

Mobile Programming and Multimedia Mobile Design

Prof. Ombretta Gaggi
University of Padua



Dissemination



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

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

Differences with Desktop apps

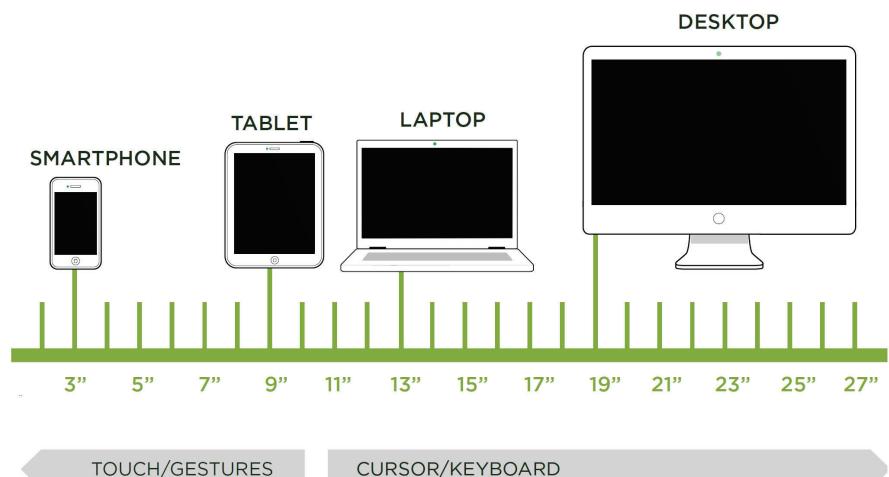
User interface design for mobile applications must consider several aspects

Main differences:

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



Interfaces and interactions



Interfaces variability



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



Touch is used even with desktops



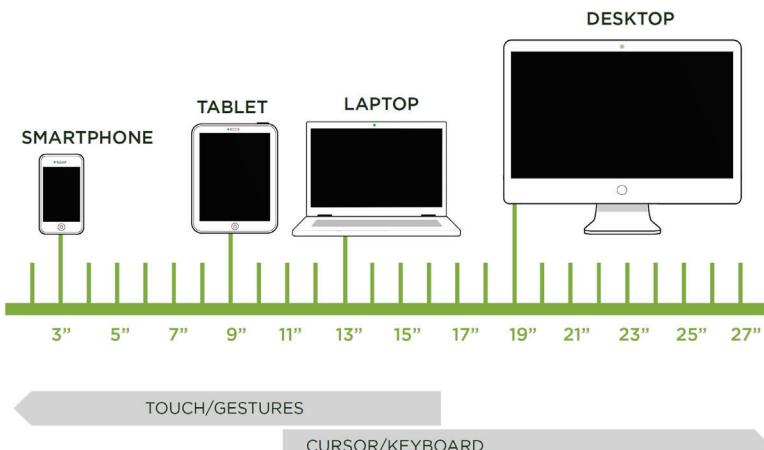
Lenovo IdeaTab Lynx

Lenovo ThinkPad Twist

Interfaces and interactions



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



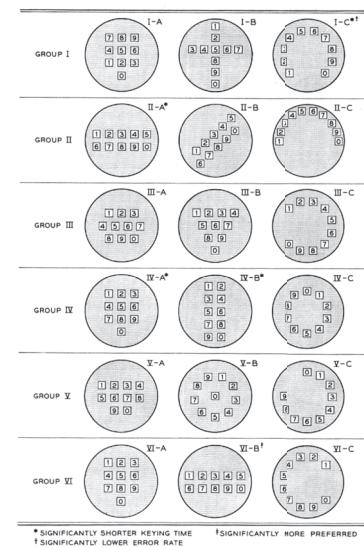
An old but effective story

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

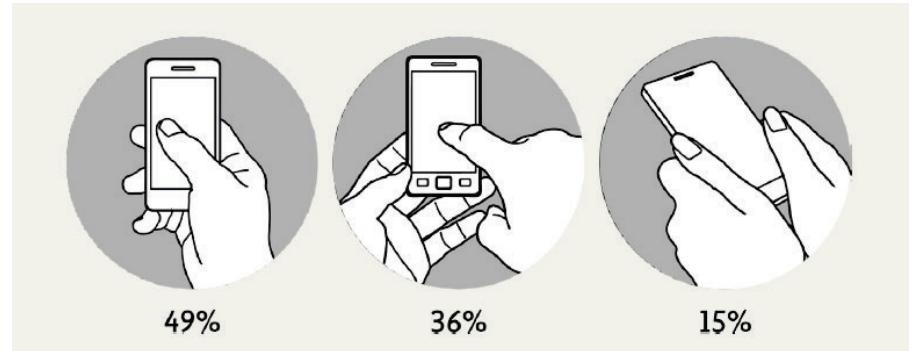
Mobile Programming and Multimedia



9

First consideration

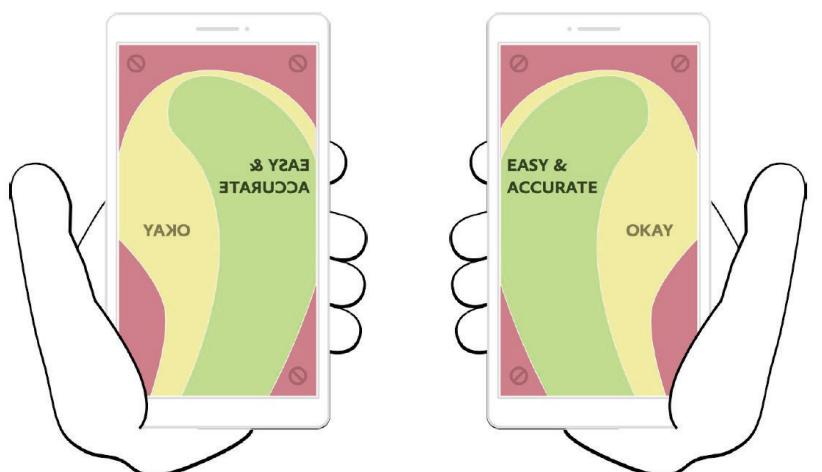
The reachability of different components of the interface depends on how we hold the device



Mobile Programming and Multimedia

10

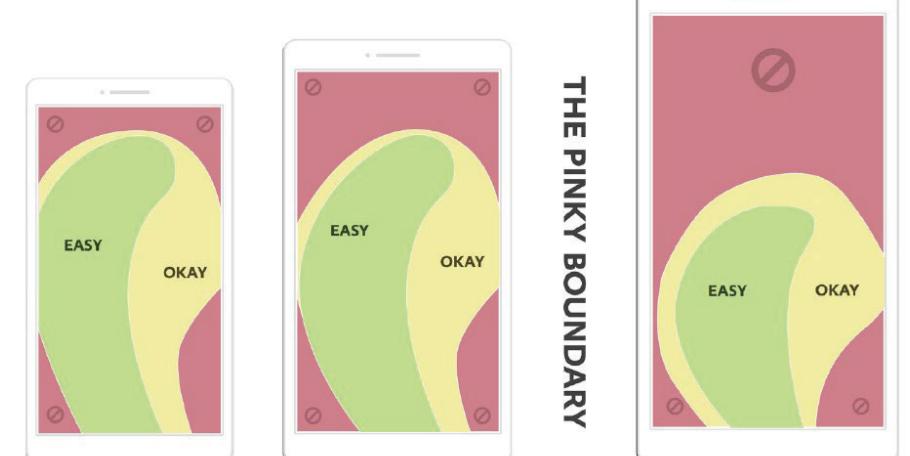
Confort zone



Mobile Programming and Multimedia

11

Screen size



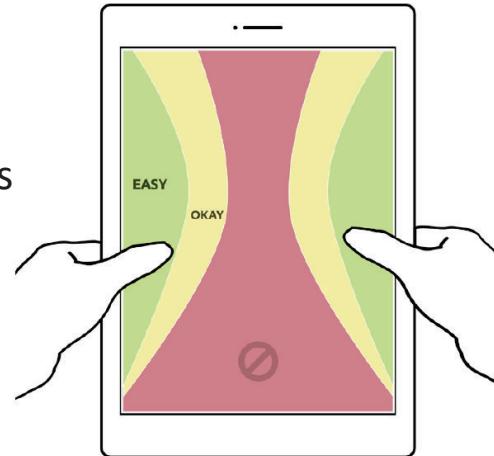
Mobile Programming and Multimedia

12

Tablet



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



Big tablets



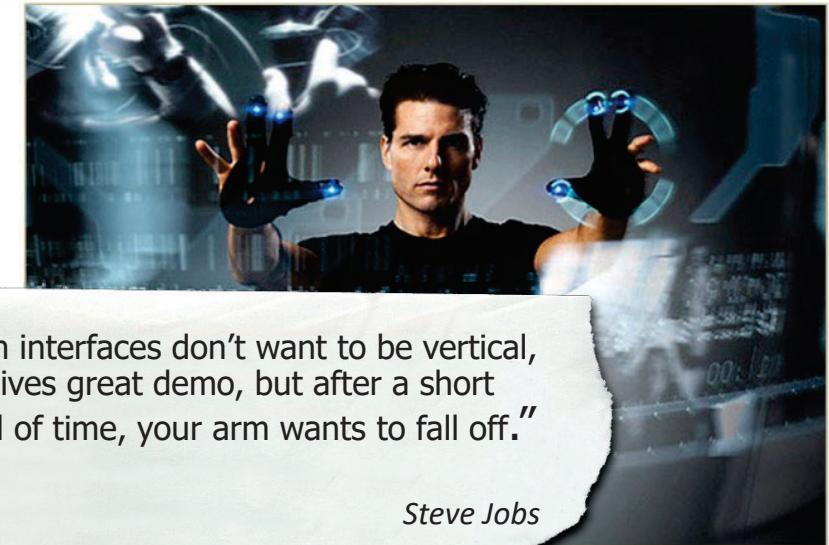
Increasing device dimension means increasing weight

- 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

The Gorilla arm problem



"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



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

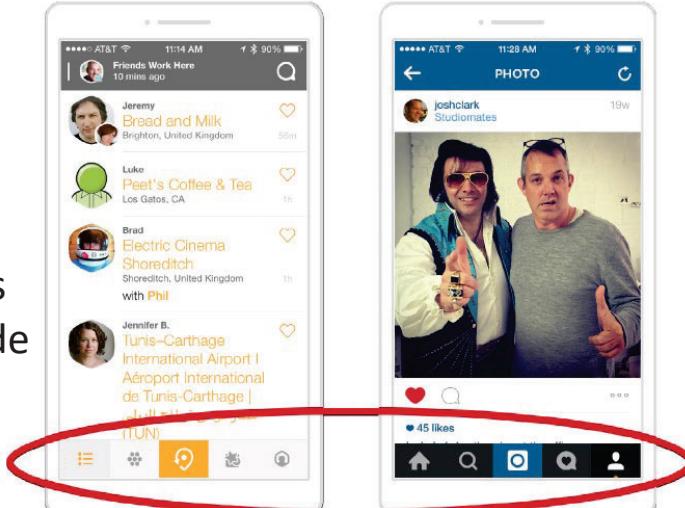
- It is important to calculate their encumbrance
- Important data must remain visible
- If necessary, they can hide the controls



Attention!



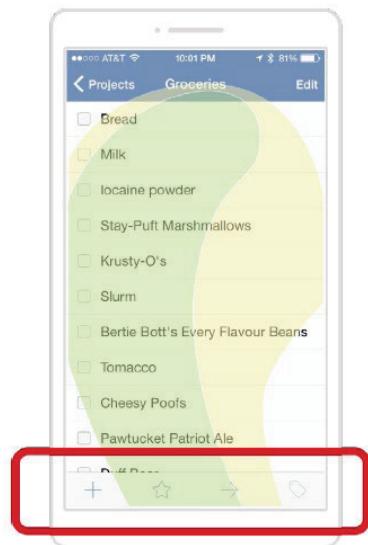
If an application requires to modify data frequently, then controls must be inside the comfort zone



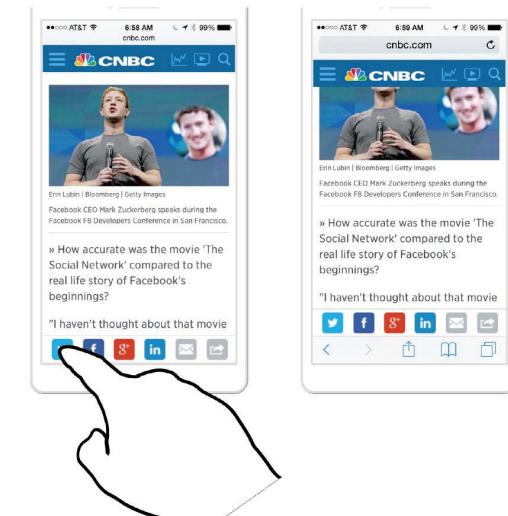
Operational guidelines



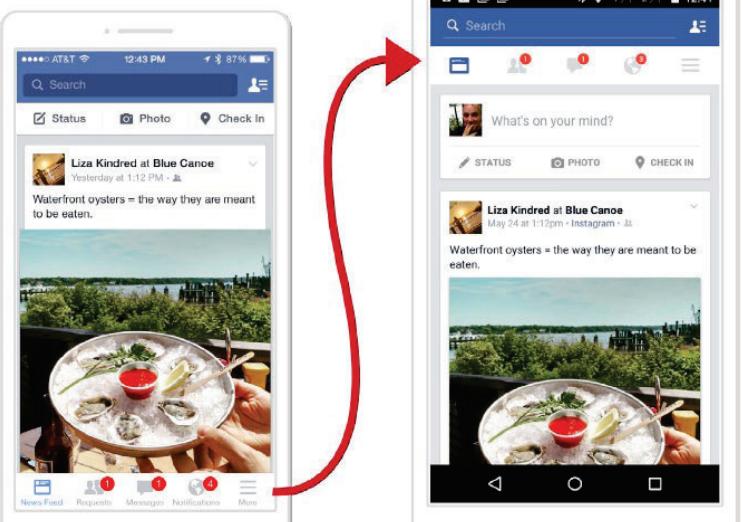
The «*Content always on top*» rule forces to leave the content in the center and move controls above, below, or on the sides



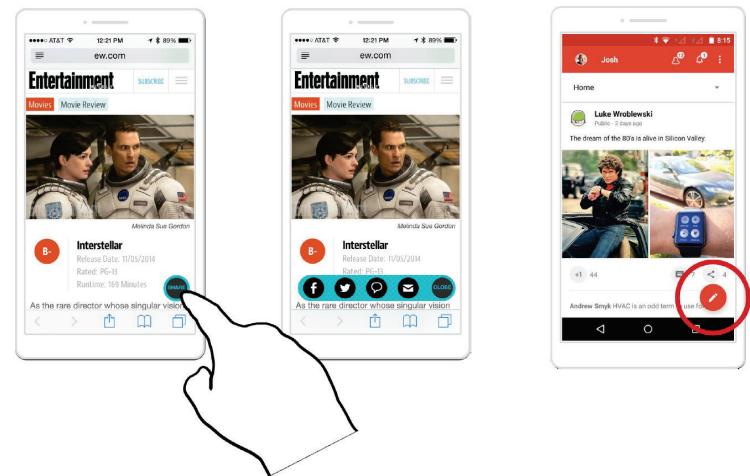
Problem



Different rules



Floating trigger button



Practical rules



Android

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

iOS

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

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

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

Fingers vs. Cursor



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

Hover problem

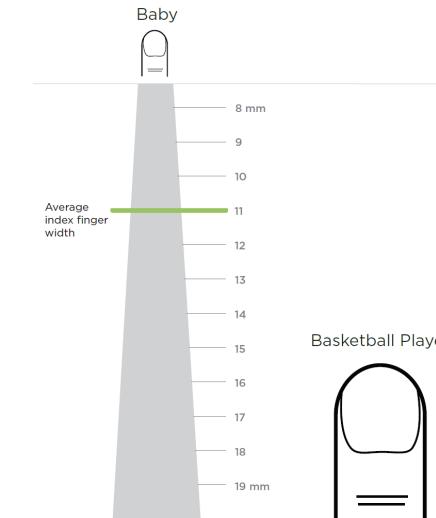


With exception to several proprietary solutions (ex: the pen of the Surface or the Stylus pen by Samsung), the hover event is not available on touch interfaces

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

Thumb size

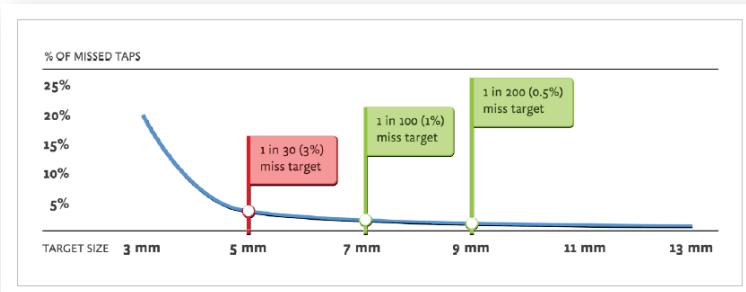


Controls size



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



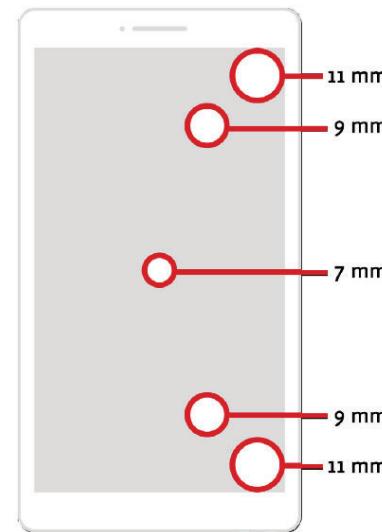
From mm to pixels



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

Size vs position



Do not crowd interfaces



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 - 2



The screenshot shows a mobile application interface. On the left, a sidebar has a 'Log in or Sign up' button at the top, followed by a yellow 'THE SESSION' button. Below it is a 'Fáilte' section with a search bar containing 'The Session' and a 'SEARCH' button. Underneath is a 'Recent activity' section showing updates from 'Moulouf' and 'David50'. On the right, the main content area has a yellow header with the word 'SESSIONS'. Below it is a list of categories: TUNES, RECORDINGS, SESSIONS, EVENTS, and DISCUSSIONS. At the bottom of the main screen are links for HELP, CONTACT, LINKS, and DONATE.

Example - 1



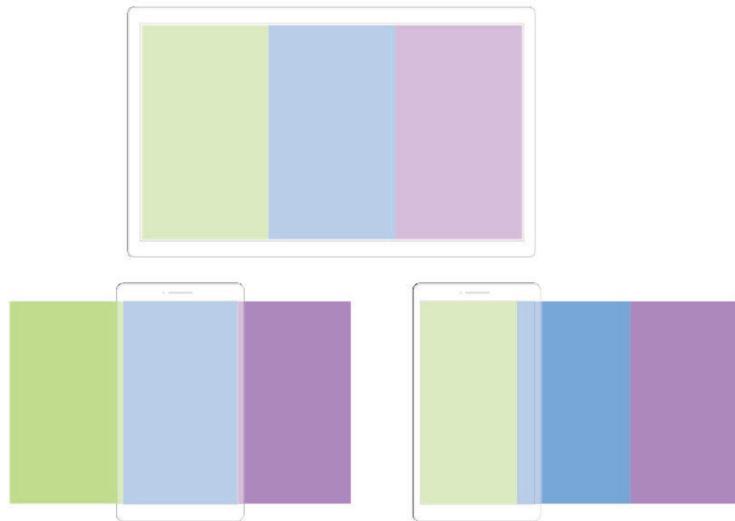
Number of interactions



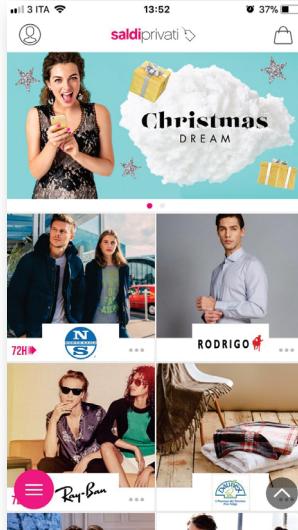
With increasing bandwidth available, and the availability of a local database, the number of taps is less critical:

- 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



Correct usage



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

Carousels: when?



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%

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

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:

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

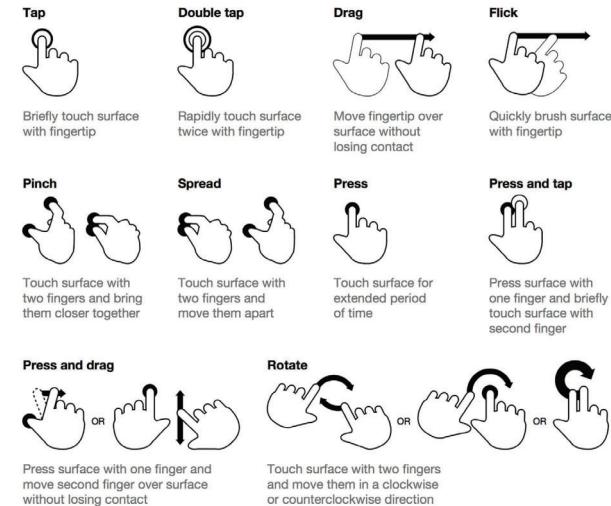
It is better to use specific gestures, e.g., a *swipe* to answer calls or to unlock the device

- 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



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

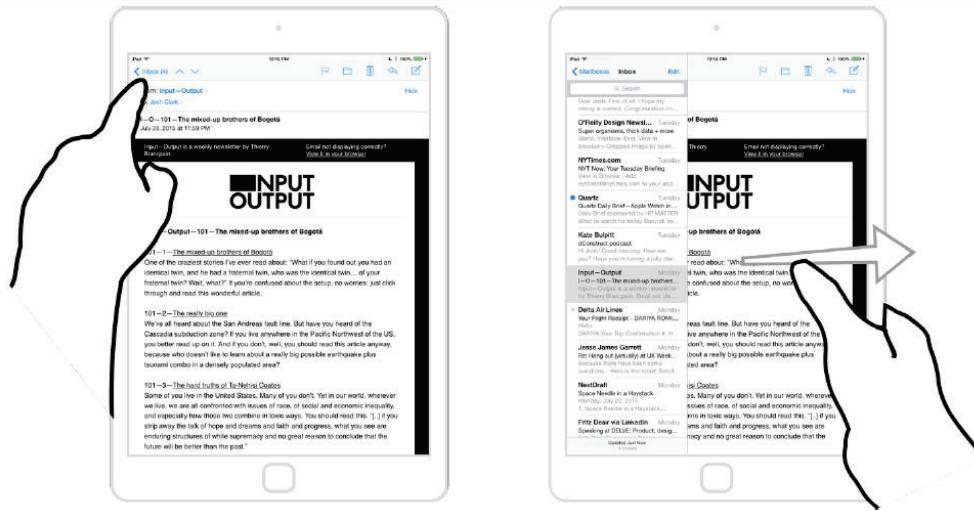


Long press + drag: equals to drag&drop

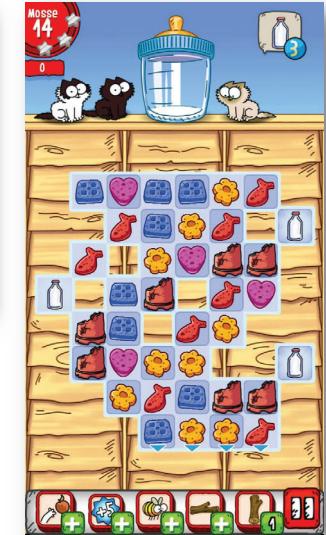
Pinch/spread: zoom in/out. Semantic zoom uses pinch gesture as alternative of back button

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?



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

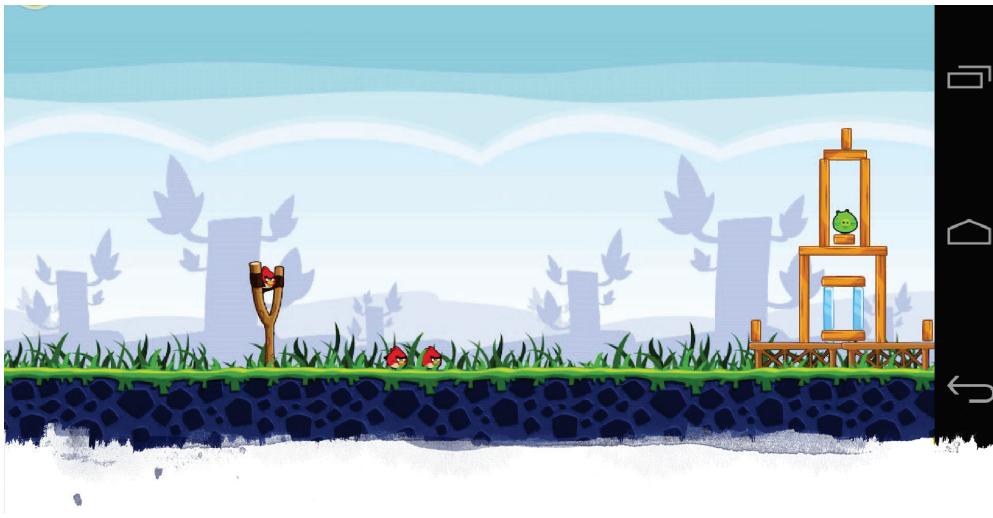
Interaction with real objects



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

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

Card metaphor



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

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

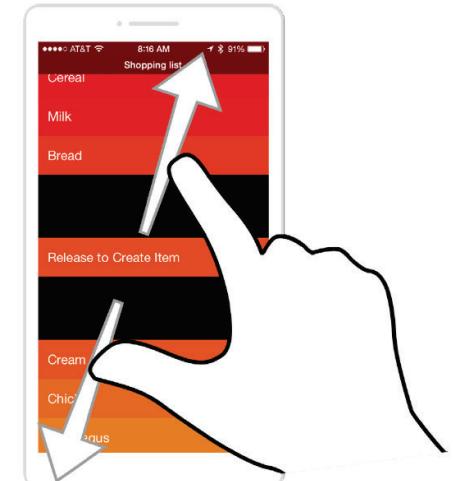
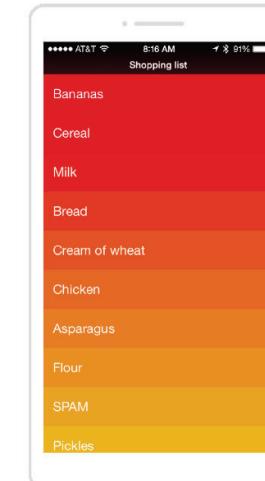
Suggest several natural interactions:

- Flip the card
- Put them in a stack

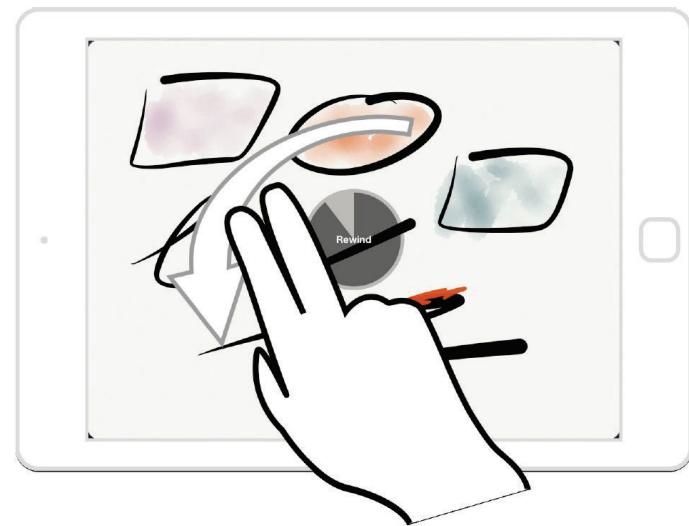
Sometimes there is no direct correlation

- 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? - 2



Knob movement



Follow the operating system



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

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



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

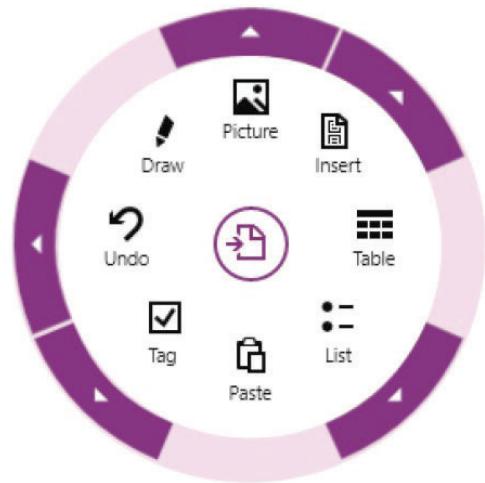
Frequently used with games

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



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

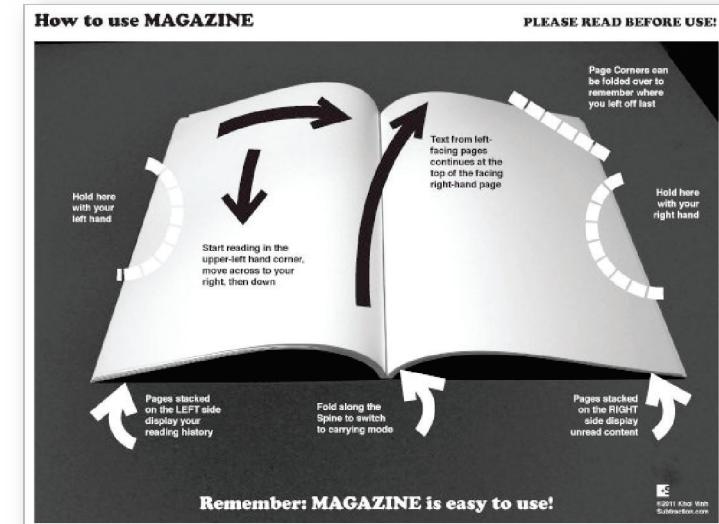
Some gestures are trivial, but often after having discovered them

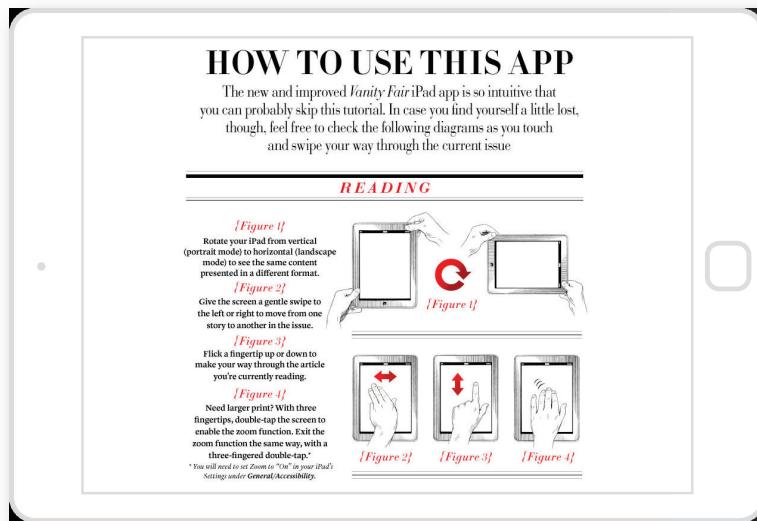
Solution: *just-in-time* education

How to teach gestures?

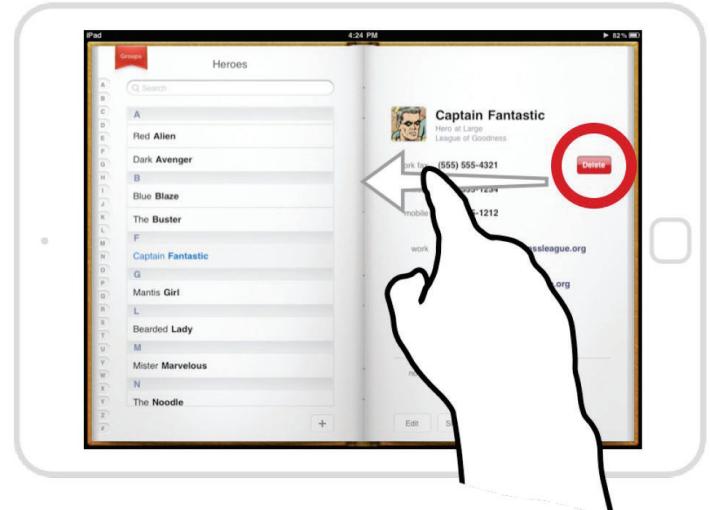


Journal metaphor





Wrong example - 1



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 - 2



Too much realistic interfaces



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

Looks like \Rightarrow 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

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

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

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

Power-up

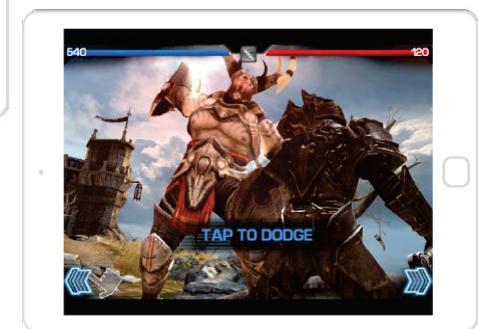
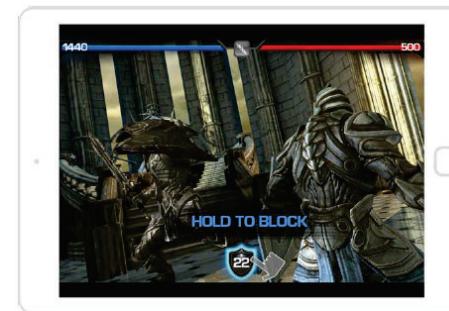


Typical of videogames, power-ups provide facilitations to the user. In videogames, power-ups are gained, hence providing great satisfaction to the user

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

Games example



Power-up example





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



Mobile devices also allow other types of interactions besides touch

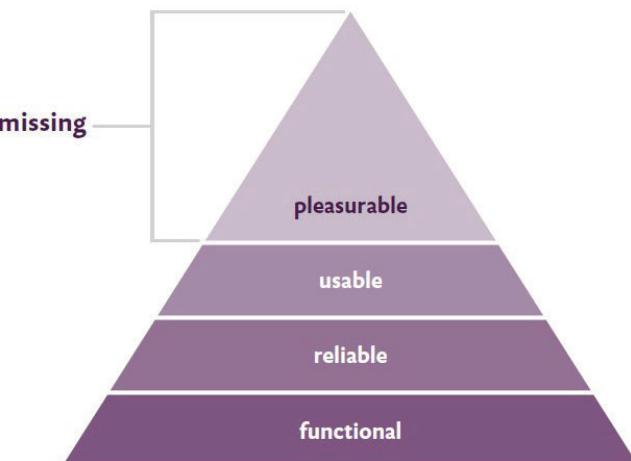
- GPS can provide user's location (ex: maps)
- Accelerometer, compass, and gyroscope can recognize the movements of the user
- Other sensors can provide several data (ex: luminosity sensor)
- The camera can be used to collect data (ex: translator, QR code reader, accessibility for blind people)
- Fingerprints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

Subway example



Emotional Design

... remapped on users' needs

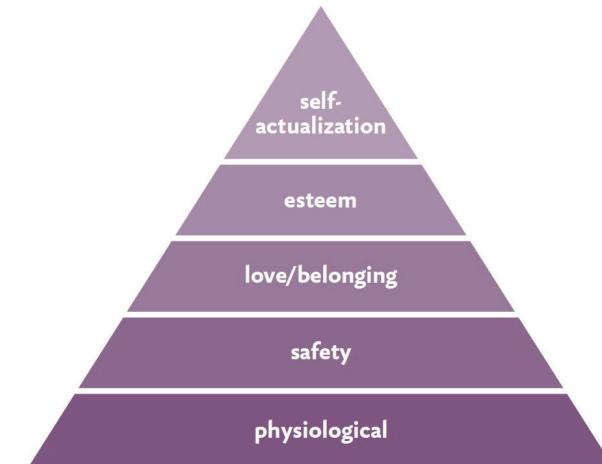


Designing for Emotion, Aarron Walter, 2011

Maslow's pyramid



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



Mobile Programming and Multimedia

82

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



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



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

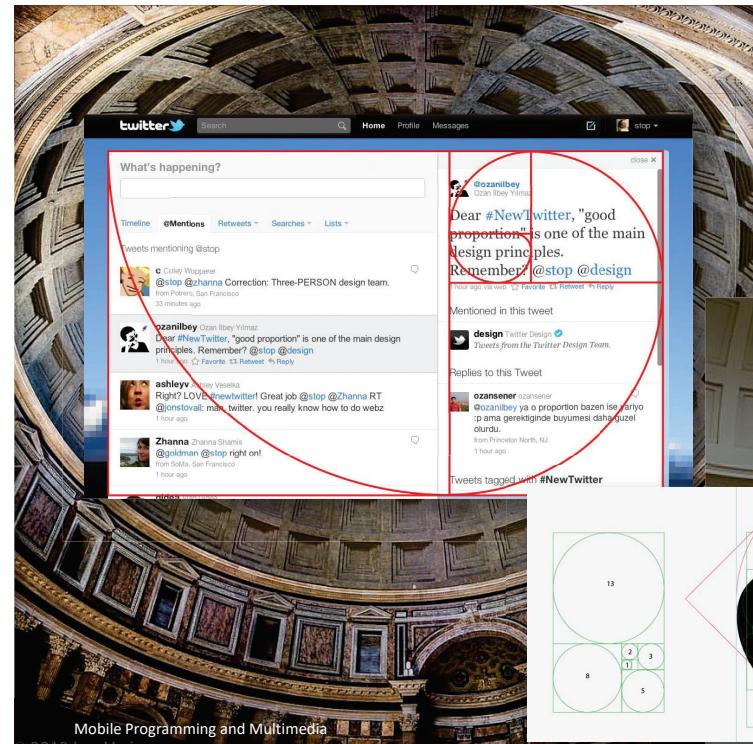
A simple example



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



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



Humanization



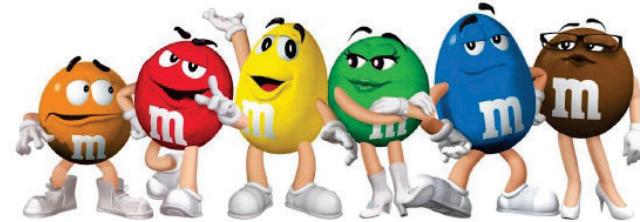
UNIVERSITÀ
DEGLI STUDI
DI PADOVA



Another example



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



User archetype

Julia

THE INFLUENCER

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 did a little in the past—the Great British for a summer with her family and 10 Mexican pesos—but this time going abroad through her other friends who are studying 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'd have to do by subway, as well as a local language credits transfer. She doesn't have a lot of extra cash to travel in a week study trip 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

TECHNOLOGY	DOMAIN	EXPERIENCE
4	3	3

Lifecycle

Activities and Interest

INTERNSHIPS	FULFILLING CREDITS	TAKING ELECTIVES	EXPLORING	SOCIALIZING	NYU TRAIL RUN	SPECIALIZED COURSES
4	3	3	4	5	4	5

Influencers

CLASS DIFFERENCES	INTERNSHIP	FINANCIAL AID	NYC EXPERIENCE	FULFILLING CREDITS	PARENTAL SUPPORT	NYU REPUTATION
1	1	1	1	1	1	1

messagefirst | design studio

Personalities



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

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



Persona



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

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



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

The screenshot shows a product page for the "Dreamy Diana Lens". At the top, there's a "FREE Shipping! On USA orders over \$50" banner. Below it, a large image of a woman holding a camera is displayed with the text "The Dreamy Diana Lens Adds a retro mode to your DSLR!". To the right, there are two price options: "Nikon Lens + Adapter \$60.00" and "Canon Lens + Adapter \$60.00", each with an "Add to Cart" button. Below these, there's a section for "Just the Adapter \$15.00" with a "Pick one:" dropdown and an "Add to Cart" button. A testimonial from "Dave Johnson PC World" says, "I'm never disappointed by Photojojo." The page also includes social sharing buttons for Facebook and Twitter, and a "Description" and "FAQ" section.

Mobile Programming and Multimedia

93

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



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

The screenshots show the Nicolò app interface. The left screen displays a profile section with a blue background, showing "COPERTURA SONTUOSA" and a progress bar for "0/3 AMICI GIORNI". The right screen shows a map of a neighborhood with several locations marked with blue circles and text overlays such as "ASSETTA UN ATTIMO, INDOSSI I PANTALONI?" and "AMORE, AMORE... TANTO AMORE.". These overlays likely represent challenges or rewards within the game.

Mobile Programming and Multimedia

95

Another example



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

The image is a promotional graphic for a Nike x Carhartt WIP Air Force 1 collaboration. It features a large, stylized digital clock face with the number "17:00" prominently displayed. Below the clock, the text "Articolo prenotato oggi fino alle ore" is visible, followed by the product name "Nike x Carhartt WIP Air Force 1". The background is dark brown.

Mobile Programming and Multimedia

96

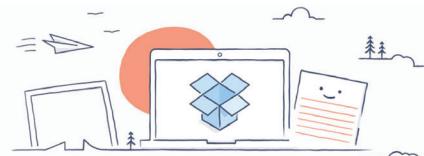
Follow the instinct



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

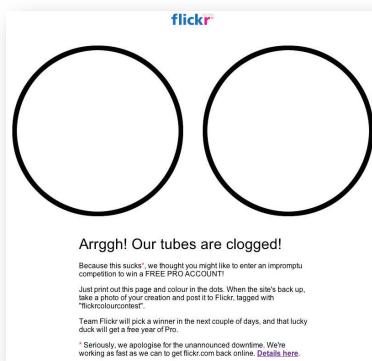


A good design or the use of games/incentives can help for a good decision

When it is not possible to use



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



What if it doesn't work?



- 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?

References



- Steven Hoober, *How do users really hold mobile device?*
 - <https://www.uxmatters.com/mt/archives/2013/02/how-do-users-really-hold-mobile-devices.php>
- Josh Clark, *Designing for Touch*, A Book Apart, 2015
- Aarron Walter, *Designing for Emotion*, A Book Apart, 2011
- Erik Runyon, *Carousel Interaction Stats*
 - <https://erikrunyon.com/2013/01/carousel-stats/>
- Jack Callahan, Don Hopkins, Mark Weiser and Ben Shneiderman, *An Empirical Comparison of Pie vs. Linear Menus*, CHI 88
 - <http://www.donhopkins.com/drupal/node/100>

References for platforms



- iOS Human Interface Guidelines
 - <https://developer.apple.com/ios/human-interface-guidelines/overview/themes/>
- Material Design (Android)
 - <https://material.io/guidelines/material-design/introduction.html>
- Windows Design
 - <https://developer.microsoft.com/en-us/windows/apps/design>