ITP 140

Mobile Application Technologies
Trina Gregory

• Background
  – BA, Mathematics-Computer Science
  – Software engineer for over 15 years
  – MS, Computer Science
  – Teaching at USC since Spring 2007

• Mobile Development
  – Taught the first iPhone class Spring 2009
  – Created the Mobile App Development minor
  – USC Center for Body Computing
  – USC School of Social Work
Why mobile?

- Mobile is the fastest-growing industry on the planet
  - digital technologies
  - major media
  - money
  - medical
- It's huge!
What does 'mobile' mean?
What defines a smartphone?

- Mobile operating system
- Connectivity to the Internet
- Have apps like email and web browser
- Ability to install third-party apps
Planet

• > 7.4 billion people
  – China has > 1.4 billion people
  – India has > 1.3 billion people
  – USA has > 300 million

• As of 2015, 1.1 billion people who live without electricity

http://www.worldometers.info/world-population/

Other Statistics

- 1.2 billion personal computers in use worldwide
- 1.1 billion fixed landline phones
- 1.0 billion automobiles registered and in use
- 1.6 billion television sets
- 1.7 billion credit card users
- 2.2 billion people with a banking account
- 3.9 billion radio receivers in use worldwide
How big is mobile?

ACTIVE MOBILE SUBSCRIPTIONS
7.324 BILLION

TOTAL WORLD POPULATION
7.280 BILLION

We Are Social • Sources: GSMA Intelligence, Worldometers
http://wearesocial.sg • @wearesocialsg
Unique Mobile Users

- **4.5 billion** unique mobile phone users
- 34% of all mobile phone users will have more than one account
- 64% of all people alive on the planet have a mobile phone
Smartphones

• The most popular smartphone activity is (in order):
  1. Texting
  2. Internet browsing
  3. Playing games

• Most likely owners (62%) are between the ages of 25 and 34
What are we going to cover?

• The mobile industry
• Various types of mobile apps
• Business-side of making apps
• How to design an app
• How to build a prototype
• How to monetize apps
• How to create a business presentation
Course Objective

• This class covers the mobile industry, devices, operating systems, types of apps, how to monetize apps, and how much it costs to build an app.

• Upon conclusion of this course, students will have taken an app idea from start to prototype and business plan.

• Students will use various tools to create a color palette and app icon, wireframes, and an interactive prototype.

• The goal is an interactive prototype of an app, not a working native app.
Prerequisites

- Officially none
- Desire to learn about mobile apps
Instructor

• Trina Gregory
  – Call me "Trina", "Ms. Gregory", "Professor Gregory"

• Contact
  – Piazza: https://piazza.com/usc/spring2018/itp140/home
  – Email: trina.gregory@usc.edu or trinagre@usc.edu
  – Office: OHE 412

• Office Hours
  – http://bcf.usc.edu/~trinagre/
  – They are posted on Blackboard, Piazza, ITP website, etc.
Course Structure

• The class meets for one hour and 20 minutes twice a week for a total of 2 hours and 40 minutes.
• These sessions include lectures and hands-on learning labs.
• One exam is given during the semester and held during the class meetings.
• Weekly assignments and a final project are completed outside of class time.
• Access to a computer is recommended, although ITP holds open lab hours with computers.
Course Format

• Lecture/Lab
  – Meet twice a week
  – Tuesday/Thursday
  – 12:30 – 1:50 pm
  – KAP 160

• Roster
  – Will be passed around each lecture
  – Please sign your name
Spring Schedule

• Holidays
  – Martin Luther King Jr. Holiday
    • Week 2
    • Monday, January 15, 2017
  – President's Holiday
    • Week 7
    • Monday, February 19, 2017

• Spring Break
  – Monday – Friday
  – March 12 – 16, 2017
# Grading

<table>
<thead>
<tr>
<th>Assignments (weighted proportionally)</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Exam</td>
<td>25%</td>
</tr>
<tr>
<td>Final Project</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Grading Scale

• The following scale is used to determine the letter grade:
  – 93% and above  A
  – 90 - 92%  A-
  – 87 - 89%  B+
  – 83 - 86%  B
  – 80 - 82%  B-
  – 77 - 79%  C+
  – 73 - 76%  C
  – 70 - 72%  C-
  – 69 - 65  D
  – 64 and below  F

• If you are taking the class with a grade of P/NP, you must earn a grade of 70% or higher in order to receive a P. Final grade percentages are calculated to two decimal places and rounded to hundredths. For example, 89.99 is a B+ while 89.995 is rounded to 90 and thus an A-.
Attendance and Participation

• Attendance is important, but not mandatory.
• A percentage of your grade is NOT dependent on participation.
• But if you have 3 or less non-excused absences, then I will add a percentage point to your overall grade.
• Excused absences:
  – Valid for interviews, documented sickness, emergencies, etc.
  – Private post on Piazza before class using the tag absent including date and reason
Grading

• Midterm Exam
  – Week 9, 2nd lecture
  – Thursday, March 8, 2018

• Final Project Presentations
  – Scheduled final exam time
  – Wednesday, May 9, 2018
  – 2 – 4 pm, KAP 160
Homework

• The assignments will be posted on Blackboard under the “Assignments” section.
• Each assignment will include instructions, a due date, and a link for electronic submission.
• Assignments must be submitted using this link.
• All assignments will be digitally submitted through Blackboard except where specifically specified.
• Do not email them to the lecturer or lab assistant.
Homework

• It is your responsibility to submit assignments on or before the due date.
  – Assignments turned in up to three days late will have 50% of the total points deducted from the graded score.
  – After three days, submissions will not be accepted and you will receive a 0.

• Each student will be allowed ONE three-day late assignment for “free”.
  – You must indicate that you are using your free late in the comments when you submit the assignment, and this may not be used on the final project.
Homework

• You are required to keep a copy of all of your assignments.
• You may save your assignments using a USB flash drive or a website such as http://www.dropbox.com.
• You will not be able to save your work on the ITP lab computers.
• ITP is not responsible for any work lost.
Homework Questions

• Please post your questions on Piazza.
  – You should have all received a link.
• Students and instructors can respond.
Policies

• No make-up exams (except for documented medical or family emergencies) will be offered.

• A roster will be passed around the room during each lecture session.
  – Please sign by your name for the appropriate week.
  – Do not sign in for another student; doing so is an academic integrity violation.
Open Labs

• ITP offers open lab use for all students enrolled in ITP classes.
• These open labs are held beginning the second week of classes through the last week of classes.
• Hours are listed at [http://itp.usc.edu/labs/](http://itp.usc.edu/labs/).
• The open labs will not have a lab assistant for this specific class.
• These lab times are there in case you do not have a computer or need extra time to complete an assignment.
Viterbi Honor Code

• Engineering enables and empowers our ambitions and is integral to our identities. In the Viterbi community, accountability is reflected in all our endeavors.

• Engineering + Integrity.

• Engineering + Responsibility.

• Engineering + Community.

• Think good. Do better. Be great.

• These are the pillars we stand upon as we address the challenges of society and enrich lives.
Academic Integrity

• Students may NOT collaborate, work together, or in any way exchange solutions for assignments and projects unless allowed by the instructor.

• Any sharing of assignments or past exams will be considered a violation of academic integrity (cheating); an SJACS report will be filed with the recommended penalty of an F in the course.

• Do not share your work with anyone else in this or a future section of the course, as allowing someone else to copy your work carries the same penalty as you copying yourself.
Academic Integrity

• SCampus is USC’s Student Guide to Policies and Conduct Code
  – http://scampus.usc.edu

• Office of Student Judicial Affairs and Community Standards (SJACS)
  – http://www.usc.edu/student-affairs/SJACS/

• An academic integrity tutorial
  – http://www.usc.edu/libraries/about/reference/tutorials/academic_integrity/index.php
Useful Resources

• Almost half of all college students will experience severe depression or symptoms of mental illness in college

• Student Counseling Center
  – Free confidential counseling
  – (213) 740-7711
  – https://engemannshc.usc.edu/counseling/

• Trojans Care for Trojans
  – Anonymously let staff know you are concerned about a fellow student experiencing personal difficulties
  – https://studentaffairs.usc.edu/trojans-care-for-trojans-tc4t/
Useful Resources

• Relationship and Sexual Violence Prevention and Services (RSVP)
  – Immediate therapy services—confidential
  – (213) 740-4900
  – https://engemannshc.usc.edu/rsvp/

• Office of Equity and Diversity
  – Report issues related to harassment, discrimination, sexual harassment, or Title IX
  – (213) 740-5086
  – https://equity.usc.edu/
Useful Resources

• Trojan Alert
  – Sign up to receive alerts during emergencies
  – https://trojansalert.usc.edu/register.php

• USC Emergency Information
  – http://emergency.usc.edu

• Campus Safety and Emergency Preparedness
  – http://safety.usc.edu

• Department of Public Safety
  – Emergency: 213-740-4321
  – https://dps.usc.edu
Useful Resources

• Student Health Center
  – https://engemannshc.usc.edu

• The Center for Women and Men
  – http://engemannshc.usc.edu/cwm/

• The Office of Disability Services and Programs
  – https://dsp.usc.edu
Expectations

• Come to class
• Take notes in class
  – Studies show handwritten notes are best!
• Start your assignments early
  – Turn in on time
• Try your best
  – Come to office hours for help

• Special Needs
  – If you are requesting academic accommodations, please arrange to speak with your instructor at the start of the semester
## Course Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Overview; Mobile Industry Technology Background; Internet</td>
</tr>
<tr>
<td>2</td>
<td>App Types – web, native, hybrid Cross-compiled Tools</td>
</tr>
<tr>
<td>3</td>
<td>WWW and Networks Responsive Web Design</td>
</tr>
<tr>
<td>4</td>
<td>Mobile Design Interface Design</td>
</tr>
<tr>
<td>5</td>
<td>Colors, Images, and Icons Photoshop</td>
</tr>
<tr>
<td>6</td>
<td>Application Styles Wireframing Tools</td>
</tr>
<tr>
<td>7</td>
<td>User Interfaces – iOS User Interfaces – Android</td>
</tr>
<tr>
<td>8</td>
<td>Monetization Balsamiq</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Review Midterm Exam</td>
</tr>
<tr>
<td>10</td>
<td>User / Usability Testing Wireframes Usability Testing</td>
</tr>
<tr>
<td>11</td>
<td>Buy vs Build The Cost of Development</td>
</tr>
<tr>
<td>12</td>
<td>APIs and Analytics Prototyping</td>
</tr>
<tr>
<td>13</td>
<td>Business Plan Marketing</td>
</tr>
<tr>
<td>14</td>
<td>Databases; Cloud Deployment</td>
</tr>
<tr>
<td>15</td>
<td>Windows Presentations</td>
</tr>
</tbody>
</table>
ITP 140

Technology Background
Computers

Users

Application Software

Operating System Software

Hardware System
Application Software

• Software for basic productivity for end users
• Anything you double-click on the desktop or touch on your mobile device
• “Apps”
• Examples:
  – Web browsers – Chrome, Firefox, Safari, IE
  – Email programs – Outlook, Thunderbird, Mail
  – MS Office Suite – Word, PowerPoint, Excel
  – Adobe Creative Suite – Photoshop, Illustrator
  – Games – World of Warcraft, Words with Friends, Minecraft, Monument Valley
## Mobile App Stores

<table>
<thead>
<tr>
<th>Name</th>
<th>Owner</th>
<th>Established</th>
<th>Available Apps</th>
<th>Download Count</th>
<th>Development Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>App Store</td>
<td>Apple</td>
<td>7/10/2008</td>
<td>2 million+</td>
<td>&gt;100 billion</td>
<td>iOS</td>
</tr>
<tr>
<td>Google Play</td>
<td>Google</td>
<td>10/22/2008</td>
<td>2.2 million+</td>
<td>&gt;50 billion</td>
<td>Android</td>
</tr>
<tr>
<td>Windows Store</td>
<td>Microsoft</td>
<td>10/26/2012</td>
<td>669,000+</td>
<td>&gt;75 million*</td>
<td>Windows 8</td>
</tr>
<tr>
<td>BlackBerry World</td>
<td>BlackBerry Ltd</td>
<td>4/1/2009</td>
<td>234,500+</td>
<td>&gt;4 billion</td>
<td>BlackBerry OS</td>
</tr>
</tbody>
</table>

[http://www.statista.com](http://www.statista.com)

* Estimation; Microsoft has not released official numbers
# Apple's App Store Statistics

## Count of active applications in the App Store

- **Total Active App (currently available for download):** 3,188,749
- **Total Inactive Apps (no longer available for download):** 214,477
- **Total Apps Seen in US App Store:** 3,403,226
- **Number of Active Publishers in the US App Store:** 698,014

## Count of application submissions

- **This Month (Apps):** 2,565 (321 / day)
- **This Month (Games):** 677 (85 / day)
- **This Month (Total):** 3,242 (405 / day)

## Application price distribution

- **Current Average App Price:** $1.02
- **Current Average Game Price:** $0.49
- **Current Average Overall Price:** $0.89

## Application Category Distribution

**Most Popular Categories**

1. Games (797,819 active)
2. Business (312,386 active)
3. Education (270,624 active)
4. Lifestyle (265,327 active)
5. Entertainment (193,079 active)

Operating Systems

• Makes your computer (or mobile device) do more than just be an expensive paperweight
• Collection of programs for interfacing with hardware
Types of Operating Systems

• Embedded
  – Examples: Missile guidance systems, NASA mars rovers, etc.

• Network Operating System
  – Single operating system to control multiple CPUs and/or computers together

• Desktop Operating System
  – Used on desktop and laptop computers
Geek Joke

I’m a PC.

I’m a Mac.

I’m Linux.
Mobile OS

• Controls a smartphone, tablet, PDA, or other mobile device
• Combine the features of a personal computer OS with:
  – touchscreen
  – cellular
  – Bluetooth, WiFi
  – GPS
  – camera, video camera
  – speech recognition
  – voice recorder
  – music player
  – etc.
Common Mobile OSs

- **Android** from Google Inc.
  - Free and open source
- **BlackBerry OS** from BlackBerry Ltd
  - Closed source, proprietary
- **iOS** from Apple Inc.
  - Closed source, proprietary
- **Windows Phone** from Microsoft
  - Closed source, proprietary
The Smartphone Platform War Is Over

Worldwide smartphone operating system market share (based on unit sales)

- Android
- iOS
- Windows
- BlackBerry
- Symbian
- Others

Year 2009: 13.8%
Year 2010: 85.2%
Year 2011: 85.2%
Year 2012: 85.2%
Year 2013: 85.2%
Year 2014: 85.2%
Year 2015: 85.2%
Year 2016*: 85.2%

Source: Gartner
Smartphone Market Share

http://www.idc.com/prodserv/smartphone-os-market-share.jsp
The discussion around Android's share of the smartphone market became irrelevant a few years back when it became clear that devices running Google's OS would continue to capture roughly 85% of the worldwide smartphone volume.

What is interesting is to look at the many micro-trends going on within the platform.

Despite a slew of very attractive high-end Android products, IDC continues to see Android average selling prices (ASPs) decline and expectations are that the 1.5 billion Android phones that ship in 2021 will have a collective ASP of $198, down from $220 in 2017Q1.
iOS

• Coming off the first year in which iPhone shipments declined, expectations are that 2017 volumes will grow 3.8%.

• IDC slightly lowered its 2017 projections for iOS in its latest forecast to 223.6 million, while increasing its 2018 volumes to 240.4 million.

• All signs point to late 2017 and certainly 2018 being very strong for Apple as much of its installed base seems ready for a refresh and the next round of iPhones is not likely to disappoint its fans.
Windows

• Windows Phone shipments continue to fall as the lack of new hardware partners, developer support, and overall enthusiasm for the platform show no immediate signs of recovery.
• IDC expects 2017 volumes to decline 80.9% to just 1.1 million units.
• Microsoft has yet to fully commit to any "Surface"-style attack for smartphones or to push new vendors to embrace the platform, leaving little hope of mounting a full scaled comeback in the years to come.
BlackBerry

- Most BlackBerry phones are now “powered by Android” such as the BlackBerry Key, DTEK, and Priv.
- BlackBerry OS is still on the BlackBerry Passport and BlackBerry Leap.
Apple App Store

• Apple opened its App Store in 2008 at the time of the iPhone 3G launch.
• It started out with just 500 apps but within 3 months it had seen 100 million downloads and the number of apps jumped to 3000.
• By 2009, Apple hit the 2 billion download mark.
• In 2013, Apple hit the 50 billion download mark, and 85 billion towards the end of 2014.
• As for apps, it passed the 1 million app mark at the end of 2013, and Apple currently has around 1.2 million iOS apps available for download.
Google Play Store

• Google launched the Android Market in 2008 with only a handful of apps.
• By 2009 it contained some 2300 apps and by the summer of 2010 there were 80000 apps available, and the total number of downloads had surpassed the coveted 1 billion mark.
• The Android Market was re-branded as Google Play on March 6, 2012, as it was merged with Google Music, and Google eBookstore.
• Google’s store managed to surpass Apple’s, in terms of the number of apps available, towards the end of 2014.
• As for 2015, the Wall Street Journal has reported that Google Play had 70% more app downloads than Apple’s App Store in the first quarter of 2015.
Mobile App Market Share

- Market share of iOS and Android in the United States as of 3rd quarter 2016
- The total revenue of app downloads from both digital appstores amounted to approximately 2.23 billion U.S. dollars.

- Apple App Store – 61%
- Google Play – 40 %
Why develop iOS apps?

• In the first quarter of 2015, Apple’s app revenue was about 70% higher than on Google Play.
App Downloads

Worldwide App Downloads by Store Q1 2017

Indexed Downloads

250
200
150
100
50
0

iOS App Store

Google Play

+135%

Consumer Spend

Worldwide Gross Consumer Spend by Store
Q1 2017

Indexed Consumer Spend

+100%

iOS App Store
Google Play
Mobile App Forecast

iOS To Remain The Single Largest Store in Revenue, But All Android Stores Combined Forecast to Surpass iOS in 2017

Mobile App Forecast – Annual Downloads
Worldwide, By Store, in Billions

Mobile App Forecast – Annual Revenue
Worldwide, Gross Consumer Spend, By Store, in Billions
Android Mobile Devices

• Mobile phones (examples)
  – Samsung Galaxy Note 4/5
  – Samsung Galaxy S6/S6 Edge/S6 Edge+
  – HTC One M9
  – Nexus 6P
  – LG G4
  – Google Nexus 6
  – Motorola Moto X

• Tablets (examples)
  – Google Nexus 9
  – Nvidia Shield Tablet
  – Samsung Galaxy Tab S

http://www.android.com/devices/
Apple Mobile Devices

- **Mobile phones**
  - iPhone, iPhone 3G, iPhone 3GS
  - iPhone 4, iPhone 4S
  - iPhone 5, iPhone 5c, iPhone 5S
  - iPhone 6, iPhone 6 Plus, SE
  - iPhone 7, iPhone 7 Plus
  - iPhone 8, iPhone 8 Plus, X

- **Tablets**
  - iPad
  - iPad 2
  - iPad 3 (The new iPad)
  - iPad mini
  - iPad Air
  - iPad Air 2
  - iPad mini 3
BlackBerry Mobile Devices

• Mobile phones
  – Classic
  – Leap
  – Porsche Design
  – Passport
  – Z3, Z30, Z10
  – Q5, Q10
  – Bold
  – Torch
  – Curve

• Tablets
  – PlayBook
Windows Mobile Devices

• Mobile phones
  – Nokia Lumia (635, 530, 735, 930, 1020, 1520)
  – Windows Phone 8XT
  – Samsung ATIV S Neo
  – Samsung ATIV Odyssey
  – Huawei W1

• Tablets
  – Acer Iconia W700
  – Asus VivoTab Smart
  – Dell XPS 10
  – HP Envy x2
  – Lenovo ThinkPad Tablet 2
  – Microsoft Surface
  – Toshiba Satellite
History of Mobile Phones

• The world’s first mobile phone call was made on April 3, 1973, when Martin Cooper, a senior engineer at Motorola, called a rival telecommunications company and informed them he was speaking via a mobile phone.
History of Mobile Phones

- 1997 – Nokia 6110
- 1999 – BlackBerry 850
- 2002 – Samsung SGH-T100
- 2004 – Motorola Razr V3
History of Mobile Phones

- 2005 – BlackBerry 7270
- 2006 – Nokia N95
- 2008 – Apple iPhone 3G
Mobile Phone Fun Facts

• In 1983, the first mobile phones went on sale in the U.S. at almost $4,000 each.
• Over 250 million Nokia 1100 devices were sold, making it the bestselling electrical gadget in history.
• More people in the world have mobile phones than toilets.
• So many Facebook photos and videos are uploaded via mobile that it takes up 27% of upstream web traffic.
• The technology behind smartphones relies on up to 250,000 separate patents.
• The average person unlocks his or her smartphone 110 times each day.