

Mobile Programming and Multimedia Mobile Design

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Differences with Desktop apps



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User interface design for mobile applications must consider several aspects

Main differences:

- Device size
- Computational capabilities
- Operating system
- Interactions!
 - Touchscreen
 - Sensors (movements)
 - Vocal input/Output
 - More direct/natural interaction



Dissemination



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Touchscreens are available in several different situations:

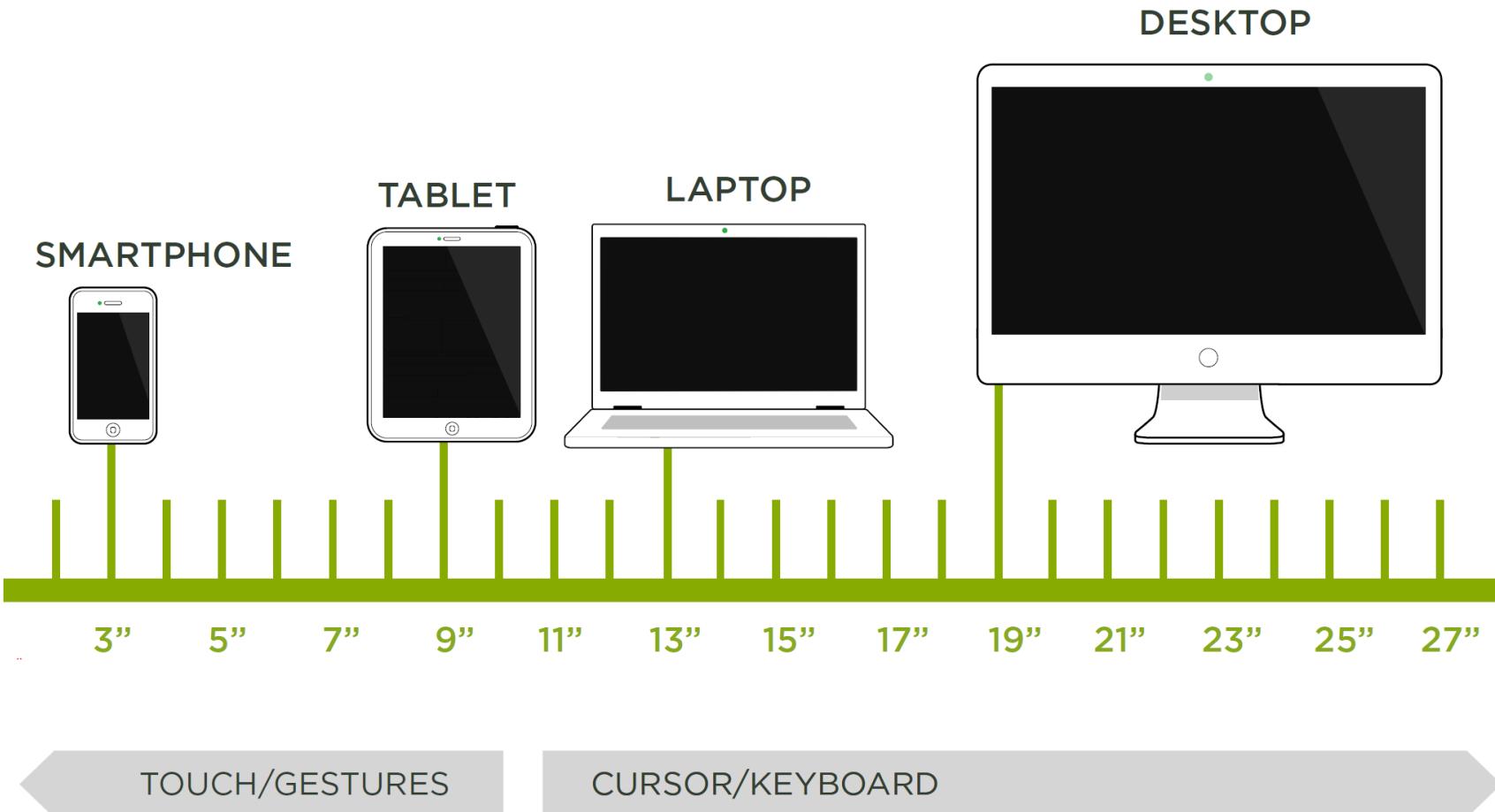
- ATM, machines for electronic sell
- Informative panels (ex: museums)
- Tablet/smartphone
- Mobile computer

In 2011 Apple sold more iPads in one year than all the other products in 20 years

Interfaces and interactions



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Interfaces variability



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Touch is used even with desktops



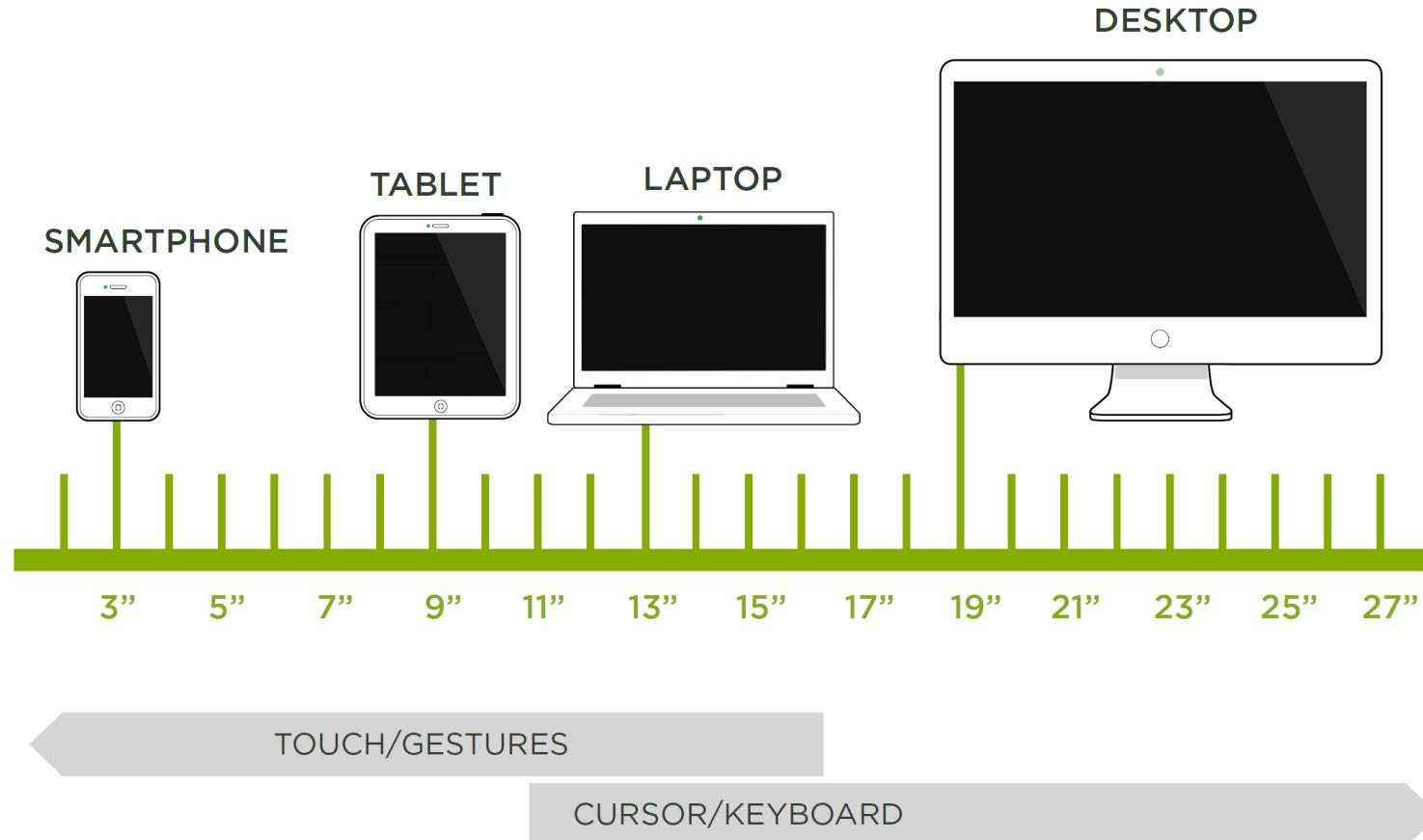
Lenovo IdeaTab Lynx

Lenovo ThinkPad Twist

Interfaces and interactions



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How to design a good user interface?



Problems

Responsive interfaces
are one step forward
but not the answer

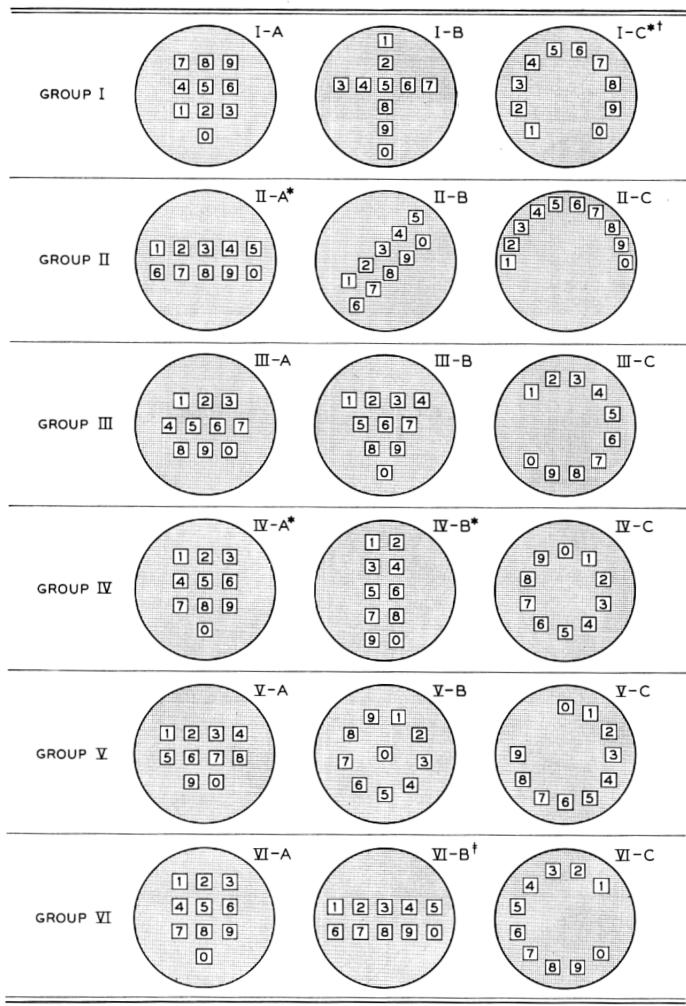
An old but effective story

In 1963 Bell's labs designed the new Touch Tone phone

They tested 16 different keyboards to find the best design, comparing them 3 by 3 with 16 users' groups.

Objective:

- improve:
 - speed and
 - accuracy
- User preferences



* SIGNIFICANTLY SHORTER KEYING TIME

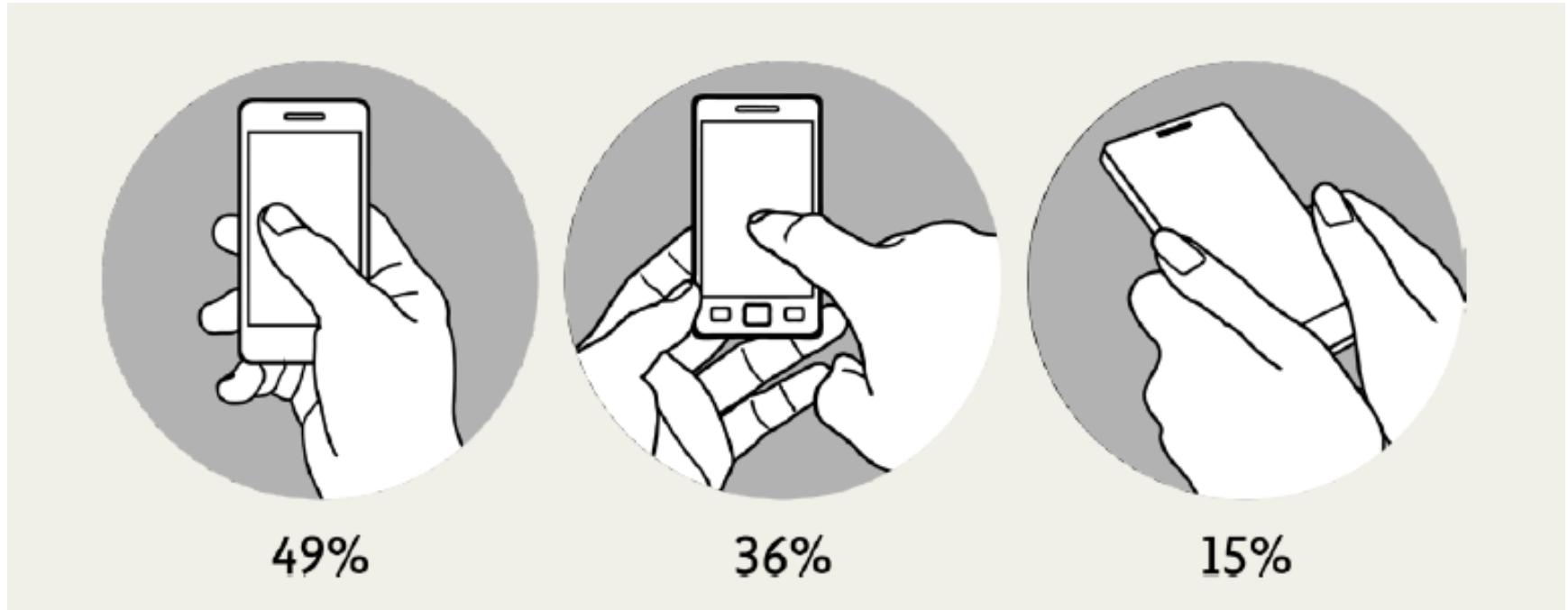
† SIGNIFICANTLY LOWER ERROR RATE

‡ SIGNIFICANTLY MORE PREFERRED

First consideration



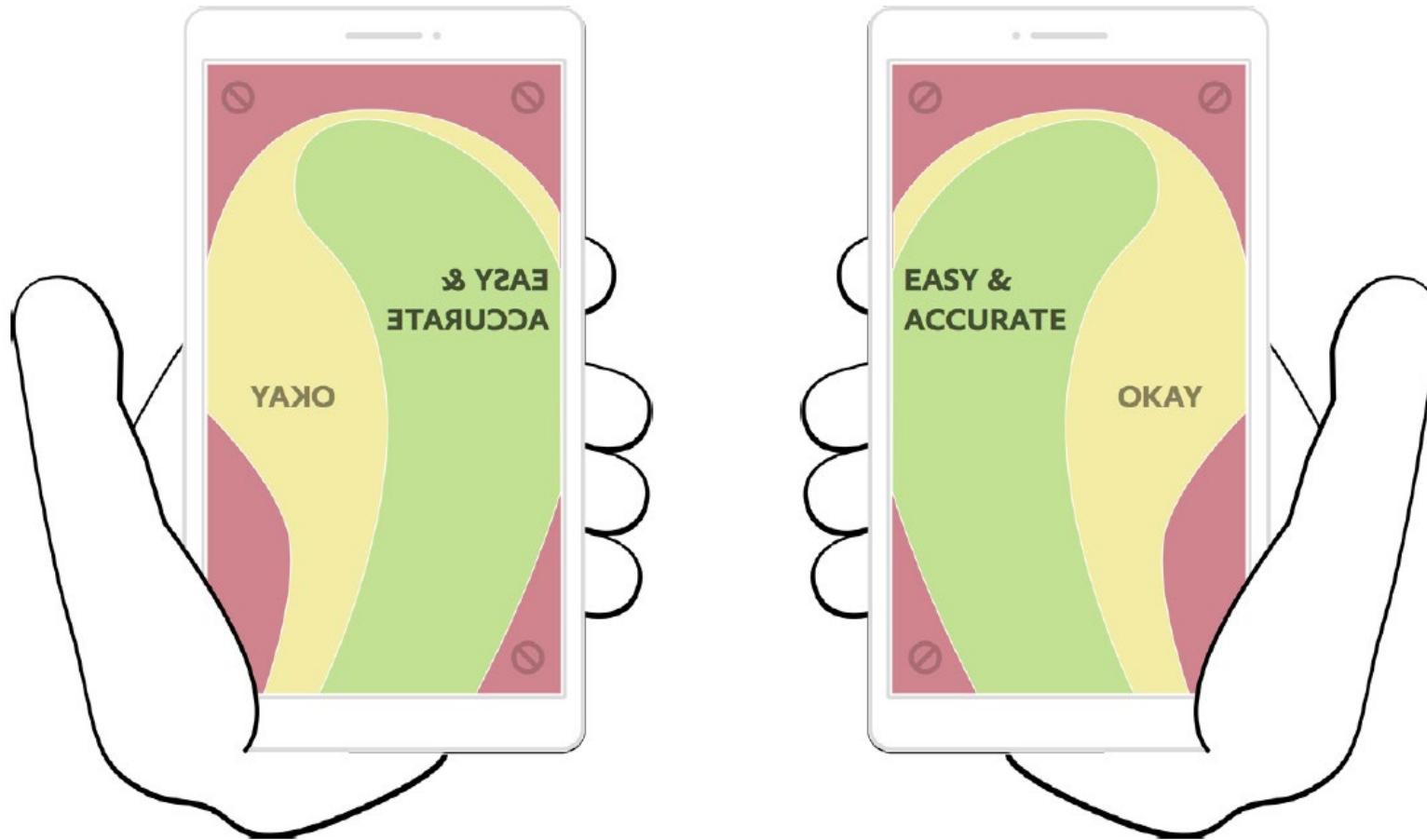
The reachability of different components of the interface depends on how we hold the device



Confort zone



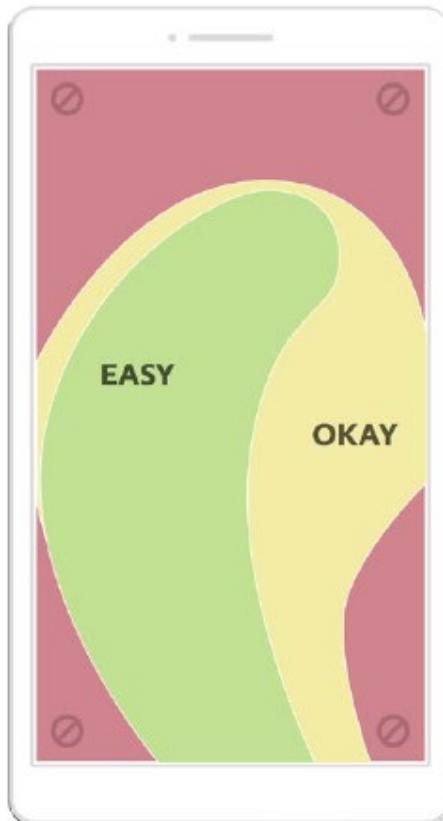
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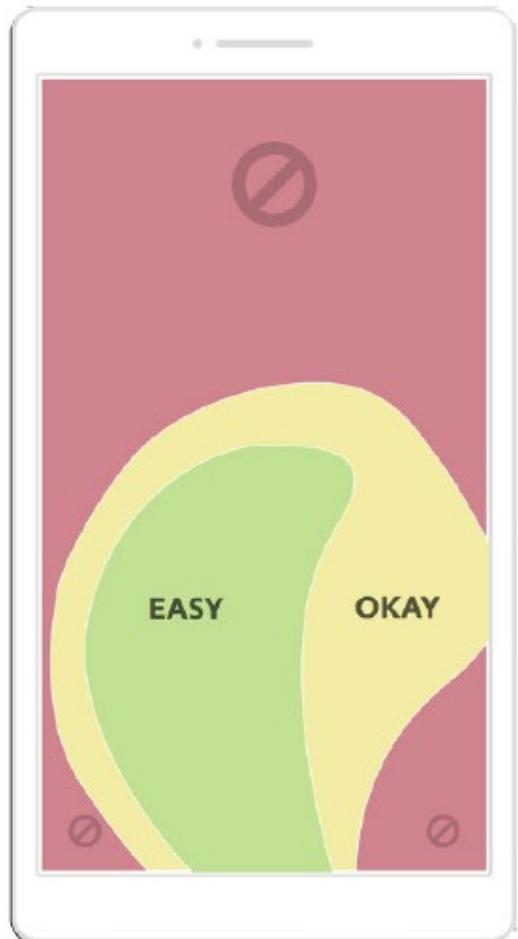
Screen size



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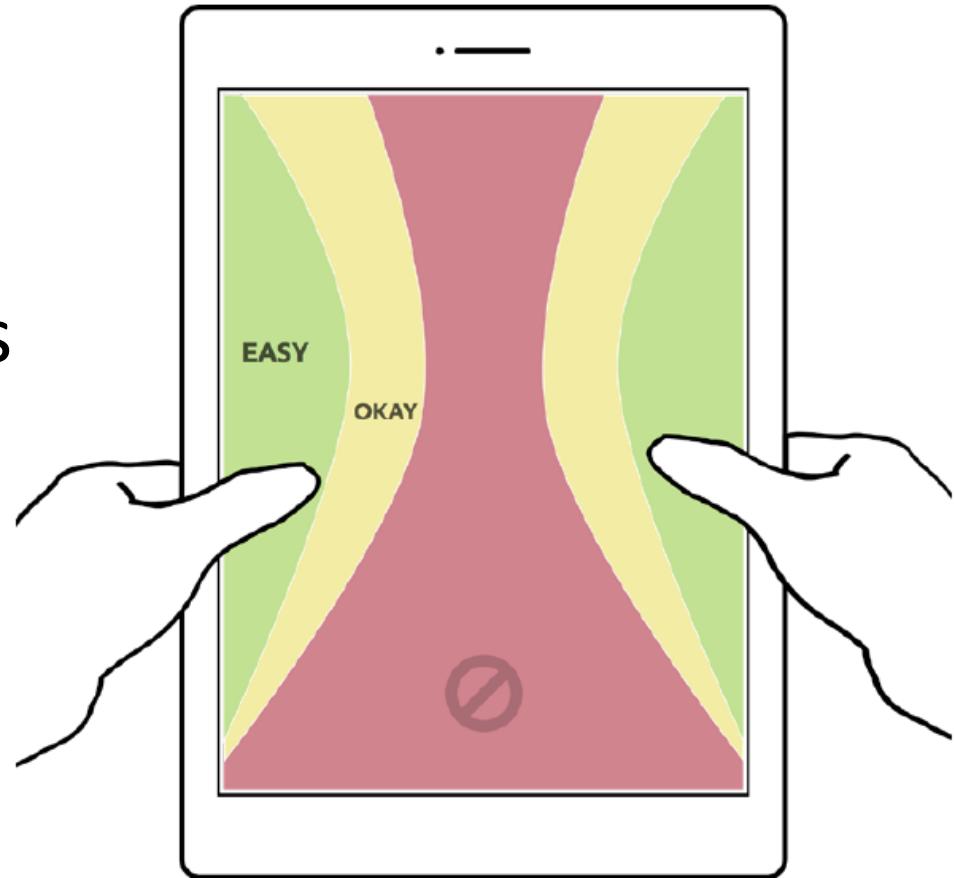
THE PINKY BOUNDARY



Tablet



With the increasing size of the screen, users tend to use the device with two hands for a better holding



The Gorilla arm problem



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“Touch interfaces don’t want to be vertical,
it gives great demo, but after a short
period of time, your arm wants to fall off.”

Steve Jobs

Big tablets



Increasing device dimension means increasing weight

- 88% of tablets usage occurs while seating, against 19% of smartphones
- Tablets are used on a holding surface two out of three times

Big devices are used in a similar way to laptops but

- Mouse is usually moved easily, whereas fingers are moved by the hand and require a higher effort
- It is essential to group controls together to avoid user's tiredness

Thumb rule



Identify the most frequently used controls and put them in the comfort zone (***thumb zone***)

It is also very important what to put ***outside*** this zone

- Controls for data modification to avoid unwanted edits or data loss

Content always on top



With classic interfaces (ex: websites), priority is given to interaction elements

Touch interfaces change interaction tool

The mouse cursor is tiny

Hands can hide part of the interface

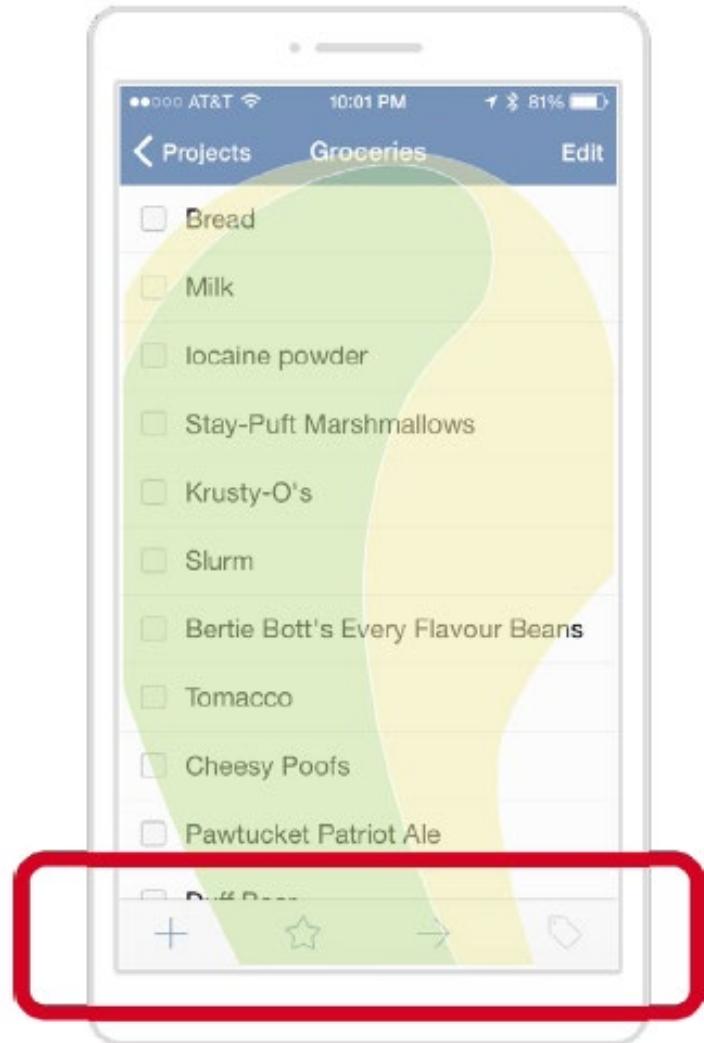
- It is important to calculate their encumbrance
- Important data must remain visible
- If necessary, they can hide the controls



Operational guidelines



The «*Content always on top*» rule forces to leave the content in the center and move controls above, below, or on the sides

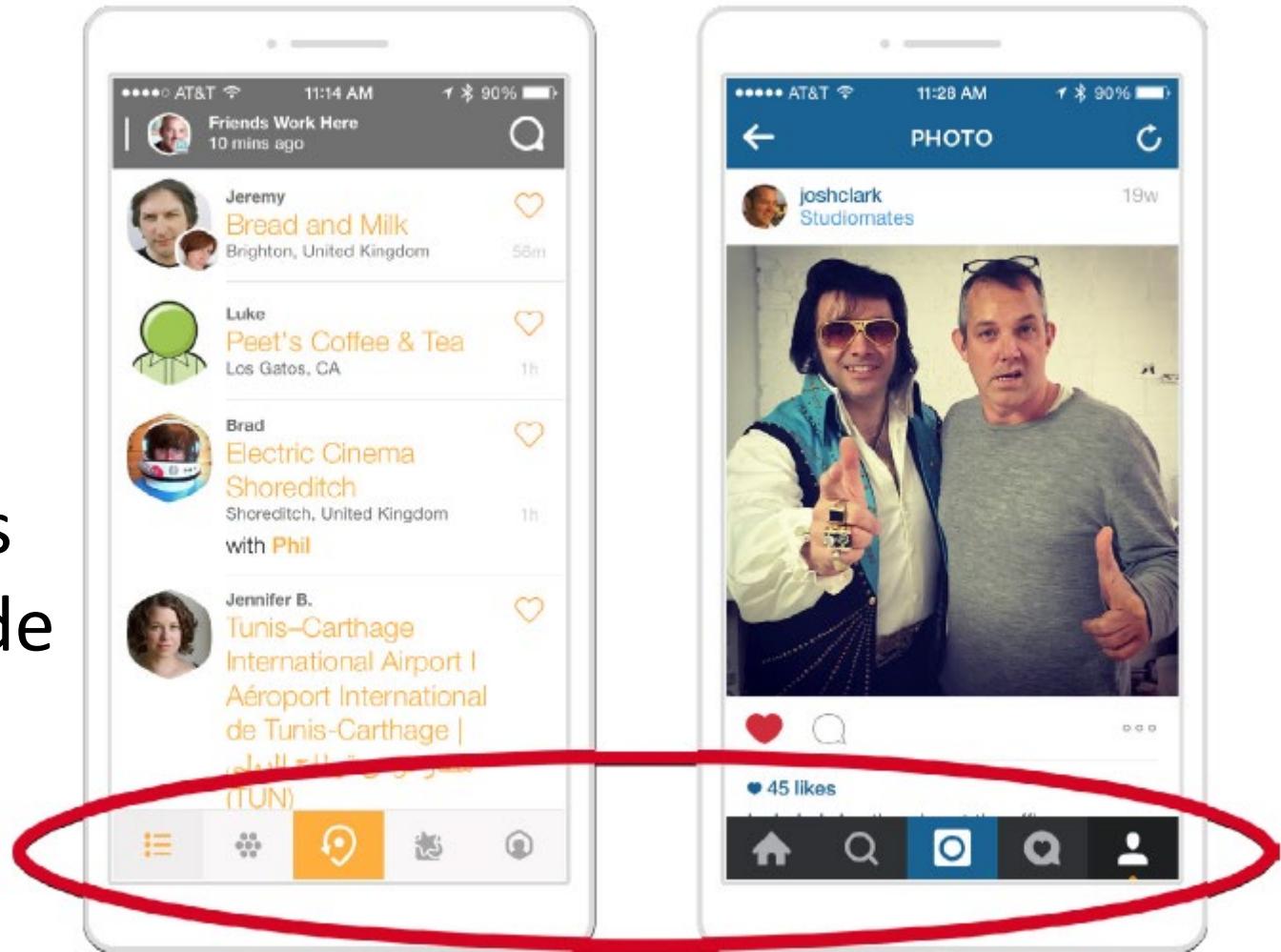


Attention!



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If an application requires to modify data frequently, then controls must be inside the comfort zone



Problem



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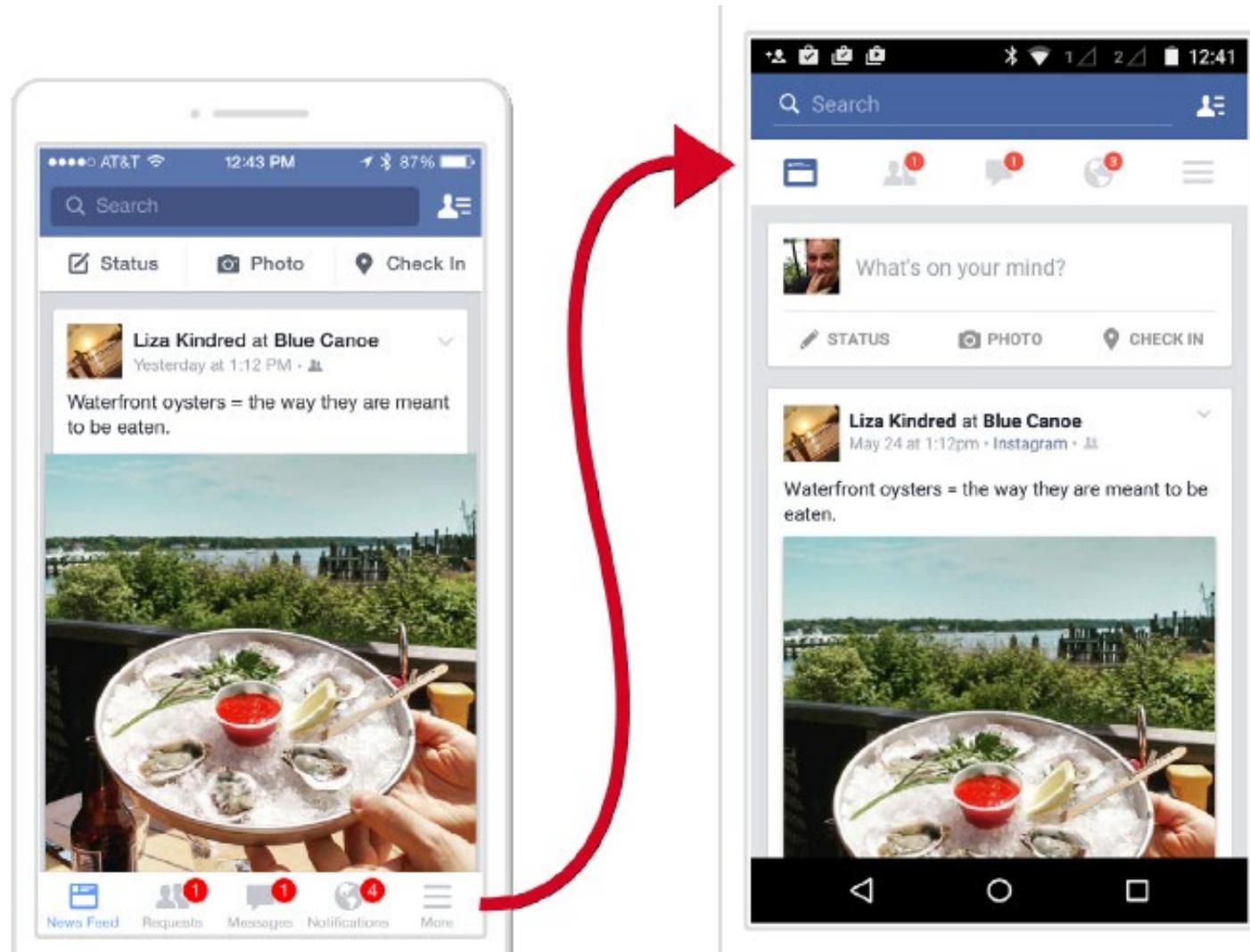
The image shows two side-by-side mobile phone screens displaying news articles from CNBC.com. Both phones show the same basic layout: a header with signal strength, time (6:58 AM or 6:59 AM), battery level (99%), and the URL cnbc.com. The main content area features a large photo of Mark Zuckerberg speaking at a microphone. Below the photo is a caption: "Erin Lubin | Bloomberg | Getty Images" and "Facebook CEO Mark Zuckerberg speaks during the Facebook F8 Developers Conference in San Francisco." A question follows: "» How accurate was the movie 'The Social Network' compared to the real life story of Facebook's beginnings?". Another snippet below it says, "'I haven't thought about that movie'". At the bottom of each screen are social sharing icons for Twitter, Facebook, Google+, LinkedIn, Email, and Print, along with navigation arrows and other UI elements.



Different rules



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Android

- Controls must be on the *upper* side of the screen

iOS

- Controls must be on the *lower* side of

Phablet

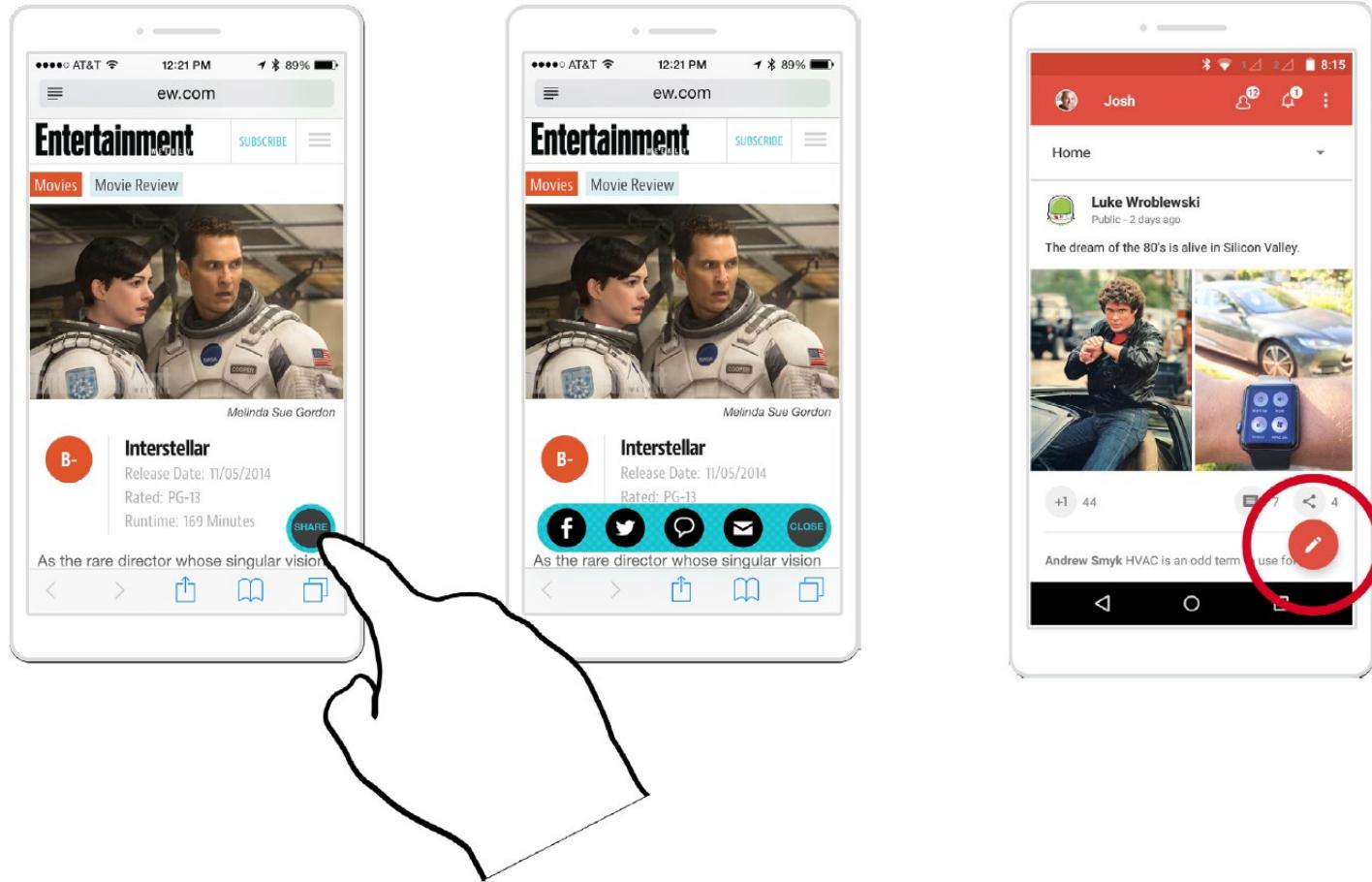
- Controls must be on the *lower* side of the screen
- It is possible to introduce a *floating trigger button* for frequent operations
- *Swipe* usage, especially for the tabbed layout

Pay attention to the last iOS versions

Floating trigger button



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Tablet Layout

With bigger screens, it is difficult to have a unique overview, but designer must consider that eyes move from top to bottom

- Buttons for interaction must be at the top or on the sides of the device
- Prefer corners at the top and not the center position
- If an element controls the content, it must be below or on the side of the content, **never** above



Big screens



The bigger is the screen, the more precision and physical activity is required during interaction

- It is crucial to reduce the number of interactions
- Group together interaction elements

Hover problem



With exception to several proprietary solutions (ex: the pen of the Surface or the Stylus pen by Samsung), the hover event is not available on touch interfaces

Adopted Solution: the first tap is the hover event, the second is the real click

For the web, the CSS3 **hover** property allows more appropriate solutions

Fingers vs. Cursor



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According to a Google study of 2013, 83% of websites provide interaction buttons too small to be used with fingers

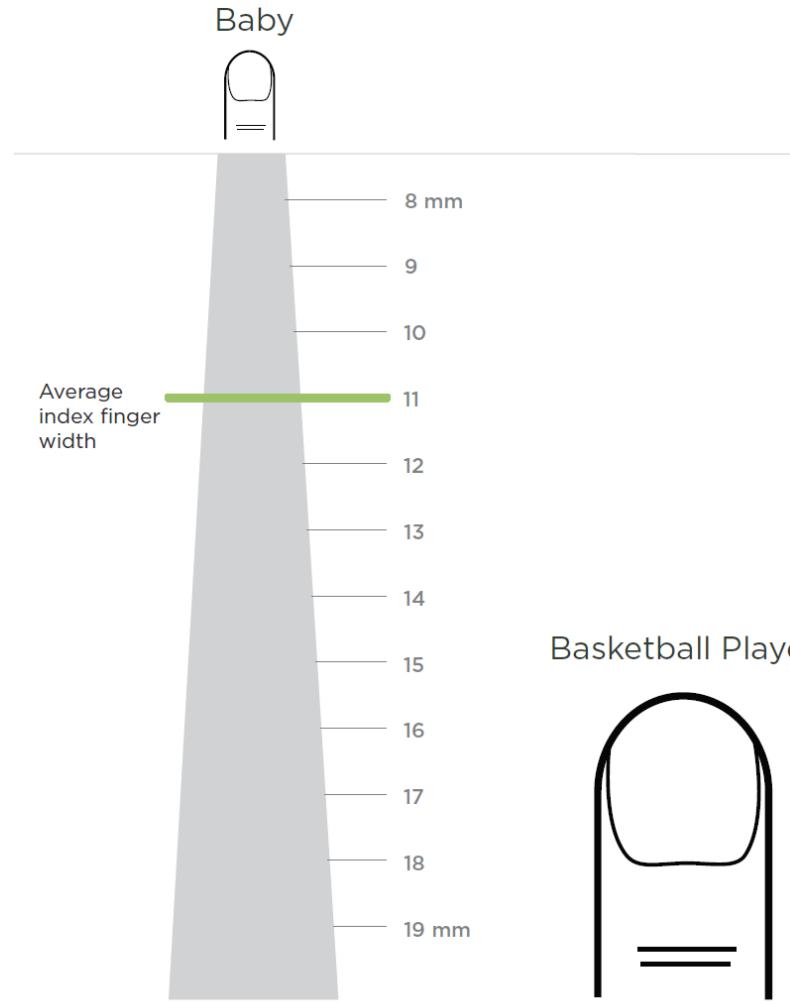
How big is a human thumb?

- The minimum is 8 millimeters for a child; the maximum is 18 millimeters of an adult

Thumb size



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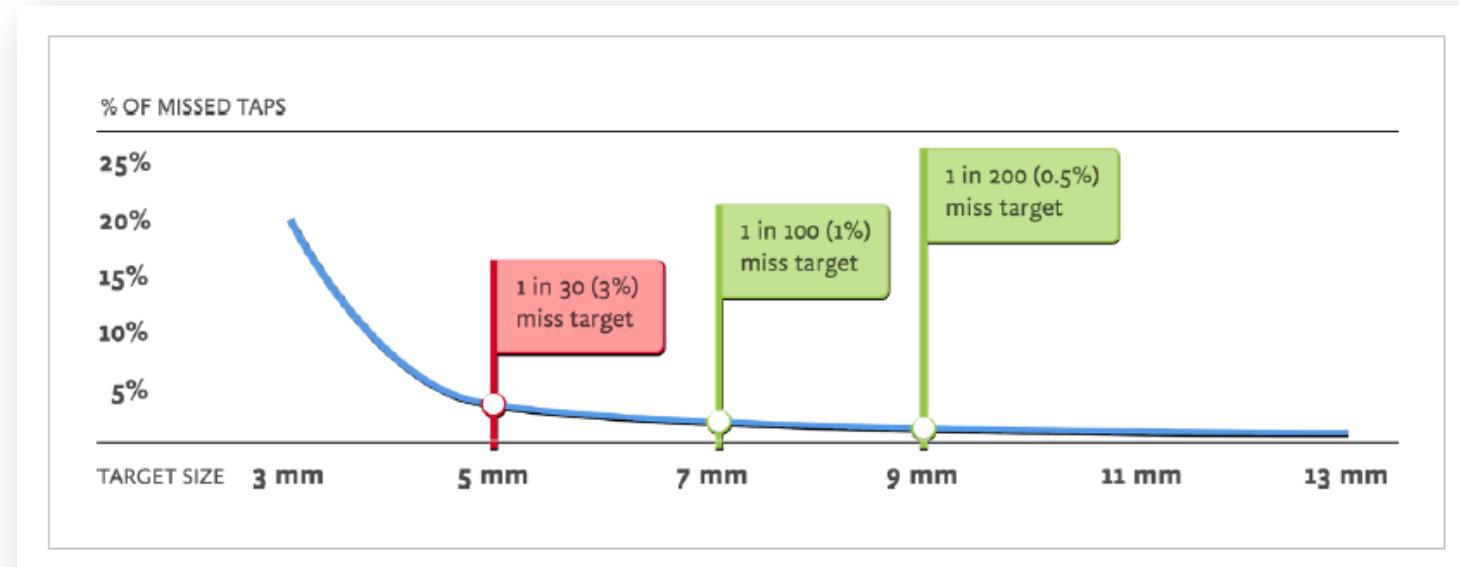


Controls size



It is a good idea to increase controls' dimension if an error requires more than 2 interactions, 5 seconds or a context switch to be corrected

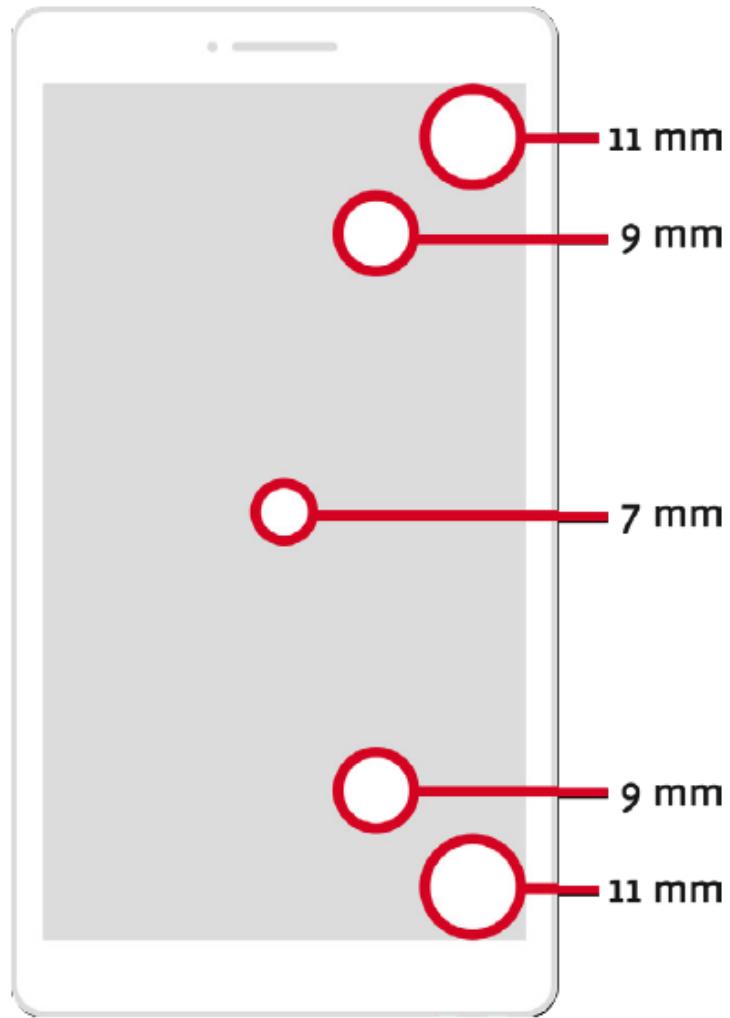
The minimum size to use is 7 millimeters, which can be increased to 9 mm with big tablets



Size vs position



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From mm to pixels



The dimension of the thumb is in millimeters, but this unit of measurement is not the best one for interfaces design

Millimeters	Pixel	Em (16px)
7mm	44px	2.75em
9mm	57px	3.5625em
10mm	63 px	3.9375em
11mm	69px	4.3125em

Do not crowd interfaces



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Even proximity between elements is a crucial element:

- If controllers are too close, they must be bigger to avoid errors
- If the elements are small, they must be far away to avoid errors
- Two buttons of 7 millimeters must be at least 2 millimeters away

Generally speaking, it is a good idea to *not crowd* interfaces

Just-in-time interfaces



A good interface must provide only what is necessary at that moment

- The main operations must be available and selectable from a list (ex. menu, products list)
- The primary information must be easily available, with further details available with another interaction (*progressive disclosure*)
 - This approach allows clarity of the provided information
- Try to foresee users' needs (ex: Context menu)

Example - 1



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Example - 2



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Log in or Sign up MENU

THE SESSION

Fáilte

Search

The Session ▾

for

SEARCH

Recent activity

Moulouf edited a set of tunes.
57 minutes ago

Moulouf added a set of tunes.
58 minutes ago

David50 left a comment on the discussion Is it ok to change tunes to make them easier?.
one hour ago

TUNES

RECORDINGS

SESSIONS

EVENTS

DISCUSSIONS

HELP CONTACT LINKS DONATE

▲

Number of interactions



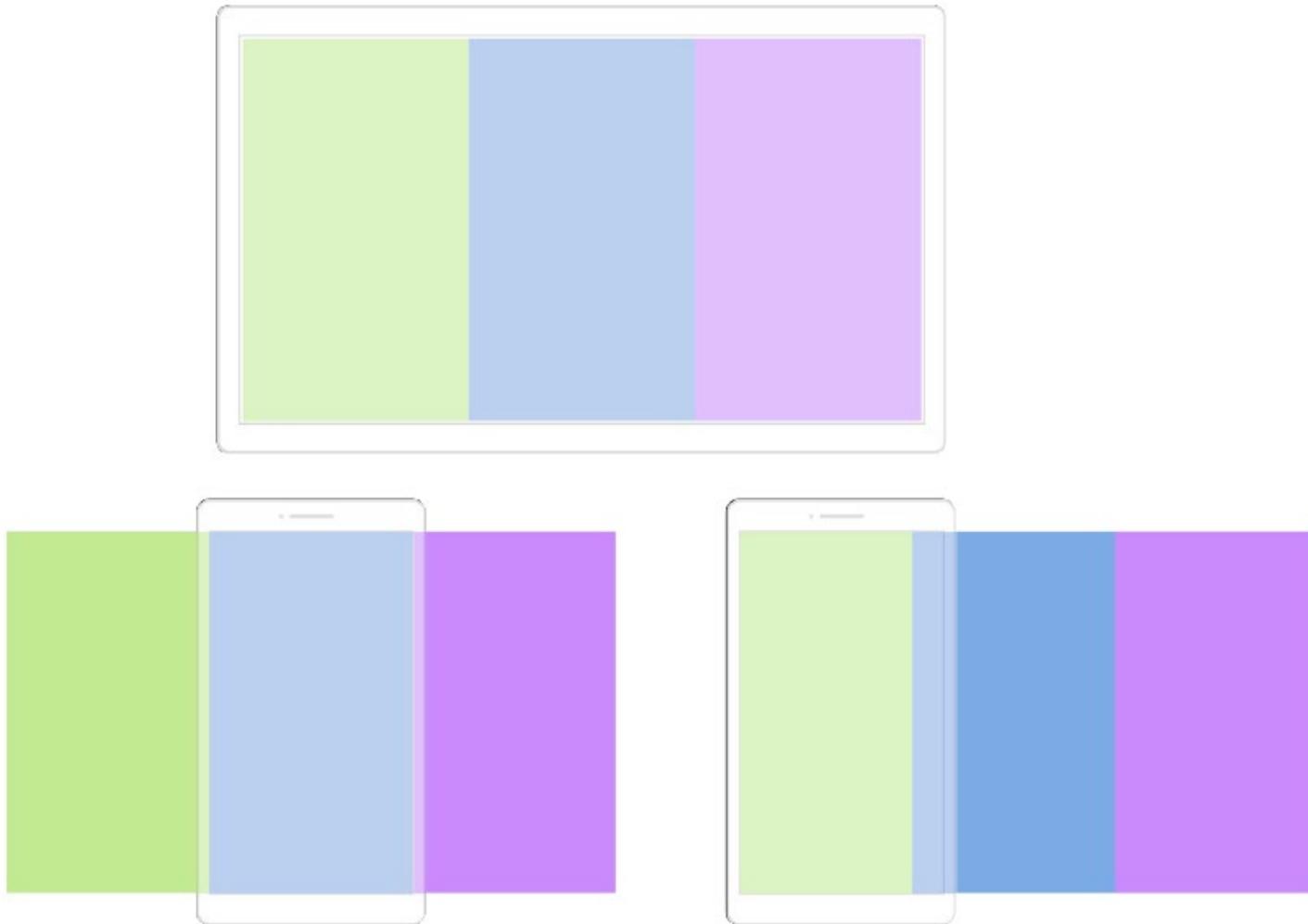
With increasing bandwidth available, and the availability of a local database, the number of taps is less critical:

- There aren't only tap!
- Distinguish between useless and quality taps
 - A quality tap is a tap that adds new information, completes a task, or simply adds a smile
 - The garbage taps are taps that could be eliminated with better interface design or substituted with gesture
- It is possible to add taps if they provide a better interface organization

The problem of long pages



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The carousels



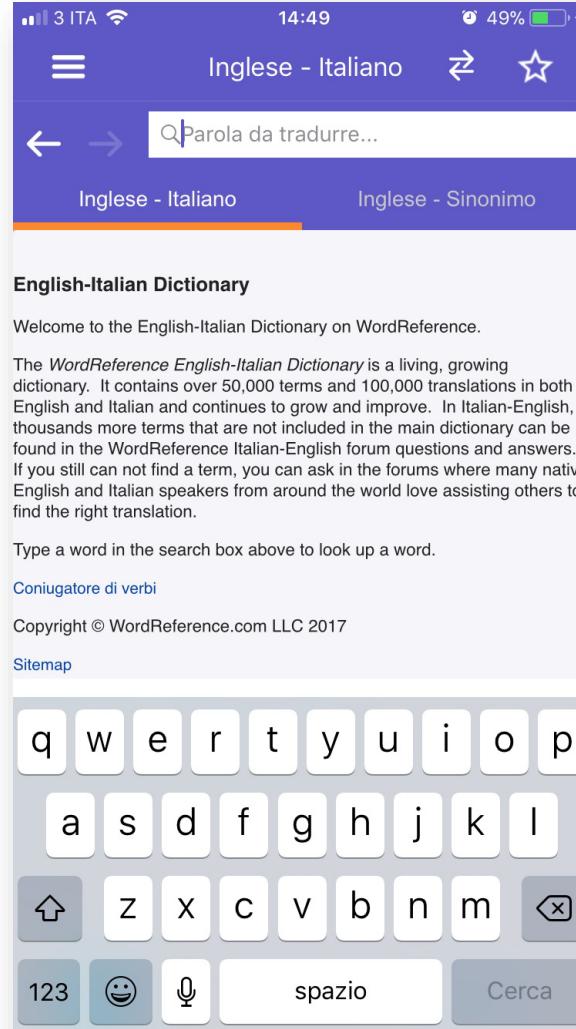
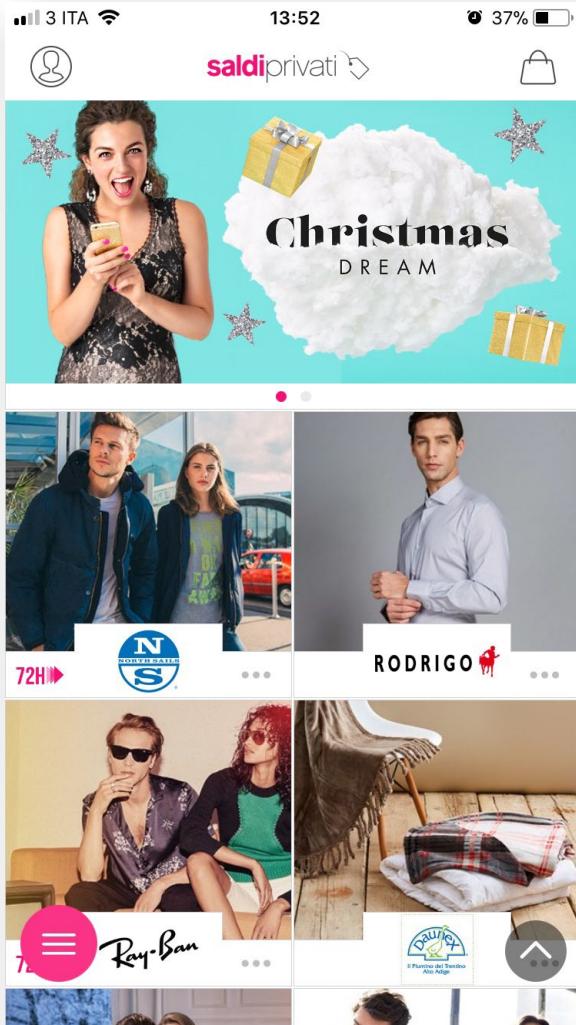
Carousels must be used with particular attention, or avoided:

- Loss of overall vision in favor of details
- If it is not clear the connection between different objects, users do not understand what comes before or after and lose interest
- A study shows that 84% of the clicks occur on the first page
- Instead of forcing the user to make several swipes for finding the information, it is better to ask for a single tap to open a page with more details

Correct usage



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Carousels: when?



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Carousels work very well in these cases:

- Linear data: user knows what to expect (ex: weather)
- Random browsing on interesting items for the user: pictures, slide show. They work better if the user knows what to expect, for example, in a known context
 - <http://shouldiuseacarousel.com/>
- To break up very long forms: in this case, they cannot advance automatically

The problem of long forms



21% of online shopping, that are not completed with the purchase, comes from the excessive complexity of forms necessary to complete all the steps (1 over 5)

Each field makes the difference: a study shows that for a contact form, decreasing from 4 to 3 fields increases contacts of about 50%

Decreasing the number of fields



With touch interfaces there is not the tab control, hence each field requires one tap more and interrupts the flow

Do not ask for more information

Credit Card Information

* required field

*Card type:

Select Credit Card

*Card number:

*Name on card:

* First Name:

Middle Initial:

* Last Name:

* Address:

Contact Information

*Primary Phone:

Evening Phone:

Mobile Phone:

Avoid keyboard usage



Generally speaking, the user is not fast when digitizing

- Provide the correct keyboard for a specific input
- Prefer a list of buttons to a menu if this one is short
- Avoid too long drop-down menu (a dataset is better)
- For numbers insertion, it is preferable to show an average value with +/- buttons if the real value will not be far away from the average

JiuJitsu Gesture



Confirmation dialogs were introduced to let the user think about the answer, but today do not work anymore and slow down the user

It is better to use specific gestures, e.g., a *swipe* to answer calls or to unlock the device

- It is sufficiently difficult to be only intentional
- It is sufficiently easy to be fast and avoids context lost
- Provides *undo* option
- To ask more attention to the user, increase gesture complexity

Gestures

Gestures



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Tap



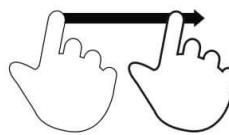
Briefly touch surface with fingertip

Double tap



Rapidly touch surface twice with fingertip

Drag



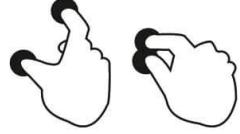
Move fingertip over surface without losing contact

Flick



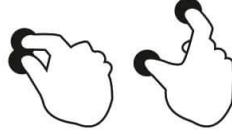
Quickly brush surface with fingertip

Pinch



Touch surface with two fingers and bring them closer together

Spread



Touch surface with two fingers and move them apart

Press



Touch surface for extended period of time

Press and tap



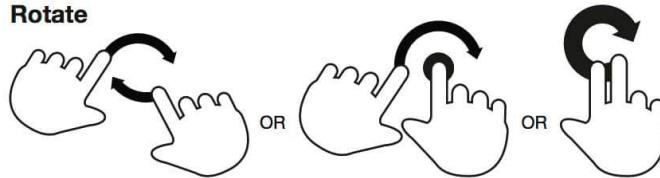
Press surface with one finger and briefly touch surface with second finger

Press and drag



Press surface with one finger and move second finger over surface without losing contact

Rotate



Touch surface with two fingers and move them in a clockwise or counterclockwise direction

Vocabulary - 1



tap: click for the “touch world”. Interpreted as the hover event

Swipe: frequently used for scrolling, view change, or show hidden panels

Long press: used for context menu or detailed information

- on MS Windows is equal to the right-click with the mouse
- on Android opens the ***contextual action bar*** to select several entries from a list and fire events on all of them simultaneously
- on iOS does not have a standard behavior, usually opens a contextual menu
- Only expert users use it

Vocabulary - 2



Long press + drag: equals to drag&drop

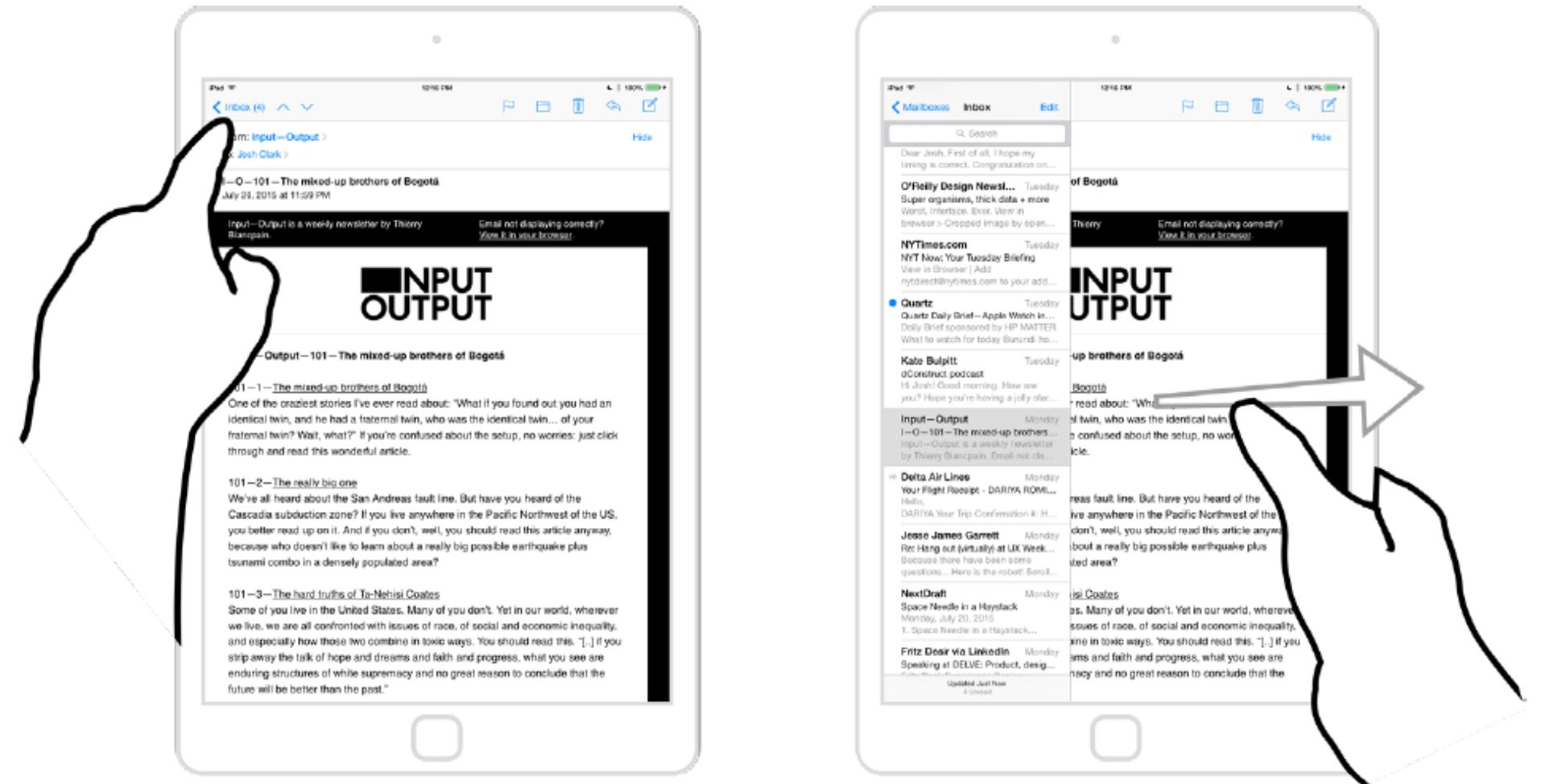
Pinch/spread: zoom in/out. Semantic zoom uses pinch gesture as alternative of back button

Double tap: zoom in/out, but can be used for other purposes (ex. Select an element and apply an action)

Do we really need buttons?



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Buttons must not cover the content



Accessibility



Gestures improve interface accessibility because they tolerate less precision. This is important in different situations:

- The elderly and children
- When the user cannot pay close attention to the interface
- Situation where it is necessary a fast interaction with no errors
- If the user knows the gestures, there is no need to watch the screen

Big gestures tend to become reflexes

- Traditional interfaces are based on visual memory
- Touch interfaces use muscle memory

Interaction with real objects



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In the real world, buttons are used to control something not reachable (ex: fan)

With touch interfaces, everything should be reachable, so before using them, always check if there is another way to manipulate the content directly

- Consider the content as an existing physical object
- Pay attention to external conventions (ex. salt and pepper, pictures gallery)



Use gestures!

Angry Birds use natural and
intuitive gestures and not
buttons

Card metaphor



The card metaphor is frequently used and deeply understood by users:

- It is natural with business cards, plane tickets, coupons, etc.

Suggest several natural interactions:

- Flip the card
- Put them in a stack

Sometimes there is no direct correlation

- In the real world, we do not flip the card clicking on a button
- Gestures are not always easy to find: help the user!

How to help the user? - 1



A good rule is to get help from the real world: if the gesture we want to use is the same as the real world, there is no need for instructions

- Always necessary to follow physical constraints
- If we follow the real world, no explanations are necessary
- Example: drawing apps

Everything must follow conventions (do not betray user expectations)

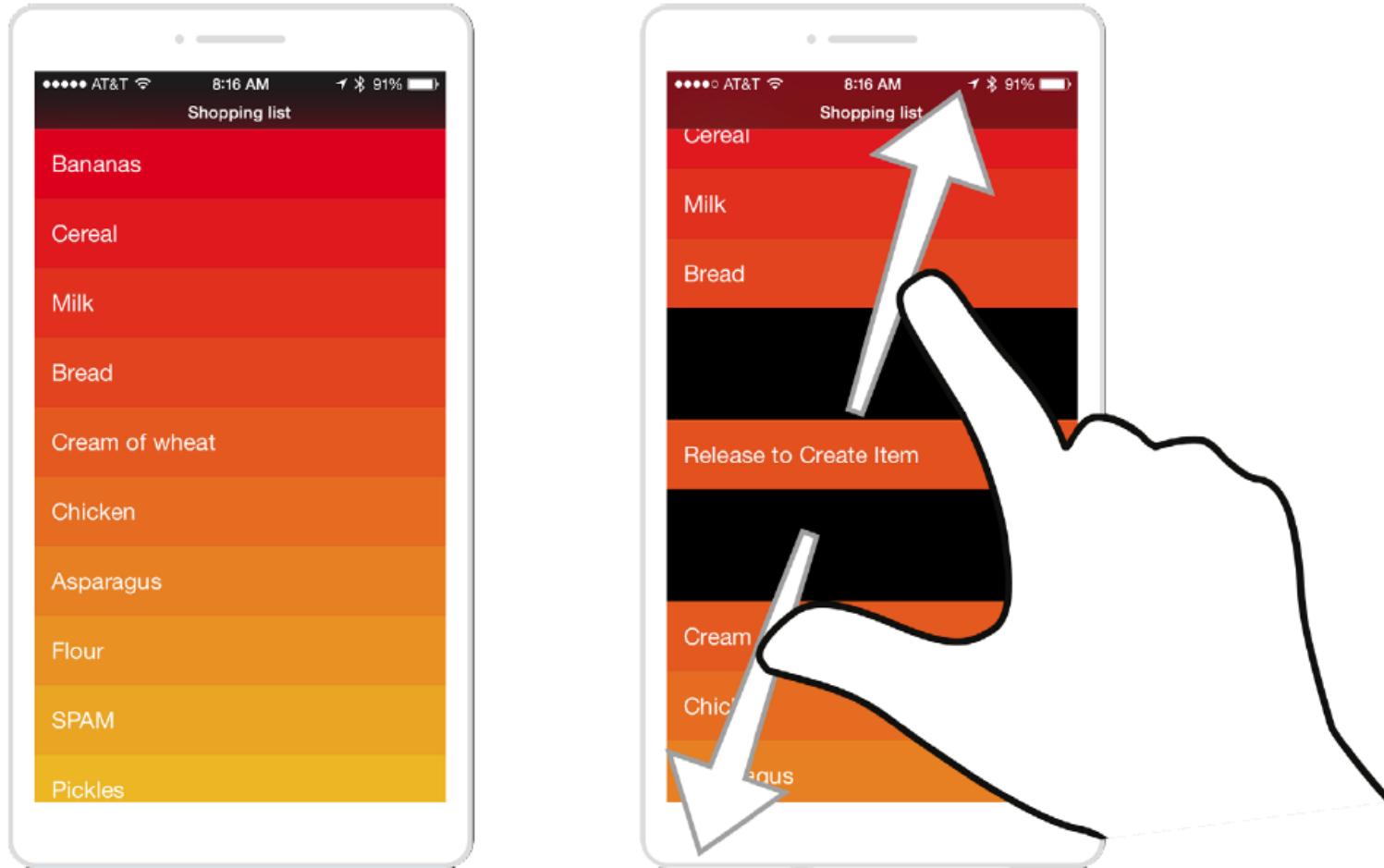
- Context is important

Use single movements from well-known interaction tools

How to help the user? - 2



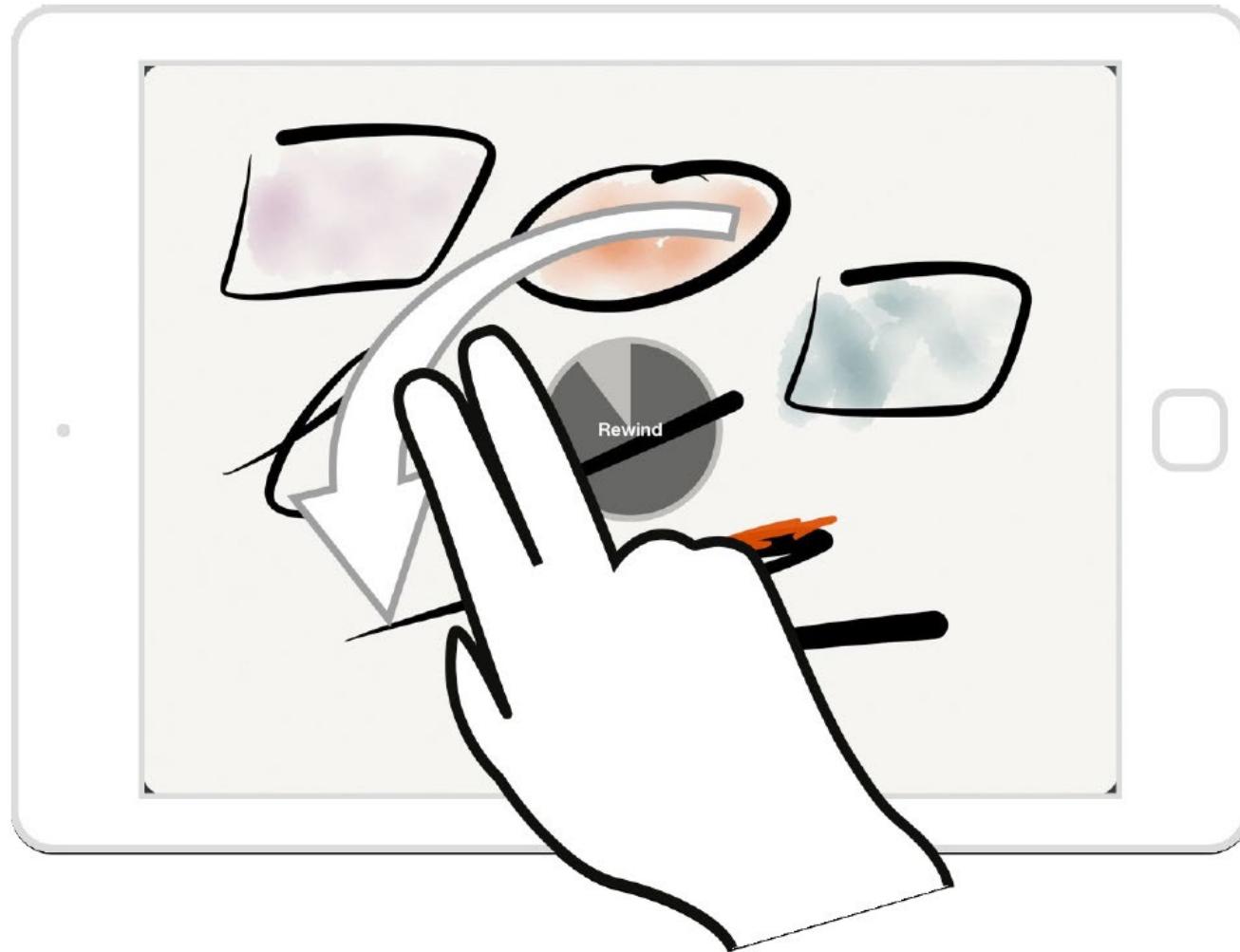
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Knob movement



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Shortcuts



Even if it is important to use natural gestures, it is possible to introduce complex gestures that can be used as the keyboard shortcuts

- Swipe to delete something instead of tap on the bin icon

In this case, the design must prefer more natural but longer gesture

It is possible to use gestures with more fingers

- Display space
- Multitouch support is not always optimal
- More complex
- Accessibility

Follow the operating system



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The operating system has the priority: gestures used by the OS cannot be used by the application

Gestures are different depending on the OS:

- With Android always start from the sides
- With iOS can be completely inside the space dedicated to the app

The override should be avoided

Circle menus



Circle menus are frequently a good way to reduce conflicts between gestures

Easy to learn because they use muscle memory, and fast to use

Frequently used with games

Useful for primary navigation, context menu, or tools

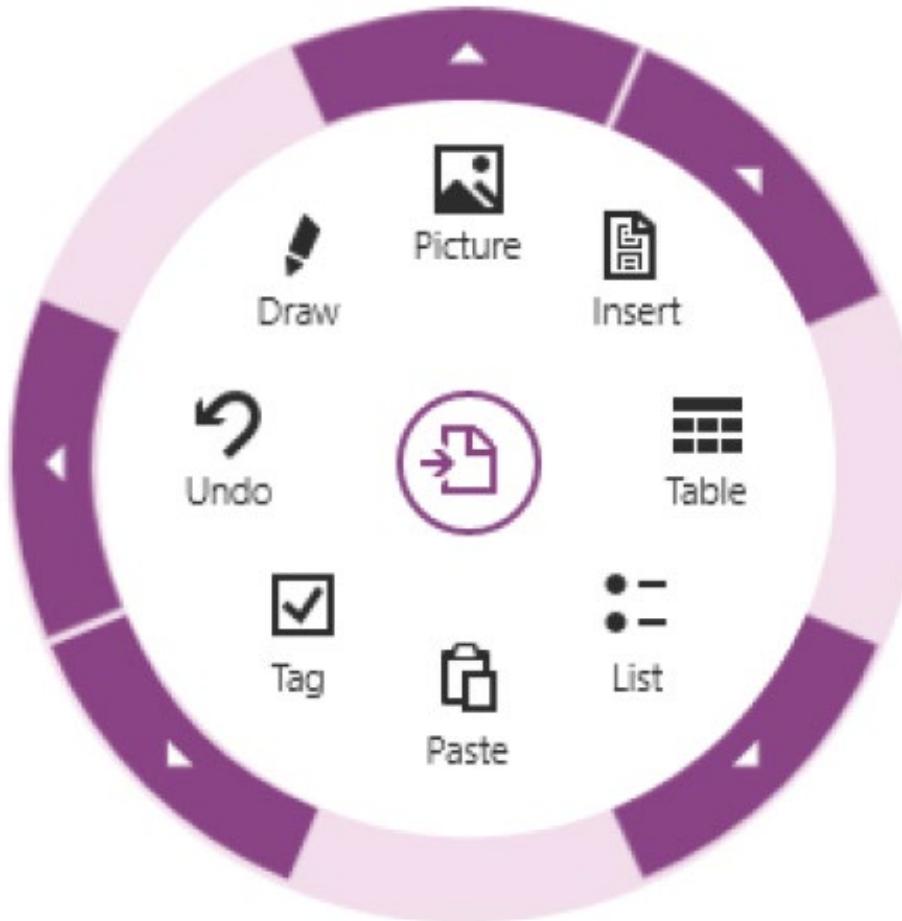
Disadvantages:

- Require more precision
- Not scalable (on phones, 3 or 4 options)
- Not easy to use the first time
- Cannot change over time

Example: MS OneNote



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How to teach gestures?

Problems



Unlike buttons and widgets used with the mouse, gestures are almost always invisible

Introduction of manuals is not effective (as well as impractical)

- Who uses an application for the first time has a precise goal (he simply wants to do something), that usually is not reading the instructions

Some gestures are trivial, but often after having discovered them

Solution: *just-in-time* education

Journal metaphor



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How to use MAGAZINE

PLEASE READ BEFORE USE!

Hold here with your left hand

Start reading in the upper-left hand corner, move across to your right, then down

Text from left-facing pages continues at the top of the facing right-hand page

Page Corners can be folded over to remember where you left off last

Hold here with your right hand

Pages stacked on the LEFT side display your reading history

Fold along the Spine to switch to carrying mode

Pages stacked on the RIGHT side display unread content

Remember: MAGAZINE is easy to use!

©2011 Khoi Vinh Subtraction.com

Vanity Fair



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HOW TO USE THIS APP

The new and improved *Vanity Fair* iPad app is so intuitive that you can probably skip this tutorial. In case you find yourself a little lost, though, feel free to check the following diagrams as you touch and swipe your way through the current issue.

READING

{Figure 1}

Rotate your iPad from vertical (portrait mode) to horizontal (landscape mode) to see the same content presented in a different format.

{Figure 2}

Give the screen a gentle swipe to the left or right to move from one story to another in the issue.

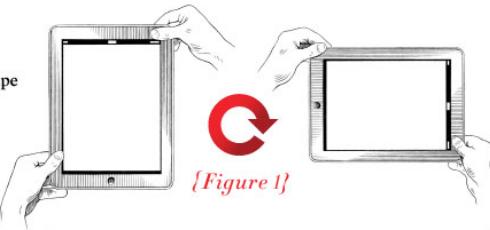
{Figure 3}

Flick a fingertip up or down to make your way through the article you're currently reading.

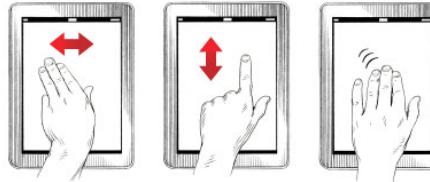
{Figure 4}

Need larger print? With three fingertips, double-tap the screen to enable the zoom function. Exit the zoom function the same way, with a three-fingered double-tap.*

* You will need to set Zoom to "On" in your iPad's Settings under General/Accessibility.



{Figure 1}



{Figure 2}

{Figure 3}

{Figure 4}

Skeuomorphic design



The principle is: «*I know this object and I know how to use it*»

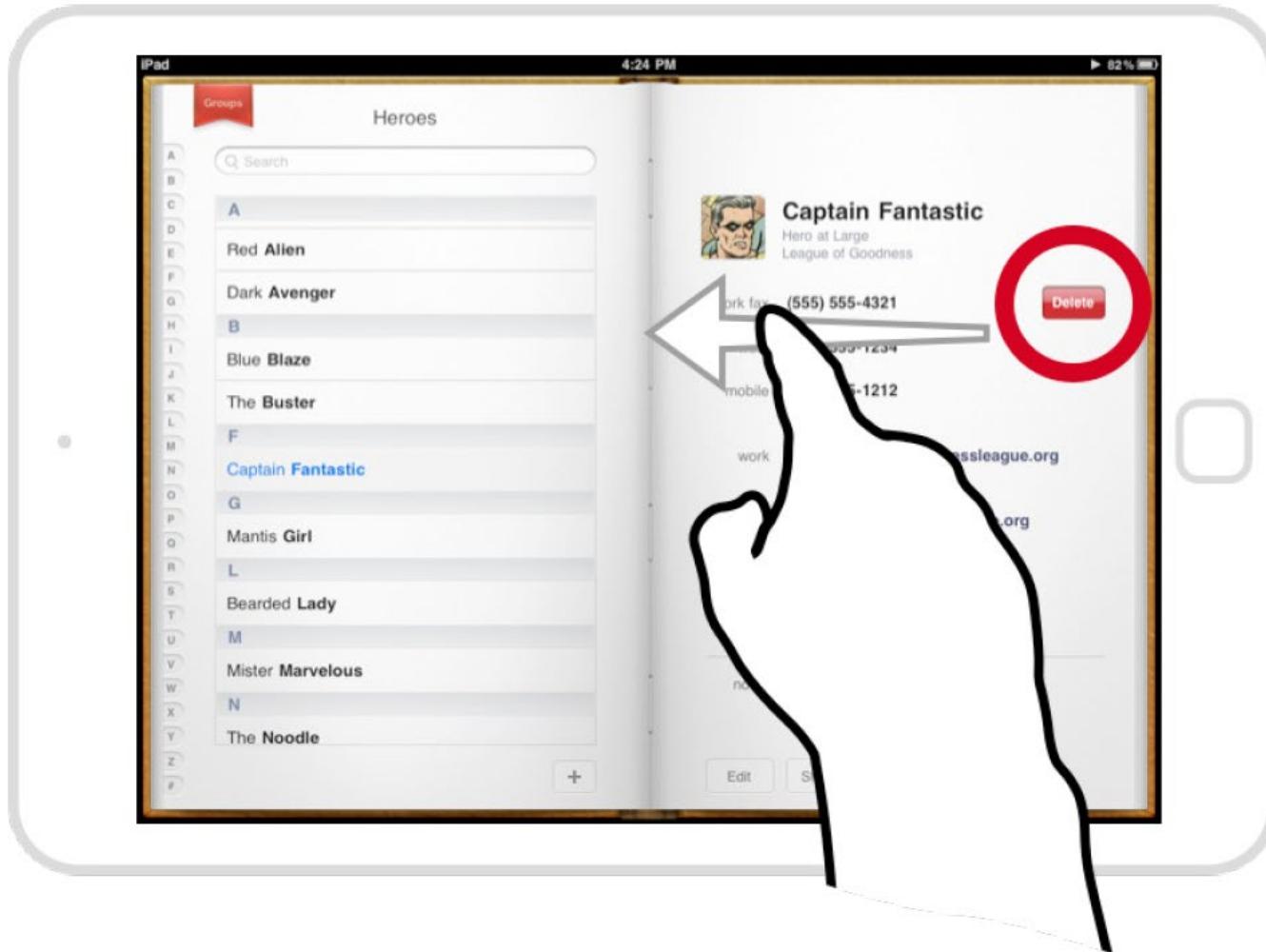
The critical point is to choose the correct metaphor and not betray it

The *Skeuomorphic Design* is not suited for gestures' teaching

Wrong example - 1



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Wrong example - 2



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Too much realistic interfaces

Making interfaces too much real can be dangerous, because usually the following equation stands:

$$\textit{Looks like} \Rightarrow \textit{Acts like}$$

If this does not happen, the user will be confused

Differently, if an object *acts like*, it does not mean that it must *look like*

Excessive realism can limit the possibilities

- Initial newspaper applications were not far away from simple PDF readers

Instructions



It is not true that if the user needs instructions, the designer has failed to design the interface

- Better learning when doing
- Teach Gradually the gestures during the interaction
- Videogames solve this problem very well: the user usually does not know what to do but learns while playing
 - Coaching
 - Leveling up
 - Power-up

Coaching



To tell someone what to do is not as effective as showing what to do

Coaching provides easy instructions when the problem shows up for the first time

The key point is to understand if and when the skill has been learned, from that point instructions are a nuisance:

- Ask the user to make a gesture
- Ask several repetitions of the gesture

Mistakes as resources



Users' mistakes help to understand what users have *not* learned and so that instructions are still necessary

If the user stops during the interaction, this could be a warning:

- An animation can help the user to complete the interaction

The best interfaces record when the user interacts, do not interact and the learning process, adapting hints and suggestions to the latter

Leveling up



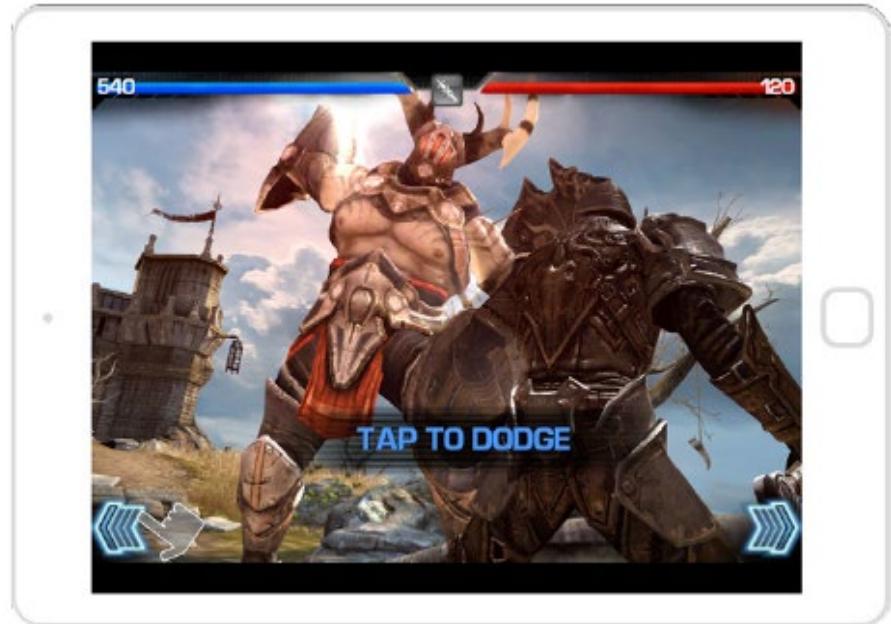
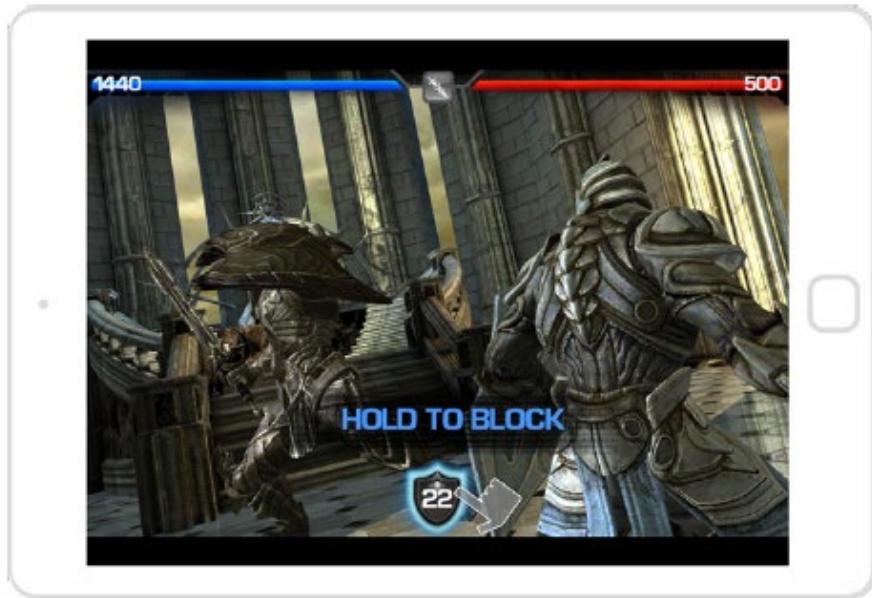
Current guidelines for modern teaching suggest not to teach everything from the beginning, but to provide small-steps knowledge. The leveling up mechanism works in the same way:

- Teaches only basic interactions at the beginning once the user needs them
- Let the users use the complex gestures if they autonomously find them
- Users are more motivated to learn something more complex when they need them
 - App must be organized in different levels
- Provide the necessary time to learn

Games example



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Power-up



Typical of videogames, power-ups provide facilitations to the user. In videogames, power-ups are gained, hence providing great satisfaction to the user

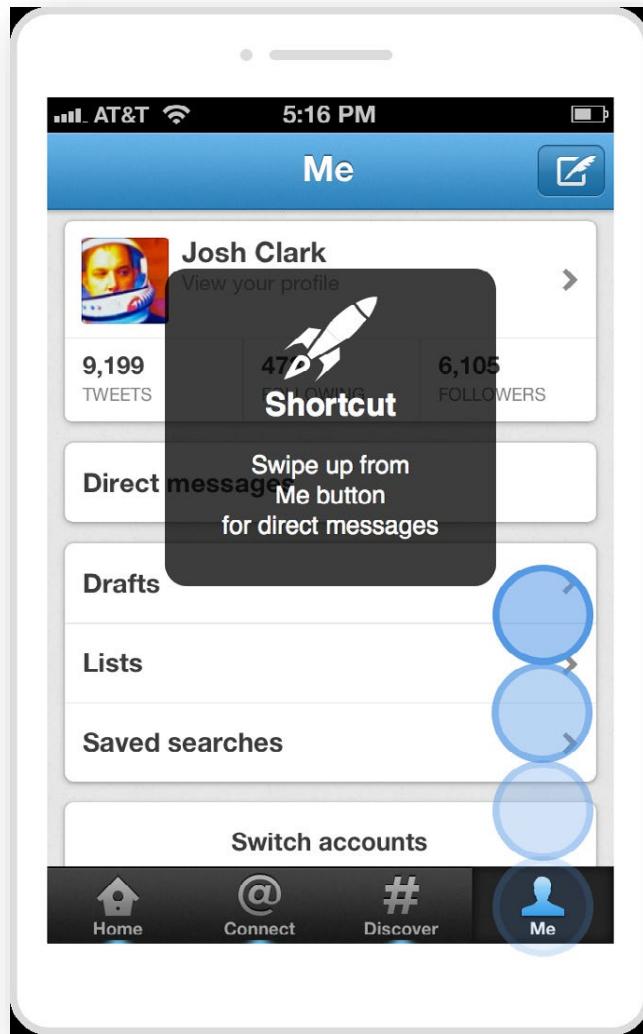
With mobile applications, power-ups are gestures that make interaction faster or easier. Teaching a new way to interact in a easier way provides the same satisfaction as with the power-up in a game

- Think as a videogame designer and provide facilitating gestures as a reward

Power-up example



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Open research



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Good touch interfaces design is still an open research problem. There are no standards or precise guidelines, and these guidelines come from the experience of different designers and from what has been learned with errors

Suggestion:

... experiment, test, experiment ...

Not only touch!

Other type of interactions



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Mobile devices also allow other types of interactions besides touch

- GPS can provide user's location (ex: maps)
- Accelerometer, compass, and gyroscope can recognize the movements of the user
- Other sensors can provide several data (ex: luminosity sensor)
- The camera can be used to collect data (ex: translator, QR code reader, accessibility for blind people)
- Fingerprints reader
- ...

Subway example



Emotional Design

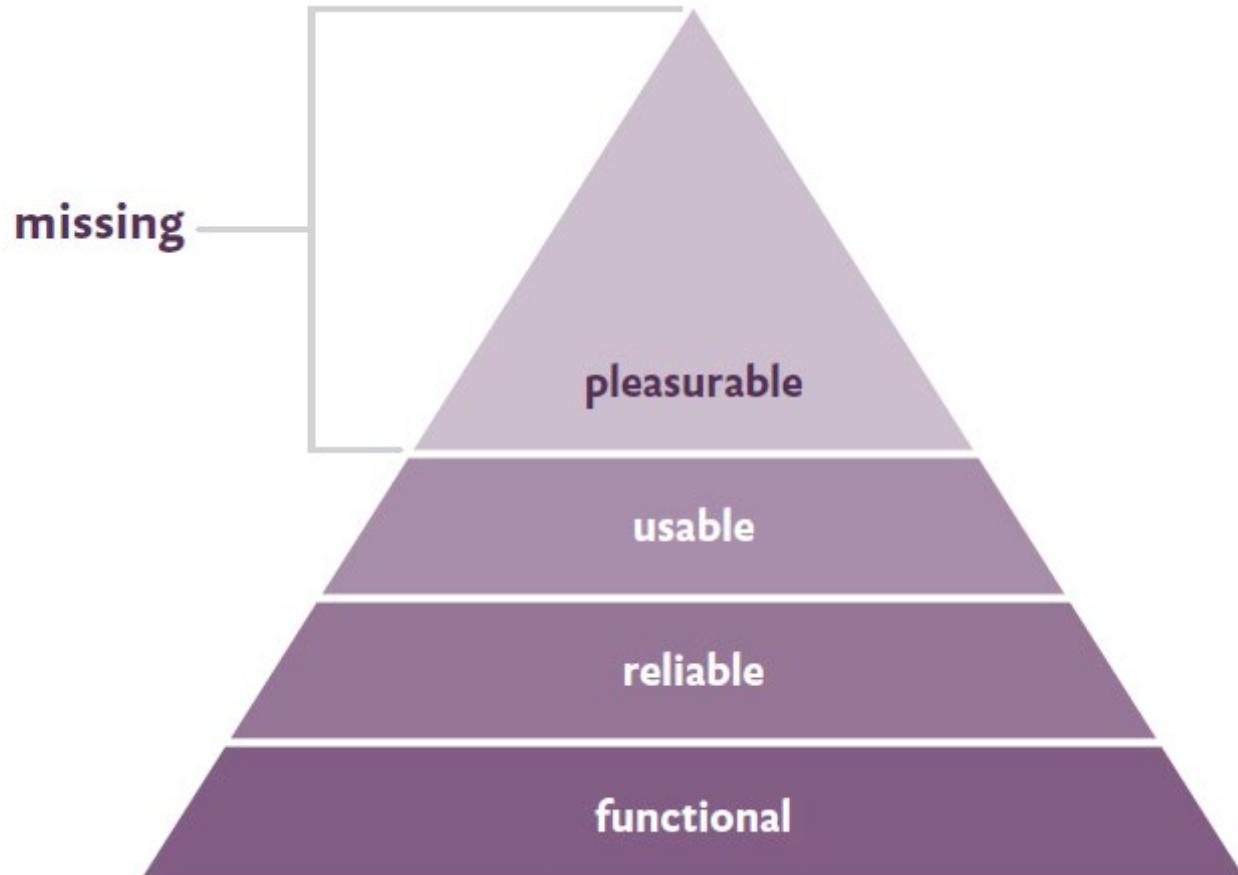
Maslow's pyramid



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... remapped on users' needs



Designing for Emotion, Aarron Walter, 2011

Users' needs

- ***Functional***: user must be able to complete the assigned task
- ***Reliable***: the system must work, failures of every kind are unwelcomed
- ***Usable***: it must be easy for the user to learn how to use the system and its functionalities
- User experience must be ***pleasant***

Emotions and memory

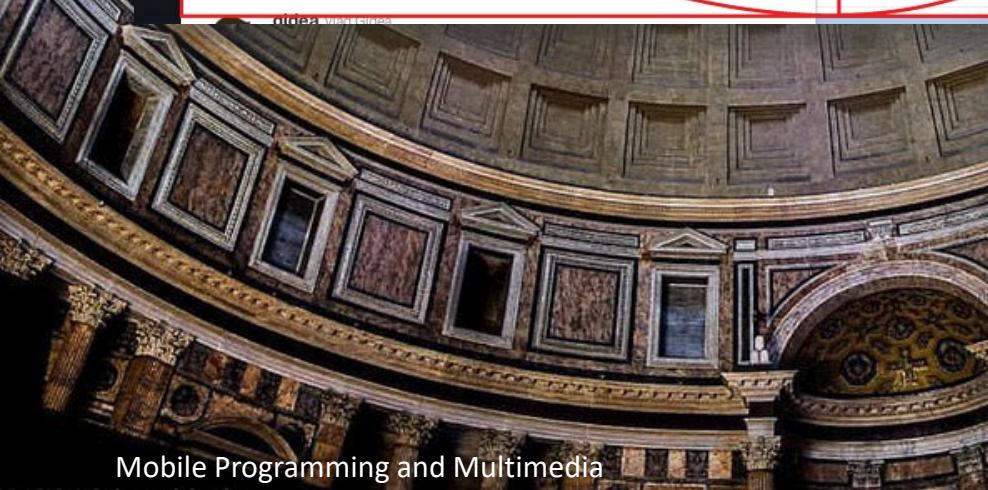
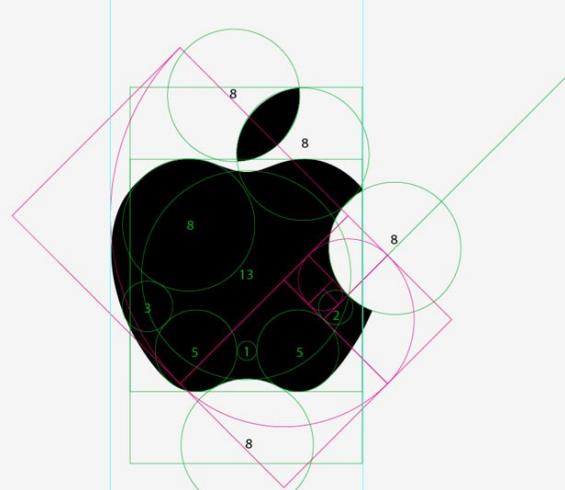


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Emotions are essential for memory management because they are a sort of reminder, like using a post-it or a bookmark on a page of a book

A screenshot of a Twitter interface. At the top, there's a search bar, a 'Home' button, and a 'Profile' button. Below the search bar, it says 'What's happening?'. Underneath, there are tabs for 'Timeline', '@Mentions', 'Retweets', 'Searches', and 'Lists'. A red circle highlights a tweet from @ozanilbey. The tweet reads: 'Dear #NewTwitter, "good proportion" is one of the main design principles. Remember? @stop @design'. Below this, another tweet from @ozanilbey is shown: 'Dear #NewTwitter, "good proportion" is one of the main design principles. Remember? @stop @design'. Other visible tweets include one from @ashleyy and one from @Zhanna. The interface has a blue header and a white background.



A simple example



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*Apple patent (2002) for a status led following
the human breath. It helps to relax the user*

Humanization



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Another example



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Personalities



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A good technique is to imagine the brand as a person with a personality, and imagine how this person could speak, answer, act, etc.



User archetype

persona



Julia

Age: 19 - 22; Sophomore; Journalism & Communications

Goals: Get a "Big City College" education, cosmopolitan experience; Build resume with internship; Take new/different courses; Make new/different friends; Experience different cultures

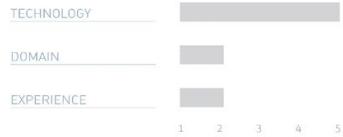
Pain Points: Limited courses offered; Costs; Organization (too much or not enough); Advantages are hidden; Challenging to transfer credits

My internship provided me with the opportunity to work in Times Square. I just love all of the lights, action, and excitement!

Julia has been taking Spanish since high school and is excited to study abroad in Buenos Aires next spring. She's traveled a little in the past—to Great Britain for a vacation with her family and to Mexico for a missions trip—but this is her first time going abroad alone. Though she has other friends who also plan to study abroad, she wanted to go at a different time so she would be forced to make friends with the locals and truly immerse herself in the culture. She's heard from friends that the maturity level of some of the students plummets the moment they step on the plane to study abroad. She hopes they don't make her look like a "stupid American."

She's also heard that the dorms in Buenos Aires aren't great, which solidified her decision to do a homestay. However, she's concerned about commuting to classes, which she hopes to take at the NYU campus as well as a local university—if the credits transfer. She doesn't have a lot of extra cash and is interested in a work study to pay for souvenirs and some travel around Argentina. Speaking Spanish on the job would also be great practice, but she isn't sure what sort of opportunities there are, or even if she's allowed to work.

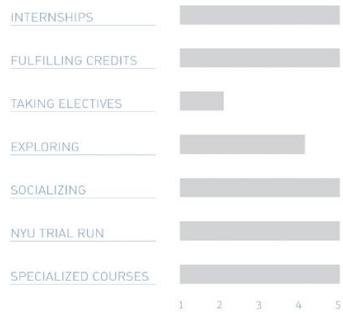
Knowledge



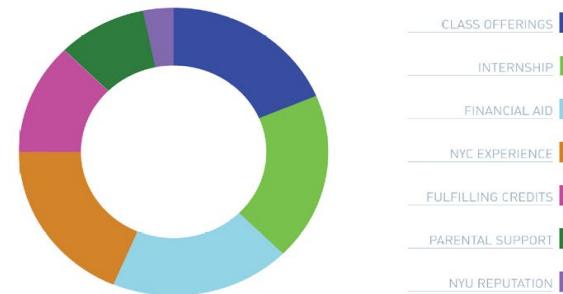
Lifecycle



Activities and Interest



Influencers



Persona



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Data to collect:

- Name and brand image
- Personality
- Language used
- Visual lexicon (font, type of icons, colors, etc.)
- How can I get his/her attention? Which emotions is the user more sensitive to?

How to use emotions



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“I'm never disappointed by Photojojo.”
Dave Johnson
PC World

Description FAQ

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But despite the hundreds of dollars spent on whotzits and whatzits galore

- Adds a soft and dreamy focus to your photos
- Includes Canon or Nikon adapter

Which emotions can we use?

There are no rules, but we can use different emotions depending on the context. Generally speaking, the most effective are:

- Surprise
- Pleasure
- Preview
- Status/Exclusivity
- Rewards

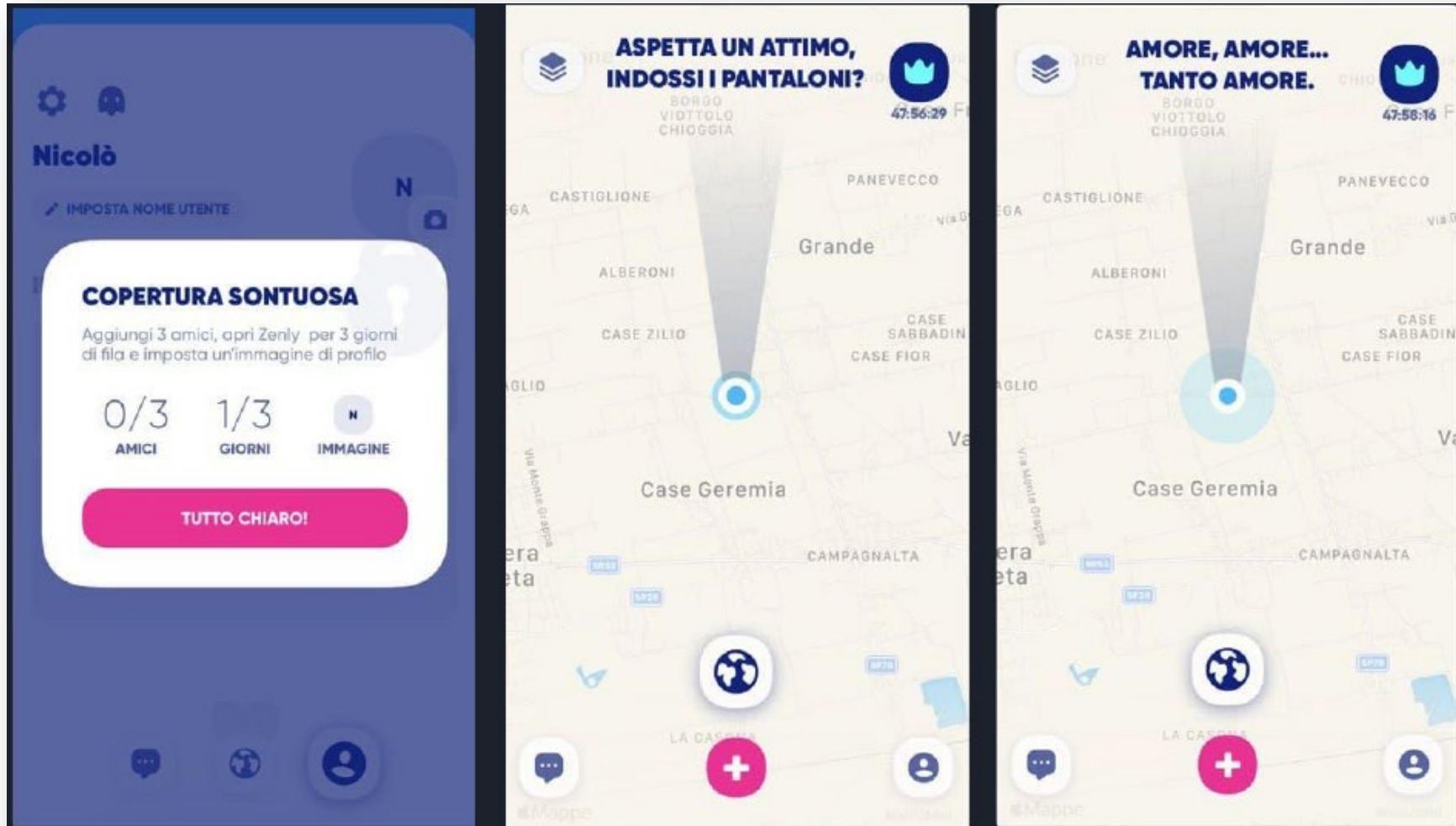


Never force the user to change!

A real example



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Another example



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Accesso in anteprima per i member
a prodotti, eventi e altro ancora

Articolo prenotato oggi fino alle ore

17:00



Nike x Carhartt WIP Air Force 1

Follow the instinct



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When a person has to decide something, he/she considers pros and cons. When it is not possible to measure everything accurately, instinct prevails.

Major obstacles:

- Laziness
- Skepticism



A good design or the use of games/incentives can help for a good decision

What if it doesn't work?



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- Is the persona created for the brand correct?
- Is it too similar to other competitors?
- User needs?
- Is the language correct?
- Is my application still usable, enjoyable, reliable?

When it is not possible to use



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It is not always possible to use informal language, but generally it is a good idea in case of disruptions. Tell always the truth!

The image shows a screenshot of a Flickr contest page. At the top, the Flickr logo is visible. Below it are two large, empty circles, one on the left and one on the right, intended for users to color in. Below these circles, the text "Arrggh! Our tubes are clogged!" is displayed. Underneath this text, there is a promotional message encouraging users to enter a competition for a free pro account. Further down, instructions are provided for the contest, mentioning a printout, coloring, and photo submission. A note at the bottom apologizes for downtime and provides a link for more details.

flickr®

Arrggh! Our tubes are clogged!

Because this sucks*, we thought you might like to enter an impromptu competition to win a FREE PRO ACCOUNT!

Just print out this page and colour in the dots. When the site's back up, take a photo of your creation and post it to Flickr, tagged with "flickrcolourcontest".

Team Flickr will pick a winner in the next couple of days, and that lucky duck will get a free year of Pro.

* Seriously, we apologise for the unannounced downtime. We're working as fast as we can to get flickr.com back online. [Details here](#).

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