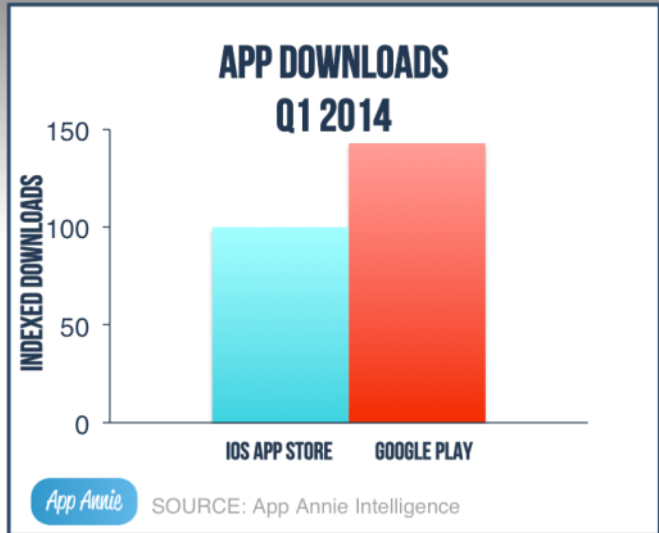


HYBRID APP DEV & MOBILE INTERACTION DESIGN GUIDELINES

DR . J A V E D K H A N
v.j.khan@tue.nl khan.gr @v_j_khan

CREATIVE APPS , FEB 2016

MOBILE IS HUGE



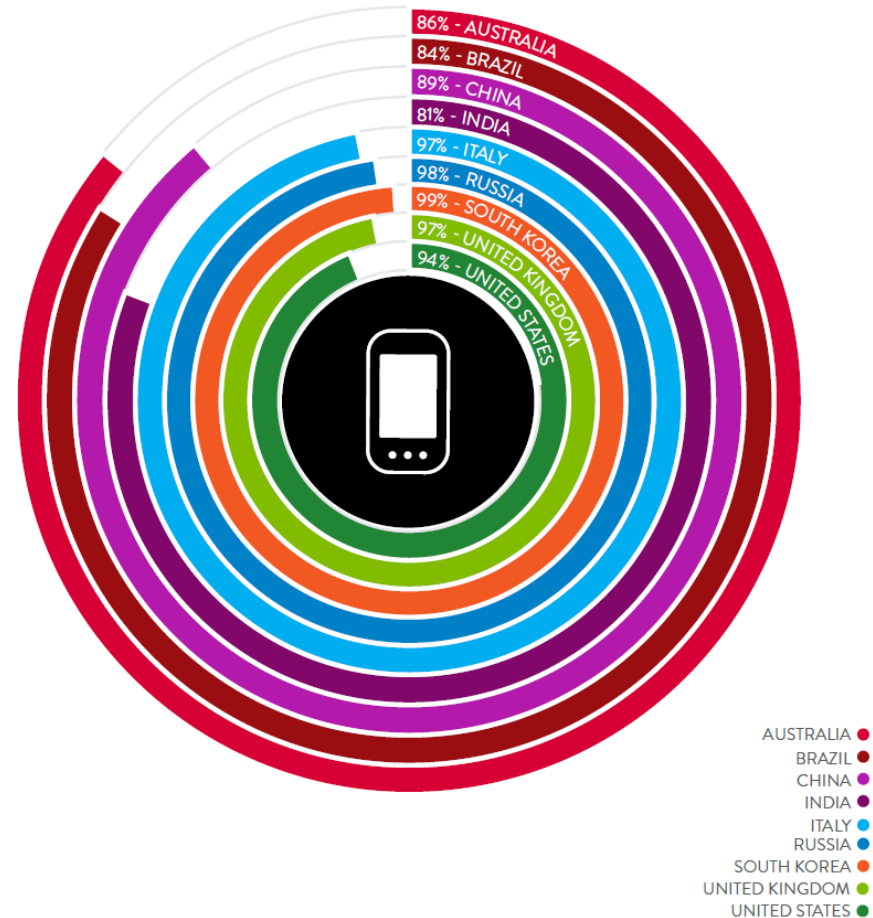
Users of mobile apps worldwide by region 2012-2017 according to Portio Research

	2012	2013	2017
App users worldwide	1.2 billion	N/A	4.4 billion
Asia Pacific	30%	32%	47%
Europe	29%	28%	21%
North America	18%	17%	10%
Middle East & Africa	14%	13%	12%
Latin America	9%	10%	10%

Source: © Portio Research (March 2013) via: © mobiThinking

HOW MANY OF US USE A MOBILE PHONE?

AMONG CONSUMERS AGES 16+



Sources: Nielsen Global Smartphone Insights, first half of 2012; Nielsen Mobile Insights, 2012

LECTURE'S OBJECTIVES

1. Introduce app design guidelines
2. Raise awareness about mobile development technologies
3. Demo of INTEL XDK

OBJECTIVE (1st)

- Introduce app design guidelines

Question

- If you had to choose one aspect of mobile interaction that is crucial to design, what would that be?
- Take a minute to think about it and write/type it

Challenges for mobile interaction?

Challenges for mobile interaction

- Requires visual attention
- Context dependent
- Limited screen
- Limited input
- Processor
- Energy

Opportunities?

Opportunities - mobile interaction

- Personal
- Sensors
 - Microphone
 - Camera
 - Accelerometer
 - Light
 - GPS
 - RFID/NFC
 - Compass
 - Gyroscope
 - Proximity
- (almost) always with user
- Connected
 - 4G, WiFi, Bluetooth
- Touch, gestures (NUI)

General to specific guidelines

Technology Acceptance Model (TAM)

- Perceived usefulness
 - is defined as the extent to which a person believes that using the system will enhance his or her job performance
- Perceived ease of use
 - is defined as the extent to which a person believes that using the system will be free of effort.

Davis, F. D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly 13(3): 319–340

TAM: Usefulness

- Extending functionality
 - Enlarging screen estate for collaboration
 - Extending keyboard for typing
 - APIs

Andres Lucero (USI2002)

- **Pass-them-around**

- [Lucero, A., Holopainen, J., & Jokela, T. (2011, May). Pass-them-around: collaborative use of mobile phones for photo sharing. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1787-1796). ACM.]

- <https://youtu.be/7JY7ZCTvmDA>

Sandwich Keyboard: Fast Ten-Finger Typing on a Mobile Device with Adaptive Touch Sensing on the Back Side

Oliver Schoenleben

Helsinki Institute for Information Technology
HIIT, Aalto University and University of Helsinki
Otaniementie 19B, 02150 Espoo, Finland

Antti Oulasvirta

Max Planck Institute for Informatics
Saarland University, Campus E1 7,
66123 Saarbrücken, Germany

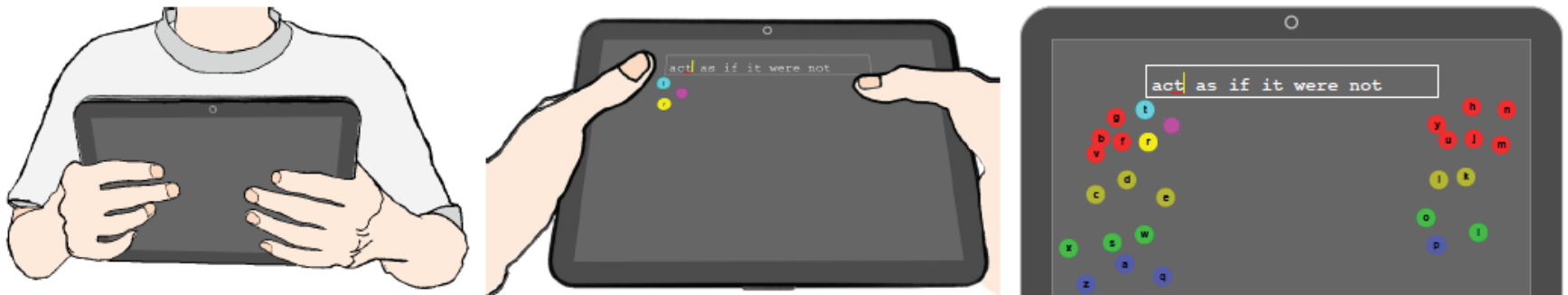


Figure 1. Sandwich Keyboard is gripped from its sides such that the thumbs type on the front side (middle) and the other fingers on the back side (left). Key targets of the keyboard in the back can be projected to the front to aid in learning the technique (right). Colors denote finger assignment.

APIs

- List of APIs
 - >13K @ programmableweb.com
 - <https://www.mashape.com/explore>
- Crowd APIs
 - <http://sandbox.gengo.com>
 - [Amazon Mechanical Turk API Reference](#)
 - [Microworkers API tutorial](#)

TAM: Ease of Use

Industry perspective

CONTEXT IS KING

[Gualtieri, M. (2011). Mobile App Design Best Practices. Forrester Research]

Figure 5 The Five Dimensions Of Mobile UX Context: LLIID

Location	Mobile users can use their mobile device wherever they are.
Locomotion	Mobile users can use their mobile device on the go. Users may be walking, running, in a car, on a boat, or in any other manner of motion while using a mobile device.
Immediacy	Mobile users can use their mobile device at a moment's notice.
Intimacy	Mobile users may use multiple devices for different purposes, and a device's use can vary from a digital appendage to an occasionally used device for a specific personal or work task.
Device	<ul style="list-style-type: none">• Mobile devices vary greatly in form factor and capabilities.• Smartphones, eReaders, tablets, and other devices.

59132

Source: Forrester Research, Inc.

Apple's Human Interface Guidelines (HIG)

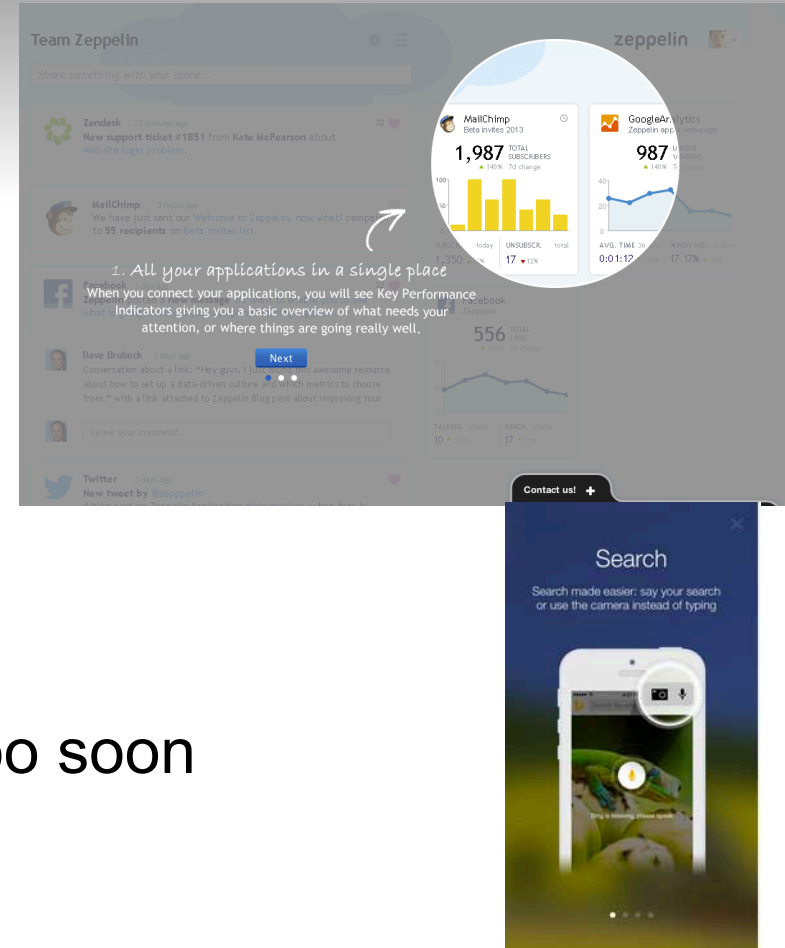
<https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/MobileHIG/index.html>

Starting and Stopping

- Start Instantly, avoid displaying a splash screen
- Avoid asking people to supply setup information
 - Set up for the needs of 80% of your users
 - Get as much info as possible from other sources
 - If you must ask for setup information, prompt people to enter it within your app
- Delay a login requirement for as long as possible
 - App Store doesn't ask login until buying something
 - If necessary provide a brief, friendly explanation with the reasons and how it benefits users

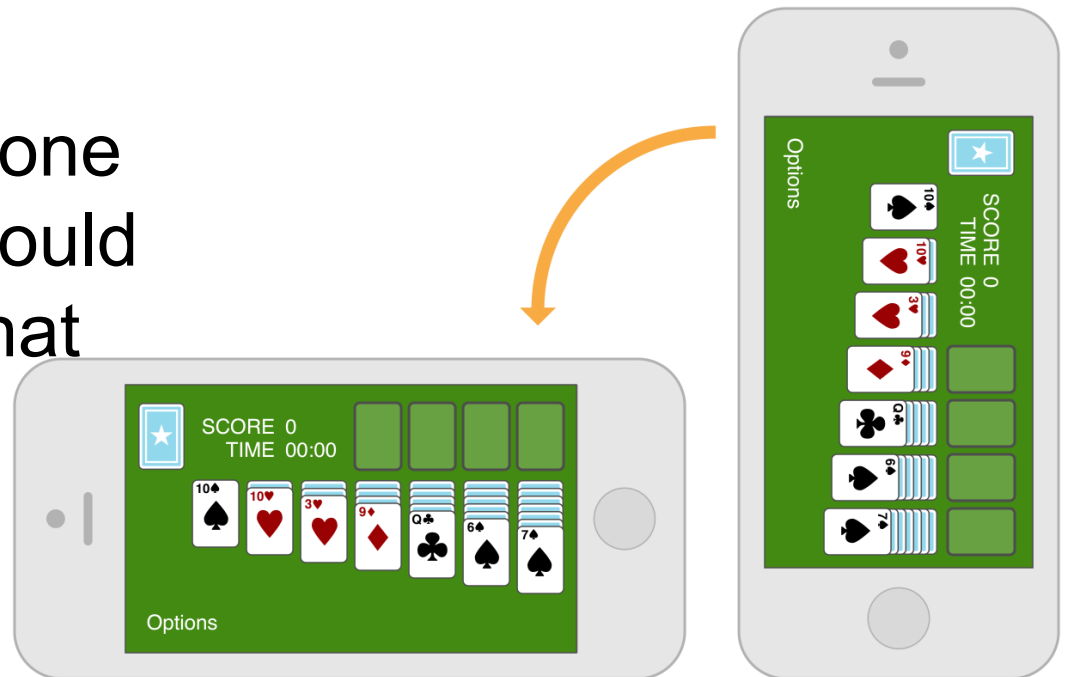
Starting and Stopping

- Think carefully before providing *onboarding*
- If necessary:
 - Give only the info to get started
 - Use animation and interactivity to engage users and help them learn by doing
 - Make it easy to dismiss or skip the onboarding experience
- Avoid asking users to rate app too soon



Starting and Stopping

- In general, launch in the device's current orientation
- If app runs in only one orientation, you should always launch in that orientation



Starting and Stopping

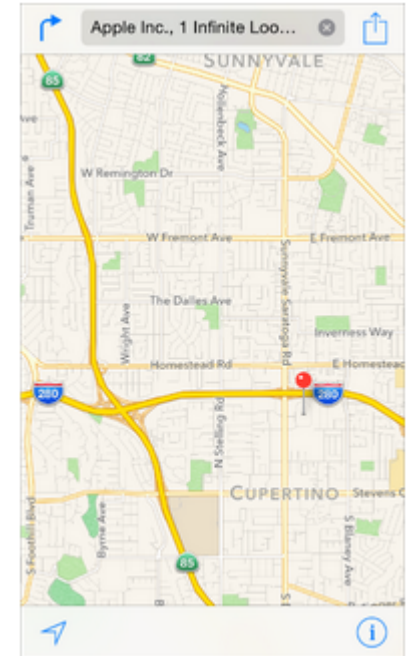
- Always Be Prepared to Stop
 - Save user data as soon as possible and as often as reasonable
 - When app restarts, restore its state

Basic guidelines

- Deference
 - The UI helps people understand and interact with the content, but never competes with it
- Clarity
 - Text is legible at every size, icons are precise and lucid, adornments are subtle and appropriate, and a sharpened focus on functionality motivates the design
- Depth
 - Visual layers and realistic motion impart vitality and heighten people's delight and understanding

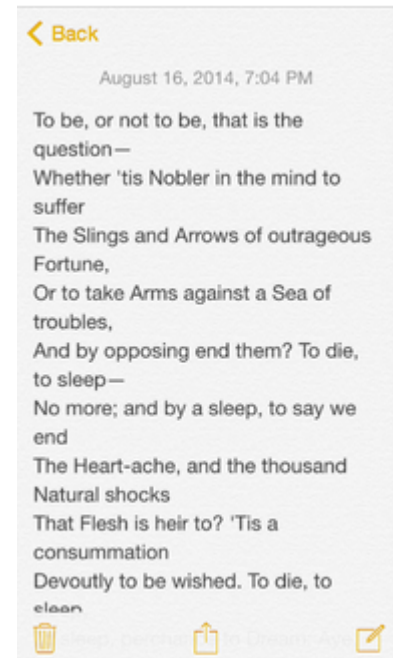
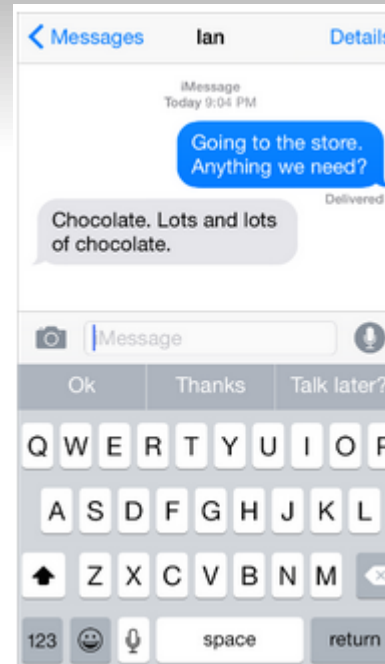
Defer to Content (content is king)

- What is the core functionality?
- Although crisp, beautiful UI and fluid motion are highlights, the content is at its heart
- Guidelines:
 - Take advantage of the whole screen
 - Reconsider visual indicators of physicality and realism

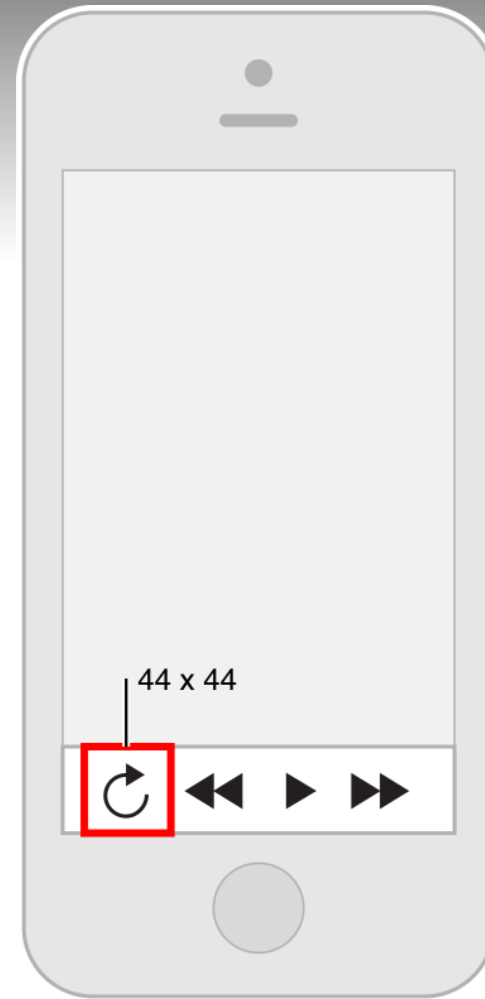


Provide Clarity

- Clarity is another way to ensure that content is king
- Guidelines:
 - Use plenty of negative space
 - Let color simplify the UI
 - Embrace borderless buttons

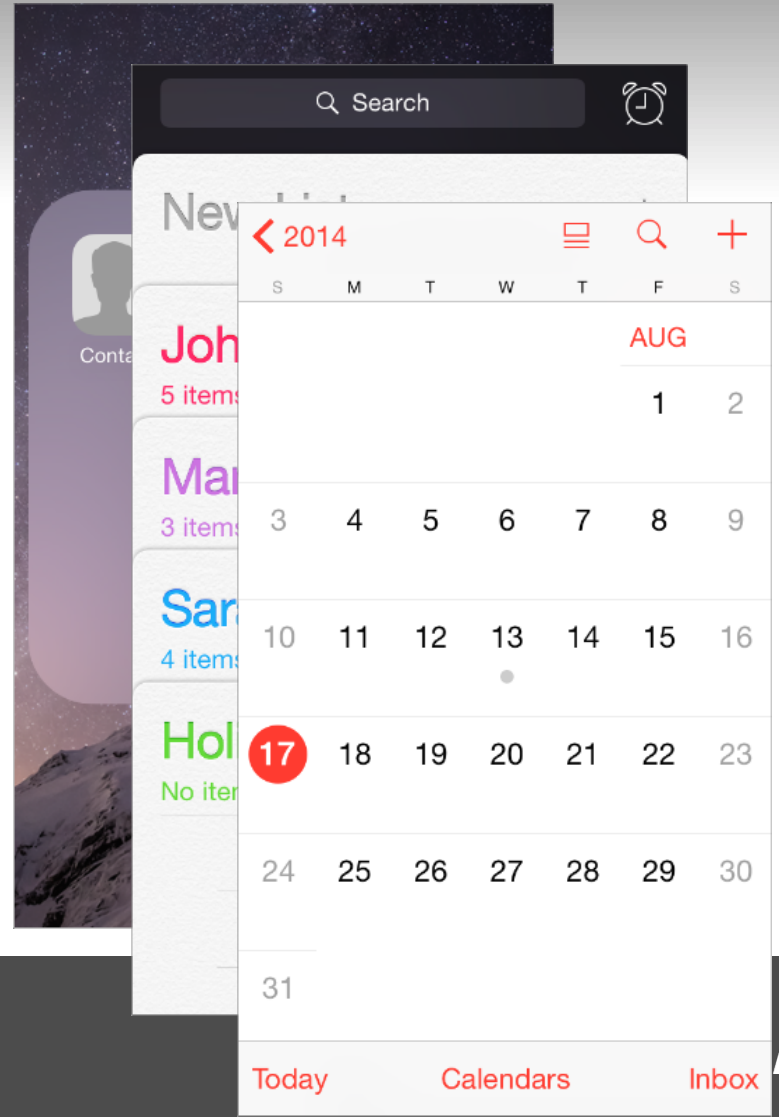


- Give each interactive element ample spacing ($\sim 7_{\text{mm}} \times 7_{\text{mm}}$)



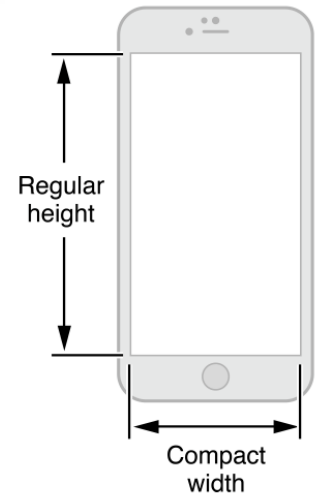
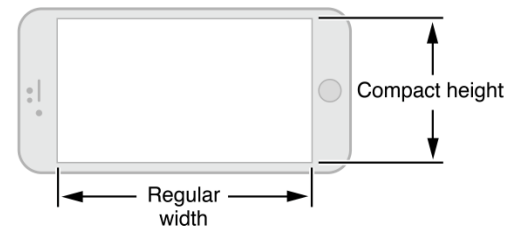
Use Depth to Communicate

- Guidelines:
 - Translucent background appearing to float above the screen
 - List in layers. When users work with one list, the other lists are collected together at the bottom of the screen
 - Use transitions to give a sense of depth



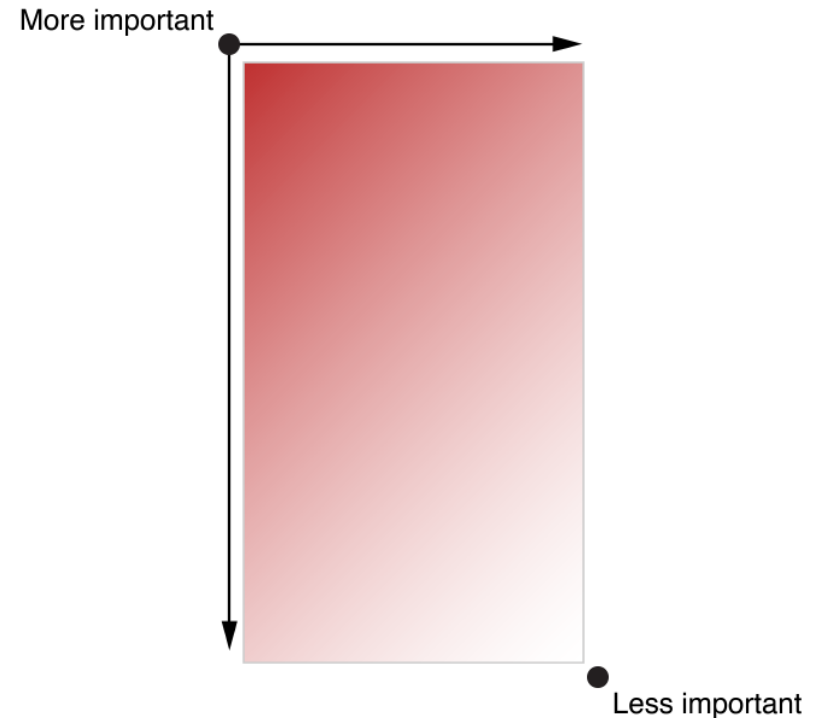
Adaptivity and Layout

- Guidelines
 - Maintain focus on the primary content in all orientations
 - Avoid unjustifiable changes in layout
 - Users expect apps in different orientations



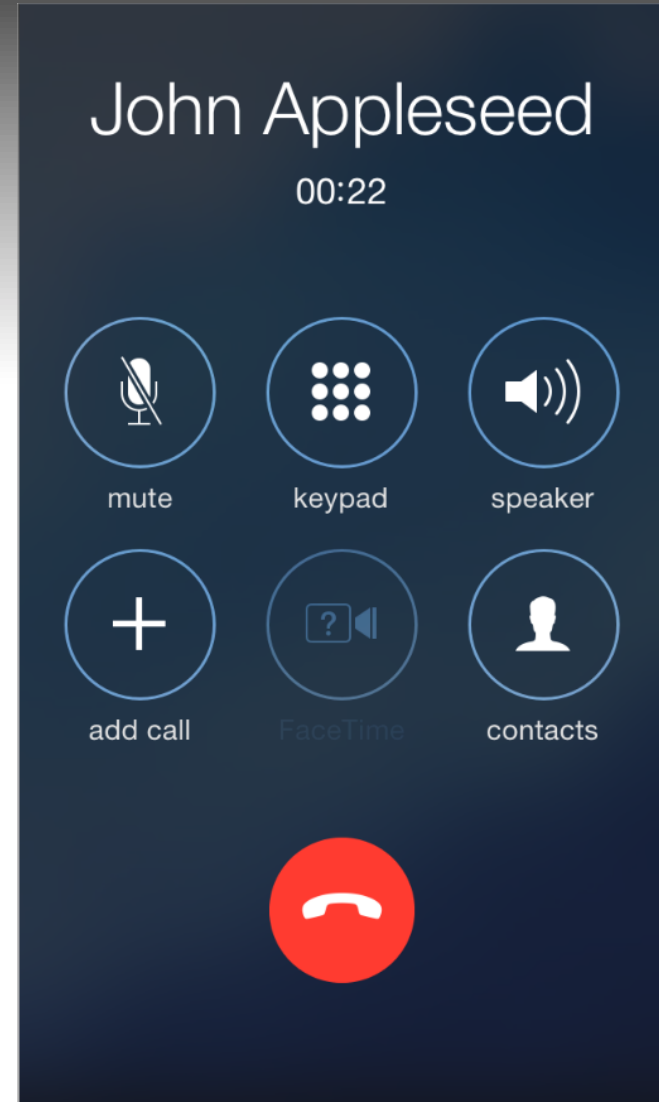
Use Layout to Communicate

- Place principal items in the upper half of the screen
- Near the left side of the screen (in left-to-right cultures)



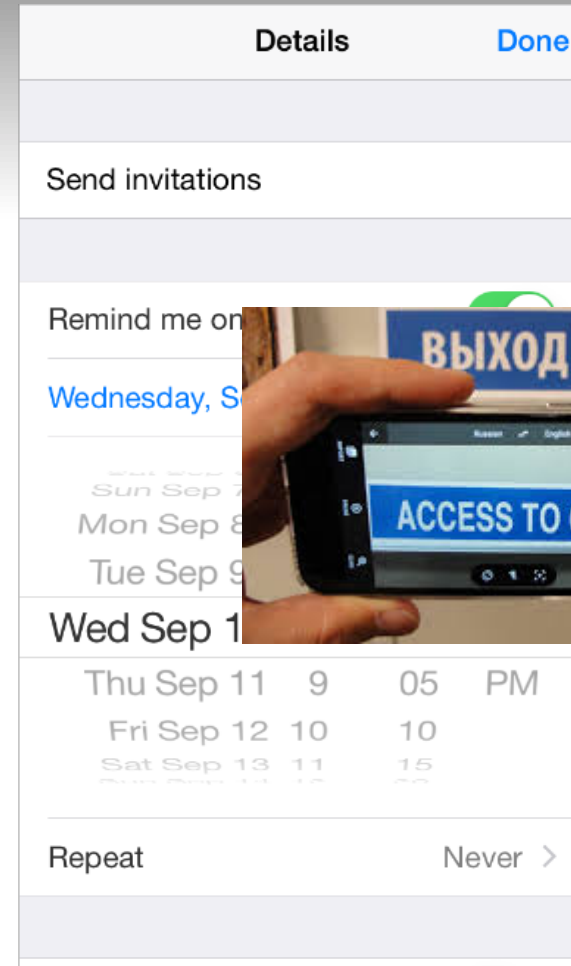
Visual “weight”

- Use visual weight to show the relative importance of onscreen elements
- Large items catch the eye and appear more important
- Larger items are easier to tap, especially useful in apps that users often use in distracting surroundings
- Use indentation and alignment to ease scanning and communicate groupings



Inputting Information Should Be Easy

- Make it easy for users to make choices
 - List instead of text
- Get information from device, when appropriate
- Balance a request for input by giving users something useful in return



Design Principles

- **Aesthetic Integrity**
 - Not a measure of the an app's beauty of artwork
 - Rather, it represents how well an app's appearance and behavior integrates with its function to send a coherent message

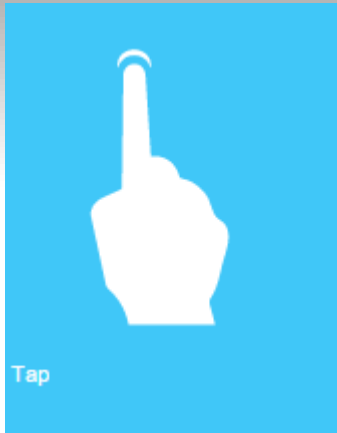


Design Principles

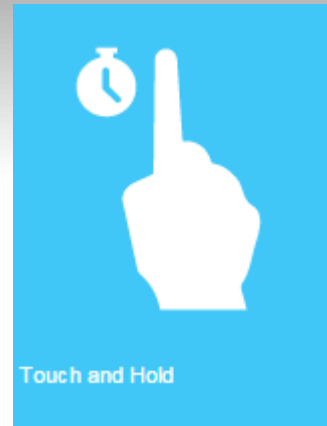
- Consistency
 - Consistency lets users **transfer their knowledge and skills** from one part of **an app's UI** to another and from **one app to another app**
 - Consistency does not mean verbatim copy of other apps; rather, it pays attention to the standards and paradigms people are comfortable with



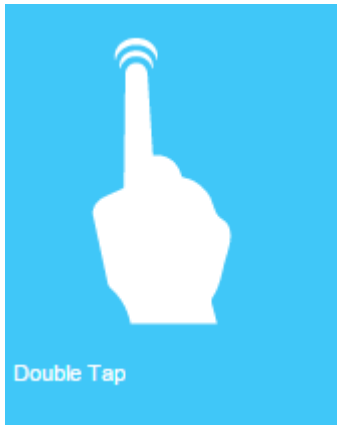
External consistency of gestures



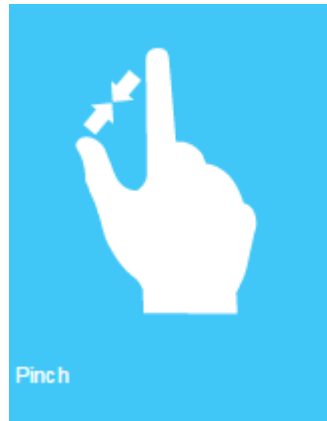
- To press or select a control or item



- In editable or selectable text, to display a magnified view for cursor positioning



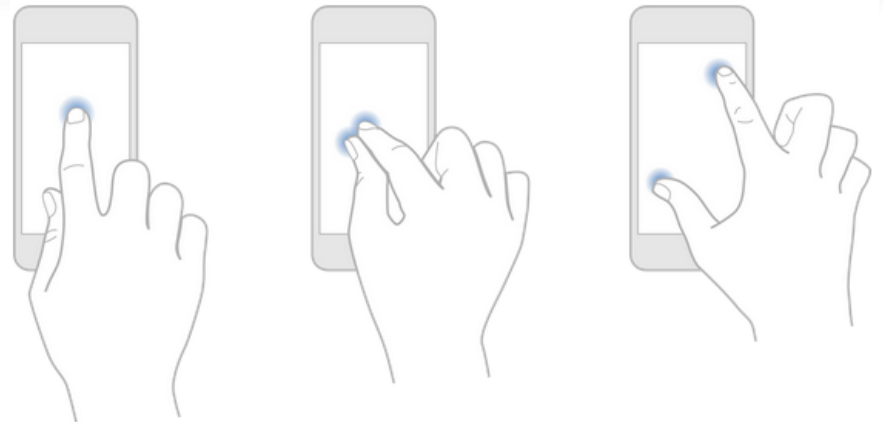
- To zoom in and center a block of content or an image



- To zoom in

Design Principles

- Direct Manipulation
 - When people directly manipulate onscreen objects instead of using separate controls to manipulate them, they're more engaged with their task and it's easier for them to understand the results of their actions



OBJECTIVE (2nd)

- Raise awareness about mobile development technologies

AV (APP VITAE)

 **CNET Download.com**

Reviews - News - Download - CNET TV - HowTo - Deals -

Home > Mobile Apps > Utilities & Operating Systems > System Utilities > sdf2xml for Windows Mobile

sdf2xml for Windows Mobile

 **Download Now**
CNET Secure Download

Average User Rating:
[Be the first to rate this product!](#)

Quick Specs
Version:
1
File size:
199.25K
Date added:
March 04, 2008
Price:
Free
Operating system:
Pocket PC 2000/2002, Windows Mobile 2003
Total downloads:
287
Downloads last week:
1

Publisher's Description

From [BeForward](#):

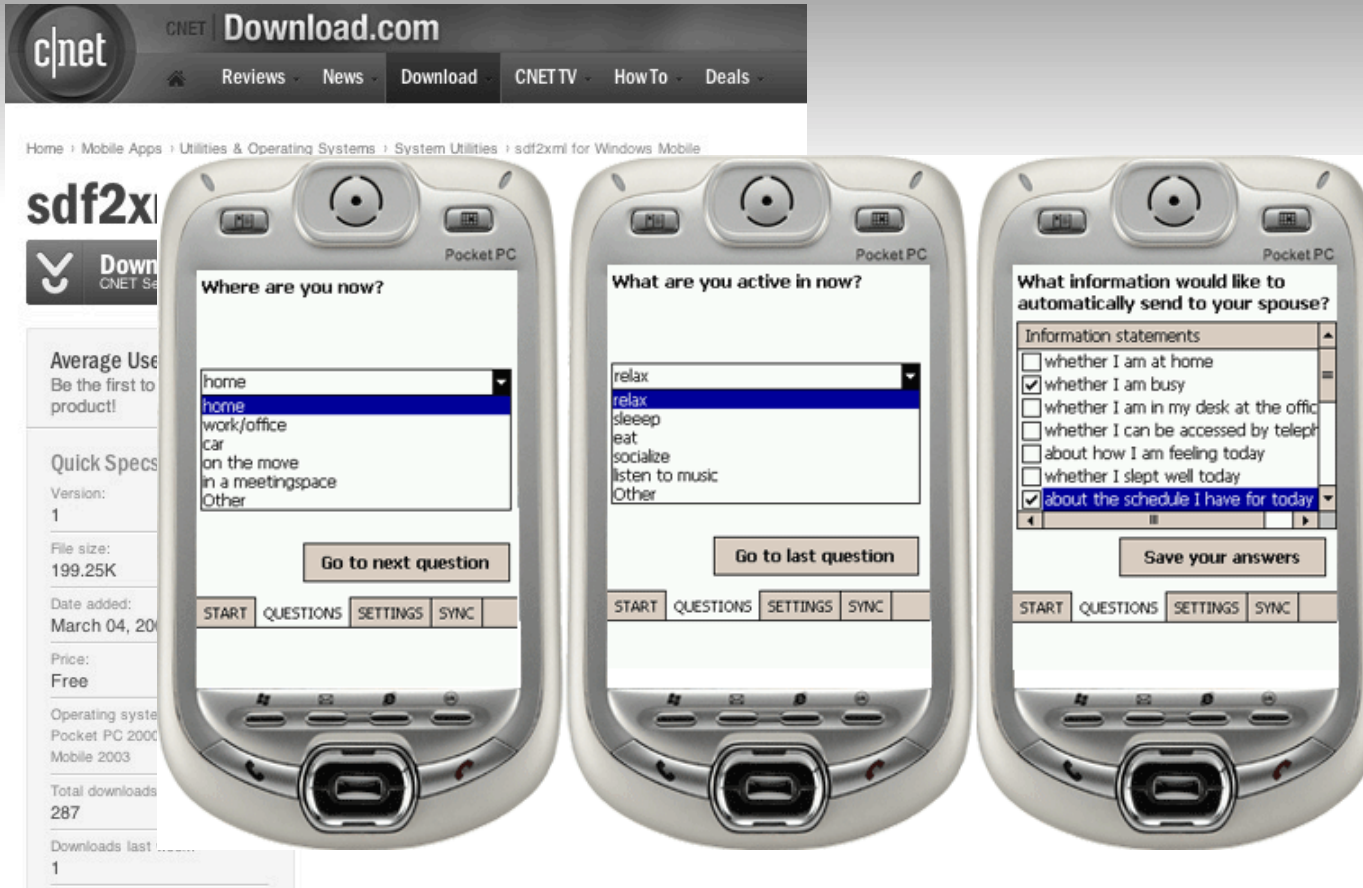
Transferring MS SQL Server CE files (that is .sdf) to the desktop might not be such an easy task. Therefore BeForward-Interactive created sdf2xml. sdf2xml is converting MS SQL Server CE files (that is .sdf) to XML. This version is the first release on CNET Download.com.

What's new in this version: This version is the first release on CNET Download.com.

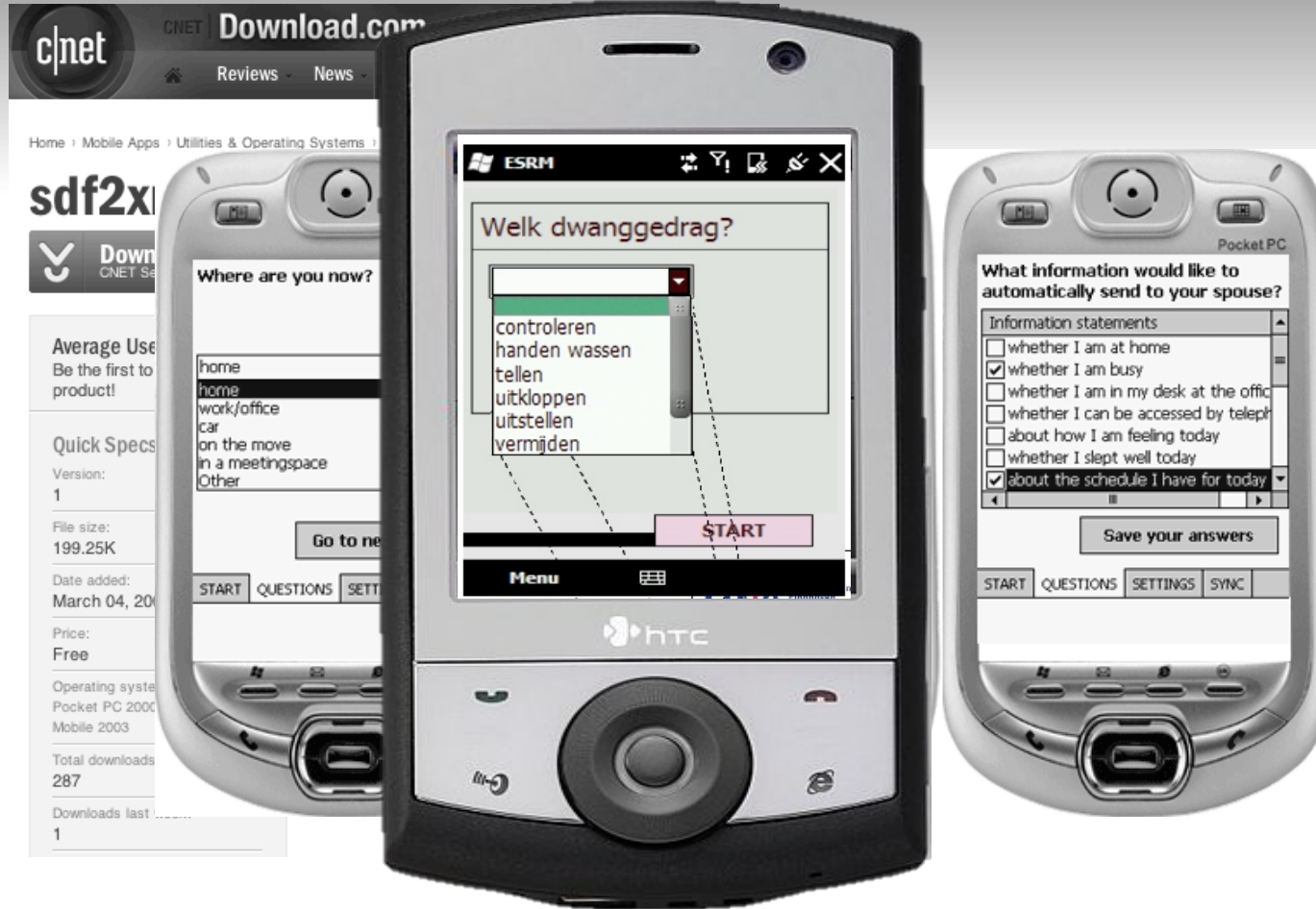


[View larger image](#)

AV (APP VITAE)



AV (APP VITAE)

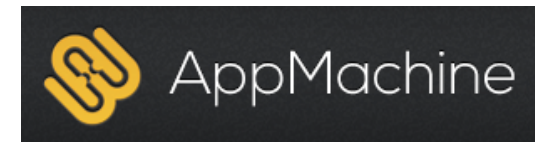


AV (APP VITAE)

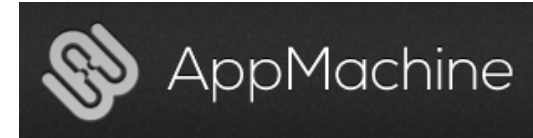
The image is a collage of three mobile devices displaying different applications:

- Left device (CNET Download.com):** Shows a mobile browser interface with the CNET Download.com logo and navigation links like 'Reviews' and 'News'. It features a search bar and a list of products, including a 'Quick S' section with details like 'Version: 1', 'File size: 199.25K', and 'Price: Free'.
- Center device (EuAsiaNews Latest News):** An Android phone displaying a news application. The app has a top navigation bar with 'News', 'Search', and 'About' icons. Below the title 'EuAsiaNews Latest News', there is a list of news items with dates, such as 'Six EU countries fail to comply with rules for highly qualified migrants, 27/10/2011' and 'EU grants protected status for India's Darjeeling Tea, 25/10/2011'.
- Right device (SP1-02 2012):** A tablet displaying a course page for 'SP1-02 2012' from NHTV Breda University of Applied Sciences. The page includes a description of the course for 3rd year students of the IMEM program, a list of 'Learning Objectives', 'Lecturers', 'Weekly Schedule', 'Literature', 'Social', 'Technology', and 'More info'.

MOBDEV TECH



MOBDEV TECH



MOBDEV TECH

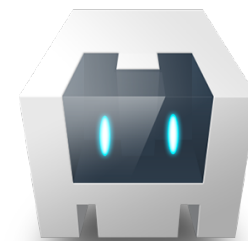
	Native	Using Web tech (Hybrid)	WYSIWYG
Technical skills	ooooo	oo	o
Native UI elements	✓	-	-
Ability to integrate phone sensors	✓	✓	-
Cross-platform	-	✓	✓
Flexibility for developing features	✓	✓	-

ADVANTAGES

- Cross-platform
- Unified UI
- Simplified development
- Progressive enhancement
- Developing not just an app but also learning how to develop a mobile-friendly website

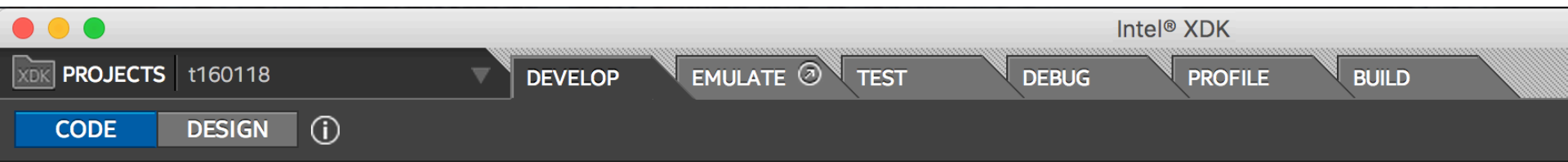
WORKING ENVIRONMENT (old)

- Editor
- For User Interface (UI) & Interaction
- Mobile app interpreter & compiler
- Great tools for Rapid Prototyping
 - (not necessarily for performance)
 - More tools are appearing as we speak



WORKING ENVIRONMENT

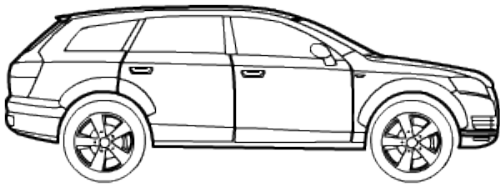
- INTEL XDK is unifying these (IDE)
- *“The Intel XDK application consists of a set of development tools to help you code, debug, test, and build mobile web apps and hybrid HTML5 apps for multiple target platforms.”* [<https://software.intel.com/en-us/xdk/docs/intel-xdk-introduction>]



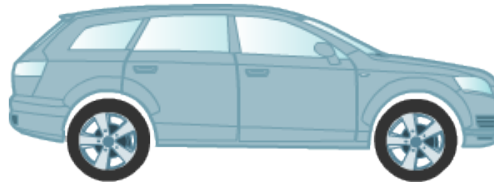
- +App preview on your phone:



CLIENT-SIDE SCRIPTING



Structure



Style



Behavior

WHAT IS JAVASCRIPT?

- JavaScript is a scripting language mainly used for creating dynamic websites
- JavaScript was initially developed by Netscape
- It is NOT Java!

WHAT IS JQUERY?

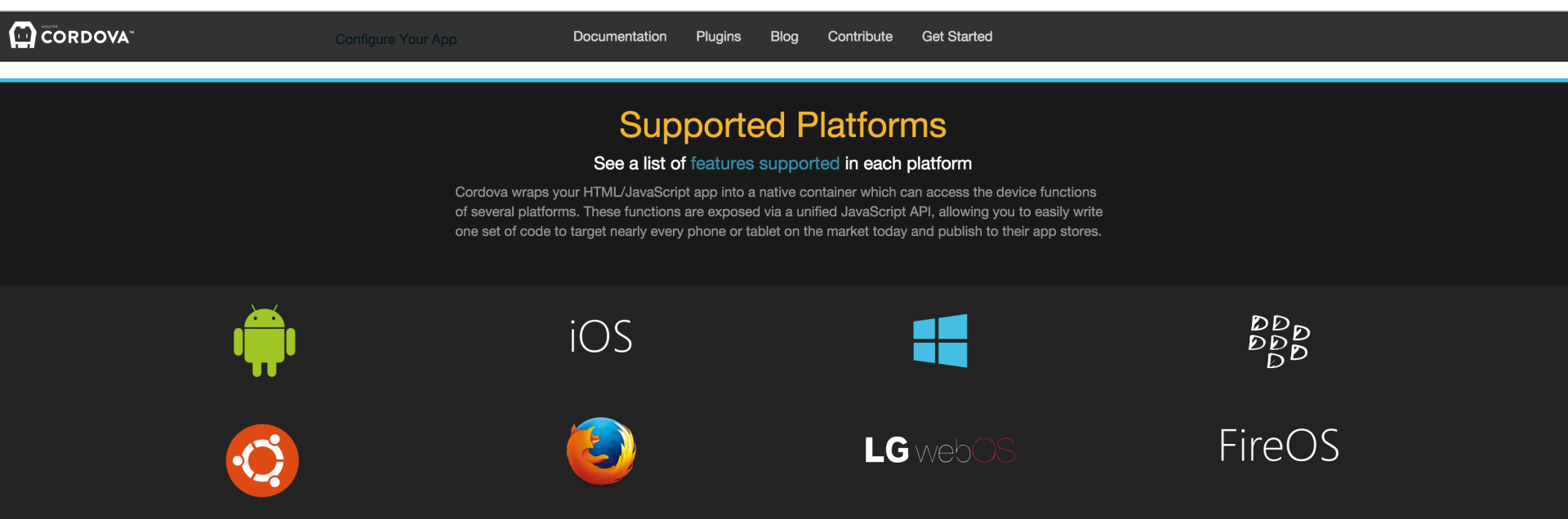
- jQuery is a fast and concise JavaScript library
- Practically speaking it is helping you to write JavaScript more efficiently

WHAT IS JQUERY MOBILE?

- jQuery Mobile (jQM): Touch-Optimized Web Framework for Smartphones & Tablets
- Developed on HTML5, CSS and jQuery
- With jQM you essentially build cross-browser, mobile-friendly websites

WHAT IS CORDOVA?

- Cordova is an open source framework for quickly building cross-platform mobile apps using HTML5, Javascript and CSS <https://cordova.apache.org/>



WEB APPS vs. HYBRID APPS

- Rely on web server and accessed via the Internet
 - Run in a mobile browser and originate from and have access to a network-addressable server
 - Have no server and no guarantee that they will ever have a network connection!
 - Run within a webview,
 - Are simply files stored in a *package* on the mobile device's filesystem (i.e. not complied)
- <http://blogs.intel.com/evangelists/2015/12/31/five-useful-tips-on-getting-started-building-cordova-mobile-apps-with-the-intel-xdk/>

HOW DOES IT WORK?

(SYSTEM LEVEL - MACRO)

- Cordova has pre baked native apps for different Oss that wrap a *webview*
- Whatever HTML5 code you write is interpreted within that *webview*
- Have access to mobile sensors (camera, mic, GPS, etc.) & mobile information (contacts, battery statue and other device info, etc.)

ARCHITECTURE - MACRO

- Cordova is a framework specific to the OS you target
- 🧱 Cordova wraps a webview
- 🧱 Developer writes HTML, CSS, JS
- 🧱 Cordova interfaces sensors with webview and packages the HTML, CSS, JS files



ARCHITECTURE - MESO

- “Multi-page, single file” architecture
 - i.e. many pages in one html file
- “Multi-page, multi file” architecture
 - i.e. many pages in many html files



HOW DOES IT WORK?

(PROGRAMMING LEVEL - MICRO)

- JQM utilizes custom *data*- attributes and has special classes build-in



HTML5 - STRUCTURE

- Elements have attributes
 - *html* element has the attribute *lang*
 - the attribute *lang* has *value* en

```
<html lang="en">
<head>
<title>Swapping Songs</title>
</head>
<body>
<h1>Swapping Songs</h1>
<p>Tonight I swapped some of the songs I wrote with some friends, who
gave me some of the songs they wrote. I love sharing my music.</p>
</body>
</html>
```

LISTVIEW

- Count bubble
 - Add a `` with `class="ui-li-count"` to a listview item (``)
 - E.g. `2`

```
<li data-theme="c">  
  <a href="#page3" data-transition="slide">  
    Lecturers  
    <span class="ui-li-count">  
      2  
    </span>  
  </a>  
</li>
```



LISTVIEW

- Change icon
 - Add to `` attribute *data-icon*

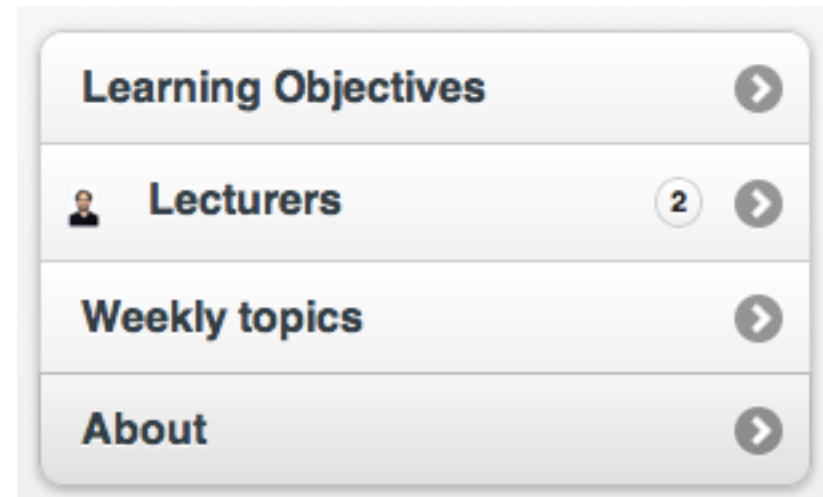
```
<li data-theme="c" data-icon="info">  
  <a href="#page5" data-transition="slide">  
    About  
  </a>  
</li>
```



LISTVIEW

- Adding icons
 - Add an `` inside an `<a>` of a listview item
 - Add the `class="ui-li-icon"` to the ``

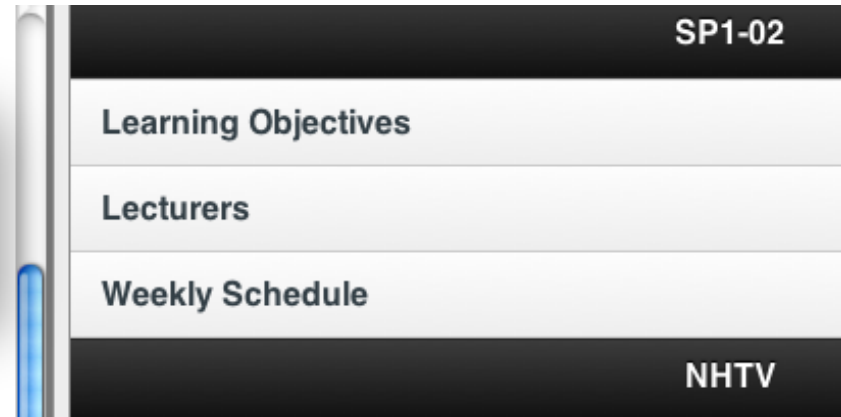
```
<li data-theme="c">  
  <a href="#page3" data-transition="slide">  
      
    Lecturers  
    <span class="ui-li-count">  
      2  
    </span>  
  </a>  
</li>
```



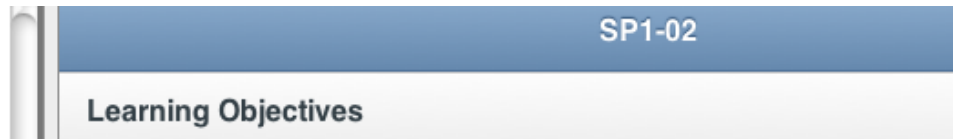
MOST UI ELEMENTS

- Change themes
 - Add attribute: *data-theme* to any element
 - Choose a value: *a, b, c, d, e, f*

```
<div data-role="page" id="page">
  <div data-role="header" data-theme="">
    <h1>SP1-02</h1>
  </div>
  <div data-role="content">
    <ul data-role="listview">
      <li><a href="#page2">Learnin
      <li><a href="#page3">Lecture
      <li><a href="#page4">Weekly Schedule</a><span class=
"ui-li-count">7</span></li>
    </ul>
  </div>
```



```
<div data-role="page" id="page">
  <div data-role="header" data-theme="b">
    <h1>SP1-02</h1>
  </div>
```



BASIC TEMPLATE PAGE

```
1 <!DOCTYPE html>
2 <html>
3   <head>
4     <meta charset="UTF-8">
5     <title></title>
6     <link rel="stylesheet" href="jquery.mobile-1.2.0.min.css" />
7     <script src="jquery-1.7.2.min.js"></script>
8     <script src="jquery.mobile-1.2.0.min.js"></script>
9   </head>
10
11   <body>
12     <div data-role="page">
13       <div data-role="header" data-theme="b">
14         <h3></h3>
15       </div>
16
17       <div data-role="content">
18
19       </div>
20
21       <div data-role="footer" data-theme="b">
22         <h3></h3>
23       </div>
24     </div>
25   </body>
26 </html>
27
```

- For linking to CDN-hosted files:
<http://jquerymobile.com/download/>

RESOURCES

- <http://jquerymobile.com/>
- <https://cordova.apache.org/> - <http://phonegap.com/>
- <https://cordova.apache.org/docs/en/latest/cordova/plugins/pluginapis.html>

- Series of videos (screencasts) on jQM:
<http://www.youtube.com/playlist?list=PLBNIfBYNGprg2qIEdkoF5HTBp2UcvIM5P>

OTHER INTERESTING TOOLS

(for rapid prototyping)

- <http://www.appinventor.org/>
- <http://ai2.appinventor.mit.edu/>
- <http://ionicframework.com/>

- <http://framework7.io/>
 - (for UI)

YOU NEED:

- Preferably phone to test sensors that are hard to emulate
- To build you can also use: <https://build.phonegap.com>

Demo INTEL XDK


Lots of examples: start with

START A NEW PROJECT


- Templates
- Samples and Demos
 - General
 - Games
- Import Your HTML5 Code Base

General


HTML5 + Cordova Standard HTML5




Blank Cordova Sta...




Hello, Cordova



Appmob Secure ...



Barcode Scanner



InAppBrowser


Hello, Cordova

Illustrates the use of some common core Cordova APIs and, where possible, the equivalent HTML5 APIs within a hybrid mobile HTML5 app.

Smartphones & tablets


[View Intel Developer Zone Article](#)

App Designer




My Private Notes

App Designer




My Private Photos

App Designer




Mashery Foodessentials

App Designer




Hello Admob

App Designer




Audio Player App

App Designer




Mashery WeatherU...

App Designer




Hello In App Purch...

App Designer




Media Recording

App Designer




Mashery Hotwire A...

App Designer




Mashery JamBase ...

App Designer




PhoneGap Audio

App Designer




Canvas Touch Draw

App Designer




WebRTCSDK Vide...

App Designer

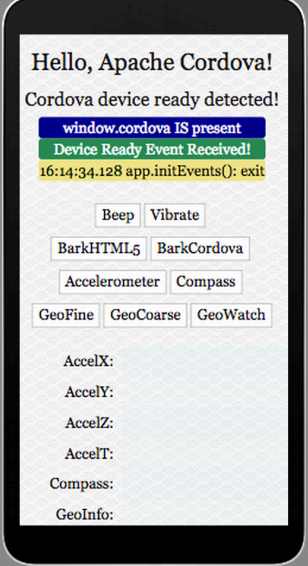


Mashery Edmunds

App Designer



Mashery Beats Music



Documentation

- <https://software.intel.com/en-us/xdk/docs/templates-to-get-started-with-xdk-app-development>

Practical...

- FeedbackCamp
- Available through email: v.j.khan@tue.nl
- Next week: sensors

5. Week 4

- Preparation:

- Install Intel XDK: <https://software.intel.com/en-us/intel-xdk>
- Go through the “Getting started tutorial” of Intel XDK: <https://software.intel.com/en-us/xdk/docs/intel-xdk-guided-tutorial-the-intel-xdk>
 - Develop an interactive prototype of an app you would like to develop with: <https://marvelapp.com/>

- Presentations:

- Introducing the development environment and system architecture
- Developing the UI with HTML5 and frameworks

- Homework deliverables (for week 5):

- Actually develop the UI of the interactive prototype you prepared in HTML5. Try it on the emulator or on your phone.
- What to be delivered (as one ZIP file)
 - source code
 - screen copy of the output

SUMMARY

- Raise awareness about mobile development technologies
- Workflow of Cordova / jQM

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