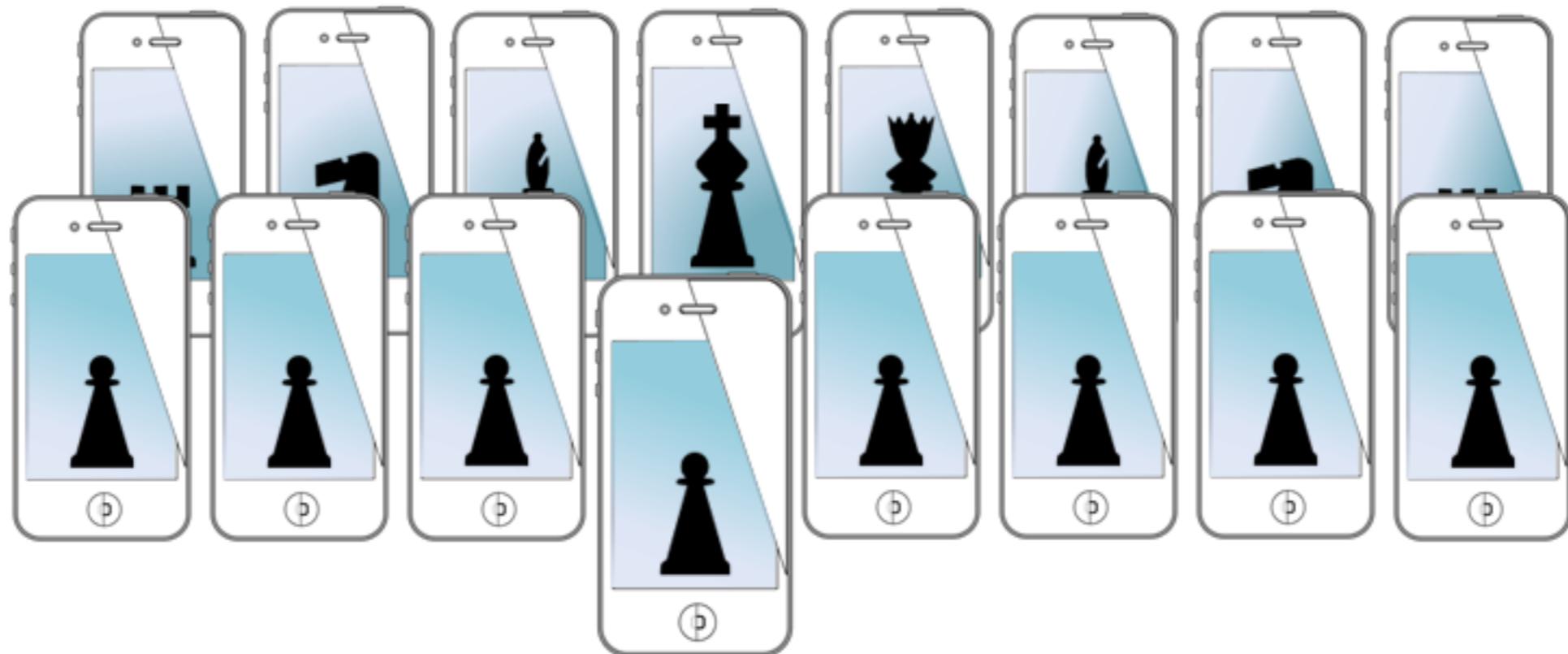


MOBILE SENSING LEARNING



CS5323 & 7323
Mobile Sensing and Learning

mobile design and interaction

Eric C. Larson, Lyle School of Engineering,
Computer Science, Southern Methodist University

course logistics

- lab one due soon!
- upgrade macOS and iOS at your own risk!

agenda

- mobile HCI
 - design, navigation, and interaction
 - many elements courtesy of apple
 - and some from others

another great resource:

227 pages of bliss, text, pictures, and video
navigable via web interface

iOS Human Interface Guidelines

<https://developer.apple.com/design/human-interface-guidelines/ios/overview/themes/>

what makes great UI?

- you know it when you see it
- no matter what I tell you, nothing is a hard and fast rule except:
 - keep it simple, clear
 - kill the clutter, display only what is needed
 - use motion/physical metaphors when appropriate

a better slide

deference

never compete
with content

text legible
clarity
background subtle

subtle visual
motion cues

depth

planning

step one

look at core function

step two

add design sparsely

step three

examine assumptions
question every element

principles of great design

how to make this slide better?

principles of great design

make it obvious



make it obvious



mobile text entry is awful

- avoid text input at all costs
- e.g., enter your state

solution text

Enter State

solution picker

Select State

GA

HI

ID

IL

IN

IW

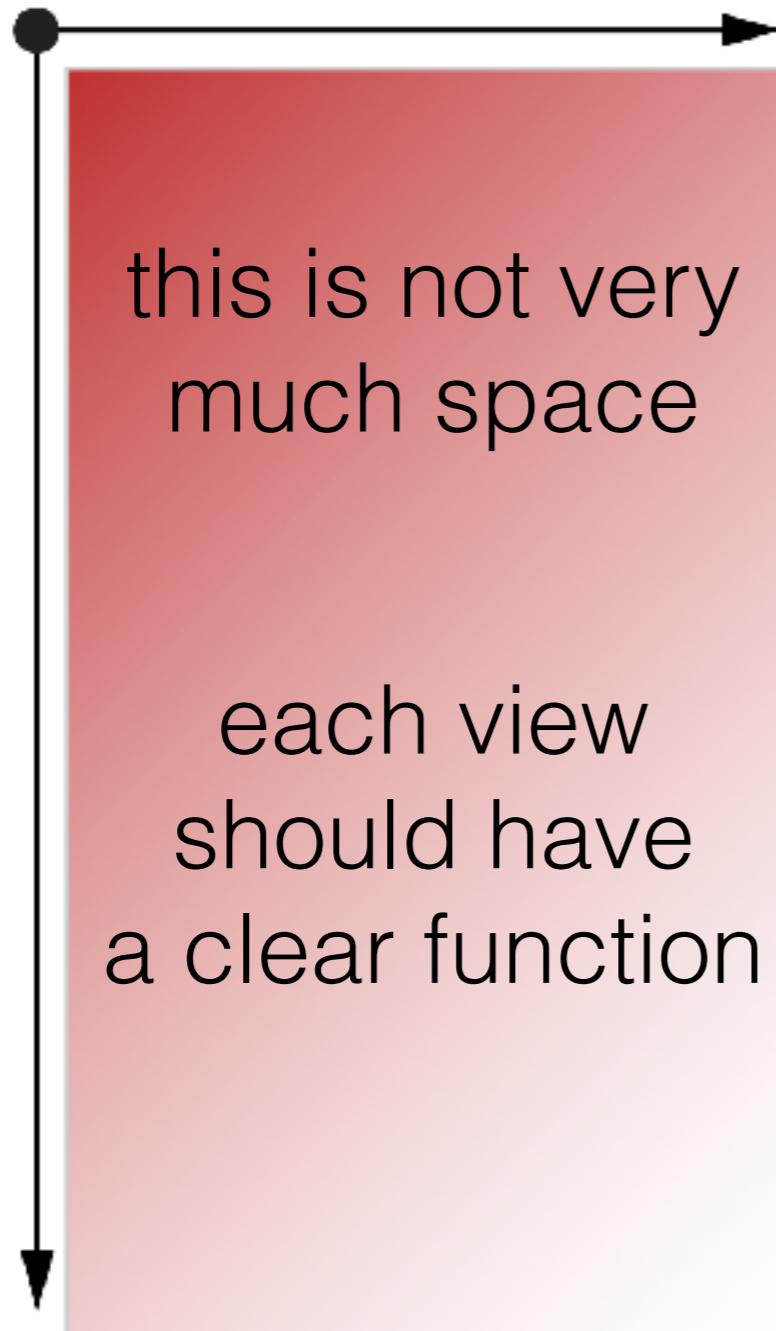
KA

solution get from current location

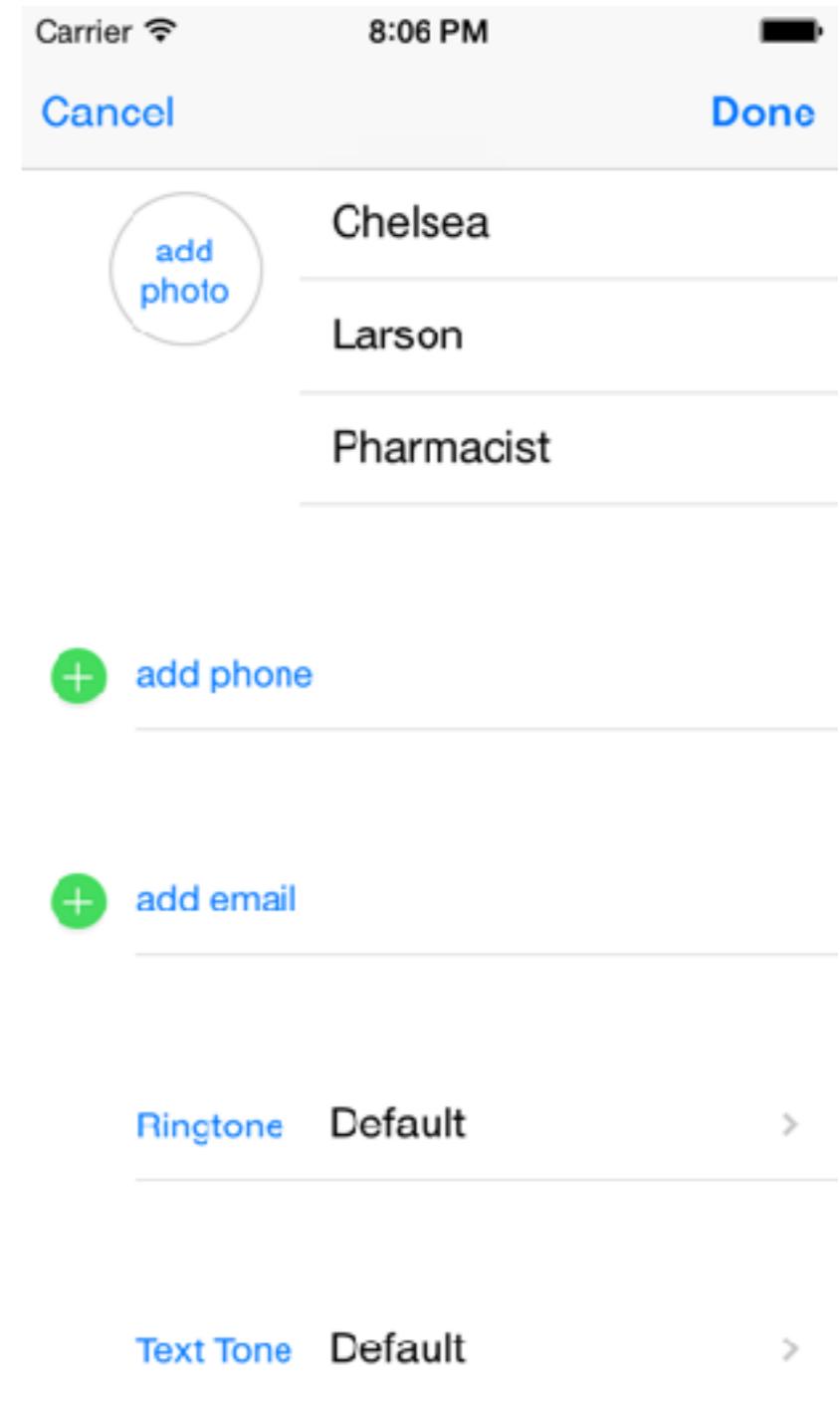
Autofill

layout with care

important



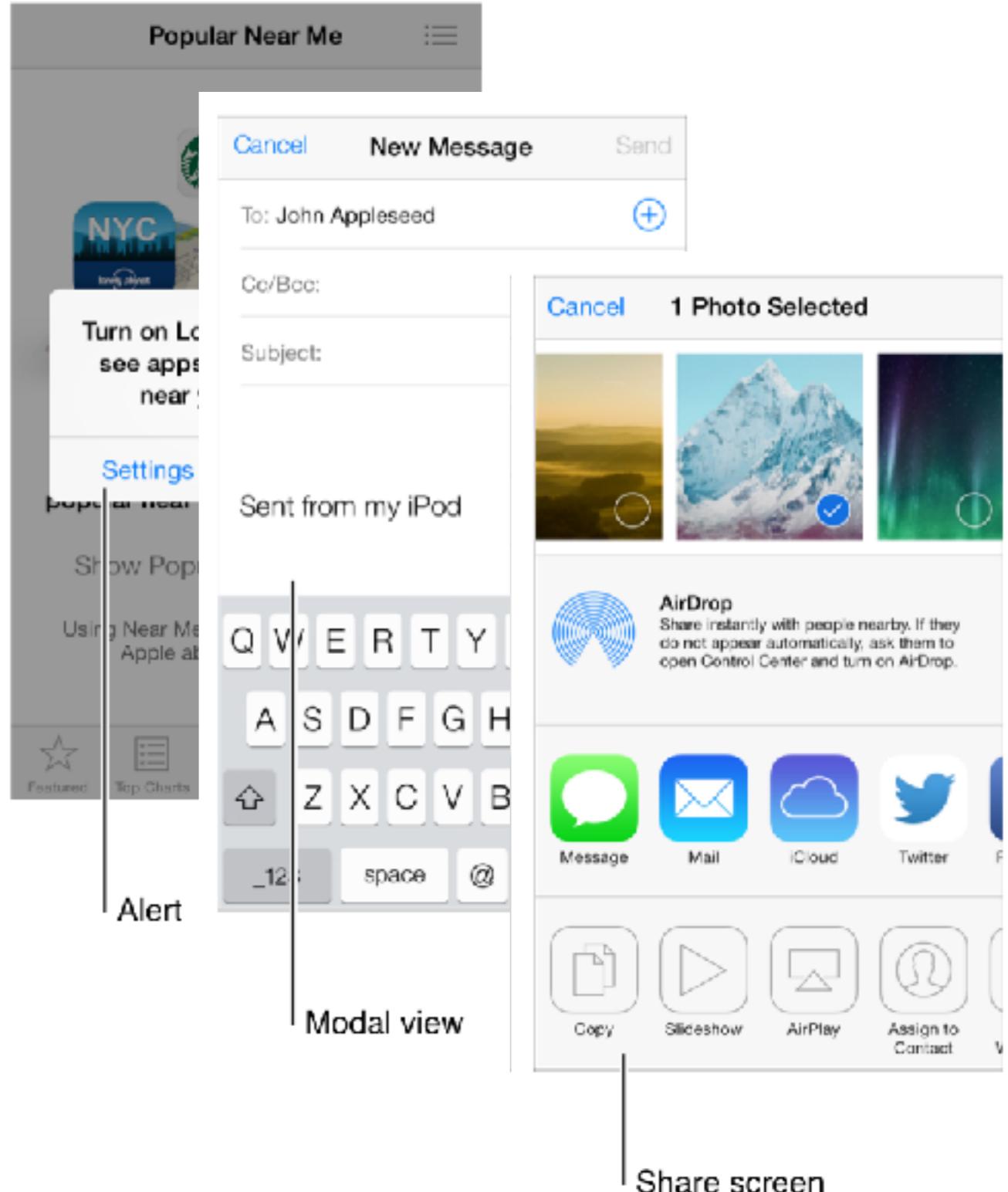
not so important



use modal sparingly

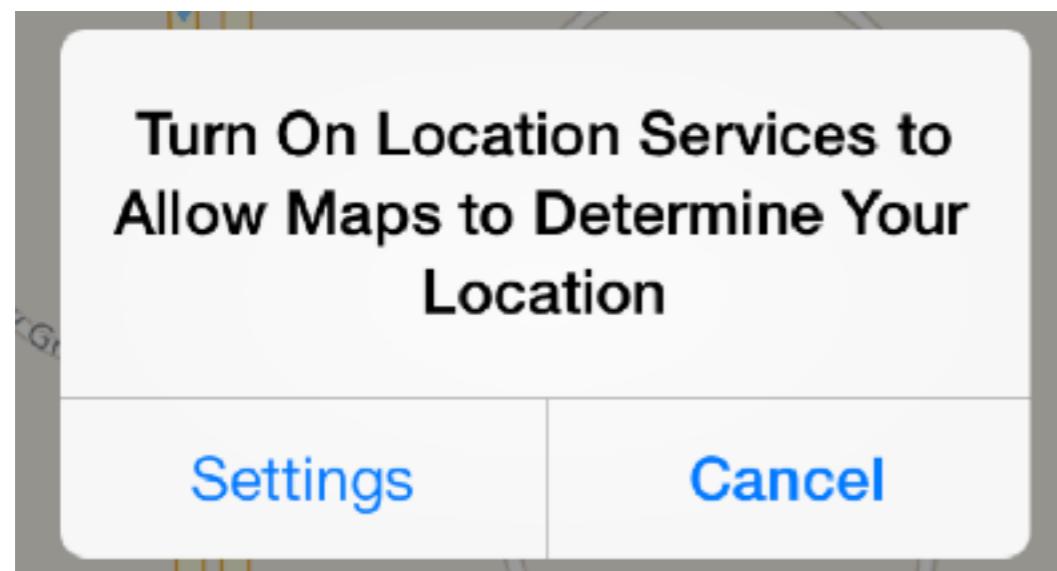
takes over the screen

- prevents other interaction
- use when:
 - critical to capture attention
 - self contained action
 - like sending email
- keep simple, not tied to nav
- provide easy, safe exit



keep alerts succinct

- change wording to be clear and concise
- avoid jargon



- use verbs for buttons
- title is meaningful
- two choices, safe choice bolded
- full sentences used in explanation
- try to only have a title
- try not to say “we” and “our”

Apple says... design is...

formatting



design for touch



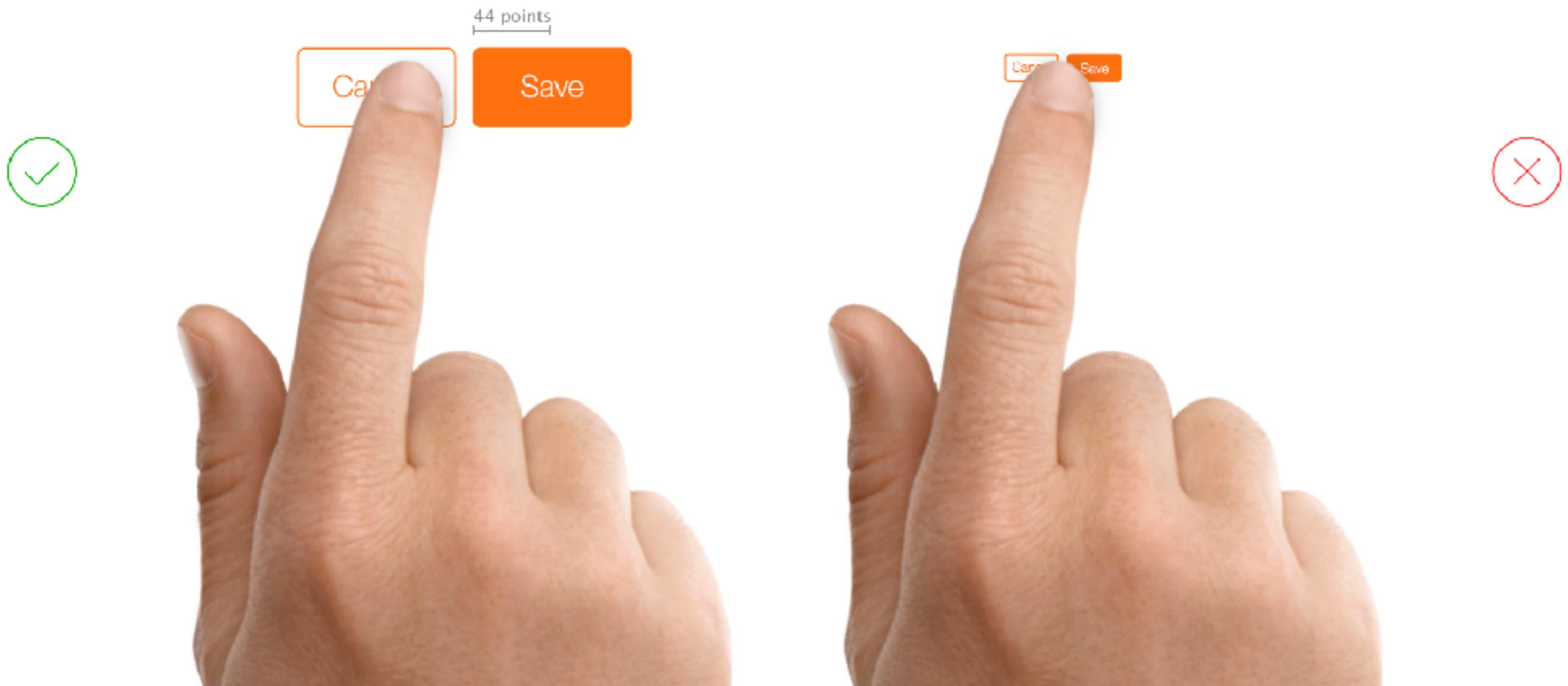
Date	October 11, 2013		4:00 PM
Tue Oct 8	1	57	
Wed Oct 9	2	58	
Thu Oct 10	3	59	AM
Fri Oct 11	4	00	PM
Sat Oct 12	5	01	
Sun Oct 13	6	02	
Mon Oct 14	7	03	

Time: : AM

Date:

S	M	T	W	Th	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

design for taps



legible text

Heading

Sub-Headline



Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.

Heading

Sub-Headline

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.



high contrast

Heading

Sub-Headline



Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend.

Heading

Sub-Headline



Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend.

negative space

Heading

Sub-Headline



Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend.

Heading

Sub-Headline



Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend egestas nisl vehicula nec. Nullam varius est dui, nec accumsan lectus posuere ut. Nullam viverra purus laoreet euismod tempor.

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus. Duis vehicula elit nulla, eleifend.

organize



Edit	
Coffee	28 g >
Grain Size	~113.3 µm >
Water	1241 ml >
Temperature	103°C >
Time	223 s >
Serving	310.25 ml >
Metric	English



coffee: 28 g. Edit grain size:
~113.1 µm Edit water: 1241
ml Edit temp: 103° Edit
time: 223 s. Edit serving:
310.25 ml Edit

Metric English
Celsius Fahrenheit

alignment



Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare*
Curabitur semper vitae urna ac adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus.



**Ornare imperdiet blandit lectus. Morbi tristique*

Continue

Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus. Morbi tristique urna ut volutpat ornare* Curabitur semper vitae urna ac tempus.



**ornare imperdiet blandit lectus.
Morbi tristique*

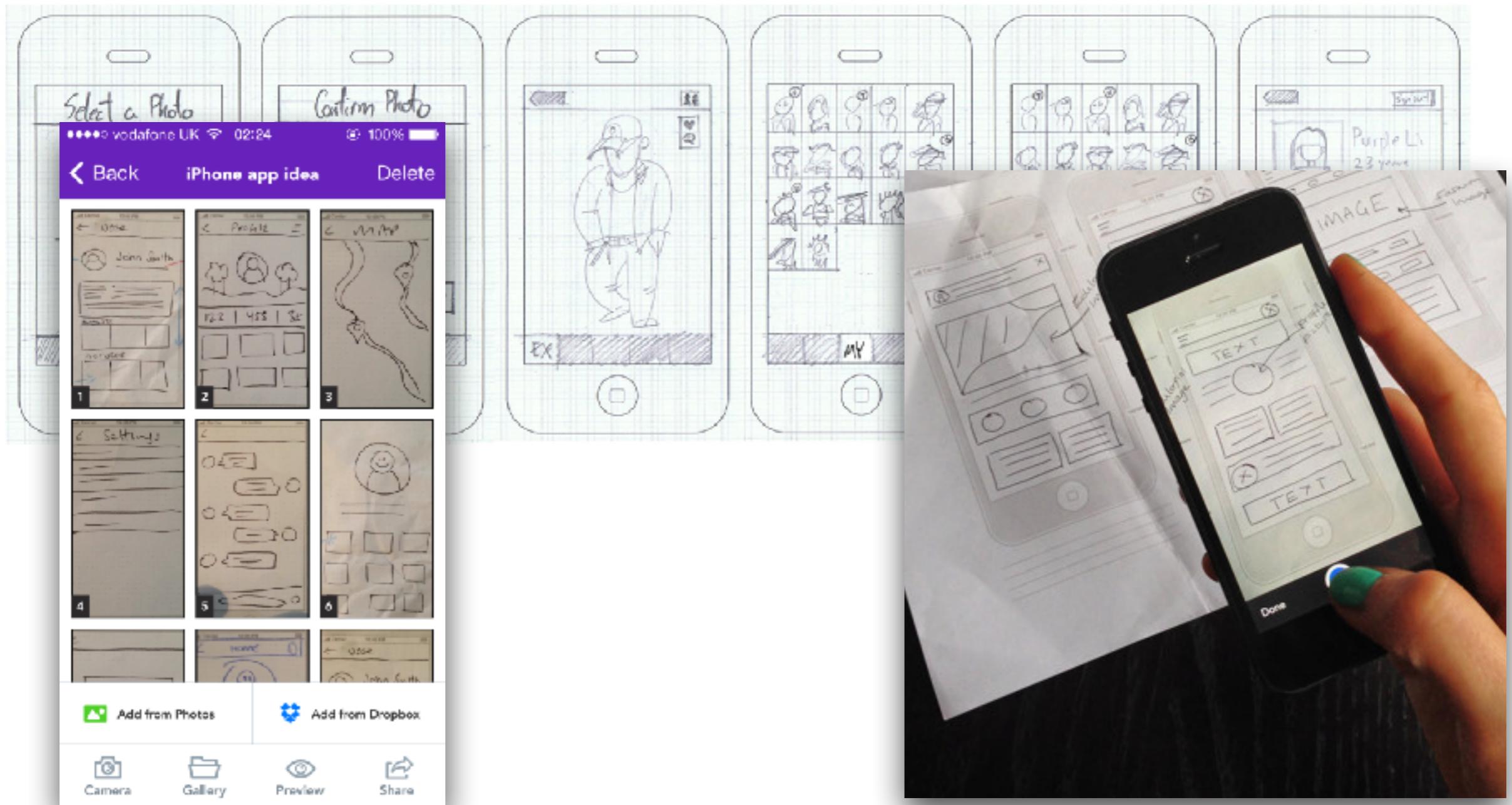
Continue



Adipiscing elit. Sed neque nisl, blandit vel ipsum eu, imperdiet blandit lectus.
Morbi tristique urna ut volutpat ornare. Curabitur semper vitae urna ac tempus.

get feedback early

paper prototypes



defining your style

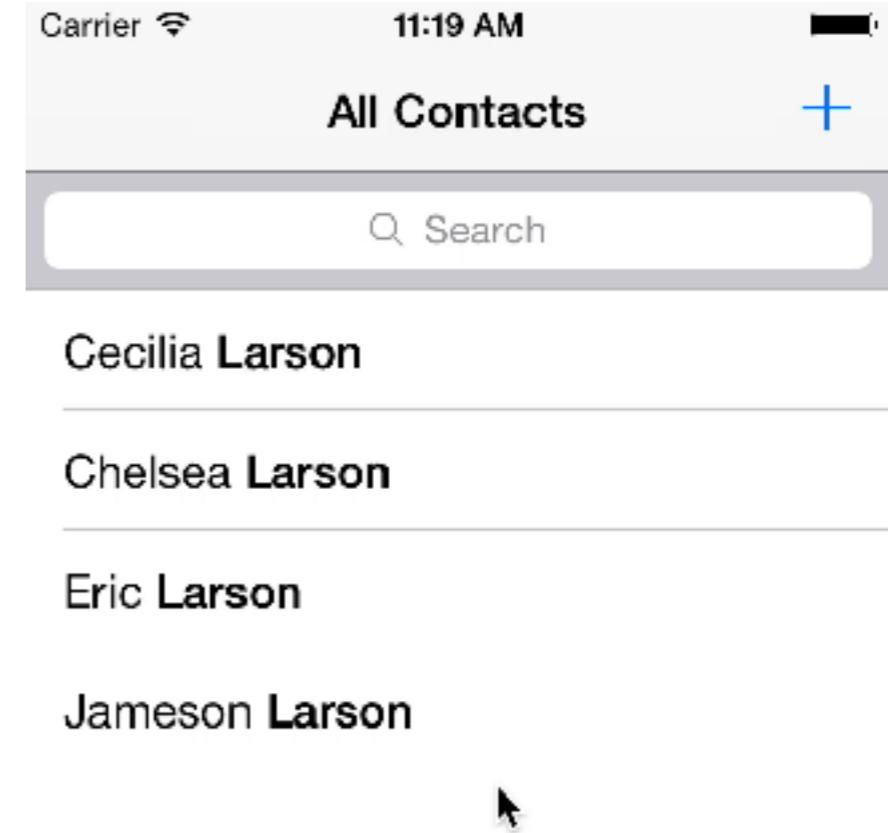
know your app: basics

style basics

design is flat

- color exposes purpose
- negative space
- subtle bordering when needed

- no shadows or bordering
- text filled minimally and descriptive
- **color** conveys interaction possible
- borders when ambiguous



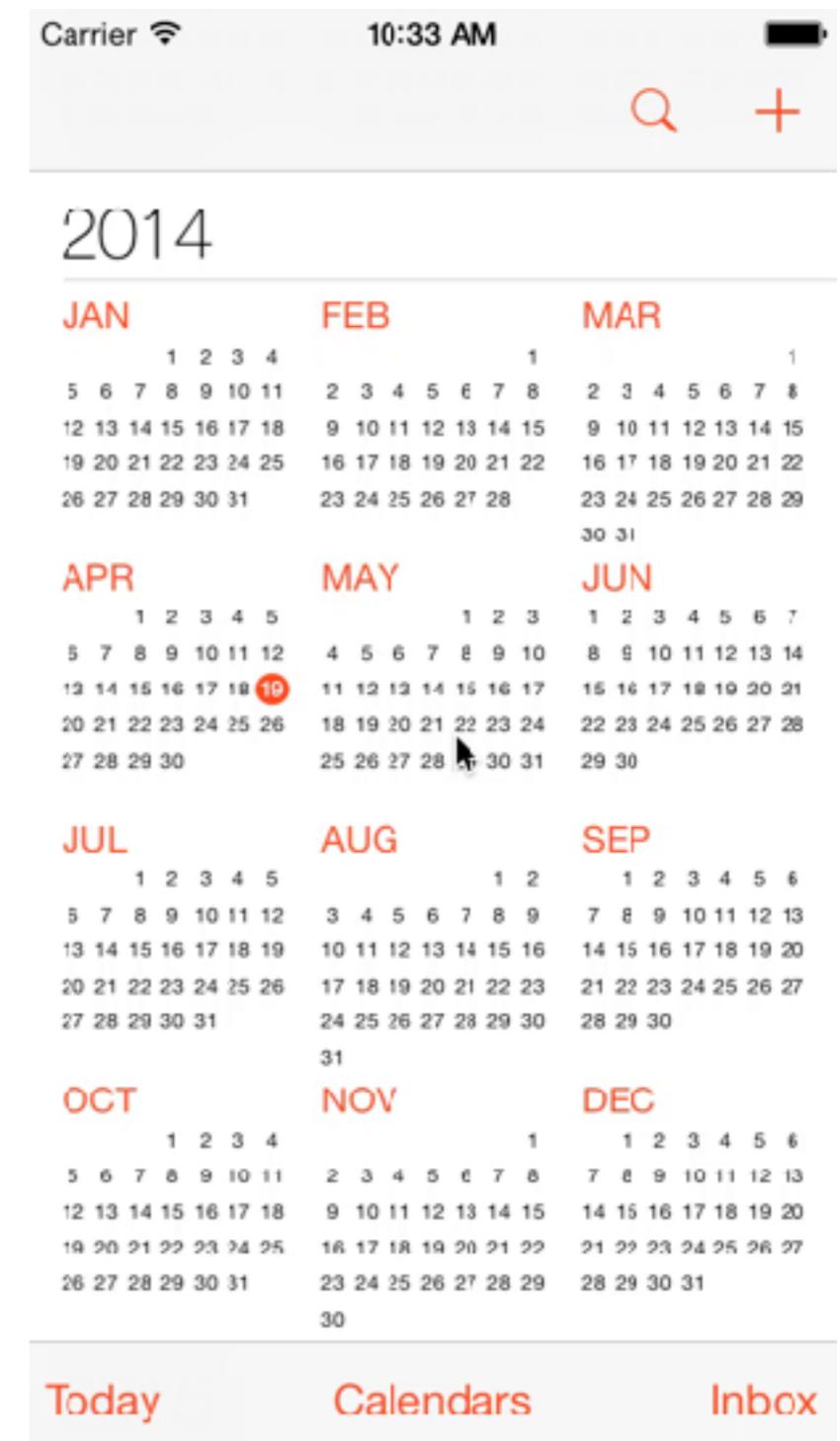
know your app: productivity

productivity apps

enables detailed manipulation

- organizing
- adding and subtracting
- drill down for detail

- depth conveys hierarchy
- transition motion orients user
- detail view takes over the screen
- manipulation tabs change with depth



know your app: utility

utility

simple task, minimal input

- highly visual
 - enhanced display of info
 - no hierarchy
 - glance-able
-
- entire screen is used
 - navigation is flat
 - input is exploratory
 - no elements are in competition

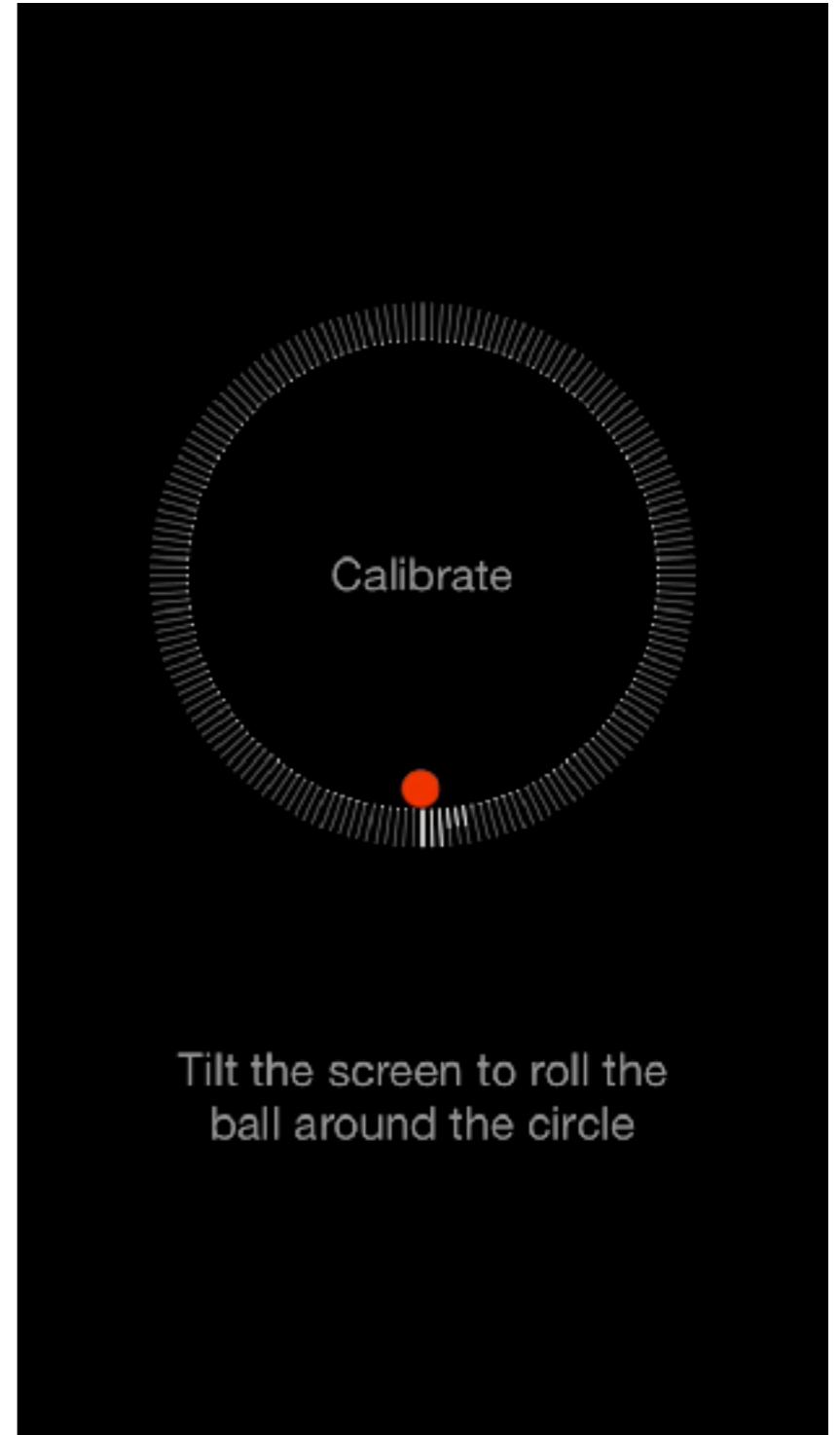


know your app: immersion

immersive

high interaction, visual experience

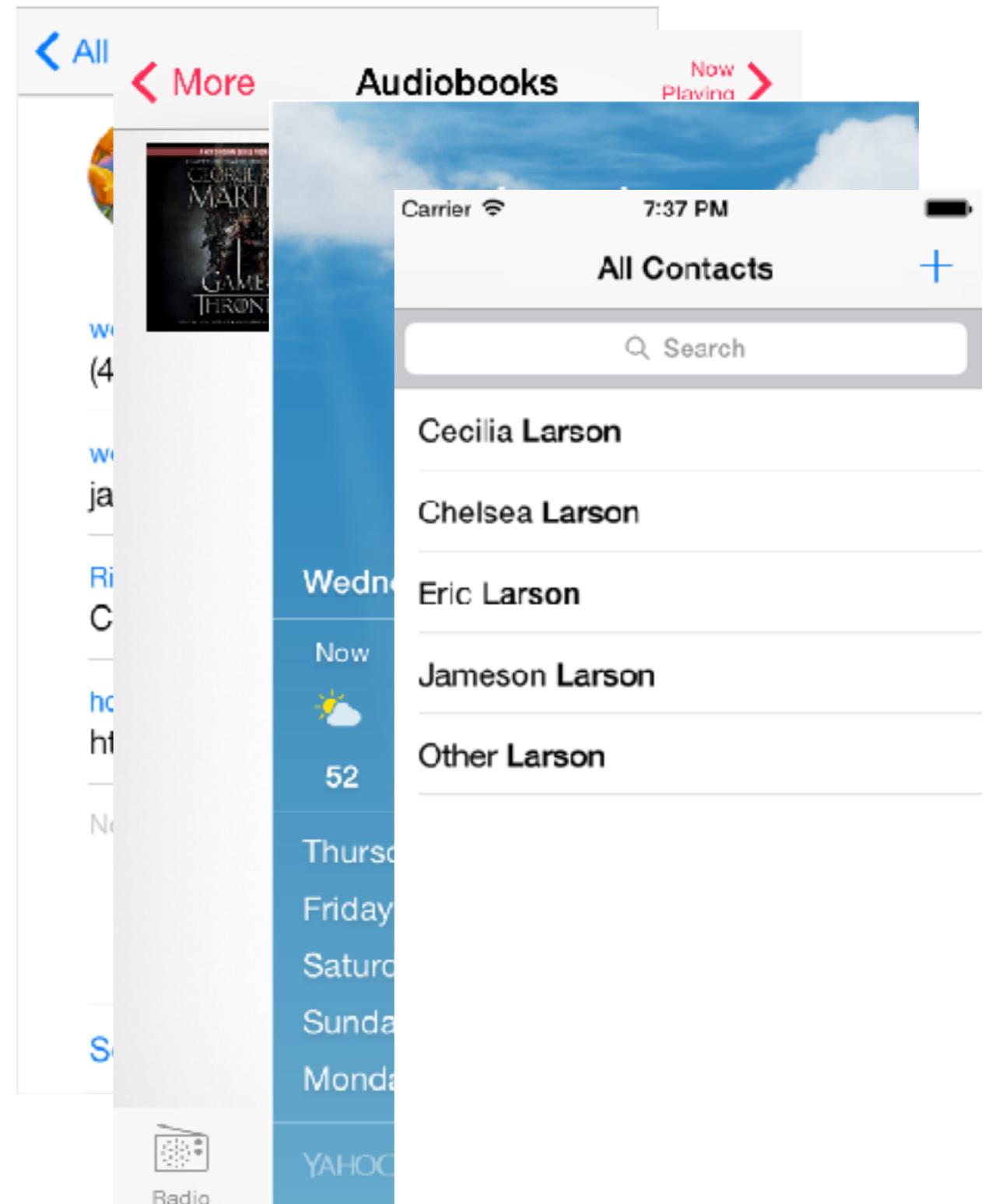
- hide UI elements
- nonstandard controls
- information centered on story, gameplay, experience



Tilt the screen to roll the ball around the circle

navigation is orientation

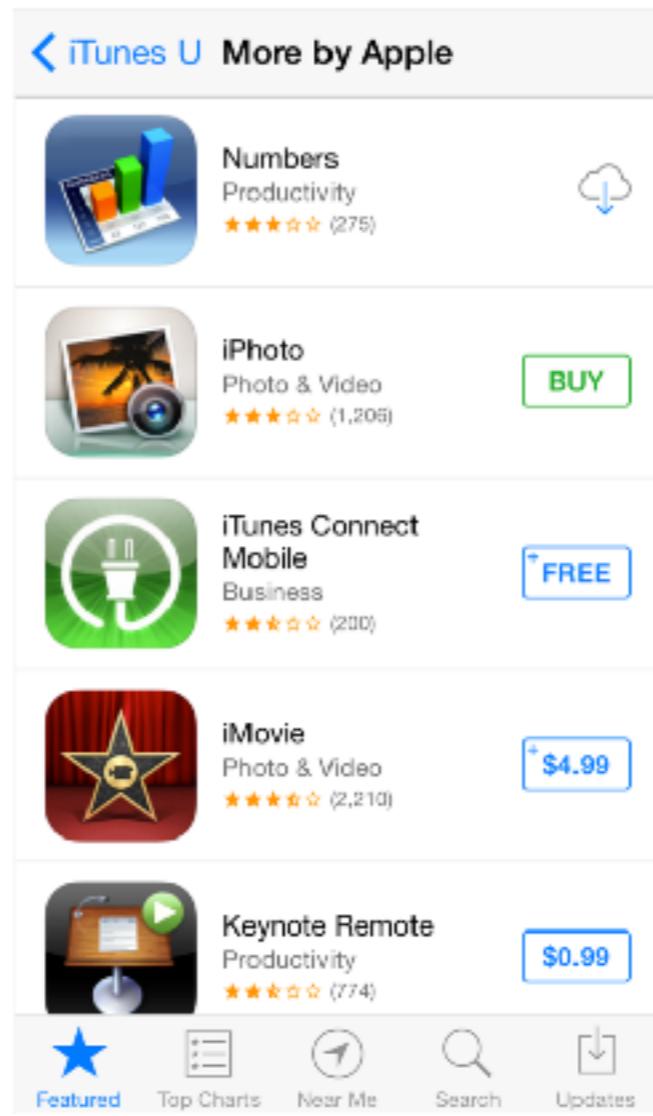
- the user must always know **where they are** in the app
- the **navigation bar** is the most understandable form of hierarchy, even when using animated hierarchy
- **tab bar** is for parallel content (peers)
 - each peer is different in function
- **page control** is for identical views, with new content
- **table view** is for master/detail
- only have **one way** of navigating to a view



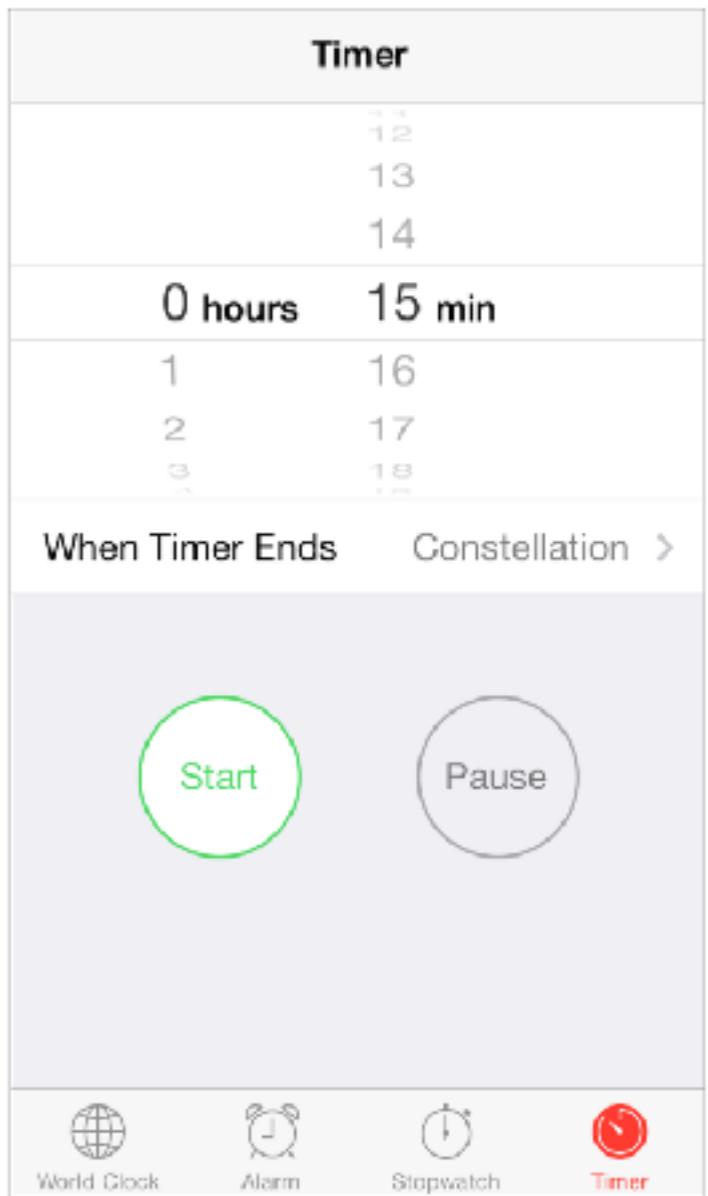
button design

- embrace the borderless
- until you need a border

distinguish
“tap button”
from “tap row”



most
important
interaction



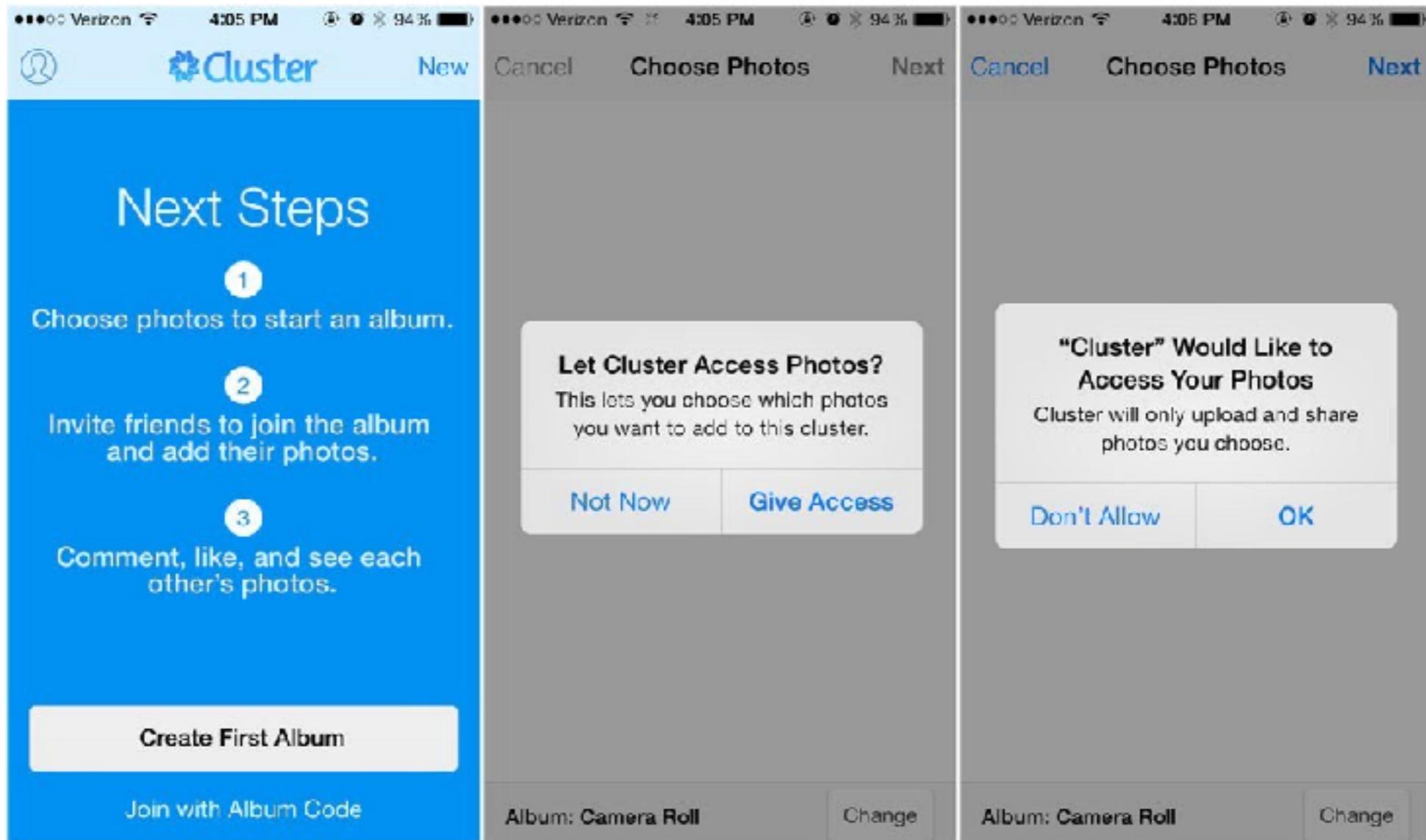
principles summary

- stay consistent
- use design elements that don't distract
 - for a game, engagement is king
 - for productivity, keep animation subtle and quick
- visible feedback and direct manipulation
- use metaphor to promote intuitive interaction
 - flick / tap / pinch
- give the user the control
 - the user always has control of their information

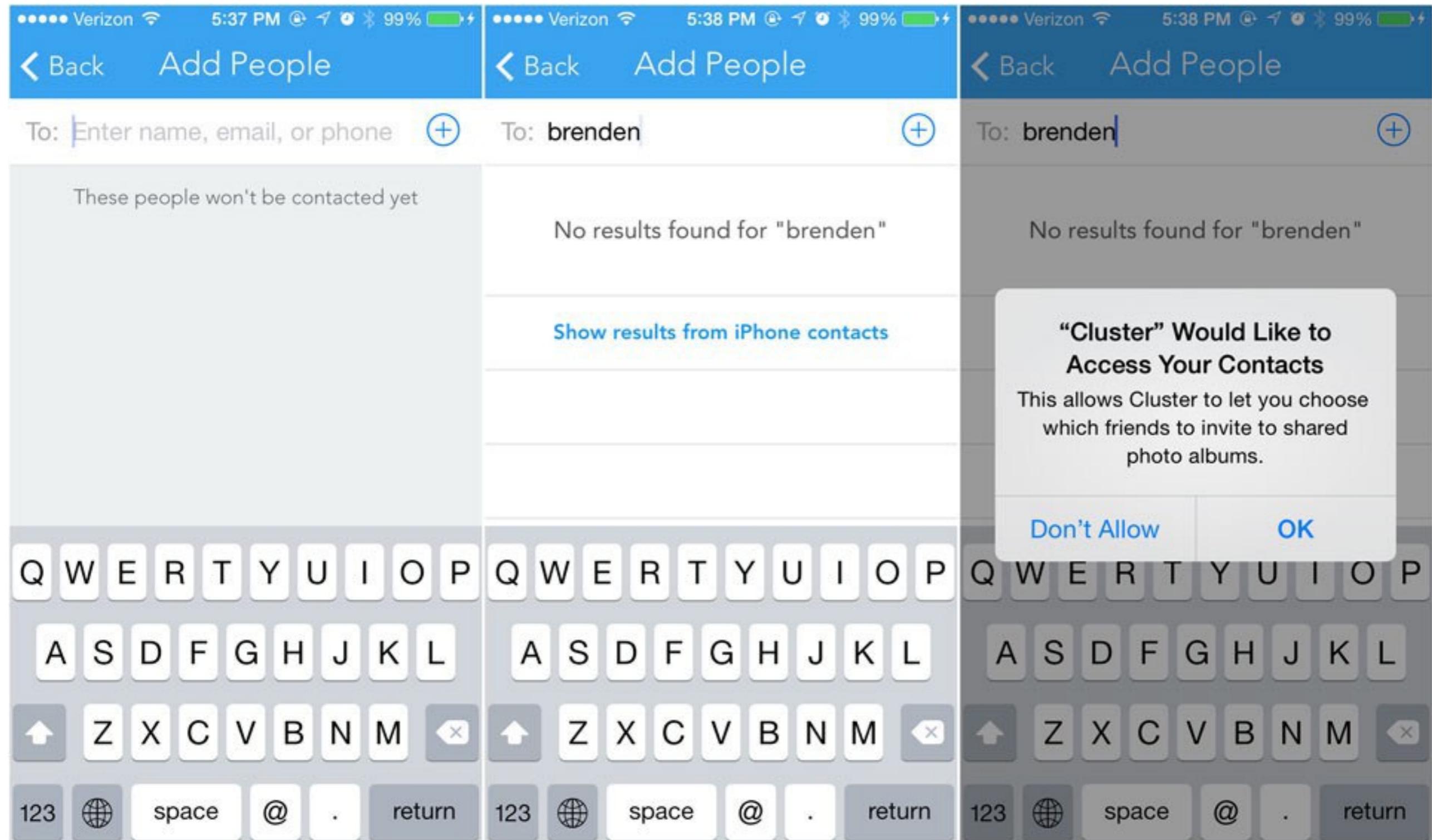
user control

user control

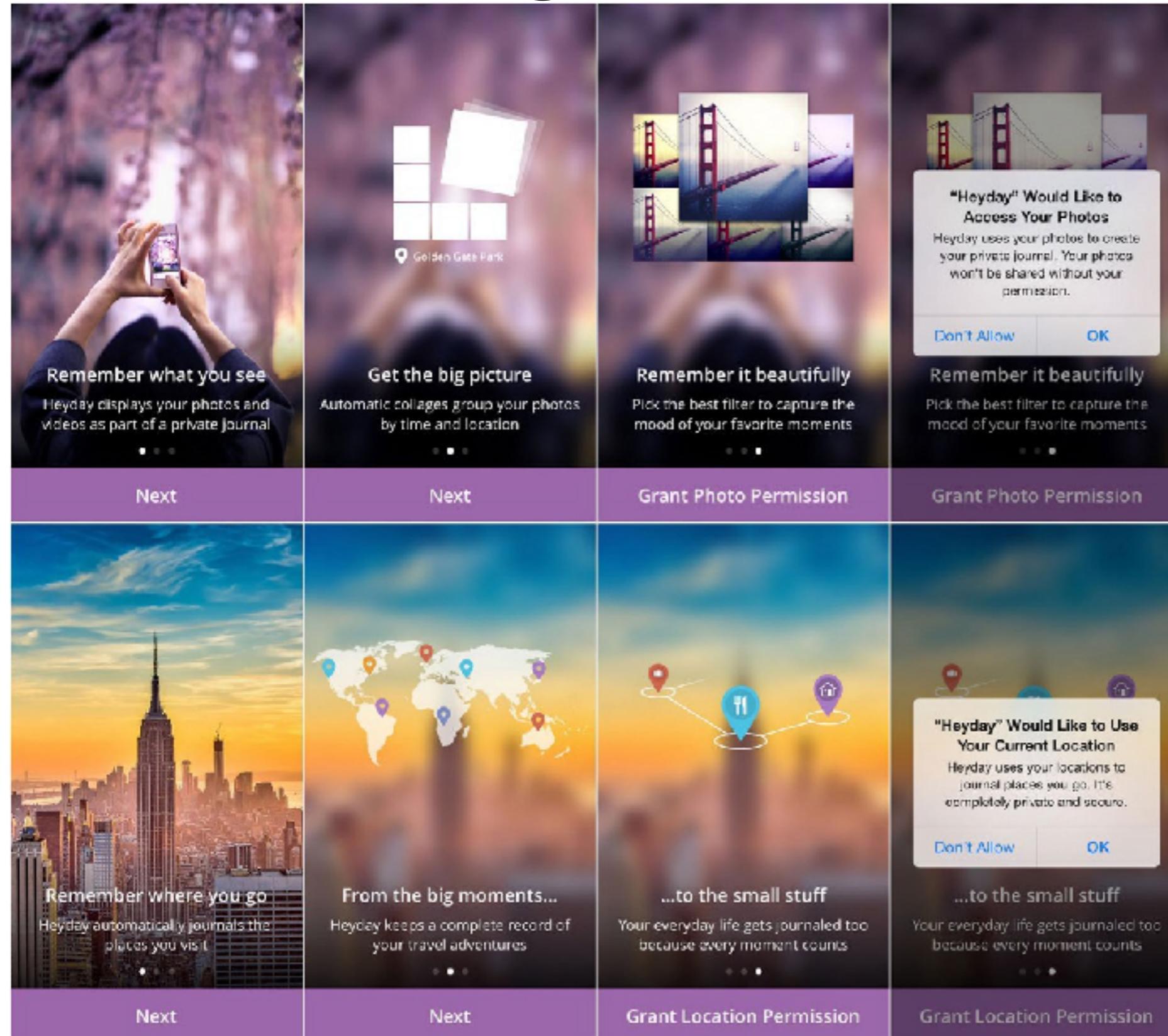
- don't ask until you need it, make sure the user knows the tradeoff
- use “benefit->explanation”
 - ask twice, showing the benefit in your own words



when asking for access



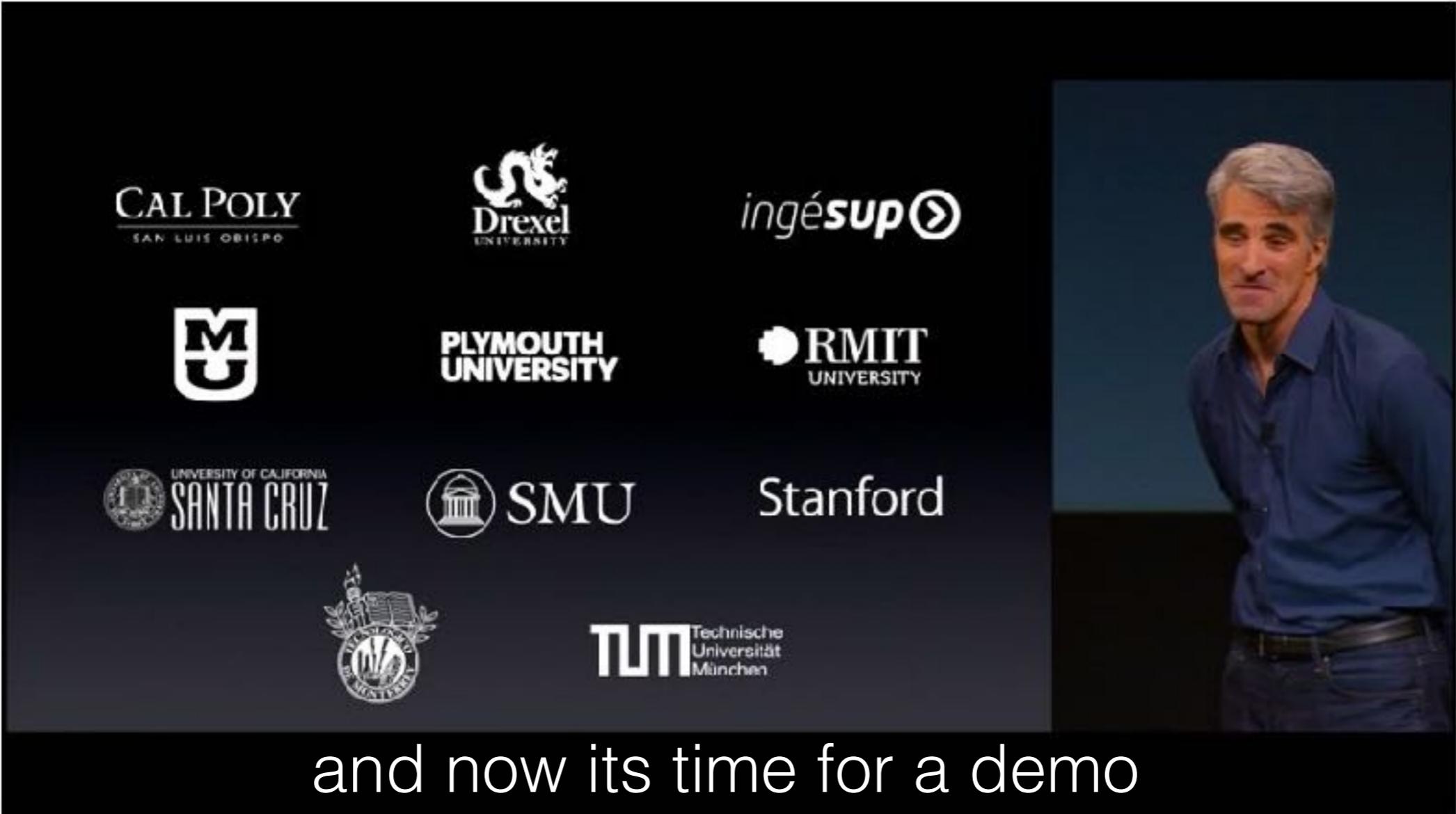
is this right?



what is good?

what is bad?

making our app better



A collage of university logos and a portrait of Steve Jobs. The logos include CAL POLY SAN LUIS OBISPO, Drexel UNIVERSITY, ingéSUP, RMIT UNIVERSITY, UNIVERSITY OF CALIFORNIA SANTA CRUZ, SMU, Stanford, and TUM Technische Universität München. To the right of the logos is a portrait of Steve Jobs in a dark shirt.

and now its time for a demo

for next time...

- introduction to audio sensing

back up HCl slides

planning the app

- **list** potential features of the app
- a recipe app

creating lists

getting recipes

comparing prices

locating stores

annotating recipes

getting and using coupons

viewing cooking demos

exploring different cuisines

finding ingredient
substitutions

planning the app

usually cook at home or prefer ready-made meals

are committed coupon-users or think that coupons aren't worth the effort

enjoy hunting for speciality ingredients or seldom venture beyond the basics

follow recipes strictly or use recipes as inspiration

buy small amounts frequently or buy in bulk infrequently

what do these users want?

who is your target audience?

- **determine** users, list it out

want to keep several in-progress lists for different purposes or just want to remember a few things to buy on the way home

insist on specific brands or make do with the most convenient alternatives

tend to buy a similar set of items on each shopping trip or buy items listed in a recipe

audience: love to experiment with recipes, are often in a hurry, and are thrifty if it doesn't take too much effort

planning the app

- **filter** potential features through your audience

audience: love to experiment with recipes, are often in a hurry, and are thrifty if it doesn't take too much effort

creating lists

getting recipes

comparing prices

Locating stores

annotating recipes

getting and using coupons

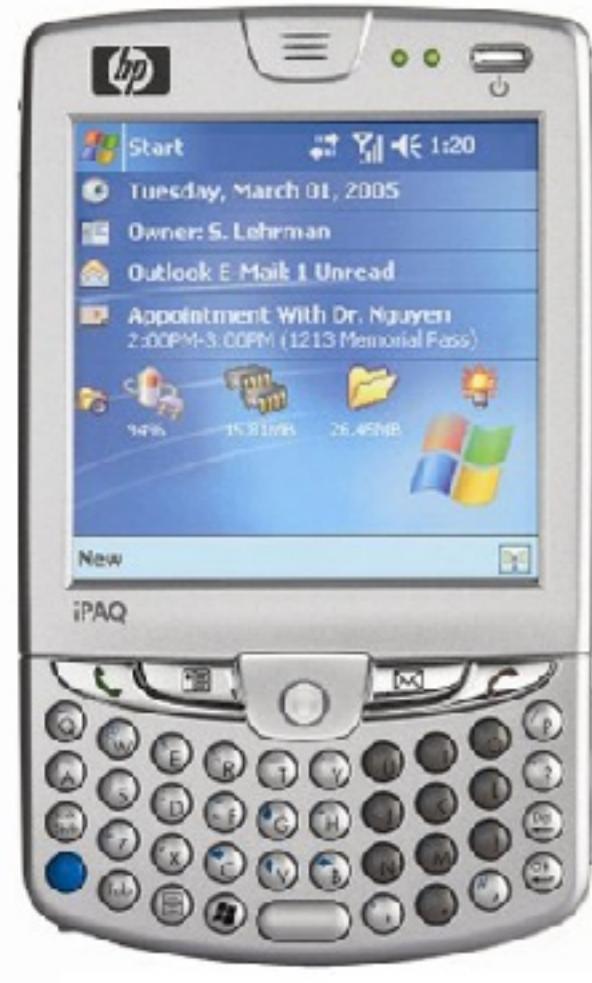
viewing cooking demos

exploring different cuisines

finding ingredient substitutions

flat design

- HCI was built on the concept of metaphor since its inception
 - called skeuomorphism
 - mobile HCI breaks all these metaphors



flat design

- no need for visual metaphor if intuitive
- make minimal and efficient
- color is king



flat design

- main principles started in advertising
- the swiss style and minimalist style



pure flat design

- minimal typography
 - Helvetica (Neue) / SF
 - text size gives importance
- colors are vibrant
 - set against light/dark
- no drop shadows
- no lightpoint gradients
- depth is for orienting only, never the UI elements



R 255
G 59
B 48

Red

R 255
G 149
B 0

Orange

R 255
G 204
B 0

Yellow

R 76
G 217
B 100

Green

R 90
G 200
B 250

Teal Blue

R 0
G 122
B 255

Blue

R 88
G 86
B 214

Purple

R 255
G 45
B 85

Pink

pure flat design?

eric c. larson

HOME PUBLICATIONS TALKS TEACHING CV

COURSES OFFERED

- Mobile Sensing and Learning
- Machine Learning in Python
- Machine Learning and Neural Networks
- Ubiquitous Computing
- Introduction to Data Mining
- Computer Science Seminar

CSE5323 & CSE7323 - MOBILE SENSING AND LEARNING

MOBILE SENSING LEARNING

COURSE DESCRIPTION

This class will equip students with the practical skills necessary to develop mobile applications able to take advantage of the myriad of sensing, machine learning, and control capabilities that modern smartphones offer. The course focuses on interfacing with the hardware of the phone and inferring high level information from the sensors streams. Particular focus will be placed upon efficiently analyzing and controlling hardware peripherals on third-party hardware, such as an embedded micro-controller or peripheral such as Google Glass. This third-party hardware platform will interface with the mobile platform and allow students to integrate realtime control/automation with the sensing learned earlier in the semester. Assignments will use both objective C and C++ programming languages, on the iOS platform. Feel free to contact the instructor at eclarson@smu.edu if you have any questions.



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Dallas, TX 75200

SMU UbiComp Lab:
Johnson Square 119

eric c. larson

HOME PUBLICATIONS TALKS TEACHING CV

Filter: | On my Google Scholar page.

2019

GROUP BY Year Pub Type None

Y-AR
2018 (6)
2018 (2)
2017 (4)
2016 (2)
2016 (4)
2014 (3)
2013 (6)
2012 (8)
2011 (8)
2010 (9)
2009 (2)
2008 (4)
2007 (1)

Keyboard Snooping From Mobile Phone Arrays With Mixed Convolutional and Recurrent Neural Networks
Tyler Gialanella, Travis Siems, Elena Smith, Erik Gabrielsen, Ian Johnson, Mitchell A Thornton, Eric C Larson
IMWUT 2019
Keywords: side channel, security, convolutional neural networks, mobile phones

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Why Deep Knowledge Tracing Has Less Depth Than Anticipated
Xinyi Ding, Eric Larson
Proceedings of EDM 2019
Keywords: knowledge tracing, recurrent neural networks

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Computer Science Education: Fueling Tomorrow's Technology Growth
Fred Chang, Eric Larson, Mark Fontenot
Georgetown Journal of International Affairs
Keywords: security, computer science education

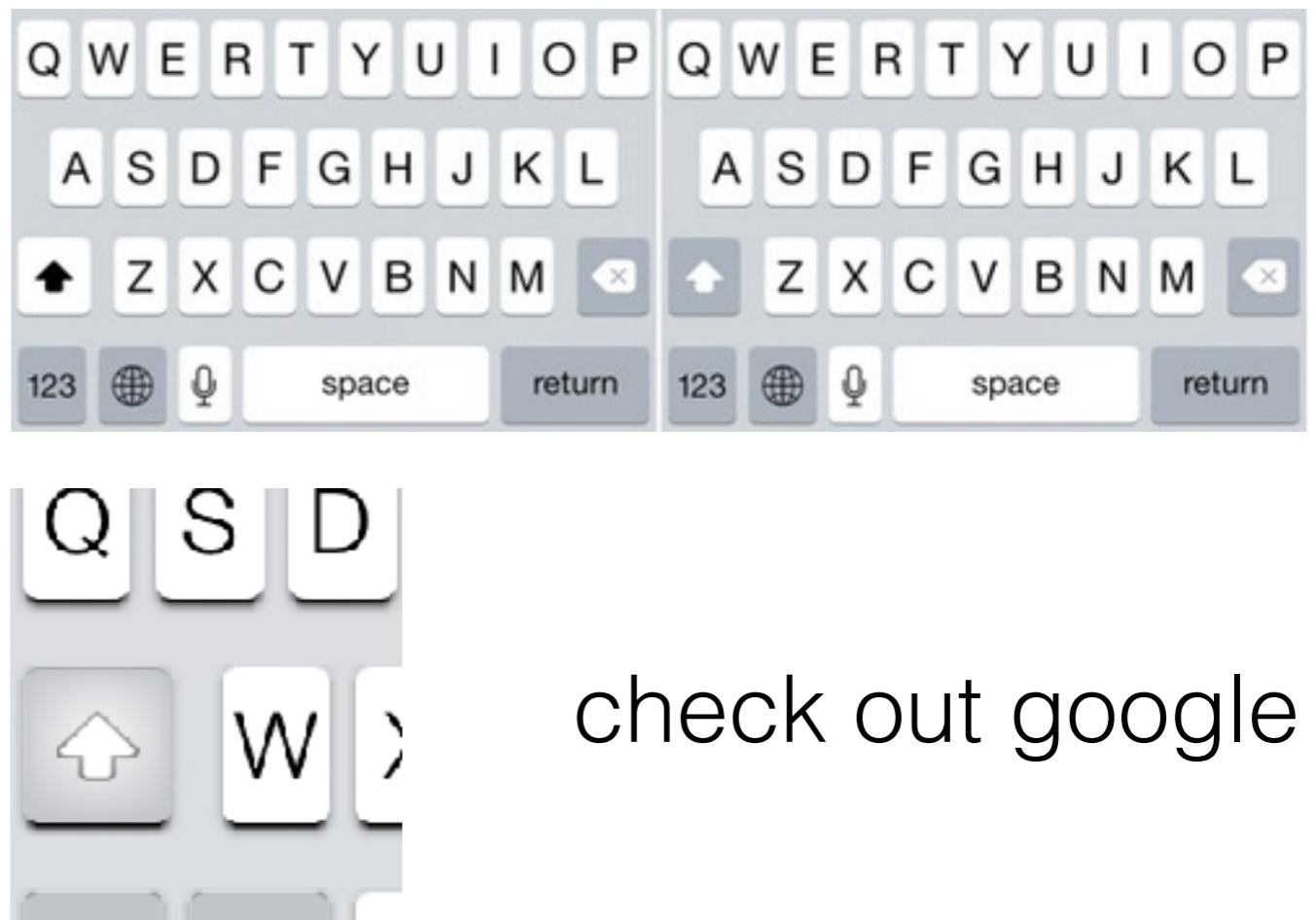
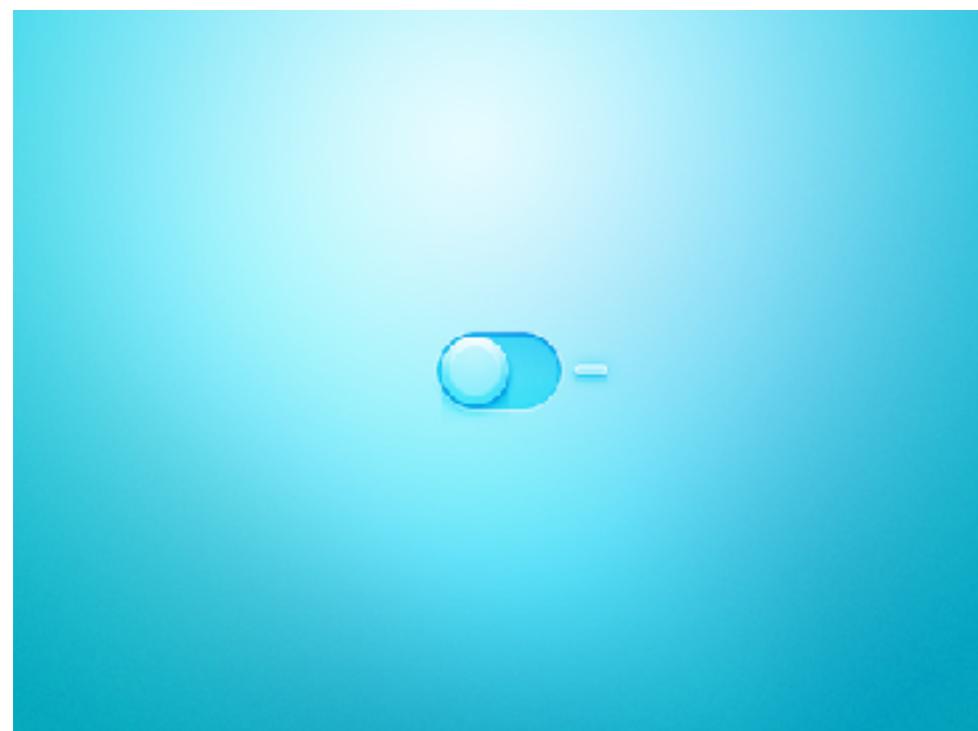
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EduAware: Using Tablet-Based Navigation Gestures to Predict Learning Module Performance
Xinyi Ding, Eric C Larson, Amanda Doyle, Kevin Donahue, Radhika Rajgopal, Eric Ding
Interactive Learning Environments
Keywords: mobile computing, cancer, mobile learning assessment

Download: [pdf] Export: [Citation]

pure flat design?

- can be the enemy of HCI
- metaphor and depth are powerful visual cues
- **post flat design:** how to keep metaphor while using minimalism?





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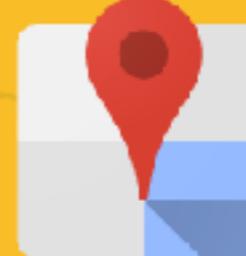
Gmail »

Video Chat with up to nine people at once; find emails from the people you care about; share photos effortlessly and more.



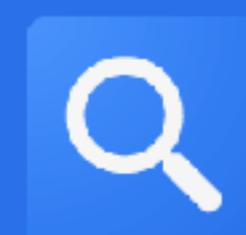
News »

Get the latest from your favorite authors, and see the articles your friends are sharing right in Google News.



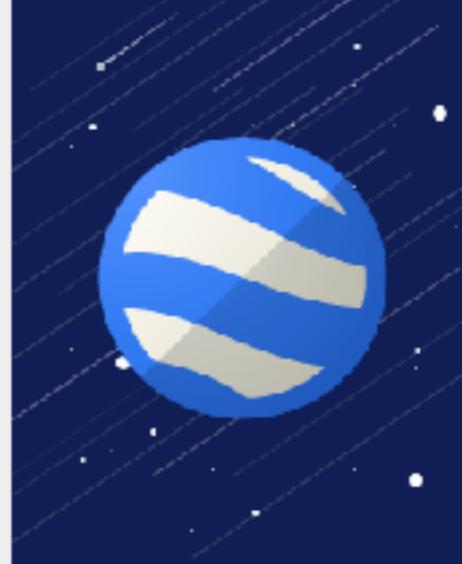
Maps »

Send directions and share the places you love with just the right people, right from Google Maps.



Search »

Search everything on the web, plus your photos, posts from your circles, and the things your friends have shared with you.



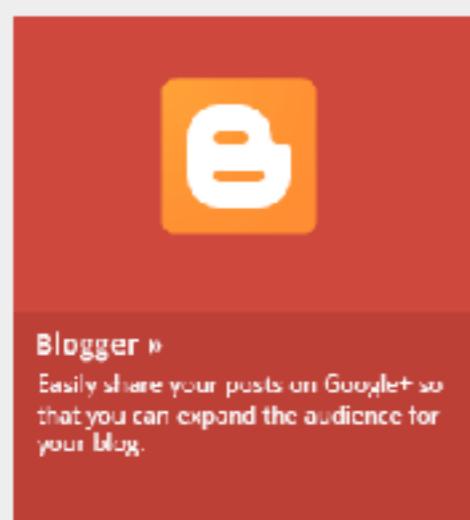
Earth »

Share images of the places you visit in Google Earth to just the right people using Google+.



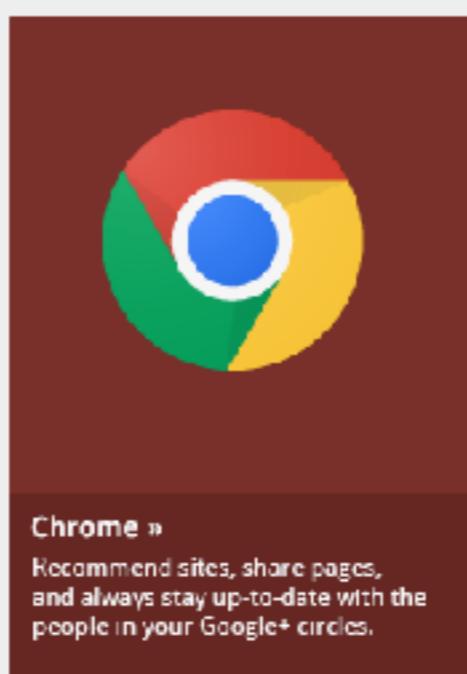
Youtube »

See which videos your friends are sharing and watch any video with up to nine friends at once.



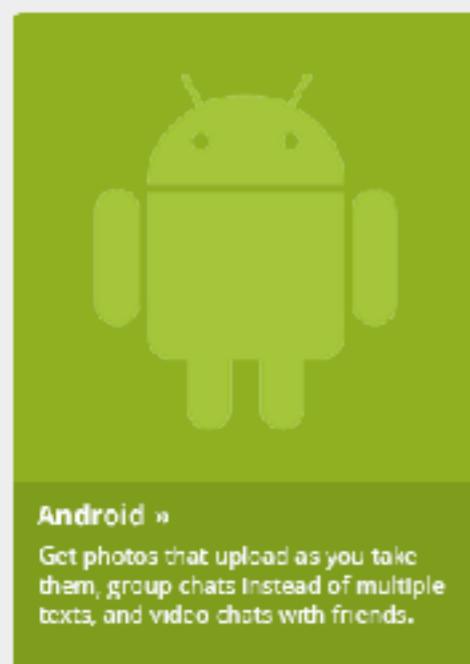
Blogger »

Easily share your posts on Google+ so that you can expand the audience for your blog.



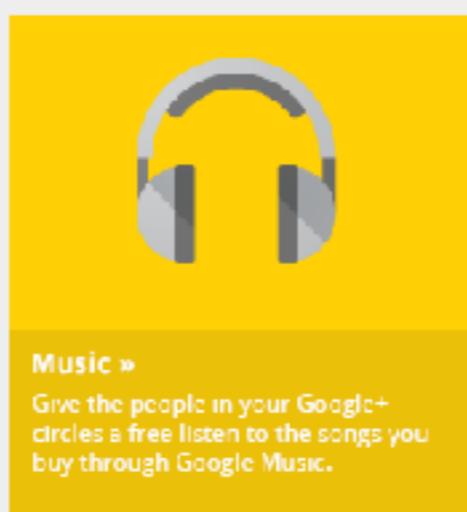
Chrome »

Recommend sites, share pages, and always stay up-to-date with the people in your Google+ circles.



Android »

Get photos that upload as you take them, group chats instead of multiple texts, and video chats with friends.



Music »

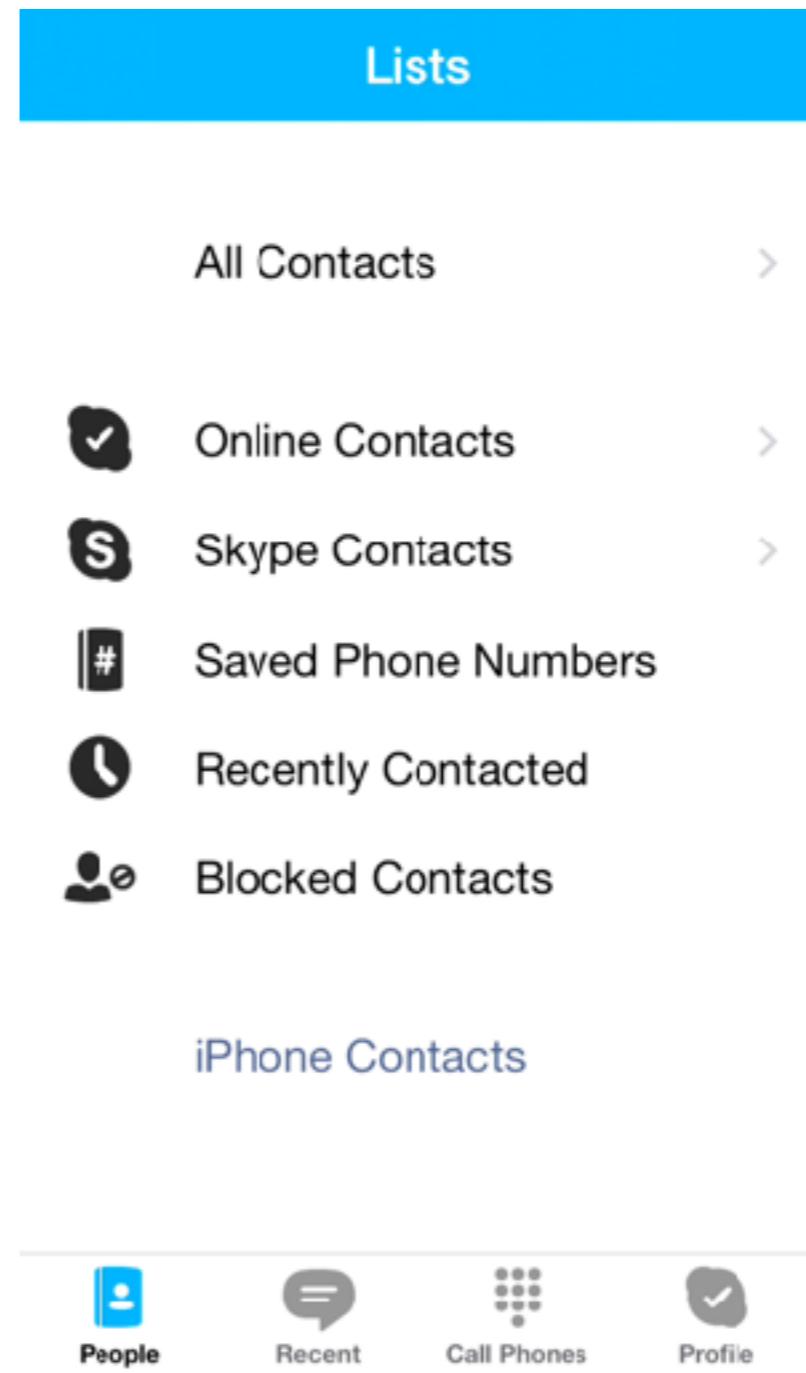
Give the people in your Google+ circles a free listen to the songs you buy through Google Music.

consider no splash

- use the splash screen to give impression of quickness

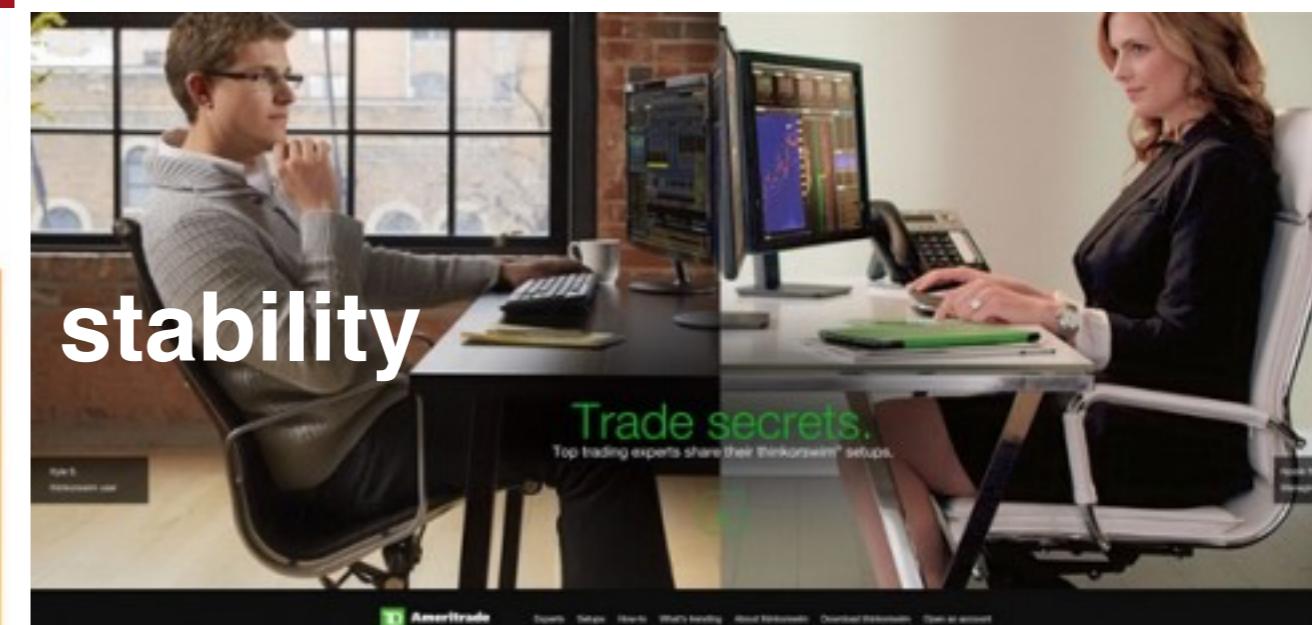
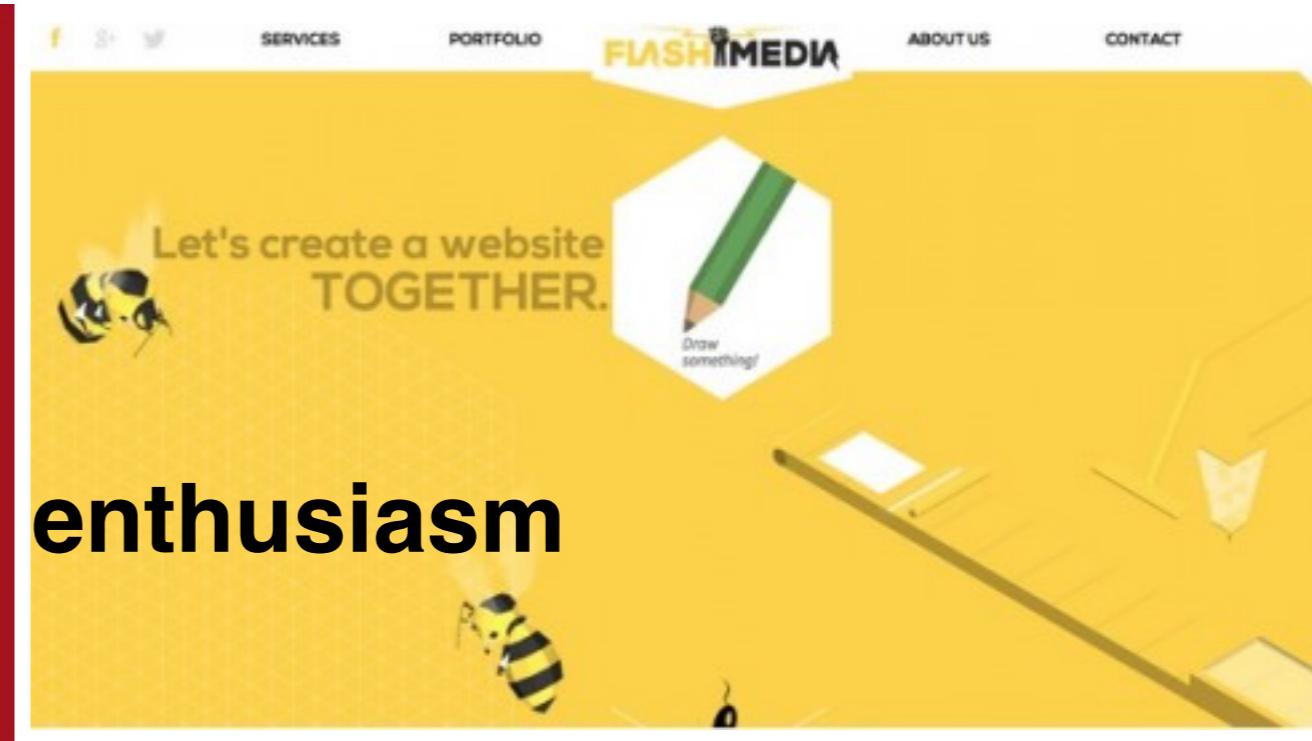


no



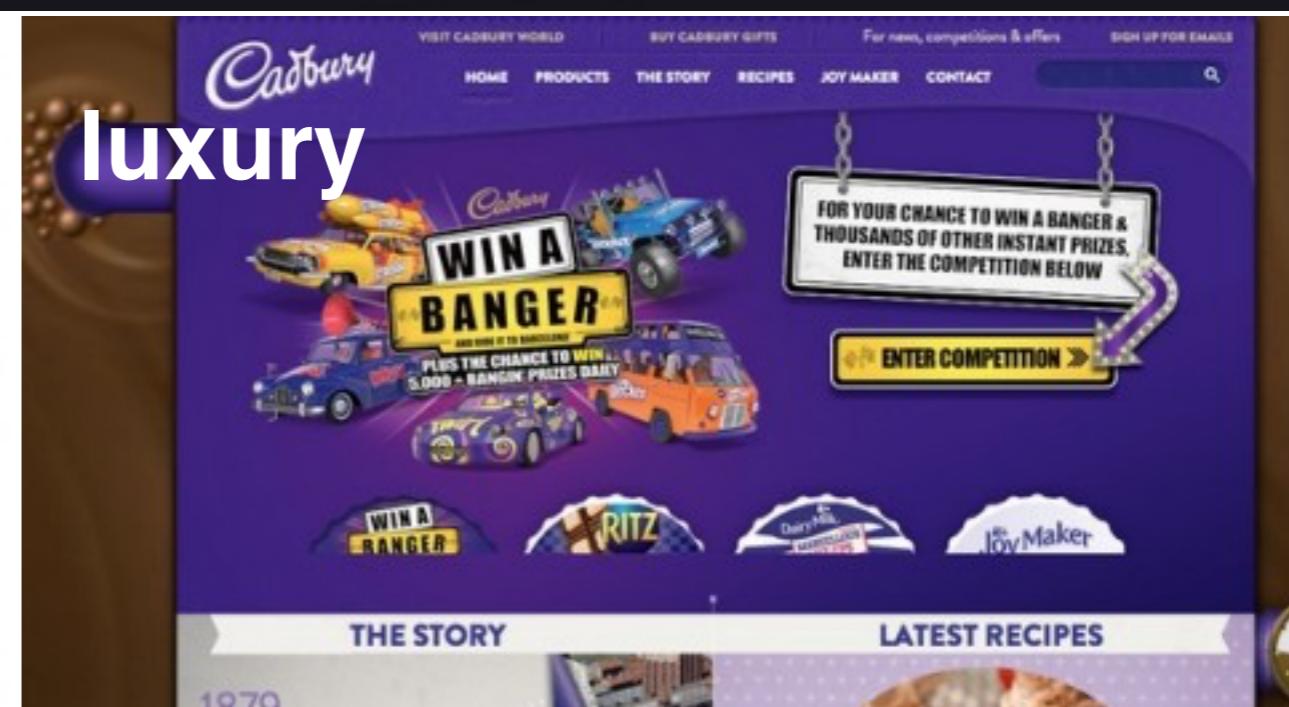
yes

use color “theory”



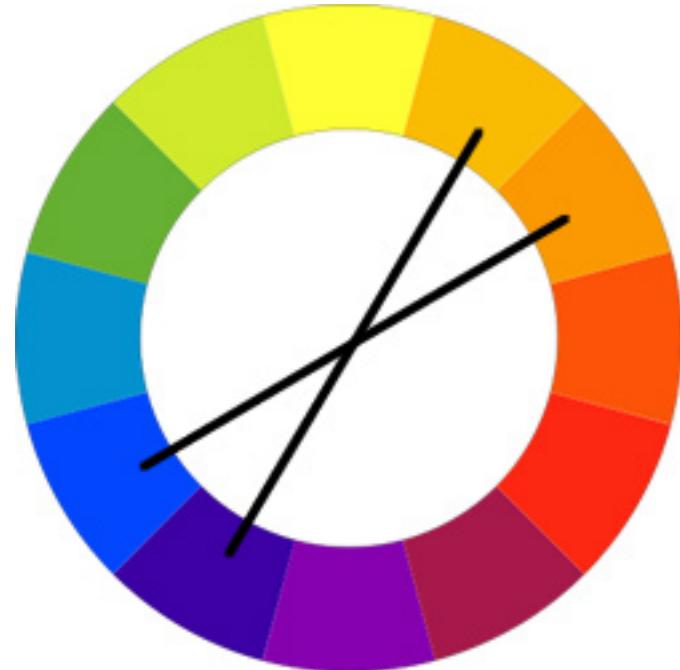
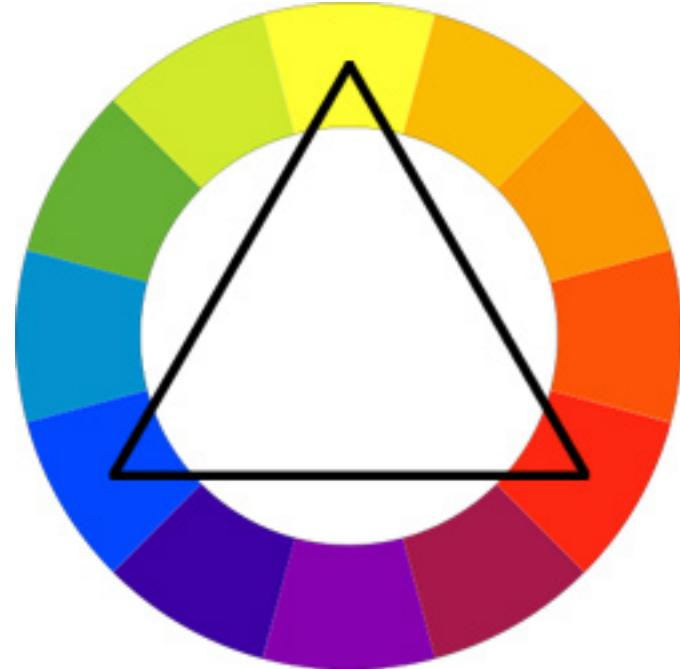
<http://thenextweb.com/dd/2015/04/07/how-to-create-the-right-emotions-with-color-in-web-design/>

use color “theory”



<http://thenextweb.com/dd/2015/04/07/how-to-create-the-right-emotions-with-color-in-web-design/>

use color



The image displays two screenshots of websites demonstrating color usage:

LemonStand (Top Screenshot): The page features a color wheel graphic at the top left. The text "The Only eCommerce Platform for Custom Online Stores" is displayed above a "Try It For Free" button. Below the button, there are three bullet points: "Easily customize anything, front-end or back", "Generate income by selling your custom modules", and "Support directly from our software engineers". To the right is a screenshot of a computer monitor showing a complex code editor with multiple tabs open.

National Multifamily Housing Council (Bottom Screenshot): This is a landing page for "APARTMENTS". The title "WE LIVE HERE" is centered above a paragraph of text: "In communities across the country, apartments work – helping people live in a home that's right for them. And demand continues to grow. Learn how apartments create communities and contribute to the economy." Below the text is a stylized illustration of buildings, trees, and clouds. At the bottom, there is a navigation bar with links like "Start", "We Build More", "We Work More", "We Spend More", "Start Over", and logos for NMHC and NAA.

<http://thenextweb.com/dd/2015/0>

use color theory



Analogous

mono-themed, but elegant
easy to select one other contrast color or highlights without
deviating from theme

match your app icon and UI palette

Silverback 2.0
Guerrilla usability testing software for designers and developers

- Capture screen activity
- Video the tester's face
- Record the tester's voice
- Add chapter markers on-the-fly
- Control recording with the remote
- Export to Quicktime

Features in 2.0 include

Preview	Batch Export
Watch sessions within Silverback	Save selected sessions, tasks, highlights or projects in one go
Tasks & Highlights	Performance
Set tasks and mark noteworthy moments within a session	Faster export, better usability

Download **Buy NOW** \$69.95 FREE upgrade for existing users

What does Silverback do?

<http://thenextweb.com/dd/2015/04/07/how-to-create-the-right-emotions-with-color-in-web-design/>

some great examples

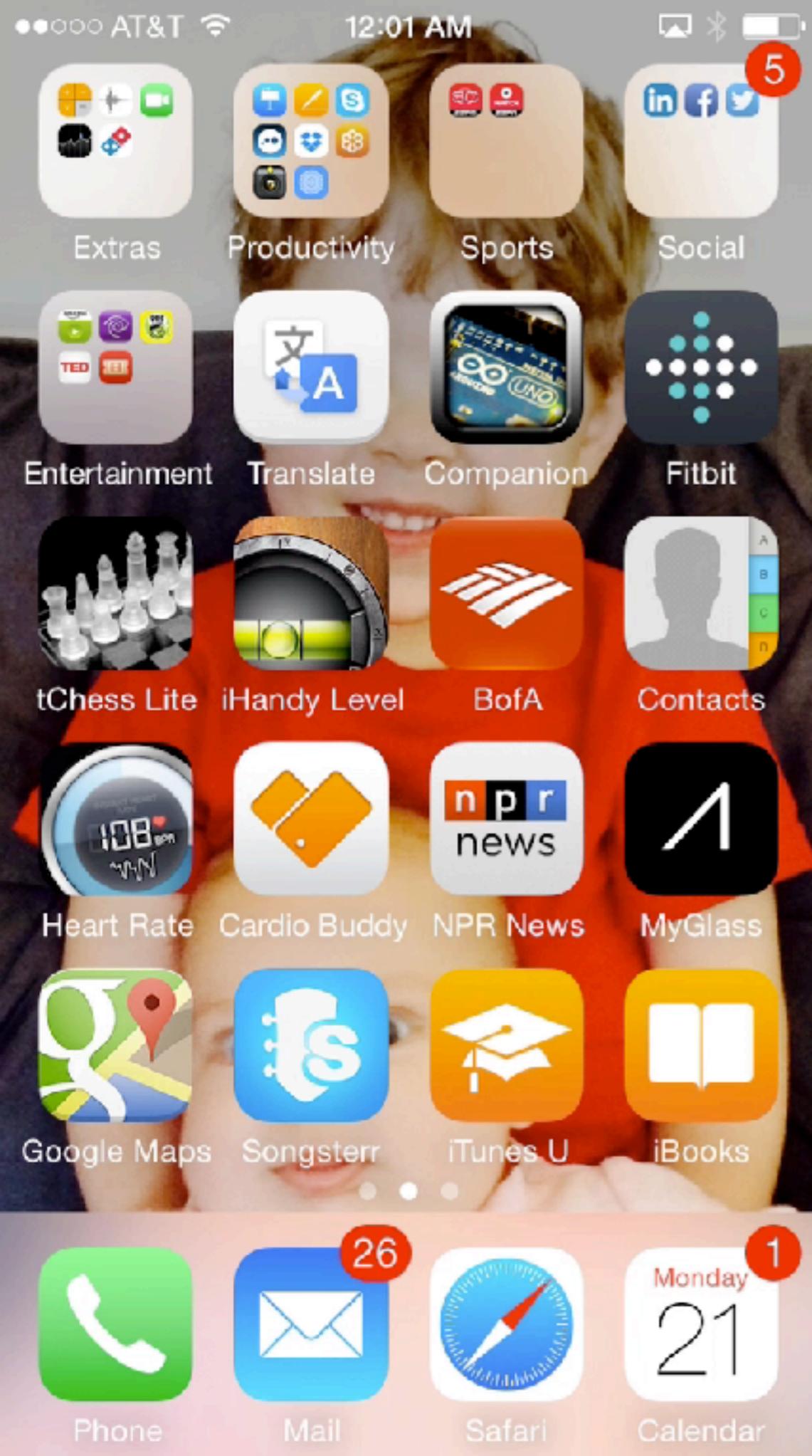


some great examples



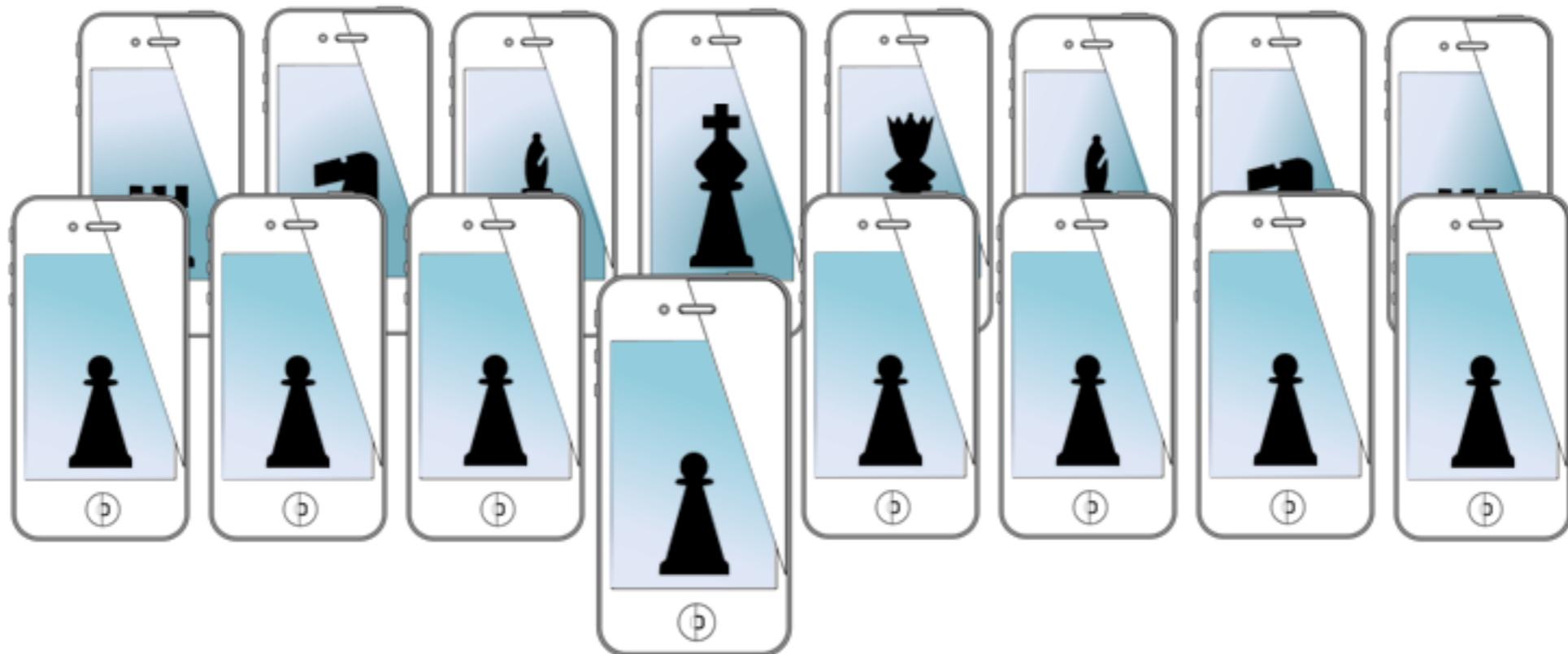


an example



a **really** excellent
example

MOBILE SENSING LEARNING



CS5323 & 7323
Mobile Sensing and Learning

mobile design and interaction

Eric C. Larson, Lyle School of Engineering,
Computer Science, Southern Methodist University