DISTRIBUTION / COMMERCIALIZATION

21w.789

Topics

- Research labs: from publishing to product (Andy)
- Old distribution means
- Current State of App Stores
- Scalability / Cloud Computing
- Instrumentation
- Public Betas
- Ethics
- Reliability of data

Research Labs Today…

- Andy Aftelak
  - Director of Research, Motorola Mobility

Distributing a mobile app - 2005

- Official way = Carrier Portals
  - Small number of (J2ME or BREW) applications available for download from the phone
  - Mostly games
  - Also apps like Shazam
  - Usually a large revenue share with carrier
  - Small number of apps got approved

Alternate distribution means - 2005

- Posting JAD/JAR on a website
  - Apps not signed by carriers
    - Limits APIs that can be used
      - No Cell ID, no images larger than VGA on most handsets
  - Users must find apps on websites and download
  - Sometimes complicated install process on phone
  - Successful examples:
    - GMail, Google Maps for Mobile
  - Moderately successful examples:
    - Radar, ZoneTag

Distribution Today

- App Stores
- Ad Hoc
  - Compiled application delivered as a download or file transfer to phone
  - Android .apk file, Apple .app file + MobileProvisioning file
  - Phones need to enable the download of non-market apps
- Debug Builds
  - Loaded directly from developer computer
  - Phones must have a debug mode turned on (Android) or special certificate installed (Apple)

App Stores today

- One per Mobile OS
- Controller by OS maker (new Amazon Android market)
- Large (100s of thousands of apps, millions of users)
- Variable submission process/oversight by OS maker
- Free or 30% cut to OS maker

Apple App Store

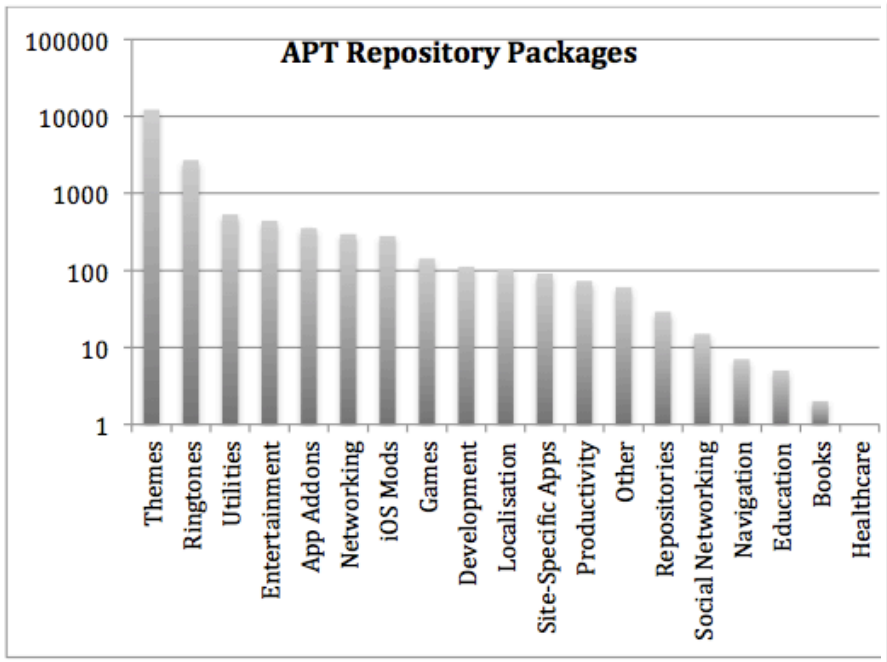
- Largest (as of 20 Oct 2010)
  - 300,000+ apps
  - 7B downloads
- Apps must be reviewed and approved by Apple
- Must enter NDA with Apple
- All communication with them is under NDA including terms of rejection
- One week to 9 month process each time app is updated
- $99/year fee and 70/30 revenue split

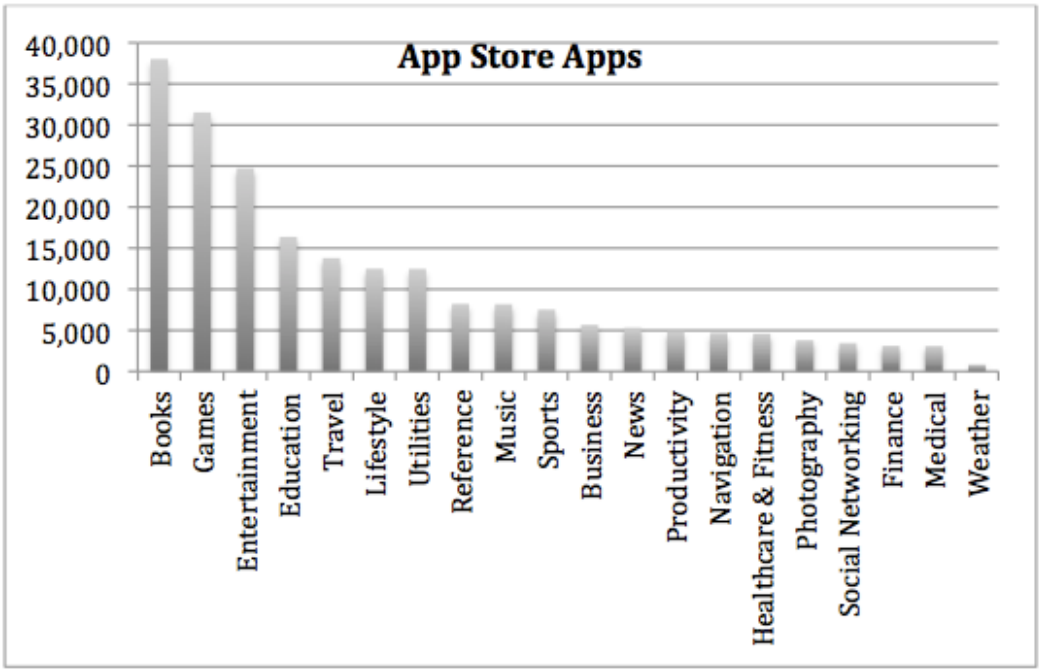
Google Marketplace

- 156,000 apps
- 2B downloads
- Any app that's submitted gets instantly published to store
- Google can remove malicious apps
- $25 one time fee to publish apps
- 70/30 revenue split

Cydia

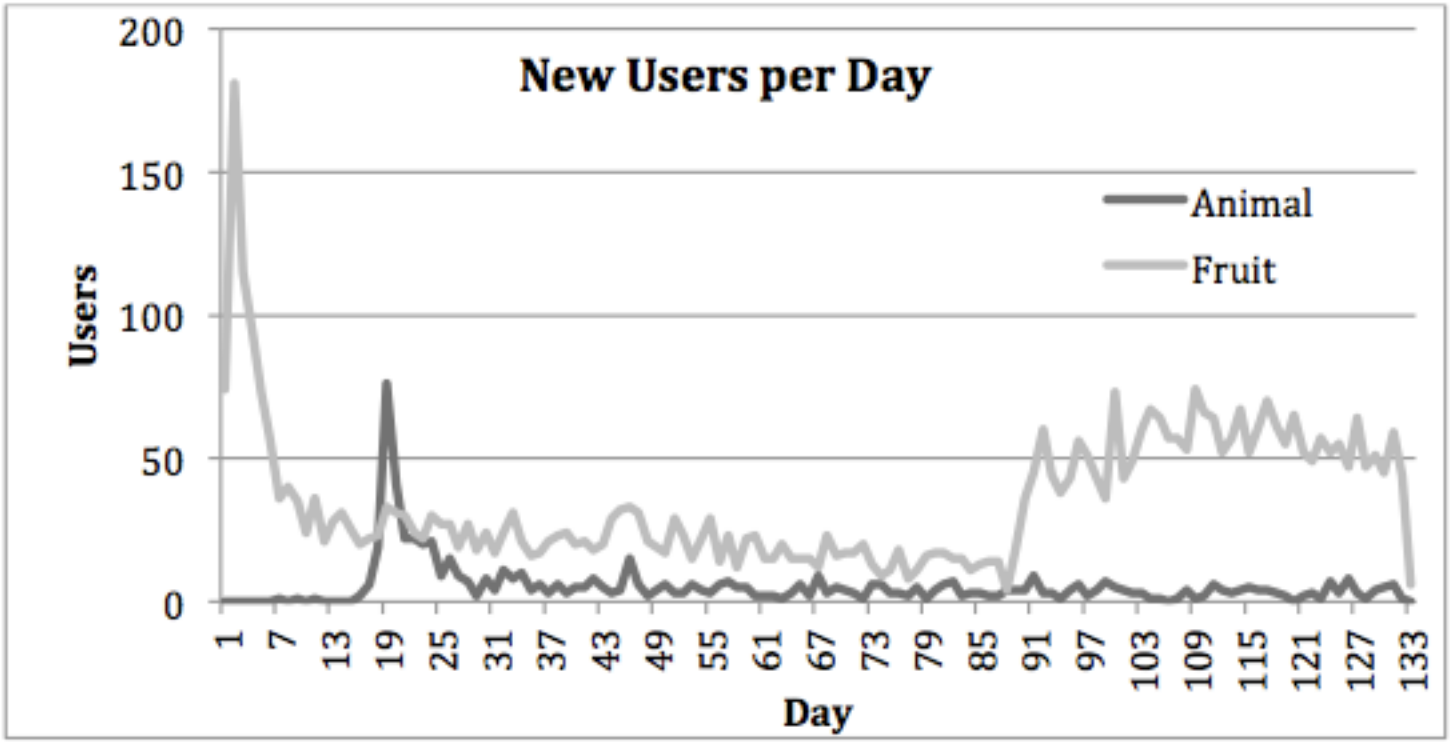
- App store for Jailbroken iPhones
- Largely contains content forbidden by apple (Themes, ringtones, etc.)
- Only 2541 apps (non theme/ringtone) (McMillan '11)





Apple App Store vs. Cydia

- Game distributed by McMillan et al
- Less populated store gives more exposure over time



Other Stores

- App World (Blackberry)
  - 9800 apps, 250M downloads
- App Catalog (HP Palm)
  - 5000 apps, 2.6M downloads
- Windows Marketplace (WM7)
  - 1300 apps
- Amazon App Store
  - 2ndary market for Android
  - Does not work on AT&T phones (restrict APK files not signed by Google)

Ad Hoc deployments

- On Android, just post an APK file on the web and send out a link
  - Will not work with phones on AT&T (block non-market apps)
  - No limit on install base
- On iPhone
  - Need to get UDIDs from each device ahead of time
  - Generate certificate with those UDIDs on the web
  - Build app with that certificate
  - Distribute cert and app to participants, must load with iTunes
  - Limited to 100 users per year

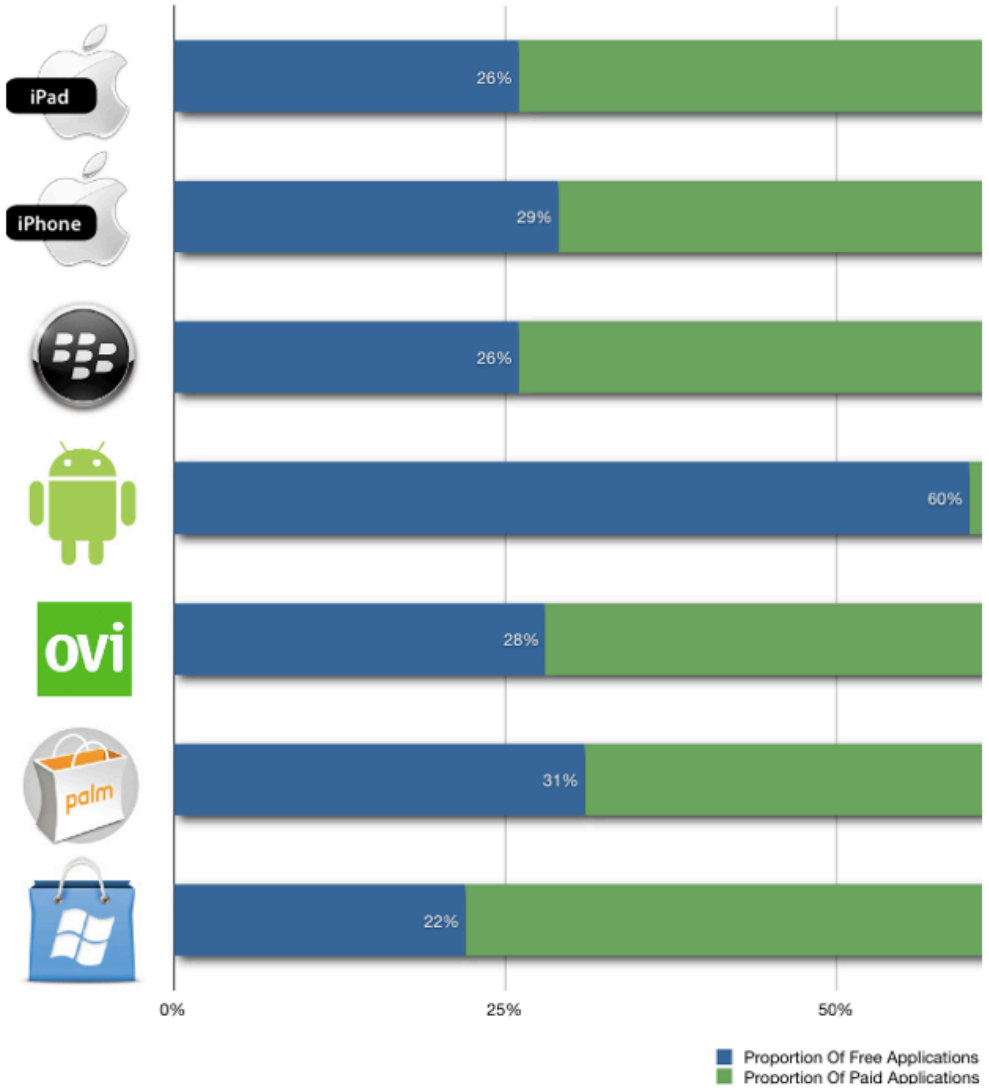
Complex choice of platform and market

- What users/segment do you want to reach?
  - Cydia heavily male and older compared to App Store
  - Android more early adopter than iPhone (but changing)
- How will you maintain visibility/popularity?
- How will you release initial betas until launch is ready?
- How often do you plan on updating your app?

Mobile Business Models

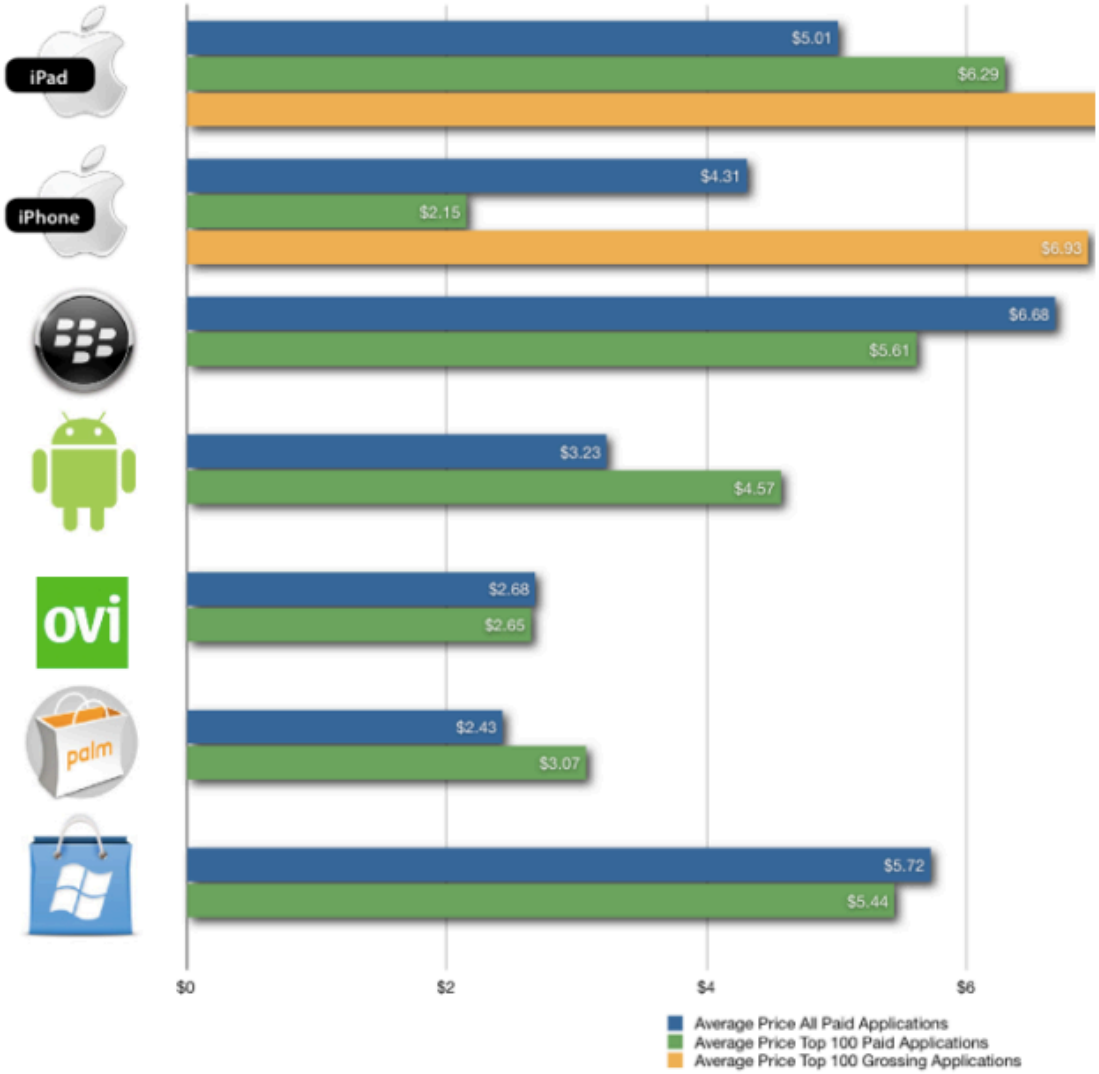
- 4 Main Options
  - Free + ad supported (Angry Birds)
  - Pay to download (MLB At Bat)
  - Pay for a service on the web, mobile app is free (Netflix)
  - Free app with in-app payments (MLB At Bat Light w/ pay per game video streaming)

Paid or free?

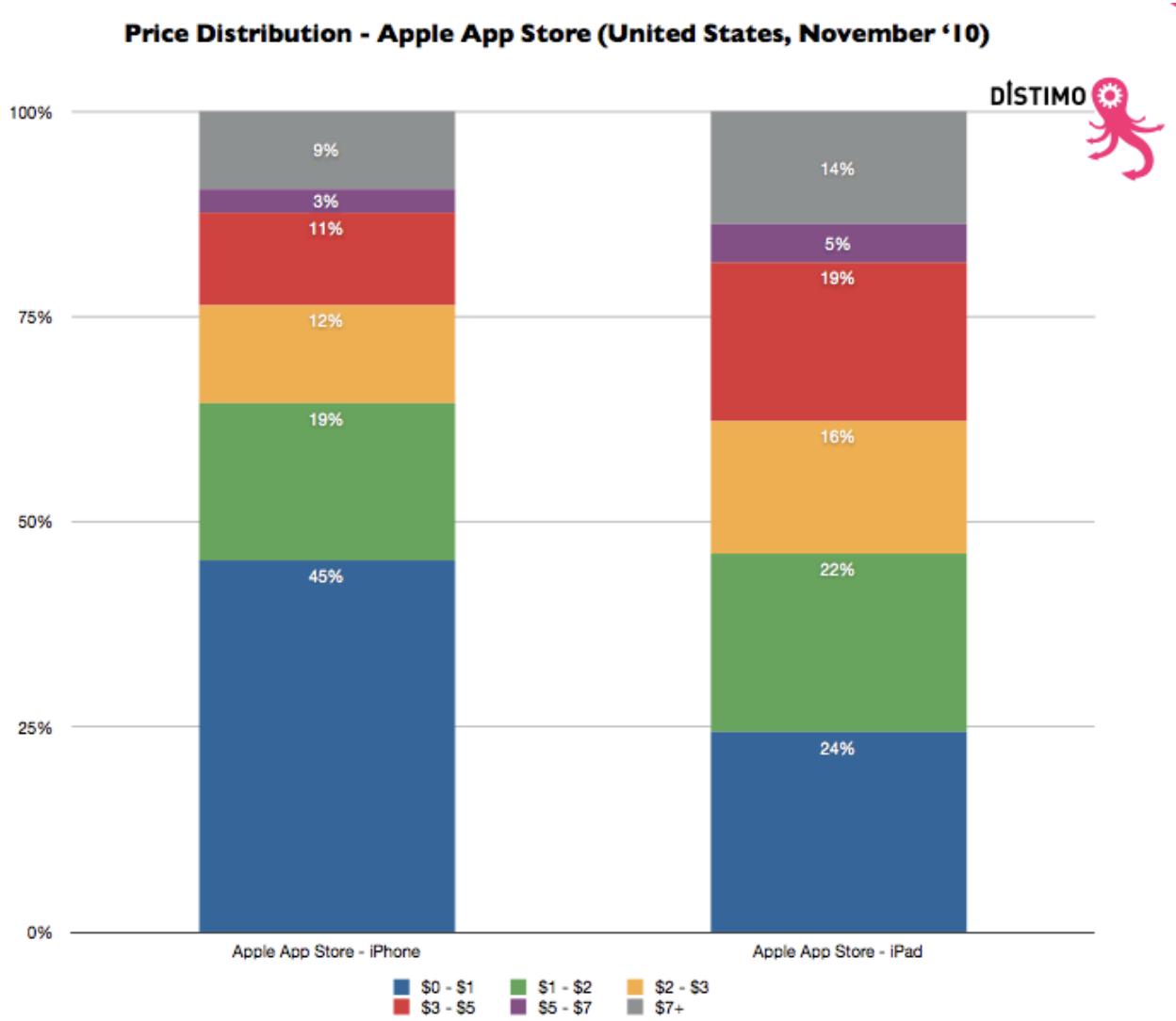


Distimo

Paid – how much?



Paid? How much?



Ad Providers

- Apple
  - iAd from Apple (60/40 split)
  - Professionally produced full-screen ads
  - Higher CPMs
- Android
  - Free to do whatever you want
  - Google provides AdMob
    - 321B impressions
    - $0.15-$0.80 per 1000 impressions (variable, no control)
    - 3-5 cents per click

Ad vs. Paid

- Avg user views 5 screens (impressions) / day
  - $0.50/1000 * 5 = $0.0025/user/day
- Use app 2x/week for a 18 months (until buy new phone)
  - $0.0025 * 2 * 4 * 18 = $0.36
- Compared to average price of $2.15 (use app 860 times!)
- But will likely get more users with free apps (400:1?)
- So really just use app twice to make up price!

Ad vs. Paid

- A different type of app – Game, in app for hour at a time
- Assume new ad each minute, 60 ads/use = $0.03
- Play twice a week for a year = $3.12

Case Study: Galaxy Impact game

- Game was free, then tried to charge $0.99

  * 10/27: 1,377 (the first day on sale)
  * 10/28: 10,839
  * 10/29: 13,110
  * 10/30: 18,875
  * 10/31: 18,556
  * 11/01: 25,898
  * 11/02: 28,390
  * 11/03: 26,156
  * 11/04: 18,182
  * 11/05: 16,633
  * 11/06: 14,883
  * 11/07: 13,024
  * 11/08: 10,928
  * 11/09: 1,153 (started charging: 27 downloads PAID)
  * 11/10: 23
  * 11/11: 20
  * 11/12: 1,435 (free of charge again)

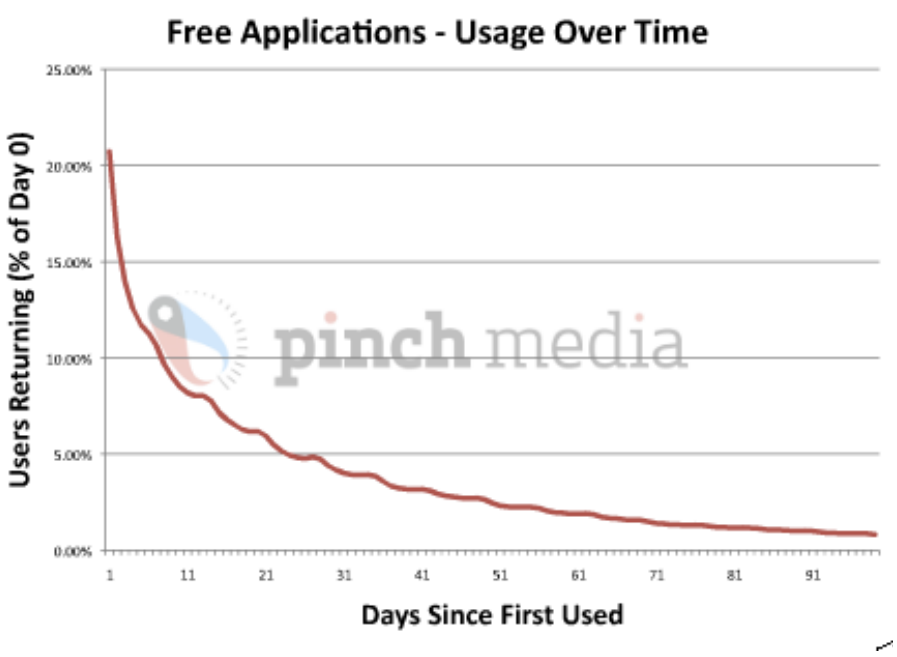
http://techcrunch.com/2009/03/22/should-an-iphone-app-developer-charge-or-run-ads-galaxy-impact-case-study/

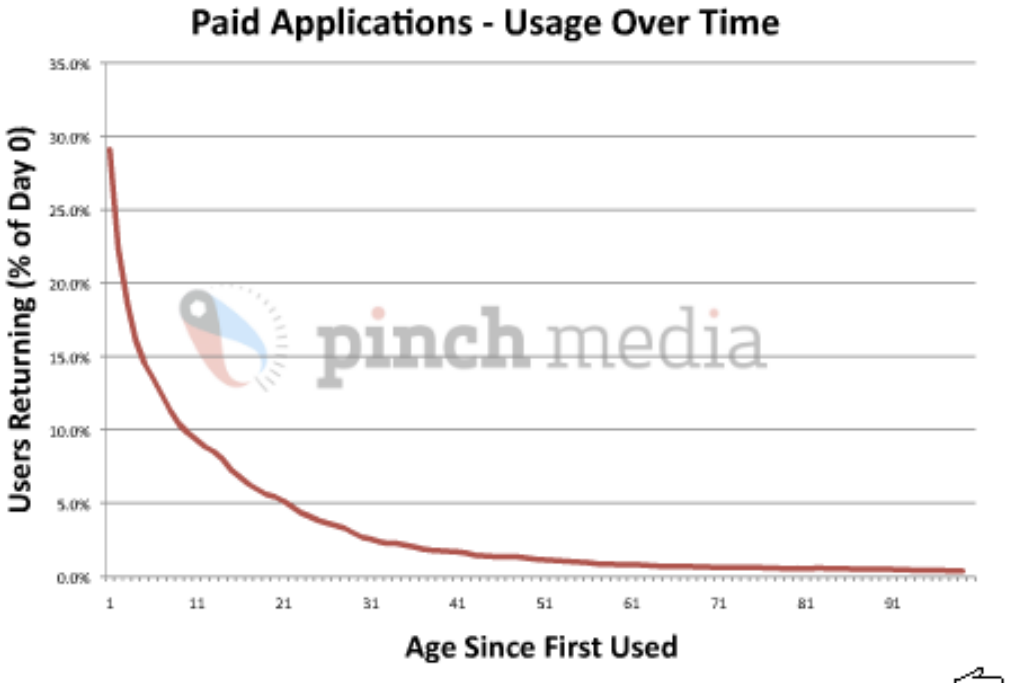
Galaxy Impact

- 220,000 downloads = $550 in revenue (400:1 @ $0.99)
- Currently making $127/mo on ads
- Findings:

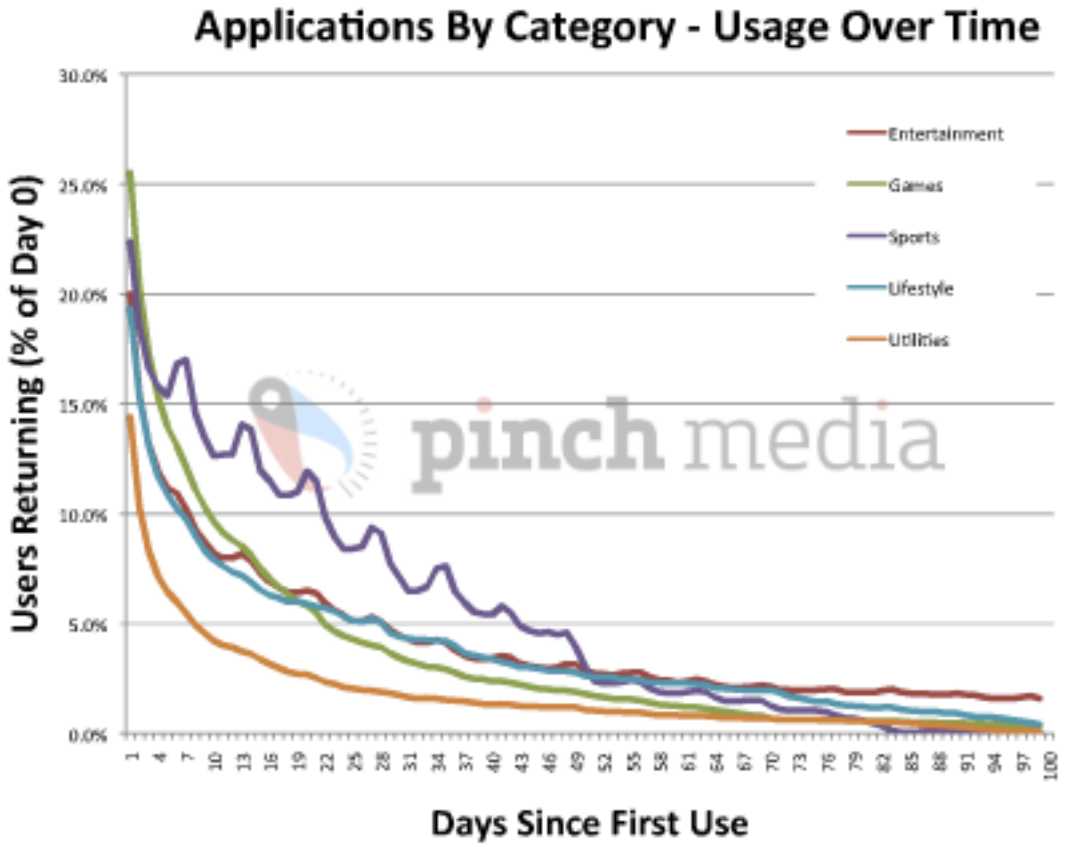
  1. Free downloads vs for fee downloads ($.99) is 400:1
  2. New downloads vs updates is about 3:1
  3. If you decide to go with ad support, do it from the very beginning.
  4. Updating does not help much
  5. Ad revenue in the long run is higher than sales revenue
  6. It's hardly a sustainable business for most common app developers (with average apps).

Usage over time

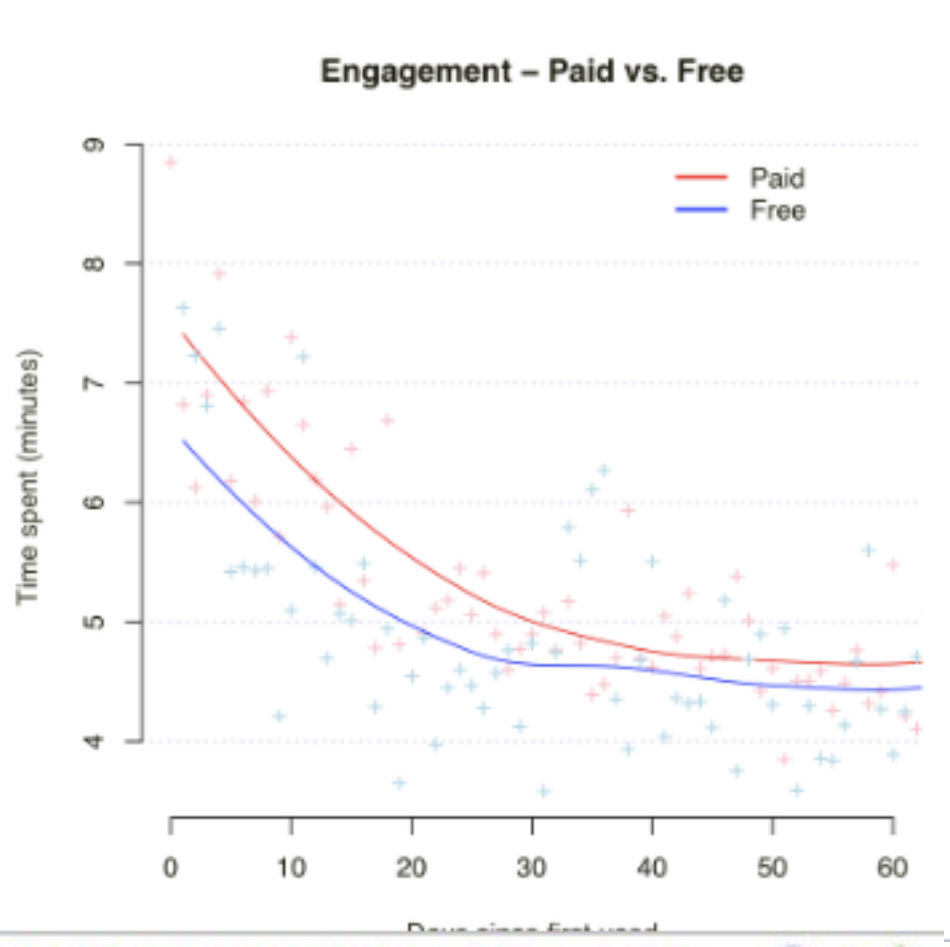


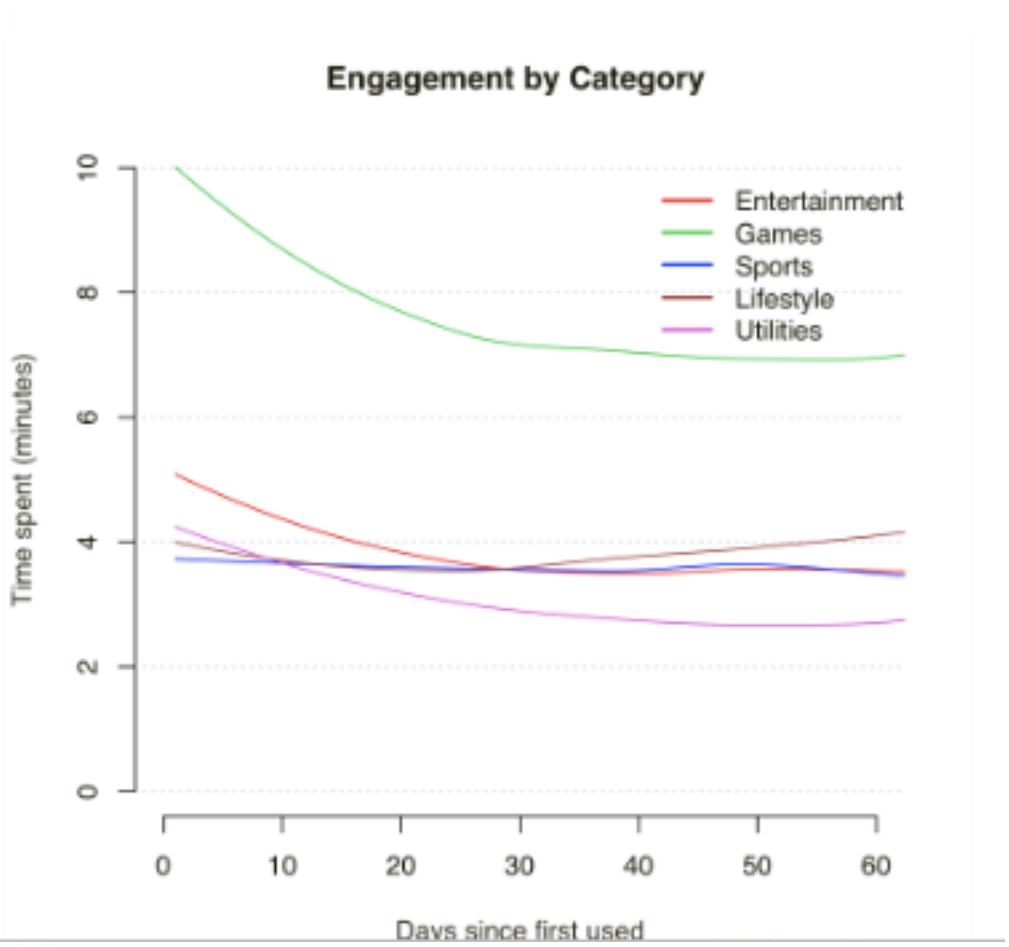


Usage over time



How long do people use apps?





Choosing a model

- Tough decision that depends on many factors:
  - Number of ads per session
  - Frequency of use of app
  - Desire to pay for your type of app
  - Aesthetics

Scalability and Cloud Computing

Scalability

- Why Cloud?
  - No capital expenditure
  - Pay for resources you need, scale dynamically (and near infinitely) as you grow
  - Availability zones around the world
  - Large Content Distribution Networks (CDNs)
    - Host content on separate servers, reduce demand on application servers

Cloud Computing

- Options
  - Amazon EC2/S3
    - Virtualized Linux (and windows) boxes in the cloud
    - Load balancing services
    - Up to developer to install and manage relevant software packages (can get a default LAMP instance)
    - Alternately can use BeanStalk (grows totally dynamically)
  - Google App Engine
    - Python and Java services in the cloud
    - No threads, no custom apps, no uploads over 200K
    - Scalability and maintenance handled by Google
  - Microsoft Azure
    - APIs into Windows Live, Sharepoint, CRM
    - Hosted SQL Databases and code based on CLR

EC2 Instances

Small Instance – default*

1.7 GB memory
1 EC2 Compute Unit (1 virtual core with 1 EC2 Compute Unit)
160 GB instance storage
32-bit platform
I/O Performance: Moderate
API name: m1.small

Large Instance

7.5 GB memory
4 EC2 Compute Units (2 virtual cores with 2 EC2 Compute Units each)
850 GB instance storage
64-bit platform
I/O Performance: High
API name: m1.large

Extra Large Instance

15 GB memory
8 EC2 Compute Units (4 virtual cores with 2 EC2 Compute Units each)
1,690 GB instance storage
64-bit platform
I/O Performance: High
API name: m1.xlarge

EC2 pricing

US – N. Virginia | US – N. California | EU – Ireland | APAC – Singapore

Standard On-Demand Instances	Linux/UNIX Usage	Windows Usage
Small (Default)	$0.085 per hour	$0.12 per hour
Large	$0.34 per hour	$0.48 per hour
Extra Large	$0.68 per hour	$0.96 per hour
Micro On-Demand Instances	**Linux/UNIX Usage**	**Windows Usage**
Micro	$0.02 per hour	$0.03 per hour
High-Memory On-Demand Instances		
Extra Large	$0.50 per hour	$0.62 per hour
Double Extra Large	$1.00 per hour	$1.24 per hour
Quadruple Extra Large	$2.00 per hour	$2.48 per hour
High-CPU On-Demand Instances		
Medium	$0.17 per hour	$0.29 per hour
Extra Large	$0.68 per hour	$1.16 per hour
Cluster Compute Instances		
Quadruple Extra Large	$1.60 per hour	

* Windows is not currently available for Cluster Compute Instances.

Small instance = $61.20/mo
Large = $244.80/mo

Data Transfer In	US & EU Regions	APAC Region
All Data Transfer	$0.10 per GB	$0.10 per GB

Data Transfer Out ***	US & EU Regions	APAC Region
First 1 GB per Month	$0.00 per GB	$0.00 per GB
Up to 10 TB per Month	$0.15 per GB	$0.19 per GB
Next 40 TB per Month	$0.11 per GB	$0.15 per GB
Next 100 TB per Month	$0.09 per GB	$0.13 per GB
Over 150 TB per Month	$0.08 per GB	$0.12 per GB

Cost of the Cloud

- Say you can support 15,000 users on "small" instance
  - $61.20 / 15000 = $0.0041 / user / month
- Use app for 18 months: $0.073

- If expected ad revenue is $0.36, that's not much profit
  - Need 3484 users to make $1000 in 18 months
- In game model ($3.12 in ad revenue a year)
  - Need 229 users to make $1000 in 18 months
- If charging $0.99 ($0.70 revenue)
  - Need 1612 users to make $1000 in 18 months

Scalability

- Reducing hits to the server
- On-Device Cacheing
  - Keep data local
    - Download large data/videos/etc. on wifi
  - Conditional GETs to server
- Leverage 3rd-party APIs directly from phone
  - Phone interfaces to FB, Twitter, Yelp, etc. directly

Scalability – Your Apps

- Have you used a cloud computing infrastructure before? Which one? What was your experience?

- Does your app have a web component?
- What are the needs of this component? (database, transcoding, media storage, etc.)
- What sort of cloud model would work best for your needs?

Instrumentation

- Understanding application use and demographics with apps deployed in the wild
- What data do you want to collect about use?
  - Screen load/hide
  - Key context (time/location/data that is displayed/ search terms)
  - Actions initiated (phone calls/maps/text messaging/ etc.)
  - Screen shots?

Instrumentation

- Why do you want the data?
  - Improve UI navigation
    - Add new features
    - Remove/Hide unused features
  - Make claims about use
    - Avg user spends x minutes a day in app
    - See distribution of feature use
  - Marketing
    - Find key demographics

Instrumentation

- How can you instrument a mobile app?
  - Mobile + Server logging
  - Server generally logs all HTTP requests
  - Combine with logs from mobile of time spent on a screen, phone-specific actions taken
- Mobile instrumentation
  - Save data to local DB or file
  - Periodically upload file (on app launch, as a background process, on app close, etc.)

Instrumentation (examples)

- Motion Presence
  - Timestamp +
    - App open
    - Person view
    - Call/Text Message
  - Saved to SD card, card analyzed by researchers
- Family Stories
  - Timestamp + location +
    - App open
    - Notification show/hide
    - Call/Text Message/View Map

Public Betas

- Why do a public beta?
  - Learn more about adoption
  - Systems that require large network effects
  - Scale gracefully
  - Get feedback from lots of users on feature sets
- Examples:
  - Phi^2
  - Spotisquare
  - ZoneTag

Issues with public betas

- Security
  - System needs to be tightly locked down
  - Fix vulnerabilities to hackers
    - Good programming practice anyway
    - Rarely done with quick and dirty prototypes
- Scalability
  - Paying for additional server resources
  - Designing system for scalability
    - Memcache, etc.
- Finding users…

Getting initial users

- Social Media
  - Facebook ads targeted towards target market segments
  - Twitter – getting retweeted by major blog, tech pundit
- Other
  - Google Ad Words
  - Pay for placement in app stores
  - Update app – Android Market, show up under “latest” apps each time there is an update

Getting users

- Has anyone here used Facebook or Twitter to find users for a project?
- Worked? Not?

- Has anyone farmed out tasks to Mechanical Turk? Participated in a Mechanical Turk task?

- Has anyone run a public beta? Size? Success?

Ethics and Recruiting

- What is a research study if it's released like a product to thousands of users in an app store?
- How can we ensure that the many decades of work on ethical research practices is applied to this new kind of research? (or should we?)
- How can we trust the data that we get from a large deployment and how does this data compare to what is traditionally gathered in an small-n study?

Topics

- Research Validity
  - Recruiting
  - Quality of data
- Ethics
  - Informed Consent
  - Data Collection
  - Ending the “study”

Research Validity: Recruiting

- In the small:
  - Recruit a diverse set of 10-12 users from different backgrounds/ages/genders
  - Likely all from one city
  - Usually meet in person
- In the large:
  - Anyone can download
  - Demographics (if collected) are self-reported and unverified (Facebook login??)
  - Likely from all over the world

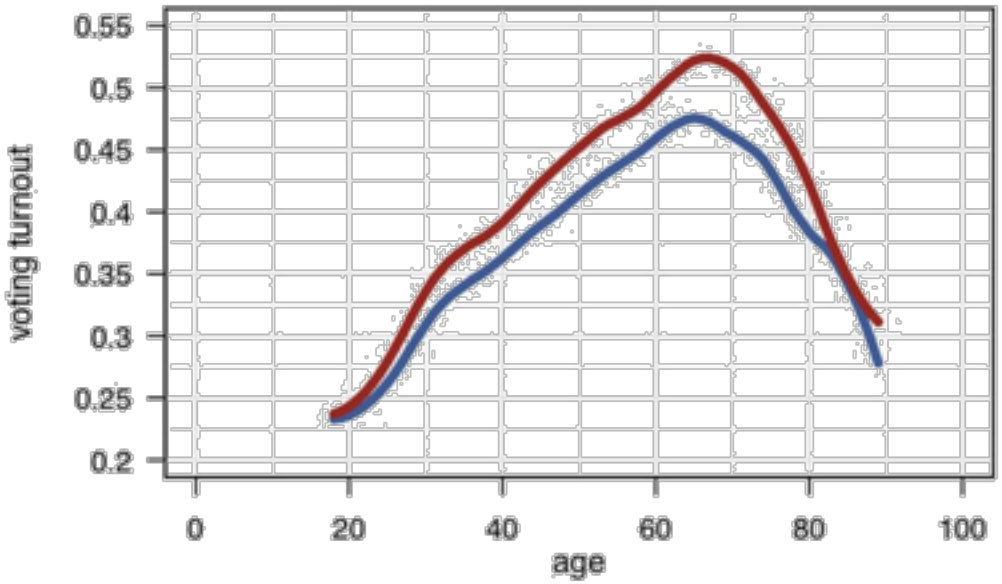
Recruiting: Benefits and Issues

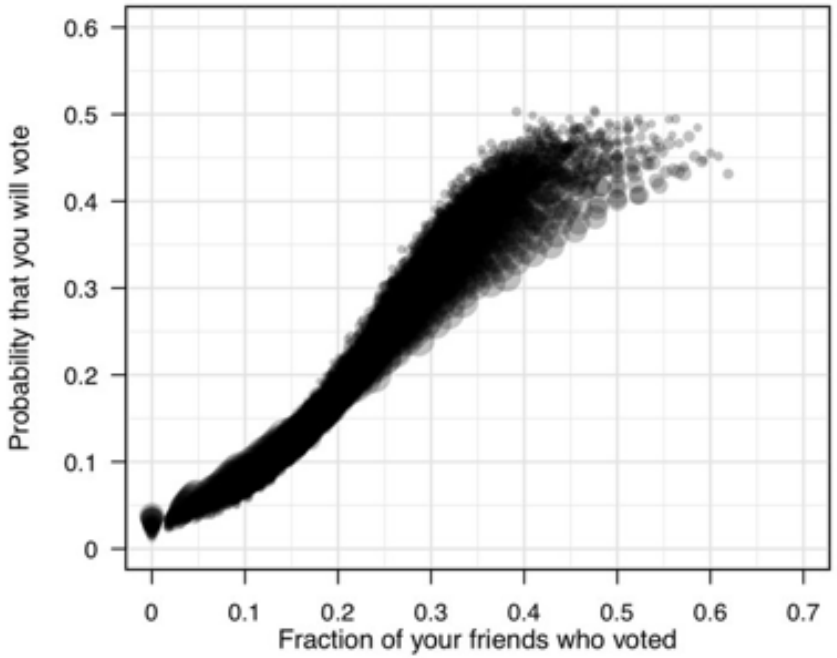
- Benefits
  - Larger N
  - More diverse geographically
  - Potentially more like “real” users
- Issues
  - Possibly less diverse than if you had handpicked participants (aggregate results shown not to be trustworthy for use in general population)
  - Less trustworthy demographic data
  - Less understanding of use by very different user populations

Recruiting: What is the app?

- Present as a research study
  - Probably get fewer users (perception that it will go away, in progress)
  - Probably different demographic (younger, geekier, male)
- Present as a "real" app
  - Provide some benefit to user
  - Need to be more "polished" – high expectations!
  - How is this different from Facebook?
    - Facebook Data has all sorts of "research" trends pulled from usage

Example from Facebook Data Team





Quality of Data

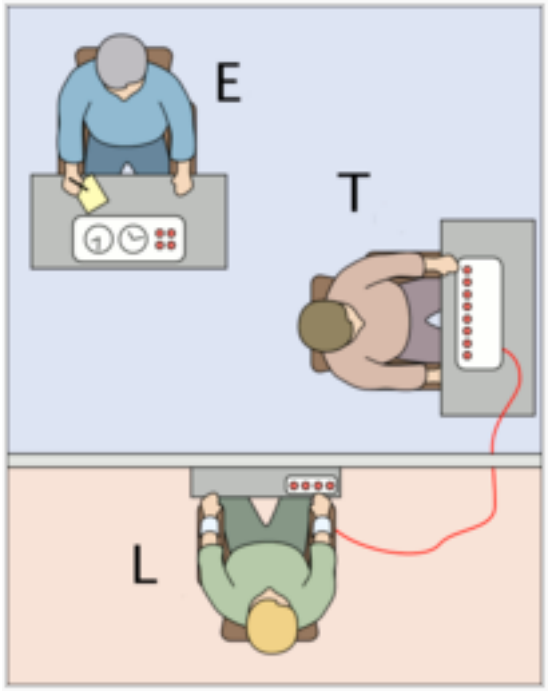
- In the small:
  - Voicemail diaries
  - Interviews with participants throughout study
  - Ability to check logs with diaries for all participants
- In the large:
  - Lots of server logs
  - User comments/tweets/surveys
  - Maybe a few interviews over email/Skype with some users

Quality of Data: Benefits and Issues

- Benefits
  - Lots of usage data from real use in the world
  - Ability to create more realistic usage models
- Issues
  - Less contextual data about use
  - Lack of an understanding of why usage is the way it is
  - Hard to get random users interested in in-depth interviews or diary logging

Informed Consent: The "Other" Milgram Study

- Talked about "familiar strangers" last class
- More infamous experiment: "Experiment on obedience to authority figures"
- Learner answers questions asked by the Teacher (participant)
- When Learner gets an answer wrong, Experimenter tells Teacher to shock them
- Increasing levels of electric shock (simulated, but T doesn't know this)



Milgram's effects on research ethics

- Large amount of stress put on participants
- They had no idea what they were getting into, possible risks

- Led to the creation of consent forms and Institutional Review Boards nationwide

Ethics: Informed Consent

- In the small:
  - IRB approval
  - Informed Consent form explaining purpose of research, benefits and risks, explicit consent for data collection and reuse
- In the large:
  - A EULA that no one reads
  - No ability to sit down and explain to users what they are getting into, answer questions, address concerns, etc.

EULAs

- Best to consult with a lawyer
- Important to make sure users understand what data you are collecting
- Protect yourself by making terms of the service clear
- Some 10+ pages of text

- Does anyone read them?
- Would knowing what they are doing prohibit installs? Good et al – YES!
  - Our study of 222 users showed that providing a short summary notice, in addition to the End User License Agreement (EULA), before the installation reduced the number of software installations significantly. We also found that providing the short summary notice after installation led to a significant number of uninstalls.

Example EULA - TuVista

TuVista End User License Agreement

PLEASE READ THESE TERMS OF USE CAREFULLY BEFORE USING THIS APPLICATION. IF YOU DO NOT AGREE TO THESE TERMS, PLEASE DO NOT USE THE APPLICATION.

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Graphical EULAs:

- How to represent text in a way everyday people will understand, might actually look at

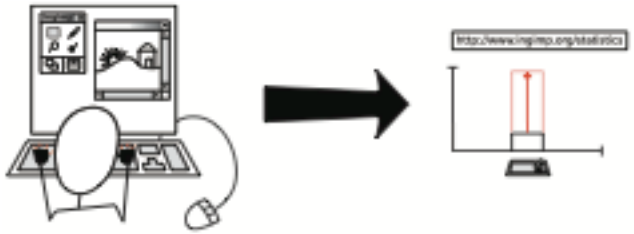

Figure 4. A diagram in the "interaction data collection" set, depicting the fact that keyboard activity is recorded. By using a single bar in the graph, most viewers correctly assume that individual keystrokes are not recorded.

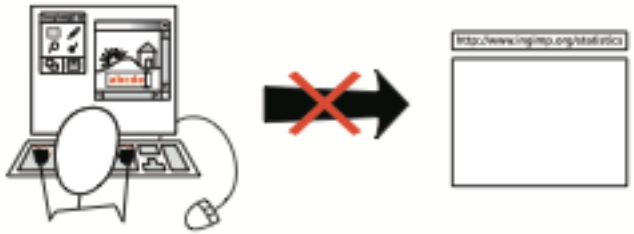

Figure 5. Previously established conventions for data collection (the arrow and graph) are broken to display an example of data not collected (specific keys/text typed).

Ethics: Data collection

- In the small:
  - Data collection spelled out in Informed Consent
  - Anonymity of data / use in publications explained
- In the large:
  - Usage/content logged for all users
  - Different from Google/Facebook/other analytics companies?
  - No face-to-face opportunity to explain data collection procedures and ensure understanding

Ethics: Ending the "study"

- In the small:
  - Participants are recruited for an n-week study after which the system is taken away
  - Participants know what they are doing is evaluating a research prototype that is still in development
  - Participants are usually paid for their participation
- In the large:
  - System can be taken down at any time / often unexpectedly for users
  - Users may not understand the concept of a research application or know that they are using one
  - User data can disappear
  - Participants unpaid

Understanding use with large deployments

- Telefonica Research study
  - Surveys given to users in app or through email
    - High amount of random answers, need to filter them out
    - Even when filtered, averages not telling of general population
    - Need to scale respondent categories based on % of population
  - Same applies for usage data of apps
    - The mean is not the mean if different groups of people start adopting it!

Mixed Methods

- Large Deployments with Small Ethnographic Research
  - ZoneTag (Ames et al)
    - System deployed publicly on web (500+ users)
      - Self-selected early adopters
    - Small-scale ethnographic study
      - 13 users
- Large deployments get more statistically meaningful data about use
- Small qualitative studies help to understand use

Mixed Methods - Benefits

- Example:
  - Quantitative data showing that no one is using feature x
    - Why is this so? Not a useful feature? Hidden in the interface? Function not explained well? Benefits not explained well?
  - Ethnographic data can help to interpret this finding and understand the problem
- Opposite works as well, find data in small-scale study, use data from large deployment to confirm severity of problem

Other Mixed Method Studies

- Radar.net
  - Garau et al 2006
- FourSquare
  - Cramer et al 2011

Distribution Discussion

- How would you distribute the app you made in this class?
- What would you expect to be the average use over time (Time in app/Drop off rate)?
- What model works best for this model?

Final Presentations

- 5/3
- 10 minutes each (7 min presentation, 3 min questions)
- Tell the story of the semester (generative study, concept development, related work, design, usability, implementation, final testing)
- After presentation, will have 10 days to complete final paper (including feedback from presentation)

Next “class”

- Final Project Triage
- Arrange a time to meet with Ed to review your progress on your final project
- No physical class until the final project presentations on 5/3