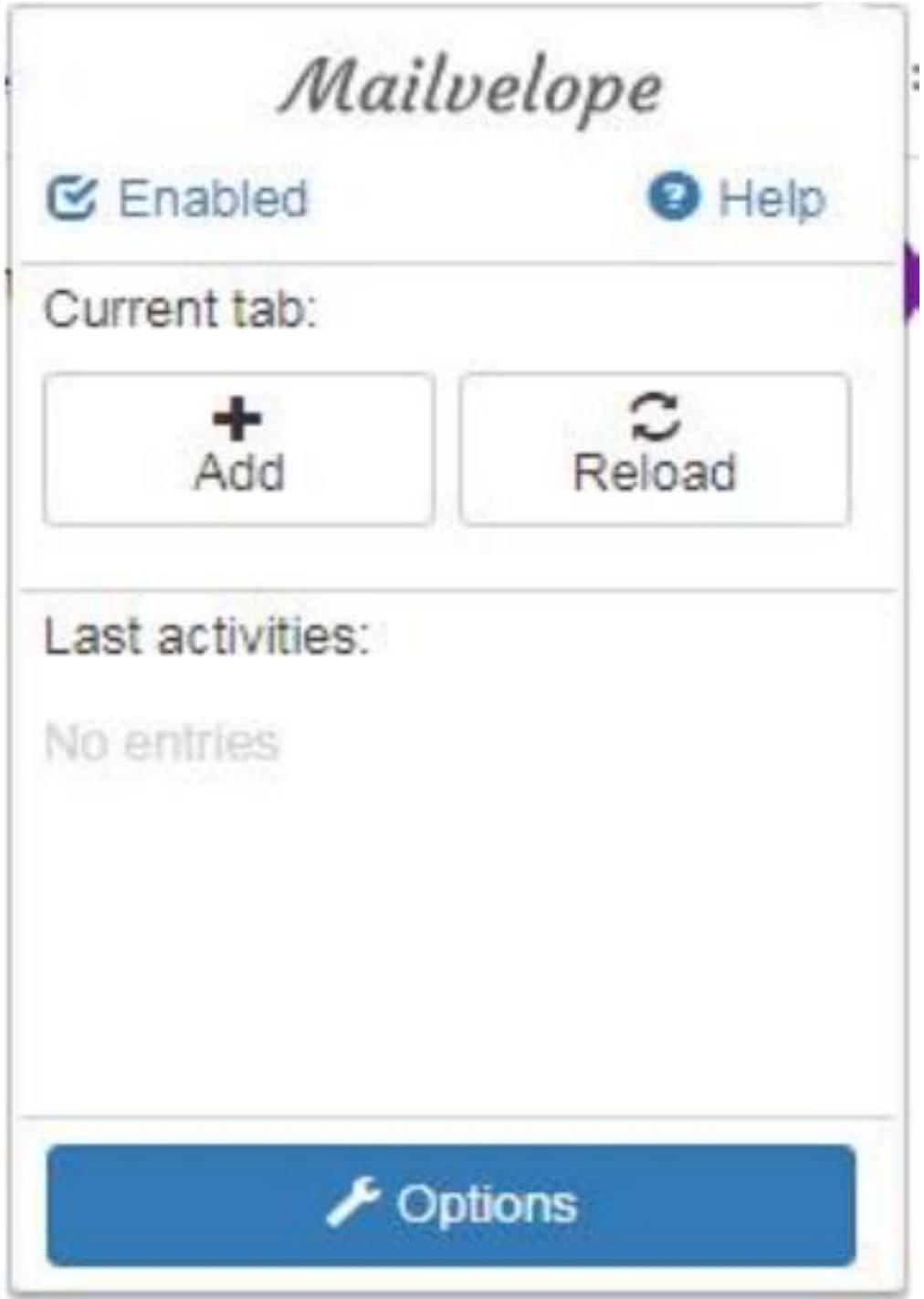
Next we setup a think aloud study to see if actual users would fail where expected.

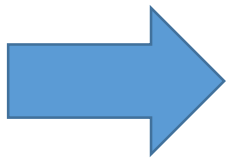
	Task 2: Write an encrypted email			
	Webmail login	Composing email on	Opening Mailvelope popup	Sending encrypted email
T1	Success(hint)	Webmail editor	Failure	Failure
T2	Success(hint)	Webmail editor	Failure	Failure
T3	Success(hint)	Webmail editor	Failure	Failure
T4	Success(hint)	Webmail editor	Failure	Failure
T5	Success(hint)	Webmail editor	Failure	Failure
T6	Success	Webmail editor	Failure	Failure
T7	Success	Webmail editor	Failure	Failure
T8	Success	Webmail editor	Failure	Failure
T9	Success(hint)	Mailvelope popup	Success	Success
T10	Success	Webmail editor	Failure	Failure

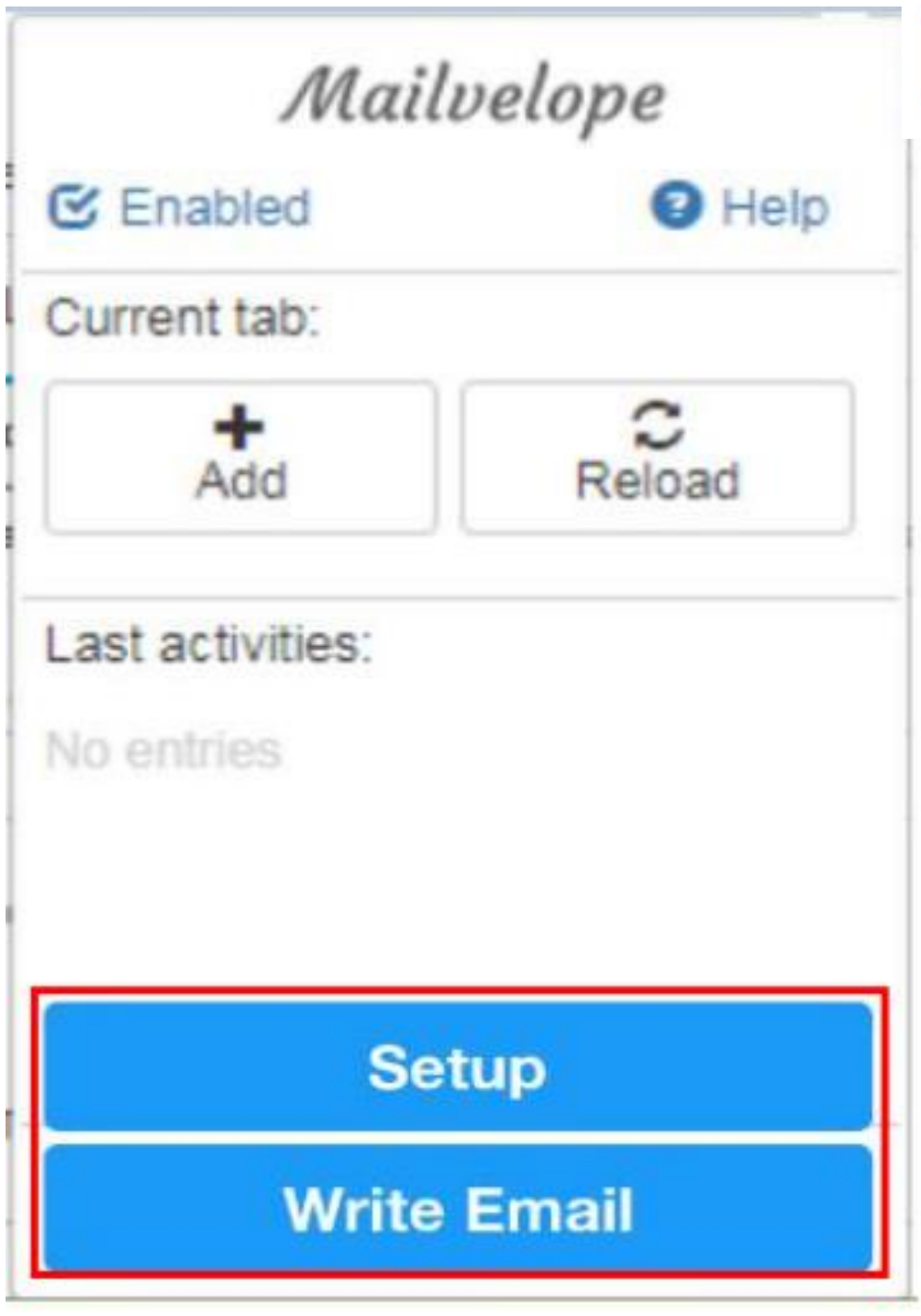
Table 4.3: Completion details of Task 2 for each participant.

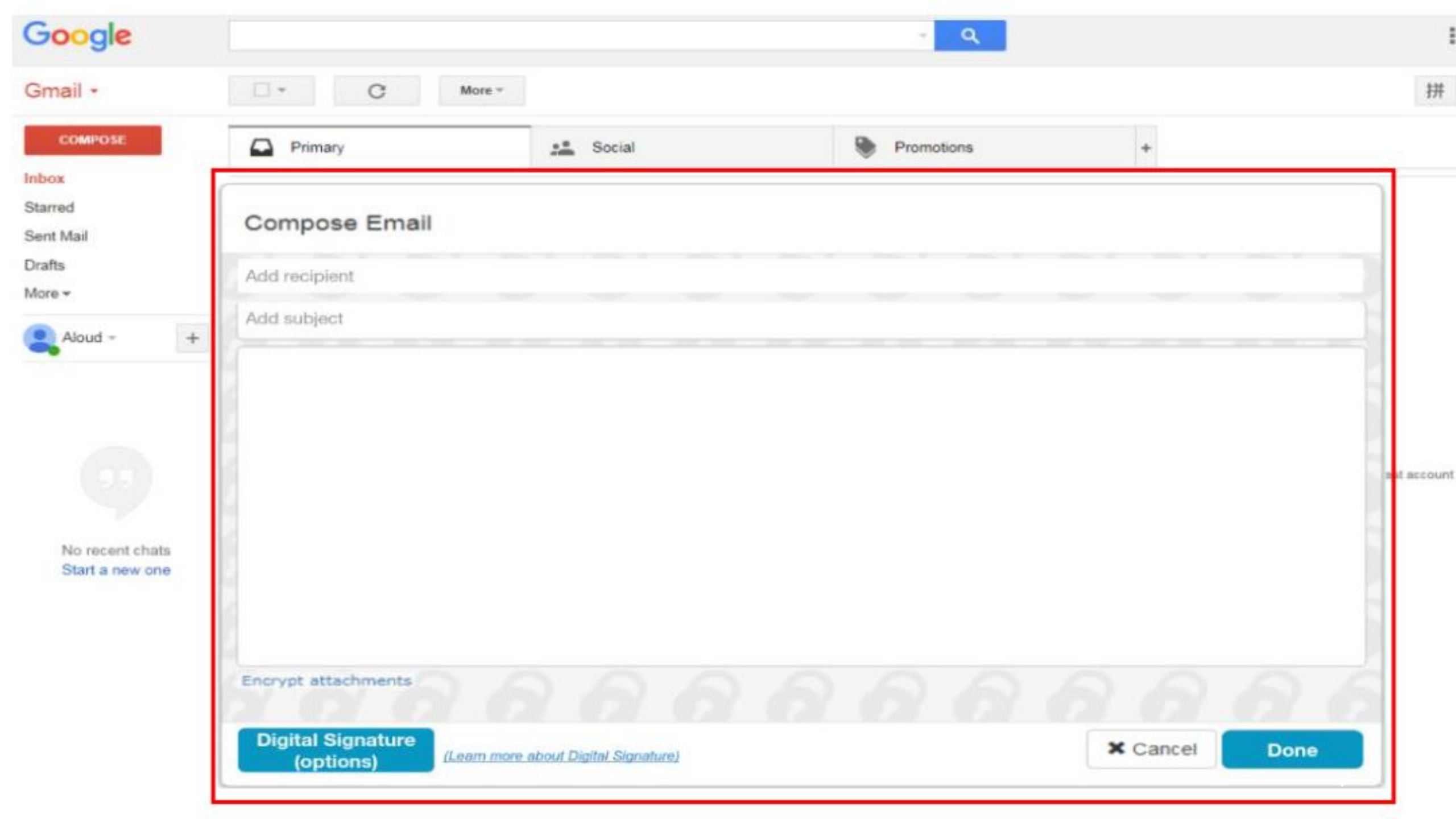
Design process



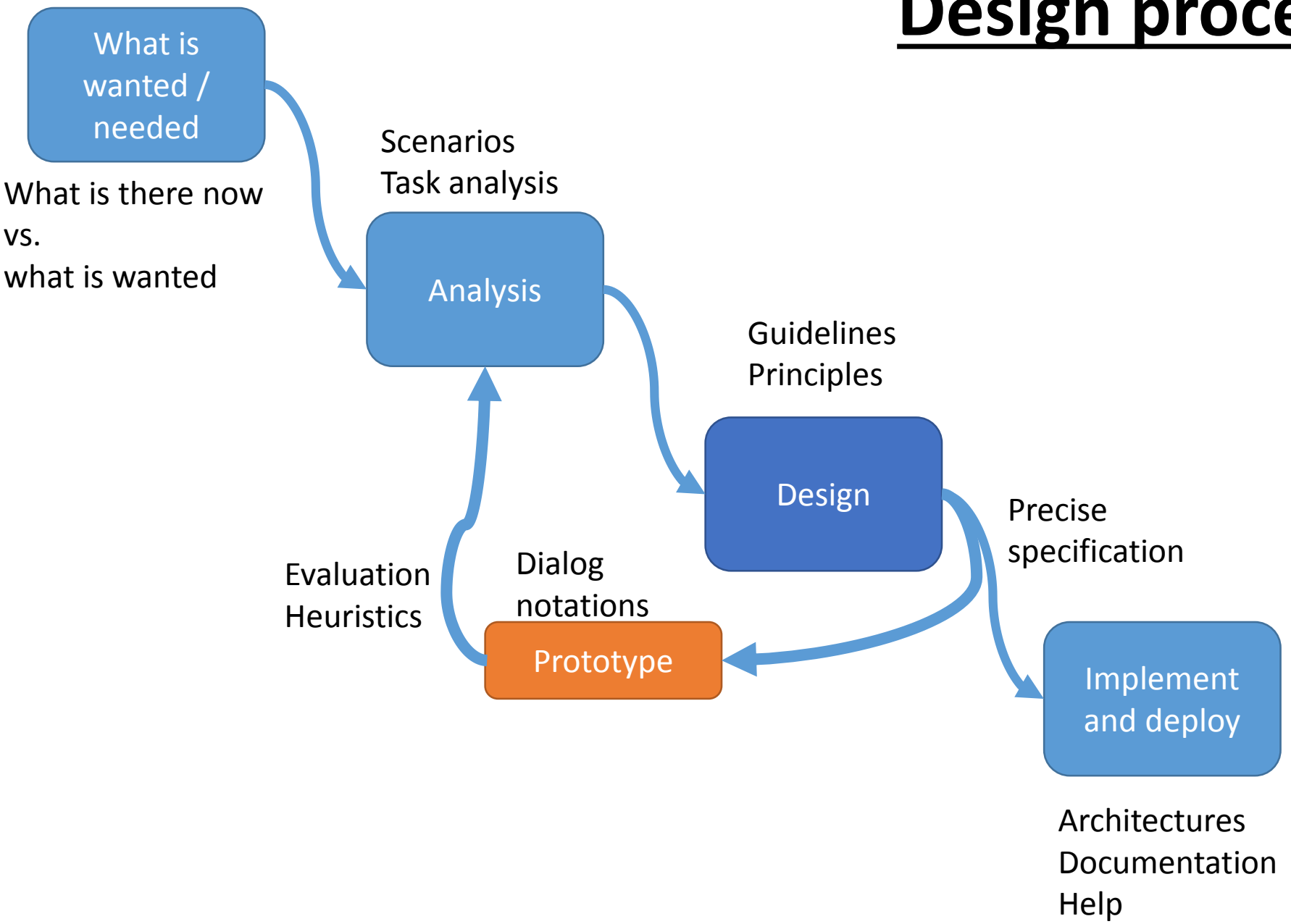

Mailvelope
Enabled
Help
Current tab:
Add
Reload
Last activities:
No entries
Options




Mailvelope
Enabled
Help
Current tab:
Add
Reload
Last activities:
No entries
Setup
Write Email


Google
Gmail
More
COMPOSE
Primary
Social
Promotions
Inbox
Starred
Sent Mail
Drafts
More
Aloud
No recent chats
Start a new one
Compose Email
Add recipient
Add subject
Encrypt attachments
Digital Signature (options)
(Learn more about Digital Signature)
Cancel
Done

Design process



All participants selected the email provider from the dropdown list and clicked on the "OK" button. All of them noticed the auto-opening popup but they did not think it belongs to the Mailvelope. However, they considered it as the webmail editor. They all intended to write the email on this popup. D1 said "it is clear for me to compose the email on this editor."

Questions