West University of Timisoara, CS Department

PROGRAMMING FOR MOBILE DEVICES

Lab 3

What exactly is an app?

Rules in Mobile Apps design

Rules in Design & Development of Mobile Games

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What exactly is an app?

- "App" is the shorthand for "**App**lication".

- In general, an app is a software developed with the purpose of making a task/tasks, easier and more streamlined. We can see an app as a unified set of several types of files and records that collectively deliver a service.

- In our days, the term is used to refer the software that runs on a mobile device (smartphone, tablet) even if sometimes it's used in the case of PCs or other computing devices.

The apps development process

The main steps on developing mobile apps:

1. Define the goal
2. Define the data model
3. Build the application
4. Test the application.
5. Share the application or provide to users
6. Give feedback from users
7. Sometimes update the app and go to Step 4

The apps development process

1. Define the goal

- What does the application need to do (the utility)?
- Who will use it (the users)?
- How will we know if it works (feedback)?

Example:

- *Compute the PI value for Algebra seminar*
- *Students*
- *Seminar discussions and comments on e-learning platform forum*

The apps development process

2. Define the data model

- What information needs as input and what is the output (the data)?
- What links are between input and output (the algorithm)?

In fact, this is

Q1 **Q3** **Q2**

What we have? **HOW? (the algorithm)** **(What we want**

In math, this is:

hypothesis **demonstration /prove** **conclusion**

Example:

- *The approximation (number of decimals) and the initial values of PI (first and second terms of series)*
- *The PI value computed with a desired approximation*
- *The algorithm:*

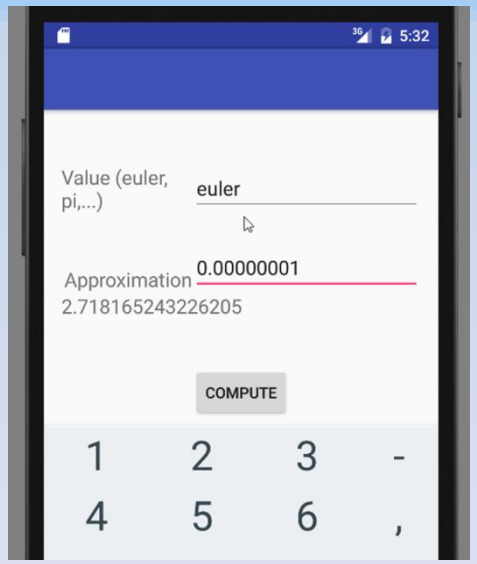
$$\pi = 4\sum_{k=0}^{\infty}\frac{(-1)^k}{2k+1} = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11}\cdots$$

- he

```
if(value.equals("pi"))
  {   //pi
        double prevterm = 1;
        double curr_term = -1.0/3;
        sum = prev_term + curr_term;
        i=2;
        int sign=-1;
        while (Math.abs(prev_term) -
Math.abs(curr_term)
                    > approx)
        // approx  value is given by user's input
        {
           prev_term = curr_term;
           i++;
           sign *= (-1);
           curr_term = sign * 1.0 / (2*i-1);
           sum += curr_term;
        }
        sum = 4.0 * sum;

computeResult.setText(Double.toString(sum));
      }
```

Data model <- activity




```
public class MainActivity extends AppCompatActivity {

   // Variable Declaration

   EditText firstValue;
   EditText secondApprox;
   TextView computeResult;
   Button btnCompute;

   double approx, sum;
   String value;

   double prev_term;
   double curr_term;
   int n, i;
   double aux;
```

Variables from controls
In connection with *content_main.xml* file

corresponding variables of … used in java processing

Other variables used in computation

The apps development process

3. Build the application

- Select the IDE needed (for a simple 2D game , Unity or Corona is enough)

- Select an app creation method (create a project using the default template, a custom template or a previous project. You can modify the project settings after the project is created, if needed)

- Create application data tables (data model) to store application-specific data.

- Design the user interface (UI) (layout forms) and find de UX elements

(UI and UX <- Course 2)

- Put the apps to a GIT repository (<- Course 3) to save and manage multiple versions of your app

GIT = a version control system used in general in software development process. It can tracking changes in files and is very useful in case of multiple coworkers (needed in big and complex projects)

The apps development process

4. Test the application

Verify:

- if the app meets its business requirements.
- the UI and UX elements
- Runtime
- memory space
- bugs

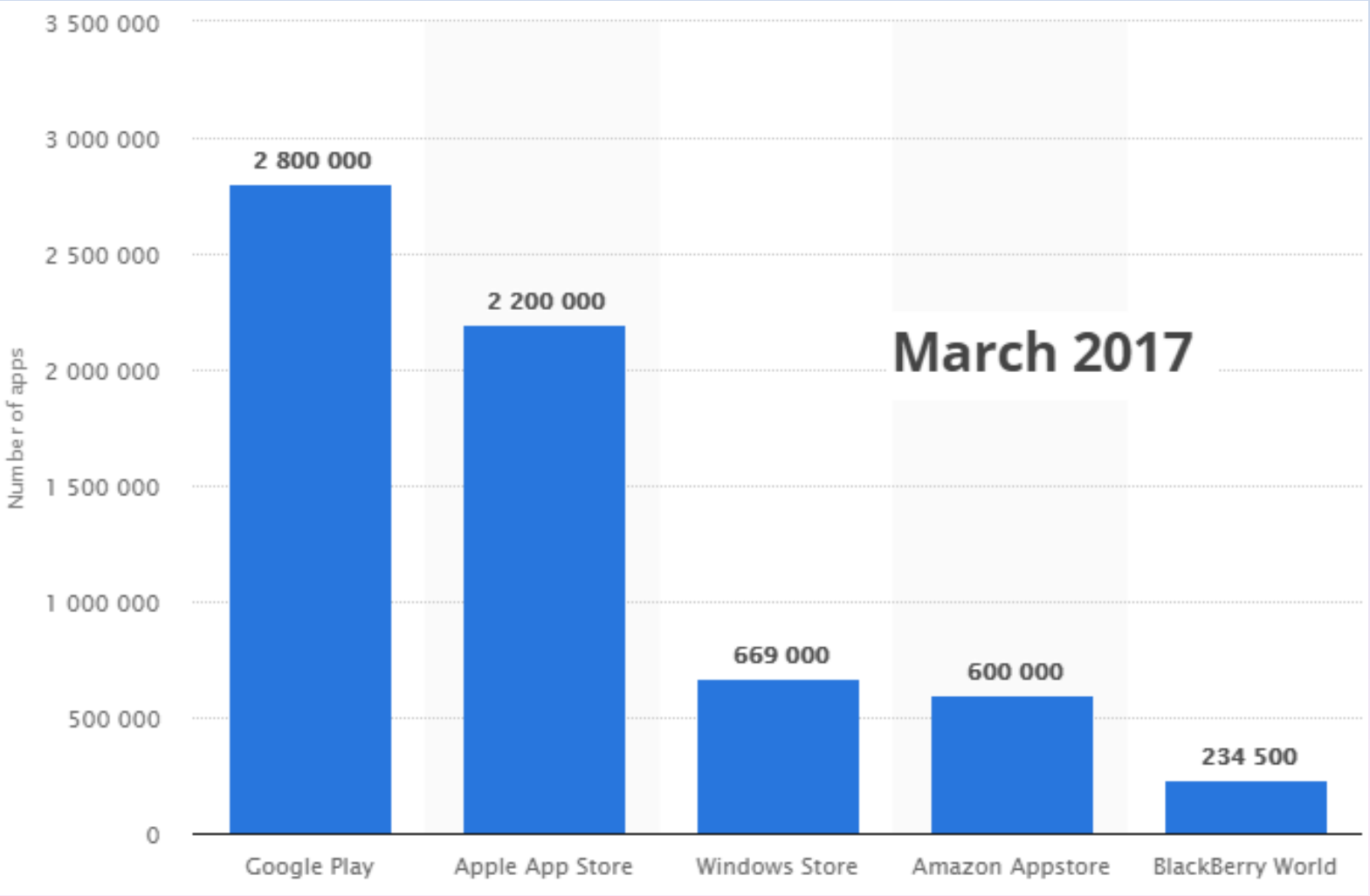
The apps development process

5. Share the application or provide to users

Android Market

Apple Store

……



The apps development process

6. Give feedback from users

What is feedback: the transmission of evaluative or corrective information about an object, action, event, or process to the original or controlling source;

In computer science, the term refer software applications, more exactly the informations from users to developers after the product was released

A software company uses customer *feedback* to improve its products.

How much "general" is an app?

1. Some apps are specific to a particular device

Due to different programming languages used for different operating systems (iOS, Android, WP…) apps will only run on devices for which it is specifically written.

many devices ⇔ many versions of same app

but

2. Other apps can run on multiple devices

Web technologies and cross-platform frameworks make it possible to develop apps which can run on multiple and different device types.

So, we have:

1. **Mobile apps (native apps)**, that can't run on any device, but, have full interactive capabilities and can run without an internet connection.
2. **Mobile websites**, that can run on any device, but, only with a browser and an internet connection

1. Mobile application is a software application that works on a specific mobile device's operating system and is downloaded to the device to perform a specific task.

2. Mobile website is a site that is intended to be viewed using a mobile browser on the various display sizes of smartphones or tablets.

How much "general" is an app?

Mobile/Native Apps

- Testing begins with app installation and launch
- Testing on some mobile devices requires access to a device ID
- Functionality and Usability need to be tested on multiple devices. Consider:
  - Operating System and its version
  - Screen size
  - Custom themes

Mobile Web

- No installation required (on mobile device)
- Requires an internet connection,
- Connectivity varies by location
- Load time is extremely important to mobile web users (source):

-60% of users expect sites to load within **three seconds**

-74% of users will only wait **five seconds**

Conclusion: neither mobile/native apps or mobile web is going to win out any time soon. Even if in present days there is a mobile web invasion.

How much "general" is an app?

Mobile Web + Native Apps = Hybrid Apps

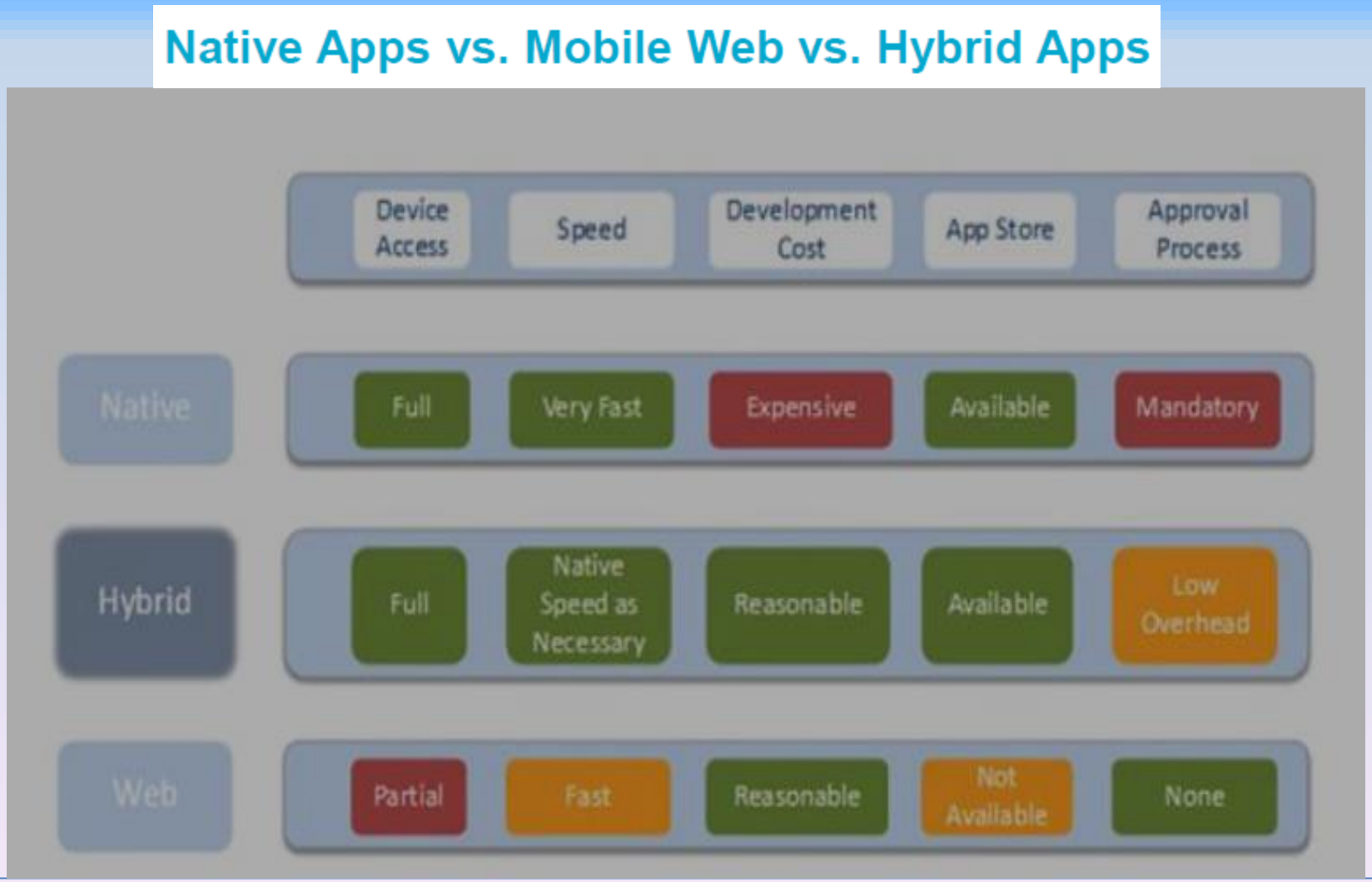
Hybrid applications have more in common with web apps than native apps. (web apps are displayed via the smartphone's native browser).

Motivation: Sometimes, the app's security impose a hybridization

Examples of Hybrid Apps:

- ***ESPN ScoreCenter:*** *The ESPN App gives you up-to-the-minute scores, news, and video highlights for the NFL, MLB, NBA, College Football, and more.*
  - *–A native app with updated scores within the app*
  - *–Directs users to a mobile website for further articles*
- ***Lotte Card:*** *an app for one of South Korea's biggest credit card companies*
  - *–100 pages written in HTML and used across platforms*
  - *–A smaller number of custom developed native pages*
- ***Bank of America***
  - *–A native app icon pushes users directly to the bank's mobile site*

How much “general” is an app?



Source: http://www.scribd.com/doc/50805466/Native-Web-or-Hybrid-Mobile-App-Development

?1: why Native apps have expensive development costs ?

?2: why Native apps are very fast from runtime point of view?

How much “general” is an app?

Hybrid apps: advantages and disavantages

Advantages:

- Unified Development
- Fast Deployment
- Offline Support
- Scaling

Disadvantages

- Performance
- Debugging
- Features

How much "general" is an app?

Hybrid apps: advantages and disavantages

Advantages: Unified Development

It is not necessary developing and maintaining separate code bases for different mobile platforms.

Only one version of app is necessary for all types of mobile devices (hardware and OS together)

It is designed a hybrid framework of choice that ensure that everything (apps on all kind of devices) will work best.

How much “general” is an app?

Hybrid apps: advantages and disavantages

Advantages: fast deployment

Using “easy” technologies, - like HTML, PHP, CSS, JS – help developers who need to have their app in the App Store as fast as possible.

How much "general" is an app?

Hybrid apps: advantages and disavantages

Advantages: Offline Support

Web applications are critically limited by their lack of offline support, especially when there isn't a high-speed Internet access. Local storage on native apps of support information can also dramatically enhance the overall user experience.

So, a combination of user support on both part is recommended

How much "general" is an app?

hybrid apps: advantages and disavantages

Advantages: Scaling

An application program would be **scalable** if it could be moved to different operating systems and take full advantage of the all operating systems in terms of performance (user response time and so forth)

! Attention: in others computer science areas, the term "scalable" has different sense (example HPC, an app is scalable if…?...)

In the case of mobile platforms, if the used platform is popular enough, for hybrid apps, it can be expected that platforms providers will quickly add support for any new mobile operating systems and updates of older platforms, so it is expected to have scalability without a new apps' developers contribution.

How much "general" is an app?

Hybrid apps: advantages and disavantages

Disadvantages: Performance

Hybrid apps add an extra layer between the source code and the target mobile platform, so a possible loss of performance can be.

How much “general” is an app?

Hybrid apps: advantages and disavantages

Disadvantages: Debugging

Debugging is the process of finding and solving defects or problems (called *bugs*) within the program that prevent correct operation.

The term "bug" is very old and is originated from US Naval, Grace Hopper define for first time the terms "bug" and "debugging". There was refered a *hardware bug* related to Mark I computer (Harvard University)

? When it was that ?

Since developers don't have a deep knowledge of all targeted platforms, finding the exact cause of an issue and its debugging can be a long and expensive process.

How much "general" is an app?

Hybrid apps: dedicated frameworks

1. **Ionic:** is the best framework for building high-quality hybrid apps. It is free and open source. Ionic's default UI template and its JavaScript and CSS components make it easy for beginners.
2. **Kendo.UI :** Open source framework. Has a very good support for UI (ready-to-use themes, cross-browser compatibility, buttons, menus, Spreadsheets, Charts, Maps, etc).
3. **React Native**: Developed and maintained by Facebook and Instagram. It can be used to create apps that work on Android and iOS. Run natively, not in WebView
4. **jQuery Mobile**: It doesn't try to mimic Android, iOS, Windows Phone or Blackberry apps. And, it is very easy to learn.

Apps' design - elements and rules

App design is a very important process, so important so, that Apple has released a book, "***The Human Interface Guidelines***" which describe the rules and principles to design user's interface.

(https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/MobileHIG/)

Apps' design - elements and rules

Rule 0: Does the app I am thinking about already exist?

If you have an idea, before to think about app, first, you must do some research about what has already been created related to this subject

- these places could be: iPhone Apps, Mac Apps, iPad, Apps for Android, Kindle Fire™ Apps, etc …

or

- you can use a Search Engines (Google search): searches for the type of app you are looking for, or problem you are trying to solve, can be very valuable in finding already existing options.

Note: If a similar app already exists on market, you must consider whether your app distinguishes itself in a way which makes it a viable new entry in the market. In this case, you have a "clone", but if you take into consideration the last advice, nothing is bad. A useful and innovative modified clone could be a good start for you.

Apps' design - elements and rules

Rule 1: App's name.

Any app **must** have a name.

The app's name **should**:

- summarize its function.
- be easy to pronounce and spell;
- be memorable.
- stands apart from the names of competitors.
- be short enough to fit under the app's icon (about 11 characters for iOS).

Apps' design - elements and rules

Rule 2. Logo

What a logo is? It is a graphic mark, emblem, or symbol used by organizations to aid and promote instant public recognition.

Logos **can be** simple or complex, and include a logotype (text only), a logo mark (icon), or both.

Must be clear and high quality at a small size. Is not easy to do this!

Apps' design - elements and rules

Rule 3. Icons

ICON ≠ LOGO.

-The icon is the graphic that will identify an app on market and on user's devices.

-More, the icon is that the user tap every time they want to start an app. So, it is the first thing that user will see in an app and thus will work as a reminder of an application's functionalities.

! *It is proven that users tend to click and download the most creative, unique and attractive icons. It is clear that the app icon is crucial and must be able to get attention.*

Apps' design - elements and rules

Rule 3. Icons *(continued)*

-apps' icons must have specific sizes in order to be displayed correctly on all devices (Table 1).

App Type	Size for iPhone5/ iPod touch (5th generation)	Size for high-resolution iPhone/iPod touch	Size for iPhone/iPod touch	Size for iPad	Size for high-resolution iPad	Size for Android tablet	Size for Android smartphone	Size for Windows 7	Size for Windows 8	Size for BlackBerry 10
App icon (required for all apps)	114 x 114	114 x 114	57 x 57	72 x 72	144 x 144	96 x 96	48 x 48	62 x 62	99 x 99	86 x 86
App icon for the store	1024 x 1024	1024 x 1024	512 x 512	512 x 512	1024 x 1024	512 x 512	512 x 512	300 x 300	300 x 300	480 x 480

Table 1. Icons size criteria

(https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/MobileHIG/IconMatrix.html)

Golden rule: **Less is more.**

Avoid cramming several images into a single icon.

Ideal: one thing to represent whole app

Apps' design - elements and rules

Rule 3. Icons *(continued)*

- Must avoid using style, images and colours that may create confusion with other apps on the stores.
- A satisfying user experience (UX) depends on the consistency existing between app's icon and app's internal design.
- Focus on contrast rather than colours.
- Avoid using coloured fonts if you have a lot of content.
- An icon is a graphical representation of a word SO avoid to use text. If however must be, avoid using greek text, wavy lines and many letters.
- Avoid using photos/pictures.
- Avoid transparency, because only clearly visible icons encourage tapping (it is also a recommendation of apps' stores).

• *Attention! When iOS displays an icon, automatically adds: Rounded corners and Drop shadow.*

Apps' design - elements and rules

Rule 4. Splash Screen

The *splash screen* also known as ***splash image*** or ***launch image*** is the full-screen image that appears while an app is loading after being opened.

Even if, it is visible for a short time, it helps users to get a first impression of the app.

Rule 4. Splash Screen *(continued)*

The *splash screen* should be mostly visual and display minimal text.

It is an opportunity to incorporate branding. The *splash image* can be used as an opportunity to provide:

- a design introduction of your app
- an *About* window
- a space to showcase branding elements

The *splash image* must be consistent with what users are expected to find inside the app. More, store guidelines often recommend using a *splash image* very similar to the app's home page.

? Example?

Apps' design - elements and rules

Rule 5. User Interface (UI) and Content Design

User Interface (UI) is the place (virtual and real) where users and apps are meeting.

UI is a very important and large subject so an extensive discussion about this will be in a future lecture, especially for mobile apps.

Content Design (CD) has a lot of definitions:

Content design refers to the developing of front-end elements. Content designers select and organize objects and their properties like text, graphics (static and animated), sound, color, size... in scope to attract more users.

Apps' design - elements and rules

Rule 5. User Interface (UI) and Content Design *(continued)*

-Details of the UI will depend on the target device and its mOS.

-Also, keep in mind who target audience is: different generations have different preconceptions of what makes a technology cool and easy to use are radically different. More, another mistake is not knowing what content is useful to each generation in part.

-Forcing registration is another frequent mistake.

-A common and big mistake consist in too many features into only one app. Often, many of these features are unused. The main goal is to simplify the users' life ie focusing their attention on those few things that really matter.

-Good layout and design allow a user to easily complete tasks. If a button is placed in the perceived 'wrong' place, users will get frustrated and might look for an alternative product/app.

Apps' design - elements and rules

Rule 6. Mobile Localization Issues

The exponential growth of the number of mobile devices and their applications, requires apps to be accessible for users in all regions and markets ie apps that *"feel local"*.

Few of issues related to apps localization:

- ***Dates*** *– Is the date January 1 or 1th January?*
- ***Characters*** *– Différent länguages have ðifferent setʃ ʊf characters*
- ***Postal codes*** *– In some countries postal codes contain letters, in others no.*
- ***Phone numbers*** *– Different formats for different countries*
- ***Written direction*** *– Some languages are written left to right, others right to left*
- ***Currency conversion*** *– Especially important for internet retailers*
- ***Tax calculation –*** *VAT and other taxes*

it is not a game to make a game

Design your first game

The main goal is to create something new, innovative.

Sure, clones can have some success

The success of your game depends on three important aspects:

- *theme*: same gameplay, but a different theme involves 10 times more players.
- *style*: create your own style and infuse your personality into the game
- *gameplay*: requires a solid understanding of the game design for mobile devices

Important rules:

R1) Unlike PC's games that have ultra high-quality 3D graphics, the games for mobile devices must be fun, engaging, and more, have a social aspect.

R2) In mobile games, communication matters more than graphics. If people can play with others in your game, that's more important than having super high-quality graphics.

R3) Keep the Gameplay simple as possible, have one good game play idea and focus on that.

R4) Do what you can with the platform to make it easy for the player, people don't want to have complicated sign-in processes – single click is preferable for multi user games.

R5) Make your narrative simple

R6) Test on many devices. (using real devices or an Emulator.

R7) Keep your game small, the smaller the download quicker the player is playing your game.

R8) The main goal in designing a mobile game is to make sure that UI is really clear and easy to use.

R9) Game designers often think that to solve a problem completely, all this information, all these actions should be crammed in one window. But it's not like that! If this happens, then, most likely, the user's key task was misunderstood.

R10) Context help is OK, but the player only uses them as additional information.

R11) About used colors: the primary information involved in perception is the shapes and primary colors — red, blue, yellow, and green.

R12) A good menu is the one that features clearly different and easily recognizable objects.

R13) About finding information: objects size, colors and animation are very important for fast searching and perception of information. For example, a big bright or flickering button call for action.

R14) You must take into consideration the user's psychology: don't forget that the users are different. Most players are right-handed, so the most frequently used elements should be positioned on the right side of the screen.

R15) When designing a mobile game, please get acquainted with the *Fitts's Law*

Paul Morris Fitts (1912–1965), was an American psychologist, who, among other things, did experimental psychology at the University of Rochester.

Fitts's law **says that** ***the time required for moving to any item is a function of the ratio between the distance to the item and the size of the item.*** **It means that the closer and the bigger the target object is, the faster the user will process it.**

R16) The UI should always provide feedback for the user. Pressing the button, the player should clearly understand what happens as a result. If the event doesn't occur, it should be clear for what reason and what to do next. If a button is locked without any explanation, you confuse the user. Or you simply force the user to click on this button in the hope of getting a hint. The worst thing is when there is no hints.

R17)You should not display empty windows or areas that can potentially have letters, items, or anything else (but are empty at the moment); instead, explain what is happening. Just write something like "*There is no new mail today.*"

R18) Touch relate to joystick, makes games and apps much more accessible. Touch is simple, direct, and intuitive. Instead of having to click A and B and C, and toggle the joystick to the left, you can tap the item on the screen to move it. So, use the touch.

R19) A lot a developers tend to port their PC games to mobile devices and then use the touch system to emulate the joystick controller. This is not recommended.

R20) Use vibration feature to offer feedback for users. For example, when a car hitting street corners in your game (negative feedback). Or when an object hits the target (positive feedback).

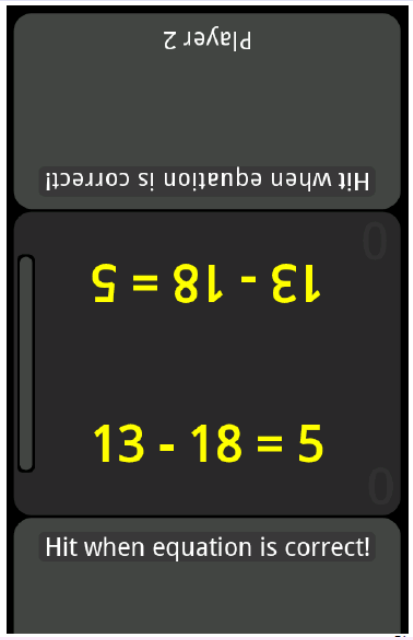
R21) The a*ccelerometer can replace the touch to* move through a game. For example, the players feel as if they are in a car by tilting the smatphone to left or right to move the car around.

R22) If it is possible, insert the content of your games from outside, from you. For example , you can use camera to insert picture (scene or objects). In this case, the content of games can come from players.

R23) Try to insert player-to-player interaction (multiple people can play the game at the same time) on the same device or over the Internet

Rule 24. Party Game Play

While there are many games that allow for player-to-player interaction over the Internet, many mobile devices allow for multi-touch interaction on the screen, meaning multiple people can play the game on the same device at the same time.



I wish you a good day