Mobile App Ecosystem:
An app developer’s path to Success

By
Dipak Shetty

M. Tech in Information Technology - International Institute of Information Technology, India
B.E. in Computer Science - Visvesvaraya Technological University, India

Submitted to the System Design and Management Program in partial fulfilment of
the requirements for the degree of

Master of Science in Engineering and Management

at the

Massachusetts Institute of Technology
May 2014

©2014 Dipak Shetty. All rights reserved.

The author hereby grants to MIT permission to reproduce and to distribute publicly paper and electronic copies
of this thesis document in whole or in part in any medium now known or hereafter created.

Signature redacted

Signature of Author: ___________________________ Dipak Shetty
System Design and Management Program
May, 2014

Certified by: ___________________________ Pai-Ling Yin
Richard S. Leghorn (1939) Career Development Professor in
Management of Technological Innovation
Assistant Professor of Technological Innovation,
Entrepreneurship & Strategic Management
Sloan School of Management, Massachusetts Institute of Technology

Signature redacted

Accepted by: ___________________________ Patrick Hale
Director
System Design and Management Program
This thesis is dedicated to my parents

My mother, Jyothi Shetty, the greatest influence on my life! She not only raised and nurtured me but also taxed herself dearly over the years for my education and personal development.

&

My father, late Anantharam Shetty, who valued education above everything else has been a source of motivation, strength and continued intellectual development.
Acknowledgements

This thesis marks the completion of an insightful journey in the Mobile Application ecosystem space. This has been a thoroughly memorable and enjoyable journey with inputs from various industry leaders.

Thank you to my advisor, Prof. Pai-Ling Yin, for being extremely flexible and providing valuable comments and feedback to shape the thesis into its current form. She was extremely accommodating and supportive, taking time out of her busy schedule. It has been a pleasure working under her.

Thank you to Dr. Patrick Hale for his amazing support and valuable inputs not only through the thesis but also throughout the program.

Finally, thank you to my wife Apeksha and my family for supporting me and tolerating my late hours all the way.
Executive Summary

This thesis is a brief study on the mobile app ecosystem providing insights to application developers to embark on the journey of app development and distribution. The methodology followed in the study is a mix of company search, online reports & whitepaper analysis of firms in this space and finally inputs from founders of firms driving this space and developers who have experienced this journey themselves. By breaking this whole journey into a 5 staged approach an application developer is better informed of aspects to be considered right from planning & development to distribution and brand building. Each stage compilation provides insights on what suits different types of applications accompanied with an analysis of the firms active in the particular area and the benefits they have to offer.
Contents
Objective................................................................. 9
Introduction ......................................................... 9
History of the Modern App Ecosystem......................... 10
App Lifecycle ....................................................... 11
Stage 1: Plan ......................................................... 15
  Rational to use App Store Analytics ........................ 15
  App Store Analytics – Companies ............................ 16
    a. App Annie .................................................. 16
    b. AppFigures ................................................. 16
    c. Distimo ..................................................... 17
Stage 2: App Development ........................................ 17
  Sketch your Application ....................................... 18
  Development ..................................................... 18
  Simulation and Verification ................................... 18
  App Development Tools and Services – Companies .... 19
    UI Development ............................................... 19
      a. Balsamiq .................................................. 19
    Cross Platform Development ............................... 19
      a. Corona Lab .............................................. 19
    Validation Platforms ....................................... 20
      a. TestFlight ................................................ 20
Stage 3: Discovery Partners ....................................... 21
  App Stores ........................................................ 21
    Platform Stores ............................................... 22
      a. Apple App Store ....................................... 22
      b. Google Play ............................................ 22
      c. Windows Phone Store .................................. 23
    Carrier Stores ............................................... 24
    Device Manufacturer Stores ................................. 24
    Independent App Stores ..................................... 25
      a. Amazon Appstore ....................................... 25
      b. Appitalism ............................................... 25
      c. GetJar ................................................... 26
  App Store Distribution ......................................... 26
    a. Appbackr .................................................. 27
    b. Codengo .................................................... 27
<table>
<thead>
<tr>
<th>Service/Platform</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metaflow - AppPublish</td>
<td>28</td>
</tr>
<tr>
<td>Discovery Services/Apps and Cross Promotion Platforms</td>
<td>28</td>
</tr>
<tr>
<td>AppCurious - AppUpdate</td>
<td>28</td>
</tr>
<tr>
<td>AppGratis</td>
<td>29</td>
</tr>
<tr>
<td>AppFlood</td>
<td>29</td>
</tr>
<tr>
<td>AppsFire</td>
<td>30</td>
</tr>
<tr>
<td>Chartboost</td>
<td>30</td>
</tr>
<tr>
<td>Tapjoy</td>
<td>30</td>
</tr>
<tr>
<td>App Store Optimization</td>
<td>31</td>
</tr>
<tr>
<td>AppClover</td>
<td>32</td>
</tr>
<tr>
<td>Appnique</td>
<td>32</td>
</tr>
<tr>
<td>MobileDevHQ</td>
<td>32</td>
</tr>
<tr>
<td>Stage4: Monetization Partners</td>
<td>33</td>
</tr>
<tr>
<td>Pricing</td>
<td>33</td>
</tr>
<tr>
<td>In-App Purchases</td>
<td>34</td>
</tr>
<tr>
<td>Payment Solution Providers</td>
<td>34</td>
</tr>
<tr>
<td>Boku</td>
<td>35</td>
</tr>
<tr>
<td>Braintree</td>
<td>35</td>
</tr>
<tr>
<td>Text2Pay</td>
<td>35</td>
</tr>
<tr>
<td>Zong</td>
<td>36</td>
</tr>
<tr>
<td>Zooz</td>
<td>36</td>
</tr>
<tr>
<td>Advertising</td>
<td>36</td>
</tr>
<tr>
<td>Ad Exchange</td>
<td>37</td>
</tr>
<tr>
<td>Mobclix</td>
<td>37</td>
</tr>
<tr>
<td>Smaato</td>
<td>38</td>
</tr>
<tr>
<td>DSP</td>
<td>38</td>
</tr>
<tr>
<td>Human Demand</td>
<td>38</td>
</tr>
<tr>
<td>MdotM</td>
<td>39</td>
</tr>
<tr>
<td>StrikeAd</td>
<td>39</td>
</tr>
<tr>
<td>SSP</td>
<td>40</td>
</tr>
<tr>
<td>Ad Network</td>
<td>40</td>
</tr>
<tr>
<td>AdMob</td>
<td>41</td>
</tr>
<tr>
<td>Appnext</td>
<td>41</td>
</tr>
<tr>
<td>iAd</td>
<td>42</td>
</tr>
<tr>
<td>InMobi</td>
<td>42</td>
</tr>
<tr>
<td>Jumptap</td>
<td>42</td>
</tr>
<tr>
<td>Millennial Media</td>
<td>43</td>
</tr>
</tbody>
</table>
g. Mobpartner ........................................................................................................... 43

Stage 5: Life Cycle Enhancers .......................................................................................... 44
a. AppTentive ...................................................................................................................... 44
b. Countly .......................................................................................................................... 44
c. Flurry ............................................................................................................................... 45
d. Kontagent ....................................................................................................................... 45

Conclusion .......................................................................................................................... 46

Exhibits .................................................................................................................................. 47
Exhibit A: Time Spent per App Category .............................................................................. 47
Exhibit B: Computing Devices – Yearly Sales...................................................................... 47
Exhibit C: Download distribution of Android apps ............................................................. 47
Exhibit D: The app developer journey .................................................................................. 48
Exhibit E: App Life Cycle ....................................................................................................... 48
Exhibit F: Downloads & Revenue Per Category .................................................................... 49
Exhibit G: Revenue Model Distribution ................................................................................ 49
Exhibit H: Mobile App Store Downloads ............................................................................ 50
Exhibit I: 80% of Mobile time spent in Apps ...................................................................... 50
Exhibit J: Mobile Users surpass desktop Internet Users ...................................................... 50
Exhibit K: App user Retention ............................................................................................... 51
Exhibit L: Game Type By Usage and Retention ..................................................................... 51
Exhibit M: Push Messaging’s impact on App User Retention ............................................... 52
Exhibit N: How to Become a Mobile App Developer ............................................................ 52
Exhibit O: Time Distribution of an App Developer ............................................................... 53
Exhibit P: Budgeting for App Development .......................................................................... 53
Exhibit Q: Price Distribution among most popular apps ...................................................... 54
Exhibit R: Successful revenue conversions of app developers ............................................. 54
Exhibit S: Stages of App development .................................................................................. 55
Exhibit T: Revenue per app-month by development time ..................................................... 55
Exhibit U: Consumer reaction to poor mobile app experiences ........................................... 55
Exhibit V: Technology Requirements by Platform ............................................................... 56
Exhibit W: Problems with mobile apps ................................................................................ 56
Exhibit X: Google Play outruns Apple App Store ................................................................. 56
Exhibit Y: China’s App Store Market ................................................................................... 57
Exhibit Z: Appbackr Distribution Model .............................................................................. 57
Exhibit AA: Revenue generated by Apps in Local Language ................................................ 57
Exhibit AB: High Retention Rate by AppFlood ..................................................................... 58
Exhibit AC: 5th Planet benefits from Tapjoy’s PPE solution ................................................ 58
<table>
<thead>
<tr>
<th>Exhibit</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ExhibitAD</td>
<td>How Apps are discovered</td>
<td>58</td>
</tr>
<tr>
<td>ExhibitAE</td>
<td>Re-Imagining Computing Operating Systems</td>
<td>59</td>
</tr>
<tr>
<td>ExhibitAF</td>
<td>Price Points across app stores</td>
<td>59</td>
</tr>
<tr>
<td>ExhibitAG</td>
<td>Revenue Effect of Putting App on Sale</td>
<td>59</td>
</tr>
<tr>
<td>ExhibitAH</td>
<td>Premium vs Freemium Revenue Growth</td>
<td>60</td>
</tr>
<tr>
<td>ExhibitAI</td>
<td>Dollars Spent on Virtual Goods</td>
<td>60</td>
</tr>
<tr>
<td>ExhibitAJ</td>
<td>Math for Paid vs Free App</td>
<td>60</td>
</tr>
<tr>
<td>ExhibitAK</td>
<td>When advertising works</td>
<td>61</td>
</tr>
<tr>
<td>ExhibitAL</td>
<td>Mobile Advertising Ecosystem</td>
<td>61</td>
</tr>
<tr>
<td>ExhibitAM</td>
<td>How DSPs, SSPs and Ad Exchange works</td>
<td>61</td>
</tr>
<tr>
<td>ExhibitAN</td>
<td>How Ad Networks potentially misuse private data</td>
<td>62</td>
</tr>
<tr>
<td>ExhibitAO</td>
<td>Display Ad Market Share</td>
<td>62</td>
</tr>
<tr>
<td>ExhibitAP</td>
<td>Customer Lifecycle / Conversion Behavior</td>
<td>62</td>
</tr>
<tr>
<td>Definitions and Abbreviations</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>CPC</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>CPI/PPI</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>CPM</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>CTR</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Freemium</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>SDK</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>References</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Information Warehouses</td>
<td>68</td>
<td></td>
</tr>
</tbody>
</table>
Objective

This study intends to provide an insight into the Mobile Application ecosystem. The investigation touches upon the various phases involved in the success of a Mobile Application and the multitude of players involved in each of these phases. With the App ecosystem gaining considerable traction, multiple players emerged to provide solutions to differentiate individual apps, providing the much needed user attention and monetization capabilities. The motivation for the study is to provide a concise picture an App developer would embark upon from the development of the App to the eventual goal of making billions in revenues and the various players he/she would interact with to enhance the possibilities to make the next killer application.

Introduction

A mobile application is a software application specifically designed to run on a mobile device. These applications started out as small arcade games, calculators and other utilities such as calendars with very limited functionalities. Compared to the integrated Software existing in desktop applications the mobile applications were software units with limited functionality. With the advent of Smartphones initiated by Apple Inc. mobile applications now popularly termed as “Apps” have revolutionized the way we live. From the simple apps that mimic applications written initially for desktop computers, apps have now become highly sophisticated in terms of utilizing the features made available exclusively by being mobile. Location-based features, touch screen sensitivity, dual cameras, voice analytics have spurned a whole new dimension of apps. With the exponential growth in smartphone sales and the continuous demand by people, multiple studios have emerged to develop apps for gaming, online purchases, banking, travel and hotel bookings, GPS and map based searches, site reviews, and social networking. Currently, the most popular smartphone platforms supporting mobile apps are Android, iOS and Windows Mobile. The Apps are primarily distributed through the App Stores owned by the platform providers such as Google Play, Apple App Store and Windows Phone Store. Moreover many popular apps are now preloaded into the devices by the manufacturers. For non iOS users, there also exists multiple alternate App Stores such as Amazon App Store or Vodafone App Store.
**History of the Modern App Ecosystem**

Mobile applications have come a long way from the time of its inception. The Motorola DynaTAC 8000X, the first commercially produced cell phone had a single contacts application in addition to the calling feature as part of its operating system. Handset manufacturers closely guarded the functions of the handset and the application development was restricted in-house to functions around calling and texting. Nokia introduced games such as “Snake” into its handset and created a market for phones as a recreational device. With technological enhancements resulting in reduction in phone sizes, enhanced battery power the demand for cell phones began rising. Handset manufacturers also realized to improve competence of their devices they had to open the internals of the devices to external developers. Palm OS and Blackberry OS were among the first smartphone Operating Systems. Blackberry provided enhanced online messaging and mailing applications that captivated the enterprise market. Up to 2007 the market was dominated by Symbian feature phones with few applications - game based or small calculator type utilities. The average daily time spent by an American in smartphone utilization was around 2 minutes [3, 4].

In 2007, Apple took the Smartphone design to new heights by releasing the first multi-touch screen iPhone. This was followed by the opening of the Apple App Store with 500 apps, resulting in a phenomenal 10 million downloads in the first weekend. Soon, the Android App store was opened with 50 Apps. In a span of 4 years Apple reaches a phenomenal 500,000 Apps in its App Stores, while Android Market reached about half this value. The one year old Windows Market contains about 25,000 Apps [4]. The term "app" has become popular, and in 2010 was listed as "Word of the Year" by the American Dialect Society.

A major inflection point was attained in 2010 when the smartphone sales surpassed the sale of PCs [ExhibitA]. The exponentially increasing number of apps was primarily responsible in fuelling this smartphone industry growth [ExhibitI]. Even the minor 20% internet usage time by smartphone users has changed industry dynamics resulting in larger internet usage through Smartphone compared to the traditional Desktop based internet usage [ExhibitJ]. Apps have now grown beyond games and utilities to provide Social Networking and Lifestyle solutions [ExhibitB]. 44 billion App downloads is the estimate for the year 2016 by when messaging through Apps is expected to surpass text messaging.
App Lifecycle

App developers at the onset of the Smartphone revolution during 2008 had fewer competitors and could gain large number of eyeballs. With the current number of Apps hovering at around 650K [6] and 770K [7] apps for the two most popular platforms of Android and iOS respectively an App Developer has to plan the entire development and marketing strategy. This problem is compounded by the fact that most of the popular apps are free apps and do not generate any revenue [ExhibitC]. An App developer must consider every aspect of the App lifecycle [ExhibitD] to enhance the chances of beating competition in gaining reach as well as making revenue. For the purpose of this report we shall limit our study to different firms within the phases as highlighted in [ExhibitE].

The App development begins with the planning stage, which is crucial as the choice of platform [ExhibitF] is quintessential to the type of App being developed and kind of audience being targeted. App Store Analytics firm help procure app statistics such as category-based downloads and revenue model based popularity for the different platform types and App Stores available. The learning curve also contributes to the platform of first choice while developing an App.

Once, the right platform is chosen the development phase can be initiated. Multiple development tools and SDKs are available in the market for enabling App Development. There are over 500 developer tools available in the market that has changed the dynamics of App Development completely. These range from UI development tools such as Balsamiq, backend services provided by CloudNine and Beta Testing tools such as TestFlight. The App ecosystem works on the principles of network effects with developers creating more applications based on number of users of a platform. Some chat and social networking applications are easily accepted based on its availability across multiple platforms. WhatsApp and Viber are alternate messaging applications that have gained high popularity due to its cross platform functionality. Currently Corono Labs provides a platform independent App Development SDK considerably reducing deployment of Apps across multiple platforms.

The AppStores were primarily created by the Platform owners such as Apple iOS Market, Google Play and Windows Market. Unlike Apple, Google has developed Android as an open market. Currently there are more than 200 Android markets owned by Carriers such as
Vodafone and Singtel, device manufacturers such as Samsung and HTC, large corporations such as Amazon and other Third party owners such as GetJar. These fragmented App Stores also include niche App Stores developed for select demographics. In addition to the large number of Apps being developed, multiple App Stores compound the problem of Distribution for App Developers. Some of the App Stores being country specific have different legal, payment and language customizations required. To ensure the App developer is not burdened with these tasks there are App aggregators such as AppPublish from InMobi that enable Apps to be distributed across multiple app stores through single submissions. Moreover review and feature sites such as AppGaleries enable user interaction and provide insights into new Apps in the market. Chomp and AppsFire provide tools to enable easy discovery of Apps across Appstores.

The App-developer has multiple choices to monetize the app [ExhibitG]. An App could be distributed as a paid app and enable monetizing right at the point of purchase. However, vast majority of the app developers [ExhibitH] choose to distribute their apps for free to gain a large user base. Some of the applications also follow a Freemium model and distribute the App for free initially and charge a fee subsequently. The follow-up payment structure in a Freemium model can be time bound, usage based or level based. A subscription based payment model is also quite common and generates higher dollar return per app [ExhibitG]. Multiple payment solutions exist that smoothen the monetary transaction between users and the App developers.

Advertising seems to be the most popular choice of monetizing Apps. App developers hope to gain a large user base and earn throughout the user interaction phase by publishing advertisements. Ad Networks such as AdMob, iAd and Millennial Media have easy to integrate SDK solutions to reach out to multiple advertisers. They provide a market place for not only aptly matching the plethora of advertisers with the publishers – the apps in this case, but also strategically place and display advertisements enabling high conversions. The Apps themselves use a lot of Advertising for distribution. Advertising has come a long way from the simple text banner based advertisements to highly interactive videos and interstitial ads. Tools such as InMobi Studio provide easily customizable and vibrant, dynamically varying and interactive ad campaigns.
Additionally, apps also use In-App purchases to monetize their apps. This is an engaging model that builds on users need to progress and compete effectively. The purchases comprise mostly simple swords, shields and power ups to enable higher competitive value in the game. Increasing levels and provides digital services and components are also available as in-app purchases. In-App purchases effectively utilize gamification [11] tenants to drive purchases. Boku and Fortumo provide in-app purchasing solutions reducing end-to-end transaction time, effectively increasing the conversion rate. Google with its ongoing revamping of the UI to create a simpler dialogue based purchase flow hopes to reduce friction while purchasing inventory by retaining the app-context in the background [12]. iOS provides customizable and easy to use APIs in the form of the StoreKit framework to request payments from a user to deliver additional functionality or content [13, 14].

Distributing multiple versions of a single app with varying payment structure is not uncommon. App developers provide an Ad based free version along with a paid Ad free version, a solution preferred by majority of users to create a non-intrusive app interaction experience.

Finally, users have a plethora of apps to choose from and clear old apps to make space for new apps. On an average a user has around 3 - 4 dozen apps installed. Finally, after jostling for visibility and motivating the user to download ones app from the millions available in the app markets, a developer needs to keep the user engaged. A typical app user is engaged with not more than 10 apps regularly [17] and has a probability of around ¼ to not engage with the App beyond 3 months of first time usage [ExhibitK]. Tendencies of retention also differ based on gender and app categories [ExhibitL]. Hence, different approaches are required for engaging users. App analytics companies provide strategies to not only acquire users but also identify current bottlenecks to engagement by analyzing user flow and frequency of interaction. Location or time based usage pattern peaks helps in determining various user segments and identifying the most loyal user base. Mobile game publishers can leverage this information in customizing marketing campaigns targeting the right kind of user audience. Dashboards and analytics reports provide effectiveness of particular marketing campaigns to app download conversion.

Push based notification is a direct communication channel, where the customer has accepted being provided with information even when he/she is not directly engaging with the app. This
is by far the most effective channel to get close to the customer. Unlike regular communication channels, push notification provides opportunities to reach out to customers at any point of time and can be tailored based on user segments, locational and time attributes. Push notification if used strategically has shown up to two fold increases in the retention rates beyond the first month of usage and up to the 6th month of usage [ExhibitM]. Companies such as AirPush provide easy to integrate solutions for Push Based notifications and Location based analytics to deepen customer involvement, improve brand value and enhance user retention. Notifications have been used to provide news feed to life enhancing applications such as timely medication reminders.

The basis of App Analytics is to understand user beyond the initial downloads and analyze each interaction with the app, understanding how interactions can be modified, timed effectively or targeted differently for different user segments. Unlike Web Analytics platforms, the app analytics have to work around actions – the primary drivers for apps, while accounting for contention on the limited bandwidth and battery usage.

Localytics provides app optimization tools to maximize per user revenue. By collaborating with mobile advertising platforms, Localytics is able to report each app installation to the corresponding marketing campaign. With this information and additional past app usage profiles, the marketing campaigns can be easily optimized to acquire new customers. Flurry has a strong foothold in providing different app analytics and reports on usage patterns. LifeTimeValue from InMobi on the other hand works in creating easily implementable action sets to identify different user segments and provide customizable actions targeted to the specific user segment.

Most of the app analytics companies in the market provide easily customizable dashboards and reporting visualizations. These real-time dashboards give an overview on current usage, location based heat maps, most popular reward or marketing strategies and thereby is ideally suited for app developers to continuously monitor and improve their solutions.
Stage 1: Plan

App Development, as a phenomenon, has taken the world by a storm. Unlike other Software projects it has yet to attain a clear educational foundation [Exhibit N] that can be banked upon. But, the very fact that Apps can be developed without much effort by individual developers has resulted in an explosion of apps. North America has the highest concentration of App developers in the world and about a 3rd of them do not make much money [Exhibit O]. Most developers are under 20 years and do not have vast industry experience to bank on. But, this provides the developers with limitless options to dedicate their time and energy.

Given the world is the playground, how does one make a choice. And choices have to be made. What is the current technical skill? For instance, Java a commonly used language is apt for Android development whereas iOS leverages on Objective-C. Most successful developers have emphasized the choice of platform should never be made from a technical perspective. Nevertheless, it contributes to a delayed launch based on the learning curve but target audience drives downloads, hours of engagement and even the price smartphone users are ready to pay for an App.

Rational to use App Store Analytics

The critical choices to make as an individual App Developer during the planning stage are – genre or app category, the target demographics for the app, type of app interactions. Games are the most popular apps currently. But with users changing games frequently, developers need to find the right kind of audience for their games. JPAC region has shown higher growth rates compared to the US. Based on these choices the right platform and pricing model can be chosen for the apps [Exhibit Q]. There are multiple App Analytics firms that provide information regarding number of downloads, the most successful genre of apps, apps that have shown peaks off-late, geographical concentration of user base for different app-types and other insights across different App Stores. These App analytics should be leveraged by a developer to make the right choice even before committing any additional resource. [Exhibit O] highlights the fact that an App developer spends much of the time in promoting and re-engineering the apps. Along with this the budget for the App is also highly dependent on the platform [Exhibit P]. With roughly 59% apps not even breaking even [Exhibit R], App Store Analytics firm enable developers make right choices in category, pricing, marketing spend and distribution strategy.
App Store Analytics – Companies

a. App Annie

With a mission to do “The Math Behind the App Stores”, App Annie has created a suite of products to enable businesses better understand the app store ecosystem. App Annie is not an App Publisher but provides market stats for iPhone, iPad, Play, Amazon, Windows Store and MAC. The data is segmented by revenue models – Paid, Free and Grossing; with/without In-App Purchases; categories and countries. In addition, all the app market data is provided in raw format for further splicing and dicing. Apart from understanding the market data; the Analytics product suite can be used to track downloads, revenues, reviews and trends across geographies and platforms on a single dashboard. It claims 24k app publishers, which includes 80% of the Top 100 iOS publishers and around 200k apps. There are no sdk integrations required and data is collected directly via iTunes Connect, Google Developer or Amazon Appstore accounts. App Annie provides all this Store Stats and Analytics for free and only charges for its Intelligence product, which provides finer details such as revenue opportunities in an App Store within specific categories and geographies.

b. AppFigures

AppFigures is the brainchild of Fileitup Media, a New York City based interactive studio, who wanted to automate the process of procuring reports from iTunes. It’s evolved into an automatic and visually appealing platform that provides easy to understand reports consisting download numbers, world-wide reviews and ranks. It collates all app stores data and provides hourly updates in an intuitive format. The Data Bits blog section highlighted as word clouds is a good enabler providing efficient word choices in descriptions across platforms. AppFigures provides a developer API suite to access all app data information from the store. Finally, through integration with the iAd and AdMob ad network, it can provide information of the clicks, impressions and revenue generated across countries, date and apps.
c. Distimo

Distimo has dedicated itself to make the app market transparent; and provide intelligence for developers and brands to take action based on factual and daily happenings in the global app market. The services extend across all major app stores and ad networks. AppIQ provides daily download and revenue information of apps across multiple app stores and geographies. Currently, there is a web-interface and Excel option and Distimo is working towards exposing an API. The estimates are based on publicly available data from app stores collated with transactional data of Apps using Distimo’s App Analytics. This is a premium product offering. The free products namely App Analytics is used to track individual developers apps across app stores and ad networks; and Conversion Tracking measures the full app sales funnel from discovery to app launch. By using a single point of entry for consumers – AppLink, helps measure the effectiveness of different app campaigns and improve download conversion.

Note: Enterprise App development is expected to grow exponentially and 80% of fortune 500 companies are expected to port part or complete applications into Mobile Apps. An incremental development strategy based on attaining higher user penetration can be attained by using the insights from these App Store Analytics firms. Firms can also use statistical data to attain at the right costing structure [23, 24] while outsourcing the app development.

Stage2: App Development

Post evaluating the idea for an App, a typical developer spends days or probably months in development. A typical app development post concept creation involves designing, coding and testing [ExhibitS] before finally launching the app. [ExhibitT] highlights an exponential increase in per month revenue with respect to increase in hours spent on developing the app. With the app space getting highly competitive, different App development software tools and online services have mushroomed to streamline the App design and implementation process. Solutions range from easy to use drag n drop based app development template services to sophisticated development sdk packages suited for the professional developers. Enterprises can also rely on Studios to take care of the complete App development process.
Sketch your Application

A friendly user interface is paramount for both early adoptions as well enhanced user engagement. An app developer has roughly less than a minute to keep the user engaged [28]. Poor user experiences have resulted in users not only abandoning the app but also create negative publicity eroding credibility of the app and its developer [ExhibitU]. An optimal design approach is creating mockups and procuring feedback on the design, user flows and interaction. MockUps or Wireframes also help hashing out the right information payload on each screen, button and text placements to smoothen navigation. Mockups work as a good requirements guidelines for enterprises, which would potentially outsource the entire app development process. Developers should also be wary of creating a standardized experience across devices. Android with its fragmented device market creates an additional burden on developers to develop customized UI for different screen sizes and resolutions.

Development

Development commences on finalizing the wireframes. The programming language and underlying technologies vary with each platform [ExhibitV]. Developers can opt between creating a native application, which leverages device capabilities and provides performance benefits, and webkit applications that use HTML5 enabling easy portability across platforms [29]. Companies such as Dapp [30] and AppInventor [31] with their ready to ship offerings, which reduce learning new technologies and maintaining a steep update and versioning cycle, provide time for developers to concentrate on their idea as opposed to implementation details. Studios such as Robosoft [32] also build apps and enable customizable sdks for enterprises.

Simulation and Verification

Validation and testing goes a long way in creating a credible brand for the developer. Around 44% of the apps have experiences problems ranging from crashes, display errors to even launch errors [ExhibitW]. This is compounded by the fact that users do not give more than 2-3 tries before switching apps. Both Android & iOS have simulators and developer testing accounts to deploy & verify applications before submissions. Developers have a plethora of tools to simulate user sequences and validating the app for its functionality as well performance goals. Nevertheless, bugs and defects do arise and developers provide patches and fixes along with later feature releases.
App Development Tools and Services - Companies

UI Development

a. Balsamiq

Balsamiq aims at reducing the time for organizing the flow and user experience by digitizing the creation of wireframes through their product - Balsamiq Mockups. By creating a tool with intuitive drag n drop and self-explanatory UI controls but being polished enough for UX designers to use Balsamiq has done a remarkable work in both reducing requirements specification and increasing its user base across engineers and product managers alike. Mockups are available on the web or as a plugin for Google Drive, Atlassian Confluence, Atlassian JIRA, FogBugz & XWiki, thereby providing collaborative development capabilities. Using the Linking MockUps together, Balsamiq now enables basic prototyping and user flow testing. The product is available as a demo version on the web and as well as a desktop application forever. But, saving the mockUps is restricted to a limited period. The product has flexible licensing options based on number of users and projects, types of plugins and bulk usage.

Cross Platform Development

a. Corona Lab

Corona Lab’s mission is to democratize app development by providing individual developers the opportunity to create cross platform mobile apps. Using the Lua language for development not only fastens cross platform deployment but also simplifies programming to a large extent. Lua provides simple APIs and reduces the code base to a fraction compared to the existing platform languages [33]. Corona claims a user base of over 150,000 of its flagship product Corona SDK. Through its easy to use APIs and features such as physics engine development time not only across multiple platforms has reduced but also device customizations has smoothened out deployment across the fragmented Android devices. Corona offers this SDK absolutely free to developers and also enables publishing across app stores. Specific features such as in-app purchases and app analytics though come at a subscription fee.
The enterprise version provides features such as calling native C and Java packages. Corona Labs acquired the Dubai based Game Minion and has rebranded it as Corona Cloud. Through this single sdk users can gain access to services such as leaderboards, push notifications and achievements. It has also integrated social networking features to connect with Facebook friends. A noteworthy feature is the cloud sync feature that allows users to seamlessly switch across devices. Corona provides a simulator packaged along with its sdk enabling easier prototyping & verification.

Validation Platforms

a. TestFlight

Testflight is a software platform to enable beta testing through its easy build distribution mechanism. Developers recruit testers through manual invitations or broadcast URL invitation. A developer than can distribute builds to the provisioned testers, who can view the new build on their registered devices and can initiate testing. The TestFlight SDK is used for tracking beta tester user analytics. Through the TestFlight SDK, developers can get real time user session and crash reports to understand how consumers interact with their app. User session reporting provides insights such as number of app launches, duration of usage and device information such as carrier and timezone. Provisioning checkpoints and implementing questions on each checkpoint allows procuring instant detailed information on the overall experience with the app. The free to use platform allows developers to manage beta testing campaigns, which can be continuously monitored on the dashboard. TestFlight has the option of monitoring both beta testers as well as live version usage through its TestFlight Live. TestFlight Live was developed post acquisition by Burstly. It is a real time dashboard which shows live audience interaction along with stability and revenue information such as sales and in-app purchases. The ability to understand live user interaction provides developers to quickly respond to on-going app crashes. As a relief to developers TestFlight Live requires no code change.
Stage3: Discovery Partners

Mobile applications are delivered to millions of consumers primarily through the platform provider’s App Stores. Lured by the billions in app store revenues carriers, device manufacturers and multiple third party app stores have proliferated. In addition, the open ecosystem offers relatively low barriers to entry for any new developer to create and publish a new app. App Store competition is much fierce now, unlike the initial years when you could launch an app without much promotion and still have a fair shot to get visibility. The App market unfortunately for individual app developers or startup firms is not top heavy with roughly 25 app developers making more than half of all the app revenue [34]. These developers mostly comprise gaming companies such as Zynga and Rovia, who release multiple games or versions of popular apps [35]. Given such a scenario where there are not only millions of apps and a fragmented marketplace to distribute in, how one gains eyeballs for an app and finally creates an urge to install is overwhelming. App Store distribution helps app developers reach out to not only multiple app stores but also relies on pre computed segmentations to push apps into relevant app stores. Discovery Apps on the other hand use services such as incentivized downloads to find apps across multiple app stores. They rely on users preferences to either find apps or market them when it is put up on a discount sale in the app stores. This being said, more than 50% of the users find their app through an AppStore and being discoverable in an AppStore should clearly be a top priority for a developer. App Store Optimization solutions precisely aid developers to gain maximum possible visibility within the app store by rehashing and fine tuning elements such as titles and descriptions in the App submission process.

App Stores

App Stores are basically digital application distribution platforms where users can browse and download apps. The platform providers such as Apple and Google introduced the app store as a market where they could review apps and provide it to the large user base post approval. Android based on open operating system and adopted by multiple device manufacturers saw the rise of many new app stores. Some of them are country or genre specific targeting a niche customer segments. Most App Stores have a revenue share agreement between the developer and the app store for distributing paid apps and do not charge for hosting free apps. There has been a race to garner more apps by each App Store and this has also led to continuous improvements in existing App Stores.
Platform Stores

a. Apple App Store

The Apple App Store is the first app store created by a platform provider. Within 5 years of its launch with 500 apps, it has grown to a remarkable 50 billion download mark [36]. Apple App Store has distributed around $9 Billion in revenues to developers and it has continued to be the most profitable App Store. Developers are charged 30% of the revenue as distribution charges. With all the hardware being produced by a single manufacturer, the developers find it much easier to provide a good user experience and publish high quality Apps into the Apple App Store. Beta Testing is provided by provisioning test devices for the apps. iOS collects crash reports every time a test device is logged in. Once the app is published iTunes Connect can be used to collect live crash reports and improve the app. iTunes Connect is a web tool to set up tax and banking information. Additionally, metadata and version information can be routed through iTunes Connect. Renewable subscriptions are also implemented through iTunes Connect. Charges are based on the price and length of subscriptions. Content can also be provided directly from the web, in which case Apple does not take a revenue share. Apple charges a steep registration fee compared to the other platforms. But, with a rigorous control on the apps being published Apple maintains the quality of apps its users enjoy. This creates a network effect of satisfied customer paying higher prices for the Apps compared to other smartphone platforms.

b. Google Play

Formerly known as Android Market, Google Play is the primary digital distribution platform for Android users, maintained by Google. To enable availability across devices and eliminating syncing across devices, Google merged Android Market with Google Music and Google eBookStore to create Google Play on March 6 2012 [37]. After years of trailing behind Apple App Store, Play has finally attained larger number of apps to offer its Android users [ExhibitX]. These comprise of both free and paid apps. A registration fee of USD $25 is charged to developers to distribute through Play and a subsequent revenue share between the developers and Google is 70-30. Google has purchase options support over 137 countries [38] with the flexibility of cancelling a purchase within 15 minutes of the transaction. Google
Wallet has been the default payments provider for app purchases. The partnership with billing provider Bango has strengthened carrier billing options to increase app purchase [39, 40] within Play. Users have an option of purchasing apps directly through the device or selecting a registered device from the web application. Play provides an option of auto updates, which ensures users have the latest updated version of the mobile apps installed. Carriers restrict the use of certain apps on their networks. Verizon restricts use of Google Wallet due to concerns on ownership of the secure element [41] or critics would put it to promote its own Digital Wallet Isis. Most carriers however block tethering apps for security concerns. Due to the plethora of devices available for Android, apps may not be compatible across all devices. Play provides compatibility details across apps based on the manifest elements such as supported screen size, device configuration, pricing details and country based targeting. Editing the build file or VPN can be used to circumvent the system [42].

Play provides multiple lists such as Top Paid, Top Free, New Apps and Trending Apps to enable App discovery. Apart from the star ratings and reviews, Play provides a section with recommended apps customized for individual users based on popular apps by location, trends of apps installed and +1’d by your social network in Google Plus [43].

Play keeps enhancing the app market and has also increased the maximum size of an app to 4GB by allowing 2 add on files of 2 GB [44]. Google monitors apps uploaded into Play and provides app details such performance metrics, user and device statistics to the developers through the development console.

c. Windows Phone Store

The Microsoft owned Windows Phone Store owns around 145k apps for the Windows Phone platform. Apart from the regular featured lists such as Top Paid, New & Rising, its ~50 % discount offerings collected into “Red Stripe Deals” provide a good discovery and distribution platform for app developers. An interesting feature is the provision of trial and full versions of the app through a single XAP package. With no restrictions on designing the trial experience and provisions of trying the full paid version [45], Windows is banking on gaining popularity by incentivizing users to browse through its store and getting started with new apps. To increase its usage the store offers both credit card based purchases and operating billing options. Microsoft had introduced a floor price of $1.49 [46], but many labels are now available at the
popular $0.99 price point. Unlike other platform providers, Microsoft has a 2 stage revenue sharing model of 30% up to $25k sales and 20% beyond that. Developers have the flexibility use Microsoft's commerce engine to support in-app purchases. The provision of Beta Testing enables fixes before public releases. Microsoft charges a fee beyond a number of free app submissions, but the Beta submissions are not counted against this. Microsoft with its emphasis on continuous support provides crash reports with exception details though its dashboard for app developers. By enabling telemetry support a developer can monitor the app quality through data collection on app runtime. The Dev Center is also equipped with analytic tools providing information on downloads by purchase type, performance and insights on mode of customer purchase.

Carrier Stores
Apart from Apple, the other leading Platform providers have jumped into carrier billing and expect a higher sales conversion rate [47]. Operators are now looking at enhancing their revenue streams by helping developers market their apps through their own independent App Stores. The wealth of customer usage patterns and subscription data, carriers are better positioned to effectively reach out to targeted audience [48], thereby reducing developers marketing efforts. With most App Stores based out of America and Europe, the carriers with a large localized user base from countries such as China and India can easily fill the geographic imbalance with their localized app stores [49]. Airtel App center and China Mobile are few of the successful carrier app stores. But, they still need to come a long way in attracting developers and establishing their technological expertise in providing a seamless user experience complete with analytics, trends and recommendations.

Device Manufacturer Stores
There has been a vicious cycle of increases sales in Smartphone and number of Apps created for a platform. Mobile App Stores seems to be at the center of this ecosystem providing content and seamlessly integrating across devices. The OEMs are creating and marketing their independent App Stores, which is pre-installed, to signal device differentiation and create stickiness [50]. What manufacturers want is to reap benefits like Apple through app revenue share. Samsung and HTC are consequently providing cherry picked apps in its store.
Independent App Stores

The exponential growth of Apps has resulted in cluttering the market and burgeoning of alternate app stores [51]. Most of these App stores bank on providing customized recommendations and targeting a niche segments of users. Country specific App Stores such as Baidu App Store in China and Yandex in Russia are also better positioned to provide localized apps [52]. Moreover, usage patterns in China indicate a strong inclination towards independent App Stores [Exhibit Y].

a. Amazon Appstore

The Kindle Fire and Kindle Fire HD tablet comes pre-installed with the Amazon Appstore. It also can be installed into other Android devices as a standalone app. Unlike Google Play, the app shares are restricted to SMS and email; and the store lacks device filtering. There have been complaints with regards to reduction in list price [53] and installation of the Appstore application on the Kindle Fire. Nevertheless, Amazon is banking on its deals and “free app a day” features to gain more user traction. Surprisingly it’s also noticed at times the “free app a day” is available for free in Google Play. Amazon provides app recommendations based on past purchases and aims at reducing buyer’s remorse through its “Test Drive” feature. Leveraging its server capacity Amazon launches the app during Test Drive on its elastic Cloud compute and sends real time audio and video feed to the customer’s phone [54]. By providing up to 30 minutes of trial time users can make an informed decision before purchasing an app.

b. Appitalism

With ~1 million apps Appitalism provides a community to distribute apps across multiple devices & platforms. It does not rely on algorithmic rankings but rather members can discover content through its search engine or community recommendations. Members are rewarded with App rewards for their engagement, which can be used for premium app purchase. Device filtering is offered in Appitalism and listing of apps not directly hosted is also provided. Premium apps are either pushed through SMS notification or uploaded onto the site which is accessible through the browser. Rewarding users for activities such as comments & reviews [55], Appitalism drives user engagement through social networking.
The world’s largest free app store, GetJar provides up to 960k apps across platforms supporting 3.2k devices. GetJar has pioneered the concept of an App Store since 2005 well before Apple and Google [56]. It has been highly successful as the first App store to launch popular games such as Angry Birds [57]. Through app usage data collected for over 150 million users, GetJar offers advertisers the ability to reach highly targeted audience. By leveraging on the acquisition of technology from Infrinity, Interest Targeting and Audience Targeting GetJar acquires new and most importantly a highly engaged user base. Developers can control the reach of user targeting or extension of engagements by appropriate choice of audience targeting. The platforms Pay-Per-Install billing mechanism helps developers reach out to maximum users in the most efficient way. GetJar ensures targeting to new users by filtering out users who have installed the app previously. The Gold program applies Free App dynamics to Paid Apps. By distributing the app through GetJar Gold developers get promotion benefits through GetJar and can reach a larger audience base. Developers can also use the App Commerce SDK for in-app purchases to sell levels, items or virtual goods within the apps using the Gold coins. The SDK wrapping is taken care by GetJar. Users on the other hand can procure gold coins through direct purchase or by GetJar’s incentivized downloads program. GetJar intends to use the virtual currency to reach a wider audience [58], increase conversion rates in comparison to traditional check out mechanisms and increase loyalty towards its own market place [59]. Combining its virtual currency program with its Rewards app in Play, GetJar intends to redefine app search based on usage patterns and cluster identification.

Analyst firm research2guidance predicts a rise in alternate app stores not only supported by manufacturers and carriers but also targeting specific areas such as health and business [60].

**App Store Distribution**

Each app store is inundated with a flood of app submissions. The submission details and requirements of each app store are varied and only a marginal number of apps get featured – a factor considerably increasing sales. App stores are also currently ill equipped in featuring the most suitable apps [61]. App Store distributors or publishers provide developers the ammunition to connect with the right app stores while simultaneously easing the process.
a. Appbackr

Appbackr is a wholesale digital marketplace enabling developers find “backrs” to fund applications and drive sales. Sensing a void in the wholesale distribution model of the app stores compounded with the complexities involved with the submission and featuring in each individual app store, Appbackr created Xchange and MarketPlace offering wholesale distribution [61]. Each submitted app is basically scored on a scale of 10 through a machine learning model using customer reviews, downloads, crash reviews and marketability. Backrs can then choose to purchase wholesale copies of the apps even at the pre-release stage and share sales proceedings with the developers. Appbackr takes a cut for enabling this distribution model [ExhibitZ] while backrs have a potential to make a profit of 26%. App featuring is enabled in the stores when more than 3 backrs fund an app. Appbackr had an option of funding apps at the concept stage, which has been terminated and funds are now released only at app launch to assure backrs money is safeguarded and utilized for distribution and marketing. Currently M.A.T’s SDK, Chartboost’s SDK and Google Merchant account are used to track installs. Carrier Install Regression Analysis by obtaining usage data from data providers such as Xyologic may also be used to procure app usage data. Apart from the backrs, Stores can offer PPI campaigns which will push stores to market and distribute the acquired apps. Developers can also use Xchange to create CPI campaigns to push downloads. A dashboard provides download details including monthly sales and daily run rates for the developers as well as backrs.

b. Codengo

App Store Submission Services by Codengo simplified submitting mobile apps to the top App stores such as Amazon Appstore, GetJar, Nook and Mobango. The service allows managing developer accounts across the stores from a single location. Codengo saves developer time to support multiple app stores through image resizing for asset creation and single form submission. Developers can use the dashboard to add multiple accounts and also manage unlimited number of updates. Codengo does not take a revenue share for its distribution and has a fixed pricing mechanism. Codengo has pricing fees based on the number of App stores to distribute the apps and the number developer accounts existing. Currently 19 Android app channels are supported for distribution by Codengo.
c. Metaflow - AppPublish

Metaflow is focused in distributing digital content though cloud based services. Metaflow’s marketplace deployed on Amazon Web Services provides a central content hub. Along with its MetaConnect solution distribution is enabled. Metaflow was acquired by InMobi in 2011. Post-acquisition InMobi launched an app distribution platform called AppPublish. AppPublish provides a single platform to distribute apps in over 150 stores [62]. This service, which has multi language translation and automated image manipulations to fasten the submission process, does not have any registration fee. It has a revenue share contract with the developers based on the number of downloads driven through its distribution channel. AppPublish uses its own SDK to determine app installs and has reportedly increased downloads to the tune of 30% [63].

Publishers and crowd funding based whole sale distribution help reach a larger retail segment of app stores. The app economy is truly benefited by streamlining the apps based on localized and interest groups to country or niche app stores [ExhibitAA]. Eventually discovery by end users and downloads drive revenues. The subsequent section highlights discovery services and app store optimization services to enhance probability of app download and installs.

Discovery Services/Apps and Cross Promotion Platforms

With the growing number of apps across every platform and every app store, developers are finding it increasingly difficult to make their individual apps stand out and be discovered by end users. App reviews and mobile ad networks attempt to provide a means to address app discovery, there has been a considerable increase in the number of individual apps and services that aid in finding apps. These range from daily deal apps that fish out apps on sales to specialized discovery platforms that specialize in search on specific segments. Some of the incentivized download platforms have also evolved into app discovery apps providing enhanced search and discovery features [64].

a. AppCurious – AppUpdate

AppCurious is a Social Network aimed at App Discovery. Instead of basing recommendations on complex algorithms, AppCurious relies on network of friends to
discover apps. This app currently available only on iOS allows users to sign in using Facebook, Twitter or email. A user can share apps, comment and provide reviews, ask questions regarding an app and also collect apps based on ones networks preferences. It allows users to filter apps to display on the profile and enables twitter type user following. Unlike the regular app discovery services that repackage offerings of the app store, AppCurious creates an environment to find apps used by friends [65]. AppUpdate on the other hand is an Android app that uses only Facebook to discover apps used by friends. The suggestion feature provides an option to share an app while answering questions. Currently, the app is ad supported and expects to have a future ad free paid version.

b. AppGratis

It is an app discovery platform focused in providing a free app daily. The company does not believe in incentivized downloads and hand picks each app after thorough testing to provide high quality apps to its users. AppGratis makes money through its CPI based advertising [66]. Apart from free apps, AppGratis provides up to 90% discounts on apps. Freemium giveaways such as level unlock and free in-app purchases for a limited period also bring in additional revenues. After being kicked out of Apple AppStore [67] the company moved onto the Android platform. Recently Apple has shut down its push notification for existing consumers [68]. With reported 12 million users and roughly 1 million downloads a day, AppGratis which has helped many apps climb the charts is still a strong player in discovering apps [69].

c. AppFlood

A cross-promotion network available across iOS and Android enables developers to buy, sell and exchange users. AppFlood provides higher eCPMs as the services are completely free. PapayaMobile does not intend to monetize this service but is leveraging it to reduce user acquisition costs [70, 71]. Developers are allowed to directly exchange points earned for app installs to money or install campaigns. It’s a good medium to connect high volume traffic apps to monetize and promote new apps but takes up to 48 hours for app approvals and campaign creation. Advertisers have an option of creating targeted campaigns for a country, OS version and language. App Match technology provides ad placement optimizations while integration with Ad-X
and Has Offers enables app usage tracking. Through appropriate app matches AppFlood claims CTRs to the tune of 45% and high user retention rates [ExhibitAB].

d. AppsFire
The original concept of AppsFire started as an iPhone app to share favorite apps with friends. Through its 1.5 million user base it has directed more than 100 million downloads and 1.5 billion app recommendations [72, 73]. It provides best app deals and limited period offers across multiple stores along with a featured app of the day. The site also provides an option for members to get notification of apps when the price drops. Through Facebook integration AppsFire provides details of apps used by friends along with options of sharing deals. The AppsFire App Score [74] computed through ranking, ratings, developer clout, citations and twitter trends along with the badges [75] highlighting trending apps, best developers and copycats ensure users not only discover apps but are informed of their quality. The App Boosted SDK provides an easy mechanism to engage with users and create a positive feedback loop.

e. Chartboost
Chartboost is primarily a games only platform aiding developers. It offers internal cross promotion across a developer’s app library. Chartboost’s transparent network also allows developers to test promotional campaigns across a pool of 1200 developers and based on campaign success negotiate promotional deals directly. Both cross promotions and direct deals are free of charge. But relying on individual developers to attain a fair exchange may be both time consuming and complex. Chartboost enables developers to create CPC or CPI campaigns with country and time based user targeting and offers revenue sharing publishers to fill unsold inventory. Focus on interstitials allows Chartboost to position ads as app recommendations [76].

f. Tapjoy
Tapjoy is a mobile app advertising and publishing platform with a revenue model based on incentivized virtual good sales. Tapjoy provides its users virtual coins in exchange of watching videos, installing apps and subscribing to services. These virtual coins can be used to make in-app payments. Users can also make in-app purchases with real cash but virtual coins bring new users for app developers but also
incentivize the users to try new apps. Tapjoy Marketplace offers targeted advertisements for app users in return for virtual currency while developers can monetize. Developers also have the option to use the regular marketplace that provides only monetizing options. Apart from the regular language, location and device targeting Tapjoy's sequential retargeting offers a deep user and brand engagement experience. Tapjoy PPE and Reconnect ensure not only procuring users but also continuous engagement and re-engagement options with users thereby increasing ARPU [ExhibitAC].

The Discovery service apps surely is a boon to the customers providing app recommendations not only based on taste and preference but also enabling purchase cost reduction through discount matches and incentivized downloads. App users as any other consumer would surely love to pay less for the apps and continue using discovery apps. But the new rejection clause on the grounds of “incentivizing or promoting other apps” [67] will play a crucial role in this landscape [64]. Moreover, developers are concerned with the utility value of discovery platforms due to the large app inventory they possess and loosing customer traction soon after the incentivized download. Social networks may play a significant role in app discovery and influence usage backed by trust based recommendations.

**App Store Optimization**

App store search is the single largest source to discover apps [ExhibitAD]. Since the launch of the Apple app store, apps ranked higher in the store have shown maximum downloads [77]. This is due to the fact that app store ranking relies heavily on downloads and also that users do not explicitly search for apps beyond the predetermined top ranked set highlighted in the app stores. Up to 75% of users have also downloaded apps based on the ranks even without hearing about the apps [78]. Each App store relies on different factors for its ranking algorithm apart from a set of common attributes. Subsequently developers optimize elements such as app icons, description and title to gain higher visibility within most of the app store search results. Developers should also take advantage of individual policies such as most Android Stores allowing changes in descriptions and tags without triggering resubmission [79] to experiment and verify the effects on app store rankings. App Store Optimization tools provide good guestimates of downloads and how to increase the same by customizing key app attributes along with capabilities such as competitor analysis based on keyword searches.
a. AppClover

AppClover is committed to deliver relevant information used by top app developers to develop and monetize apps. They bring in the experts to increase app downloads. AppClover provides paid App Store Optimization recommendations such as display name recommendation, optimized description and competitive research. In skilled translators provide localization and multiple language support. The App Icon design services provides up to 3 icons to choose from with final customization for both Apple App Store as well as the Play Store. Apart from this professional video and published review support can help gain visibility. These paid services that take up to 2 weeks for reviewing the app content, can be used even before launch to create an effective marketing strategy.

b. Appnique

Understanding the right keywords and associating terms used by potential customers Appnique’s scoring algorithm aids in App discovery. Appnique analyzes user metadata through text mining to perform App Store Optimization [80]. The dashboard comes with dynamic support providing details of changes potential competitors made in their keywords and effects on rankings. Publishers are charged between $50 and $1000 per month. Premium services such as daily email reports and unlimited tracking are priced much higher. Compared to other ASO tools Appnique is supposedly steeply priced with additional charges to monitor multiple keywords [81].

c. MobileDevHQ

MobileDevHQ currently hosting a rich database of around 2M apps and 350K keywords [82] provides App Store Optimization solutions. After analyzing a customer’s app, type of customers and competition MobileDevHQ provides recommendations on keyword and description customization to improve App store ranking. Priced from as low as $14 per month, services such as top chart reports and competitor tracking enable individual developers to optimize their apps.

App Store Optimization though resembles Search Engine Optimization is still nascent [83] with few players. Developers nevertheless are better off customizing app attributes through experimentation to fulfill an essential prerequisite for install – "Discovery".
Stage 4: Monetization Partners

Goldman Sachs reports a dramatic change in the computing industry with the once ruling WinTel falling to the rise of smartphone and tablet devices dominated by Apple iOS and Google Android [Exhibit AE]. Apple tightly controls the iOS ecosystem right from the hardware to the app distribution and approval. Even its major competitors such as Amazon, Microsoft and Google [84, 85] make most of their apps available in the iOS platform, making iOS an oasis of great applications along with its own individual platform benefits such as Siri and FaceTime. With the advent of new services such as Roku and Rdio there have been experts emphasizing it would be in Apple’s best interest to open its apps to other competing platforms such as Android [85]. Amazon, Google and Microsoft unlike Apple are primarily software and service companies interested in monetizing their apps directly or gaining leverage through data collection. Apple on the other hand is interested in making iOS the most sought after platform to fortify its hardware business model. On the other hand app studios such as Zynga, Rovio, which have a strong user base, are more interested in enhancing their life time value of customers. Popular apps such as Angry Birds from Rovio have generated more than 250 million dollars in revenue [86]. Individual app developers typically fall in two categories – make a few thousand dollars as a supplementary income or spend thousands of dollars to create awesome apps with the hope to make millions [87]. Forbes estimates have put the total revenue generated by the app economy for Q1 2013 to the tune of 2.2 billion dollars [88]. How exactly do these apps make money and can app developers create a sustainable profitable business model? App revenues are generated primarily by either charging its users either up front for purchase or during its lifetime through sale of in-app inventory. App developers also monetize by powering the app ecosystem by lending itself as a medium for advertisements.

Pricing

On an average 90% of the apps [Exhibit H] are freely distributed and rely on post purchase monetization. The remaining 10% of the apps have to price their apps striking the right balance between the “most money” and “most customer” price [89]. iOS has generally shown a higher user acceptance to paid apps. The price distribution for the most popular apps [Exhibit Q] though has shown a much wider range, the average price points for apps in general across iOS and Android [Exhibit AF] is around $3.18 for Apple app store, $3.06 in
Play and $2.84 on Amazon [90]. Given increased competition pushing the app price lower [91]; developers are better off experimenting with prices instead of holding on to a single pre-determined price point. Downloads have considerably been affected by price changes and iPhone especially has shown significant reaction to price changes [92]. Discount programs and putting app on sale not only enables app discovery but has also shown considerable revenue increases [ExhibitAG]. Freemium is also a popular pricing mechanism with users getting hooked to the app and paying for advanced features or more game play. iOS apps have shown a faster revenue growth on Freemium based apps [ExhibitAH]. Finally as highlighted by Canalsys, there has been a shift by popular apps to a Freemium model [93].

**In-App Purchases**

In-App Purchases provides app developers the flexibility to offer digital content, functionality, services and subscriptions with their apps. It’s applicable for both free as well as paid apps. Apple restricts app developers to sale of items to either consumables and non-consumables or auto-renewable, free and non-renewing subscriptions only. Among various digital content, virtual currency is by far the single largest in-app purchase revenue generator [ExhibitAI]. Recently both Android and iOS have strengthened their in-app purchase protection through means of password lock to prevent incidents were children have raked up huge bills within minutes through in-app purchases [94]. All major players such as Amazon, Apple and Amazon provide SDK and API support for in-app purchases. With forecasted revenues of up to 64% of the total app revenue in-app purchases is expected to be the dominant app business model [95].

**Payment Solution Providers**

Apple provides the Storekit framework while In-App billing is the service provided by Google Play to enable payments for in-app purchases. Third party payment solution providers offer support ranging from virtual inventory management to a variety of purchase options such as carrier billing to ensure a seamless user transaction. Apart from ensuring maximum successful conversions the payment providers also enable app developers process transactions across geographies. Android developers are faced with an additional disadvantage of the need to juggle with multiple payment providers as payment services are not compatible across markets [96].
a. Boku

Boku is a mobile payments solution on a mission to provide frictionless transaction system through the mobile phone number. It had initially provided checkout provision to purchase digital goods on the service. By directly integrating with carrier APIs Boku is in a position to lower transaction costs that would typically eat away up to 40% of the revenue [97]. Through its partnership with around 240 carriers the payment support spans to around 66 countries. Boku provides integration with merchants of the likes of Facebook and Zynga. The 1-Tap SDK has been developed to provide in-app purchase payment support for Android developers. This SDK works on carrier billing and includes support for around 32 languages and 40 currencies.

b. Braintree

Braintree has been powering the payment support for high growth companies such as Rovio and Airbnb. It is estimated to process more than $2 billion on mobile transactions for over 4000 merchants [98]. Braintree provides payment options in up to 40 countries accepting over 130 currencies. The storage of credit card information in its vault and reliance on token matches without actual transfer of credit card information has created a robust and secured platform easily adopted by app developers such as Level Up [99]. Securing credit card information in the vault has also enabled a seamless subscription pricing model accommodating for changing renewal dates for customer of the Animoto app [100]. Venmo Touch, which boasts of integration within 15 minutes, makes payments seamless enabling saved card credentials to be utilized in other apps. Service is currently priced at 2.9% plus 30 cents per transaction with an option of custom pricing for heavy transactions.

c. Text2Pay

Text2Pay provides a quick and easy means on payment for virtual good by removing out forms and credit information set up. It offers a comprehensive API to customize a unique billing platform. BitCoin - a peer to peer social currency is also accepted by Text2Pay. Tap2Pay currently live in 43 countries is Text2Pay service offering payment solutions via direct carrier billing services and premium SMS to sites and apps. It is available for all mobile platforms and can automatically detect the platform the user is on.
d. Zong

Zong is a leader in mobile payments for virtual goods and was one of the main payments partner to purchase Facebook credits [101]. Zong has around 3.2 billion users via 250 carriers across the world. It was acquired by eBay to enable PayPal users fund their accounts directly through their phone [101]. The Zong Payment Index released every month tracks spending patterns by its user base. Segmented by its top 40 markets the report reflects customer’s willingness to use their phone to buy goods and cost of mobile payments as determined by operator’s fees [102]. 1-Touch Payments by Zong, first adopted by Papaya mobile [103] brings in the carrier billing option to the Android market.

e. Zooz

Zooz platform enables merchants to deliver the ultimate checkout experience. To ensure higher transaction rates, Zooz continuously optimizes its screen based on insights generated from the platform. The Zooz SDK is available for Android, HTML5 and iOS. Developers also have the option of using Zooz plugins with other app developing platforms such as Basic4Android and Phone Gap. Recently Zooz has launched an innovative In-Ad Payments solution that streamlines the checkout process and increases the click-to-buy conversions of mobile banner ads [104].

Advertising

Continuous rise in the time spent on mobile apps has created an increased demand for ad inventory. Gartner estimates the growth of mobile ad revenue at 400% reaching an estimated $24.5 billion worldwide [105]. Advertising has subsequently been the most popular monetization strategy for app developers [ExhibitG]. But, when app developers distribute apps for free choosing ad based monetization there is a significant dollar value left on the table right at the time of purchase. This drives a high CPM value to regain lost purchase revenue [ExhibitAJ]. Given this scenario in-app advertising must be weighed as an alternative based on the genre of app and brand being developed. Analytics firm Pinch Media, now merged with Flurry, cites apps with high frequency and duration of usage such as weather utilities and sticky games are most suitable for in-app advertising [ExhibitAK]. With the multitude of ad supply options, App developers should control the use of advertising based on user’s progression through the app and brand creation [106].
Apart from genres and segments what really is required for a developer to be better equipped for monetization is to understand the landscape of the advertising industry. This huge market is structured around multiple players such as Ad Networks, DSPs and SSPs each enabling ad placements on the right mobile apps and eventually targeted to the users [Exhibit AL]. Real time bidding enables each ad transaction to pass through these players with an exchange choosing the highest bid ad from the ad networks or SSPs [Exhibit AM]. The subsequent sections details on the various players involved within the in-app advertising industry.

**Ad Exchange**

Ad Exchanges are technology platforms that facilitates sale of aggregated ad inventory from advertisers to publishers and ad networks. The Ad Exchanges have been evolving from possessing only remnant inventory to powering the sales of billions of ad impressions. Using an Ad Exchange enables integration with multiple ad networks and provides higher fill rates for developers. Moreover by promoting competition between ad networks and publishers Ad Exchanges provide the best ad matches through an auction based system [107]. The fundamental disadvantage of exchanges is that they complicate the whole ecosystem and developers spend additional time and resources to optimize for individual ad networks [108]. The rise of private ad exchanges has been cited by industry experts as a mark of the mobile advertising industry maturing [109].

**a. Mobclix**

Mobclix with its light SDK for both Android and iOS aims to connect ad networks with developers offering total transparency into ad placements. Developers can either share their existing developer accounts with ad networks or rely on Mobclix to create one. Mobclix uses a yield optimization engine to ensure highest developers are gaining the best eCPMs across multiple networks. Apart from multiple ad networks that Mobclix partners with developers can leverage the open allocation feature to choose a percentage distribution for non-partnered ad networks. Allocation to networks can be customized to either developer pre-determined percentage split across networks or priority sequencing across ad networks per ad request. Mobclix partners with 38+ ad networks and manages payments for developers except for iAD, AdMob and Millennial. Working with 18,500 developers Mobclix provides reach for the partnering ad networks to serve ad inventory. The developer dashboard provides
insights such as revenue across networks and ad types, session time, number of
impression and CTR rates to enable developers to customize the distribution
effectively.

b. Smaato

Smaato manages more than 20 billion ad requests per month by partnering with over
11k publishers and 80+ ad networks through its optimization platform – Smaato Open
Mobile Advertising. Partnering with Vertica – a leading analytics firm, enables
Smaato to analyze data in real time to optimize advertising revenue [110]. Smaato is
equipped with an automatic ad optimization and also has the flexibility for developer
override through its mediation solution. Apart from the support to a plethora of ad
networks and DSPs, Smaato has its own ad network fully equipped with carrier,
device, time zone and location based targeting to enable advertisers to create ad
campaigns. With its House Ads and Self Sold Ads features enabled in the mediation
solution developers are able to create brand awareness by redirecting traffic to their
own products. Smaato SDK is available across multiple platforms such as iOS,
Android, Windows Phone and Blackberry. Developers can view reports from all the
ad server through the analytics solutions which breaks down the data by
demographics, device and unique users.

DSP

Demand Side Platforms operate on behalf of advertisers and agencies and provide a
centralized media to buy inventory. They typically use the information in the ad requests
along with third party data sources to provide the most relevant ad match for each request
[111]. Through higher ad transparency and greater control DSPs are useful to both big brands
as well as small app developers [112]. By providing the best matching ads for bid requests
they play a crucial role in the real time bidding process of ad exchanges. DSPs enable
advertisers to get maximum possible conversions, which could be app downloads in case of a
CPI model, by systematically learning how to bid based on the inventory available.

a. Human Demand

Human Demand is focused in helping small developers advertise their apps.
Developers have an option of just providing their app url and all relevant information
is extracted. Even campaign creation is automated and it starts rolling on paying a $50 fee. Through its partnership with AdTruth – a leader in device recognition, developers can re target segmented audience [113]. Developers have the provision to view costs per install and campaign costs per publisher per app. The granular reports provide real time reports per ad. The current CPI is hovering around $1.5 [114]. Building a blacklist and blocking non performing publishers, which it identifies from its pool of roughly 35 billion ad requests Human Demand both counters click frauds as well as provides high revenue performance [115].

b. MdotM

MdotM specializes in performance based advertising and helps advertisers reach millions of iOS and Android users via display advertising. After trying multiple approaches MdotM has integrated AdTruth’s tracking technology with its own SDK to track app events and performance [116]. The universal tracking SDK enables click tracking and also provides advertisers reach users through cross device retargeting. MdotM direct deals offer app developers the option to start publishing ads within 5 minutes by grabbing the click through and banner URLs. Through its burst campaigns and effectively managing bids, clicks and conversions MdotM has successfully driven app installs for apps such as Expedia and other gaming apps.

c. StrikeAd

StrikeAd provides a mobile specific DSP platform – StrikeAd Fusion that allows agencies and exchanges to manage multiple ad campaigns. Developers can buy mobile media in real-time based on a minute wise evaluation across hundreds of campaigns [117]. It has recently launched a dedicated division called StrikeAd Engage for agencies and brands to leverage on rich media opportunities [118]. The firm particularly claims to have an efficient geo targeting capabilities to engage users in optimal locations. With its partnership across multiple exchanges such as doubleclick, right media and Nexage it powers around 4 billion impressions on a monthly basis.

Given the fact that the current existing ad networks are blind networks, the DSP will probably play a much bigger role with their capabilities to leverage user data to provide better targeted ads and ensuring a cost effective user acquisition channel for small developers.
SSP

Sell or Supply Side Platforms originated as tools for publishers, primarily managing relationship with ad networks, to sell their remnant ad inventory have now evolved to sophisticated platforms to enable RTB [119]. A plethora of advertisers some of whom do not directly deal with publishers and each with their own unique pay outs provide ample revenue stream options but also a daunting task of management. The SSPs work with publishers to optimize utilization of publishers’ online media space – basically the ad slots. Multiple sources of demand can be managed and revenue optimized for developers through the use of SSPs. The above section that covered DSPs and the subsequent section covering Ad Networks procure ad supply from the SSPs. Through insightful reports on bidding rates and actual procurements SSPs are an important cog in this ecosystem. Prominent technology players such as Google through its acquisition of Admeld [120] and AOL with the launch of its suite “Exchange” [121] have established their presence in the Supply Side Platform space.

Ad Network

Ad Networks are companies that provide a single channel for publishers to supply ad slot inventory that can be fulfilled by the demand aggregated from various advertisers. They are evolving as a technology platform providing advertisers and publishers with features such as targeted advertising, fatigue control and fraud detection. Most ad servers provide customized SDKs to app developers that abstract the means to request for ads. Based on requests and their algorithmic matching capabilities they serve billions of impressions. Currently multiple call to actions, revenue streams such as CPM or CPI campaigns along with highly interactive and rich media ad formats with higher CTRs are available increasing the revenue for advertisers while providing maximum conversions from the advertisers perspective. Most ad servers provide reporting and analytical capabilities for both publishers and advertisers to customize campaign spend, frequency of display, time and demographics targeting to further enhance and optimize revenue or ad campaign goals.

Based on the business models Ad networks are broadly categorized as blind networks, premium networks, incentivized networks and local targeted ad networks [122]. While blind networks have high volume of publishers providing both performance and brand advertising, the incentivized networks work on rewards and loyalty programs for users. On the other hand the local networks provide more targeted search and location based display [123].
The number of ad networks is immense [124] and there are new ad networks coming up continuously [125]. Apart from low revenue payout some of these smaller ad networks have also off late raised concerns on privacy issues [126] with user generated data collected from the integrated SDKs being sold out to third party without consent from actual end users [ExhibitAN]. There have been steps taken up by federal agencies to ensure apps provide sufficient information on what data is collected and how it will be used. Developers eventually have the onus of integrating with reputed ad networks to build a reputable brand while increasing their cash inflows through ad based monetization.

a. AdMob

Born from the founders need to build traffic to his web site, AdMob post acquisition by Google has grown to become the largest mobile ad network [128]. Currently AdMob support Android, iOS and Windows Phone in around 160 countries. The monthly Mobile Metrics report is a data snapshot highlighting trends in its network and along with the AdMob Analytics app developers can customize their site traffic utilization. Through its support from advertising giant Google, publishers are well positioned as unsold inventory is filled by AdSense ads [129] while developers can reach large volumes of other app developers to promote their apps. The conversion optimizer used in AdWords is soon to be integrated with AdMob to ensure higher conversions [130]. Finally, developers still working with multiple ad networks can leverage the mediation feature to distribute traffic appropriately [131]. Studios such as Kronos and Backflip have successfully leveraged their free apps to promote new premium apps through the house ad functionality.

b. Appnext

Appnext is a multi-platform cross promotion network primarily providing monetizing opportunities for developers by concentrating ad display on the exit traffic [132]. By showing ads to only users who have not spent any money during the gameplay appnext relies on app relevance to ensure maximum conversions [133]. While the non-intrusive ad formats lets app developers monetize the CPI model ensures app developers are spending money only for new user acquisitions. Appnext primarily focused on mobile and social games has enabled high CTRs especially in the Facebook platform [134, 135].
c. iAd

iAd is the Apple owned mobile advertising platform launched along with iOS 4.0 to enhance the in-app mobile advertising experience for iOS developers. iAd was the first advertising platform for iOS to ensure ad interaction without leaving the context of the mobile app [136]. Apple initially charged an outrageous $1 million entry fee for the platform [137] continuously reducing the price to the current minimum levels of $100k [138]. Further it changed the initial 60 - 40 revenue share also to the current rate of 70 - 30. Through its new iAD workbench app developers can leverage Apple’s knowledge of its user base to provide targeted ads. This new feature provides developers an option to use auto targeting or manual based customization. iAD currently contributes a very miniscule portion of the Apple revenue which the firm is keen in changing by chartering into new grounds such as audio ads for iRadio [139].

d. InMobi

InMobi is a fast growing technology company providing advertising monetization support to multiple platforms with a reach of around 700 million smartphones [140] in over 165 countries. It has recently been named as one of the 50 most innovative companies by MIT technology review [141]. The acquisition of Sprout currently rebranded as InMobi Studio gives its advertisers a powerful tool simplifying creation of highly interactive rich media ads that have shown high CTRs [142]. Apart from multiple ad formats complete with fatigue modeling, mediation support and wide range of targeting opportunities InMobi aims to provide a complete suite of solutions for app developers right from a payments solution called Smartpay to its latest app distribution platform AppPublish – rebranded post Metaflow acquisition. Developers finally can leverage the Ad Tracker, which works across multiple ad networks; and real time reporting dashboard to optimize their advertising campaigns.

e. Jumptap

With more than 20 third party data providers and a rich 100 million unique audience profile Jumptap is a targeted mobile advertising network. It is primarily leveraging the new consumer behavior of multi-screen switching through an algorithmic approach of matching ads and audience [143]. Developers can choose from its high fill rate banner ads or the engaging rich media ads which yield a high eCPM. Through its closed loop
reporting advertisers can gain top-tier insights into specific audience segments optimizing their ad campaigns.

f. Millennial Media

Millennial Media, which powers some of the largest companies, is the leading independent mobile advertising company with its display-ad market share towering even above Apple \[ExhibitAO\]. mMedia is the primary monetization solution from Millennial Media. The dashboard allows advertisers to mediate among multiple ad networks and allocate budget for house ads. To strengthen its user targeting Millennial Media is integrating with Factual to provide location sensitive information for its publishers and advertisers [144]. Continuously innovating Millennial Media is launching a suite of video advertising solutions specifically for brand positioning. Each of these ad formats are further supported with rich reporting complete with details such as time of interaction [145]. Industry leaders such as Zynga have relied on partnering with Millennial Media to monetize their apps across both Android and iOS platforms.

g. Mobpartner

Mobpartner is mainly a mobile affiliate platform that operates on a CPA basis. It has generated more than 10 million actions through its partnerships with advertisers such as EA and FunMobile. The actions supported range from subscription, registration and download to lead generations. Advertisers decide the price for each action type while publishers can choose the kind of action they wish to entertain within their apps. Mobpartner provides high CTRs through its notification ads for opted-in loyal users. Unlike other firms providing only a dashboard, the company has developed its own application for developers to keep track of their statistics at real time.

The advertising ecosystem is continuously evolving with development of new ad formats and stronger targeting providing better conversion for publishers and monetization opportunities to developers. With Apple introducing the “Limit Ad Tracking Feature” in iOS6 there may be a minor setback in targeted advertising at least for iOS [146] but it’s far from deterring growth in this industry.
Stage5: LifeCycle Enhancers

Beyond downloads and initial revenue through in-app purchases and advertising, developers need to create a sustainable business model most suitable for their mobile app. Most often than not, users utilize the apps in ways not anticipated by the developers [147]. The pirate metrics as explained by Dave McLure [ExhibitAP] is a good basis to gain valuable insights to this unique customer behavior. Similar to web analytics several app analytics firms have mushroomed providing dynamic dashboards with real time audience data and usage segmentation. Most developers procure these data but do not act. App developers are better equipped in customizing and realigning their distribution and monetization strategy based on analytical data procured from these sophisticated tools. Some of the fundamental questions that form the foundation of this strategic realignment include – what are the patterns of dips and spikes in traffic, find why people are leaving and retain them, validate conversions at larger scale, plug inconsistencies and replicate across demographics [148].

a. Apptentive

Apptentive has turned customer review process on its head by integrating user feedback right into the app [149]. The customers ranging from independent developers to leading brands such as Intercontinental Hotels Group require just 15 minutes for the SDK integration which is currently available for iOS, Mac OS and android. Customer engagement is enabled through optimized ratings, in-app feedback and surveys. The company is focused in enabling stronger communication between developers and users through the use of real time feedback enabling bug fixes and new feature development [150]. App developers have the flexibility to customize and modify the application code that is publicly available through GitHub. Basic version enabling feedback and interactions with up to 5k monthly active users is free and it gradually moves to the range of $299 and above for professional versions.

b. Countly

Countly is an open source real time analytics platforms primarily focused in collecting app data from mobile phones. Apart from being available for Android and iOS it has recently launched its SDK for BlackBerry [151]. By providing an easy to use, eye catching and customizable visualization app developers can leverage end-user statistics such as session time, popularity of versions, popular in-app inventory and
payment paths to optimize app performance across different stores and demographics. The easy to integrate SDK also provides developers the option of creating custom events with segmentation capabilities. Countly also enables Push Notifications and deep dive analytics per device – user pair. Finally, developers clearly stand to benefit from their unique pricing mechanism oriented per session as opposed to the well-established user or app based pricing.

c. **Flurry**

Information and business insights gathered by collecting upwards of 2 TB of data through 2.8 billion app sessions per day, Flurry is the undisputed leader in app analytics. Not only leading studios such as Rovio and Zynga but also thousands of individual developers rely on Flurry for user insights. The company claims to be instrumental behind a quarter of the apps downloaded from iTunes App Store and Google Play each day [152]. Flurry provides in-depth user behavior tracking including aspects such as age and device utilization [153]. By creating multiple personas with the flexibility of customizing new ones, Flurry Personas enable developers and advertisers utilize user segmentation for both targeted advertising as well as feature development [154]. Early this year Flurry strengthened its analytical platform further by including crash analytics and user acquisition analysis [155]. Flurry is slowly spreading itself both beyond analytics through its other offerings such as its RTB platform - Flurry Marketplace [156], targeted user ad network – AppCircle [157] as well as newer channels such as Blackberry [158] and cloud based offering through AppCloud [159].

d. **Kontagent**

Kontagent is the leading analytics platform primarily targeted at social games. Bearing few studios such as Zynga, social gaming apps do not have a home grown analytics platform but their sustainability is solely based on knowledge of user behavior. Its kSuite Analytics platforms offer developers monetization optimization opportunities through device tracking, user acquisition visibility and app engagement insights. Social networks such as Quepasa are relying on kSuite to improve user engagement and retention [160]. Kontagent’s data scientist aid in streamlining social economics model for game developers based on user behavior data collected from
billions of user sessions across multiple social apps. Funnels further provide developers concentrated areas of refinement based on user progression and potential drop off zones [161]. Cohort explorer and Revenue Analysis enable creation of user tranches for comparisons and determining lifetime value for user groups respectively [162]. The company also provides a kSuite DataMine tool aimed at database experts to customize queries and extract interesting information [163].

Conclusion

http://www.guidetothegalaxy.com/#/developersguide/
Exhibits

**Exhibit A: Time Spent per App Category**

WW iOS & Android Smart Device Time Spent per App Category

![Pie chart showing time spent per app category]

*Source: Flurry Analytics, November 2013*

**Exhibit B: Computing Devices – Yearly Sales**

Computing Devices - Yearly Sales

![Line chart showing sales of tablets, smartphones, and PCs]

*Source: Gartner, Bupa Market Financials*

**Exhibit C: Download distribution of Android apps**

Download distribution of Android apps, April 6, 2013

![Bar chart showing download distribution]

*Source: AppBrain*
Exhibit D: The app developer journey

The app developer journey
Jobs to be done & tools available

1. plan
   - User storying
   - Market research
   - App-store analytics

2. develop
   - Cross platform tools
   - Beta-testing tools
   - A/B testing tools
   - Beta testing as a service
   - Test frameworks

3. reach
   - App discovery services
   - Cross-promotion services
   - App store analytics
   - Push notifications

4. monetize
   - Ad networks
   - Ad exchanges
   - In-app purchase tools
   - In-app billing

5. support
   - Crash analytics & bug tracking
   - Performance management
   - Customer support
   - User Analytics

---

Exhibit E: App LifeCycle

**App LifeCycle**

- **Plan**
  - App Store Analytics
  - Data
  - App Figures

- **Development**
  - UI Development
  - Security
  - InApp App
  - Cross Platform
  - Corona Lab

- **Discovery**
  - App Store
  - Platform Stores
  - Carrier Stores
  - Cross Platform
  - Manufacturer Stores

- **Monetization**
  - Payment Solutions
  - Google Checkout
  - Advertising Solutions
  - AdMob
  - InMobi
  - Millennial Media
  - InApp Purchase Tools
  - Boku
  - Fortumo

---

Licensed under Creative Commons Attribution 3.0 License
Exhibit F: Downloads & Revenue Per Category

Downloads & Revenues Per Category
Apple App Store And Google Play Aggregated - Categories With Less Than 2% Excluded


Exhibit G: Revenue Model Distribution

Advertising most popular revenue model but subscription pays better

<table>
<thead>
<tr>
<th>Popularity</th>
<th>Most frequently used on</th>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developer Economics Jan 2013</td>
<td>38%</td>
<td>53%</td>
</tr>
<tr>
<td>Developer Economics June 2012</td>
<td>33%</td>
<td>53%</td>
</tr>
<tr>
<td>Advertising</td>
<td>Pay per download</td>
<td>In-app purchases</td>
</tr>
<tr>
<td>32%</td>
<td>34%</td>
<td>19%</td>
</tr>
<tr>
<td>iPhone</td>
<td>37%</td>
<td>iOS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Licensed under Creative Commons Attribution 3.0 License
Exhibit H: Mobile App Store Downloads

Table 1. Mobile App Store Downloads, Worldwide, 2010-2016 (Millions of Downloads)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Downloads</td>
<td>22,044</td>
<td>40,599</td>
<td>73,280</td>
<td>119,642</td>
<td>188,946</td>
<td>287,933</td>
</tr>
<tr>
<td>Paid-for Downloads</td>
<td>2,893</td>
<td>5,018</td>
<td>8,142</td>
<td>11,853</td>
<td>16,430</td>
<td>21,672</td>
</tr>
<tr>
<td>Total Downloads</td>
<td>24,936</td>
<td>45,617</td>
<td>81,422</td>
<td>131,695</td>
<td>205,376</td>
<td>309,606</td>
</tr>
<tr>
<td>Free Downloads %</td>
<td>88.4%</td>
<td>89.0%</td>
<td>90.0%</td>
<td>91.0%</td>
<td>92.0%</td>
<td>93.0%</td>
</tr>
</tbody>
</table>

Source: Gartner (September 2012)

Exhibit I: 80% of Mobile time spent in Apps

Exhibit J: Mobile Users surpass desktop Internet Users

Source: [9]
Exhibit K: App user Retention

iOS & Android App User Retention, Months Since Acquisition (%)

Source: Flurry Analytics & Estimates


Exhibit L: Game Type By Usage and Retention

Game Type by Usage and Retention

Source: Flurry Analytics, Top 200 iOS Games tracked by Flurry, March 2013
Exhibit M: Push Messaging's impact on App User Retention

Source: http://www.insidemobileapps.com/2012/05/31/how-to-double-user-retention-with-push-notifications-urban-airship-shares-best-practices/

Exhibit N: How to Become a Mobile App Developer

Exhibit O: Time Distribution of an App Developer

Unmasking the App Developer
A survey shows that app creators are, on average, young males and how much make much money.

24% make less than $15,000 from app development
12% make $100,000 or more

2 years in less

39% said app development was their full-time job
38% are college graduates
40% work alone
27% work at a person firm
54% said they were based in North America

Source: GigCMq 72 web-based survey with 392 respondents, Sept. 2012
Graphic by Lee Garvey/The Wall Street Journal

Time Spent Within App Development
- New Programming
- Updating Programming
- Promoting (Website/Twitter/Facebook)
- Learning
- Graphics
- Brainstorming/Daydreaming

http://peakmobiledesigns.com/time-spent-within-app-development/

Exhibit P: Budgeting for App Development

How To Budget For iPhone and Google Android App Development

<table>
<thead>
<tr>
<th>App Type</th>
<th>Stage</th>
<th>Single Platform</th>
<th>Two Platforms</th>
<th>Three Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>Design</td>
<td>From £2K - £3K</td>
<td>From £3K - £5K</td>
<td>From £4K - £6K</td>
</tr>
<tr>
<td></td>
<td>Development</td>
<td>From £3K - £5K</td>
<td>From £5K - £8K</td>
<td>From £6K - £9K</td>
</tr>
<tr>
<td></td>
<td>Testing</td>
<td>From £3K - £5K</td>
<td>From £5K - £8K</td>
<td>From £6K - £9K</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>From £8K - £13K</td>
<td>From £13K - £21K</td>
<td>From £16K - £24K</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>App Type</th>
<th>Stage</th>
<th>Single Platform</th>
<th>Two Platforms</th>
<th>Three Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data List</td>
<td>Design</td>
<td>From £2K - £3K</td>
<td>From £3K - £5K</td>
<td>From £4K - £6K</td>
</tr>
<tr>
<td></td>
<td>Development</td>
<td>From £7K - £11K</td>
<td>From £11K - £17K</td>
<td>From £14K - £21K</td>
</tr>
<tr>
<td></td>
<td>Testing</td>
<td>From £3K - £5K</td>
<td>From £5K - £8K</td>
<td>From £6K - £9K</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>From £12K - £19K</td>
<td>From £19K - £30K</td>
<td>From £24K - £36K</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>App Type</th>
<th>Stage</th>
<th>Single Platform</th>
<th>Two Platforms</th>
<th>Three Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex</td>
<td>Design</td>
<td>From £3K - £5K</td>
<td>From £5K - £8K</td>
<td>From £6K - £9K</td>
</tr>
<tr>
<td></td>
<td>Development</td>
<td>From £10K - £15K</td>
<td>From £15K - £23K</td>
<td>From £20K - £30K</td>
</tr>
<tr>
<td></td>
<td>Testing</td>
<td>From £4K - £6K</td>
<td>From £6K - £9K</td>
<td>From £8K - £12K</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>From £17K - £26K</td>
<td>From £26K - £40K</td>
<td>From £34K - £51K</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>App Type</th>
<th>Stage</th>
<th>Single Platform</th>
<th>Two Platforms</th>
<th>Three Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise</td>
<td>Design</td>
<td>From £4K - £6K</td>
<td>From £6K - £9K</td>
<td>From £8K - £12K</td>
</tr>
<tr>
<td></td>
<td>Development</td>
<td>From £20K - £30K</td>
<td>From £30K - £45K</td>
<td>From £40K - £60K</td>
</tr>
<tr>
<td></td>
<td>Testing</td>
<td>From £8K - £12K</td>
<td>From £12K - £18K</td>
<td>From £16K - £24K</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>From £32K - £48K</td>
<td>From £48K - £72K</td>
<td>From £64K - £96K</td>
</tr>
</tbody>
</table>

Source: http://waracle.net/how-to-budget-for-iphone-and-google-android-app-development-part-2/
Exhibit Q: Price Distribution among most popular apps

**AVERAGE PRICES AMONG THE MOST GROSSING APPLICATIONS AND CATEGORY POPULARITY**

Source: [20] The impact of app discounts and the impact of being a featured app - Distimo Publication January 2012

Exhibit R: Successful revenue conversions of app developers

Source: http://arstechnica.com/apple/2012/05/ios-app-success-is-a-lottery-and-60-of-developers-dont-break-even/
By Chris Foresmanry – ArsTechnica
Exhibit S: Stages of App development

Source: http://www.crispycodes.com/mobile/technology.php

Exhibit T: Revenue per app-month by development time

<table>
<thead>
<tr>
<th>Development Time</th>
<th>Average Revenue per App-Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1 man-month</td>
<td>$484</td>
</tr>
<tr>
<td>1-3 man months</td>
<td>$2,206</td>
</tr>
<tr>
<td>4-6 man months</td>
<td>$3,752</td>
</tr>
<tr>
<td>7-12 man months</td>
<td>$5,400</td>
</tr>
</tbody>
</table>

Source: Developer Economics 2012 | www.DeveloperEconomics.com
Licensed under Creative Commons Attribution 3.0 License

Exhibit U: Consumer reaction to poor mobile app experiences

<table>
<thead>
<tr>
<th>Consumer Reaction</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less likely to use the mobile app</td>
<td>48%</td>
</tr>
<tr>
<td>Switch to competitor's mobile app</td>
<td>34%</td>
</tr>
<tr>
<td>Tell others about poor experience</td>
<td>31%</td>
</tr>
<tr>
<td>Less likely to purchase from that company</td>
<td>31%</td>
</tr>
<tr>
<td>Give the mobile app a low rating</td>
<td>26%</td>
</tr>
<tr>
<td>Have a negative overall perception of company</td>
<td>24%</td>
</tr>
<tr>
<td>Less likely to go to that company's site</td>
<td>21%</td>
</tr>
<tr>
<td>Contact company's customer service</td>
<td>17%</td>
</tr>
<tr>
<td>Would go to the company's mobile website</td>
<td>17%</td>
</tr>
<tr>
<td>Announce on social media</td>
<td>11%</td>
</tr>
<tr>
<td>Would not take any action</td>
<td>6%</td>
</tr>
</tbody>
</table>

Source: http://internet2go.net/news/User+Experience [27]
Exhibit V: Technology Requirements by Platform

<table>
<thead>
<tr>
<th>Mobile OS Type</th>
<th>IDE</th>
<th>Skill set Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple iOS</td>
<td>Xcode</td>
<td>C, Objective C</td>
</tr>
<tr>
<td>Google Android</td>
<td>Eclipse</td>
<td>Java</td>
</tr>
<tr>
<td>RIM Blackberry</td>
<td>Eclipse</td>
<td>Java (J2ME flavoured)</td>
</tr>
<tr>
<td>Symbian</td>
<td>CodeWarrior</td>
<td>C, C++, Python, HTML/CSS/JS</td>
</tr>
<tr>
<td>Windows Mobile, Window 7 Phone</td>
<td>Visual Studio 2010, 2008, 2005, eMBEDded VC++ (free)</td>
<td>NET</td>
</tr>
<tr>
<td>HP Palm Web OS</td>
<td>Eclipse</td>
<td>C, C++, Pascal</td>
</tr>
</tbody>
</table>


Exhibit W: Problems with mobile apps

Have you had problems with a mobile app within the last 6 months? If so, what types?

Exhibit X: Google Play outruns Apple App Store

Source: http://internet2go.net/news/User+Experience [27]

Exhibit Y: China’s App Store Market

Exhibit Z: Appbackr Distribution Model

Source: http://www.appbackr.com/faq

Note: Appbackr has a distribution agreement chart based on different price and types of apps.

Exhibit AA: Revenue generated by Apps in Local Language

Source: http://blog.codengo.com/2012/07-going-local-the-importance-of-language-for-mobile-app-revenues/
Exhibit AB: High Retention Rate by AppFlood

7 Day Retention Rate:
AppFlood vs Incentivized Network

<table>
<thead>
<tr>
<th></th>
<th>AppFlood</th>
<th>Incentivized Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: http://www.mobyaaffiliates.com/blog/appflood-launches-commission-free-mobile-cross-promotion-network/

Exhibit AC: 5th Planet benefits from Tapjoy's PPE solution

Retention Rates
- Day 1 - Tapjoy PPE users' retention rates
- Day 7 - Tapjoy PPE users' retention rates

Monetizing Users
- Organic
- Tapjoy PPE

ARPU
- Organic
- Tapjoy PPE


Exhibit AD: How Apps are discovered

Source: Nielsen, Q3 2011
Exhibit AE: Re-Imagining Computing Operating Systems


Exhibit AF: Price Points across app stores

Sliding Scale | The majority of apps in the Apple and Google stores are free downloads

Exhibit AG: Revenue Effect of Putting App on Sale

+52% / +19%

Change in Revenue:
- >= 100%
- >= 50%
- <= 0%
- <= -20%

Proportion of applications:
- 15%/18%
- 24%/17%
- 39%/49%
- 18%/31%

DISTIMO
Exhibit A1H: Premium vs Freemium Revenue Growth

iOS Revenue Growth Global 2011 - 2012


Exhibit A1I: Dollars Spent on Virtual Goods

Source: Flurry Analytics, 2010-11, n = 57M transactions, r = 2.1M DAUs

Exhibit A1J: Math for Paid vs Free App

\[
\text{Paid app revenue} = \text{A} \times \text{B}
\]

\[
\text{A} = \text{App sales price} = \$0.99
\]

\[
\text{B} = \text{Developers share of sales price} = 70\%
\]

\[
\text{Free app revenue} = \text{C} \times \text{D} \times \text{E} \times \text{F}
\]

\[
\text{C} = \text{Lifetime app runs per average user} = 10.5
\]

\[
\text{D} = \text{Ads viewed per run} = 1
\]

\[
\text{E} = \text{Free / Paid ratio} = 7.5
\]

\[
\text{F} = \text{CPM}^3
\]

To generate as much money as a paid app, the average free (ad supported) app would need to generate a CPM of $8.75 or more

Source: http://www.skyhookwireless.com/developers/developersguide.pdf
ExhibitAK: When advertising works

Intensity of usage

High

Low

Gimmick apps

"Sticky" apps — can be apps from any other segment

Content apps

Utilities

Increased suitability of app for free model as usage across both dimensions increases

Length of usage


ExhibitAL: Mobile Advertising Ecosystem

ExhibitAM: How DSPs, SSPs and Ad Exchange works

Exhibit AN: How Ad Networks potentially misuse private data


Exhibit A0: Display Ad Market Share

Source: IDC

Exhibit AP: Customer Lifecycle / Conversion Behavior

Definitions and Abbreviations

CPC
The cost-per-click is the amount paid by the advertiser each time a user clicks on the ad displayed by the publisher. For an advertiser it serves as a better metric to the conventional CPM, which ends up being ignored most of the times. CPC serves as a means of measuring how effective advertising was. Networks have to handle click frauds that publishers can use to abuse the CPC model.

CPI/PPI
Cost per install or Pay per install is a payment model that advertisers can use to actually install their apps. Developers can use this model to piggyback on other apps and pay for each installation. Select ad networks use beacons to calculate installs or app launches while calculating CPI. Some of the incentivized based networks pay consumers through virtual currency for installing new apps. Apple through its section 3.10 is trying to clampdown on any paid incentivized downloads.

CPM
The cost-per-impression is an advertising model where the advertiser pays when an ad is served. It is basically the cost for showing 1000 impressions. For many brand advertisers the purpose of mobile advertising is to highlight its presence. CPM model specializing in generating impressions ensures not losing out on the opportunity cost as with the case of CPC or CPI. Very often eCPM (effective CPM) is used to convey the effectiveness of selling the publishers inventory.

CTR
Click Through Rate is a ratio highlighting how often users who see an ad actually click on it. 
CTR = Number of Clicks/ Number of Impressions
A high CTR is a good indication of ad relevance and targeting. CTRs are used by ad networks in restricting the number of future impressions for a specified campaign.
Freemium

Freemium is a business model, where the product or service is initially provided free of charge, but money is later charged for full functionality usage or advanced features. The word itself is a combination of its two underlying business models – “free” and “premium”.

SDK

SDK, an abbreviation for Software Development Kit, is a programming package that enables application development. SDK is primarily used to reduce duplication, through code re-use, and can range from a collection of simple files grouped together as an Application Programming Interface (API) to containing multiple APIs, supporting documentation, examples and built-in licenses. SDKs are provided by different developer communities and large organization to abstract underlying details and provide a simple API to both fasten development efforts and maintain modular manageable solutions.

References

10. Freemium 10: A brief introduction to the freemium business model
11. 5 Tips for Gamifying Your Mobile App – Post by Yasis Nizan, CEO and Co-Founder of The SOOMLA Project
12. Store Kit Framework Reference – iOS Developer guides
13. Getting Started with In-App Purchase on iOS and OS X – iOS Developer guides
14. Technical Note TN2259 - Adding inApp Purchases to iOS
18. How to double user retention with push notifications: Urban Airship shares best practices
19. Love, Courtship and the Promiscuous Male Mobile Gamer - Posted by Dan Laughlin on Flurry
20. The impact of app discounts and the impact of being a featured app - Distimo Publication January 2012 - By Gert Jan Spreijmsma, Analyst at Distimo
23. Waracle - How To Budget For iPhone and Google Android App Development Part 2
24. How much does it cost to develop an app? Post by Carter Thomas, BlueCloud Solutions.
27. Users Prefer Apps to Mobile Sites But High Expectations Burn Developers By - Greg Sterling
29. Approaches for Mobile Application Development – By Bhaskar Paul
34. App revenue intrigue - By Tero Kuittinen
35. 25 mobile app developers haul in half of all mobile app revenues - By Brad Reed
36. Apple App Store Hits 50 Billion Downloads - By William D'Angelo
37. http://googleblog.blogspot.com/2012/03/introducing-google-play-all-your.html
38. Paid App Availability – Google Play
43. Check out Google Play recommended apps – By Nicole Cozma
44. Android apps supersized, to 4GB – By Stuart Corner
45. Microsoft details the Windows 8 app store: Flexible cuts, prices up to $999, and try-before-you-buy – By Alex Wilhelm
46. Windows 8 Store Will Offer 7-Day “Try Before You Buy” Period for Paid Apps - By Brandon Russell
47. The "3X factor" of carrier billing in app store purchases – By Oded Israeli
49. Carriers Want Their Share of Billions in Apps Revenue - By Dragan Petric, BrightHound Staff
50. The Rise of Mobile Application Stores Gateways to the World of Apps – By Booz & Company
51. Tired of Google Play? Check out these alternative Android app stores - By Simon Hill
52. China – The Next Billion Dollar Mobile Market - By Shanishoham
53. IGDA still unhappy with Amazon Appstore policies – By Griffin McElroy
54. Test Drive is an innovation that removes the friction for customers to try new apps and games. - By Jerry Heinz, general manager of Test Drive.
55. Earning Real-Time App Rewards - Appitalism
56. GetJar aiming to rival Android Market - By Lance Whitney
57. GetJar raises another $25M for its mobile app store – By Anthony Ha
58. GetJar Shifts Focus From Distribution To Discovery And Commerce, As Its Virtual Currency Hits 50M Users, 60% Of Revs – By Rip Empson.
60. http://nexva.com/blog/alternate-app-stores-rising/
61. appbackr Xchange: Wholesale Distribution of Mobile Apps - By J. Gerry Purdy, Principal Analyst with MobileTrax
62. Introduction to InMobi App Publish – By Ujjwal Kabra
63. www.androidauthority.com/inmobi-app-publish-179890/
64. App Discovery Apps Report April 2013 - Mobyaaffiliates
65. A month after booting AppGratis, Apple approves AppCurious — a new take on discovery – By John Koetsier
66. Setting things straight about the AppGratis business model – By Simon Dawlat
67. Is Apple clamping down on thirdparty app promotion services? – By Keith Andrew
99. Appsfire rolls out a "PageRank for apps" to help separate the wheat from the chaff
106. Mobile Payments Startup ZooZ Debuts In-Ad Payments (Yes, "Ad" Not "App")
115. Human Demand launches transparent, real-time mobile ad platform for small app developers
122. Secret of Phenomenal iPhone Apps That Got People Rich
129. How Apple Gets mobile Payments Startup Boku Lands Direct Carrier Deal With Vodafone
136. EBay buys Zong as mobile payments gain traction
143. The Evolving Economics of the App
150. How to Make Money by Selling Free Apps
157. Mobile advertising matures with private ad exchanges
171. Maximizing your iOS and Android in-app advertising revenue
AOL Google Buying Supply Side Platform Admeld For $400 Million

AOL Unveils Its Supply-Side Platform - By David Kaplan

4. 7 Mobile Ad Networks for Local Publishers - By Stephanie Miles

5. Extensive List of Mobile Ad Network Companies - By Abhinav Gulyani

6. A beginner’s guide to mobile ad networks – By Peter Hamilton


8. Opera Buys Mobile Ad Startup AdMarvel For $8M In Cash Plus A $15M Earnout - By Robin Wauters

9. Google Opens AdMob to a Torrent of AdSense Ads – By Jack Marshall

10. Google Rebuilds AdMob To Include A Conversion Optimizer Tool & Local Payments Feature – By Amy Gesenhues

11. AdMob eCPM Floor Beta: Best Practices – By Eric Leichtenschlag

12. Appnext aims to make cross-promotion more effective by delivering better users – By Mike Thompson


14. Appnext Sees Click Through Rates Of 15 Percent To 20 Percent On Facebook - By GamesJustin Lafferty


17. Apple Admits Steve Jobs' Vision For iAd Was A Huge Flop – By Jim Edwards

18. Apple looks to bring developers into the iAd fold with Workbench - By Kevin Bostic

19. Apple’s iAd Staff Preparing to Handle iRadio Advertising Duties – By Jordon Golson

20. How InMobi Grew From a Startup to a Giant Mobile Ad Network – By Willis Wee

21. 50 Most Disruptive Companies 2013 – MIT Technology Review

22. InMobi nabs Sprout for easy HTML5 ad creation – By Devindra Hardawar

23. Jumptap’s Adam Chandler on Mobile Marketing and Audience-Centric Advertising – By Katharina Volkmer

24. Announcing Partnership with Millennial Media to Increase Location Relevancy in Mobile Ad Targeting – By Bill Michaels


26. Apple adds new “Limit Ad Tracking” feature to iOS 6 - By Daniel Eran Dilger

27. Learn How People Use Your App – An App Analytics Tools Round-Up – By Sylvain Gauchet


30. TechStars Spotlight: Appentive lets app lovers talk to app developers inside apps – By John Cook

31. Countly Realtime Mobile App Analytics Is Now Available For BlackBerry 10 – By Luca Filigheddu


33. http://2359media.com/2013/05/facts-discover-flurry-analytics/

34. Flurry Personas uses analytics to target apps at consumers – By Dean Takahashi

35. As Mobile Devs Get More Sophisticated, Flurry Adds Crash, User Acquisition Analytics – By Kim-Mai Cutler

36. Flurry: Look For Mobile Innovation Higher In The Funnel - By Judith Aquino

37. Flurry’s knowledge is power as it raises a whopping $25M for mobile app analytics – By Dean Takahashi


39. Flurry gets into cloud services with AppCloud, powered by Trestle purchase – By Devindra Hardawar

40. Qeepa to use Kontagent analytics on gaming sites – By James Verrinder

41. Kontagent adds funnels and custom dashboards to its mobile analytics – By Kathleen De Vere

42. http://thenextweb.com/insider/2013/03/25/kontagent/

43. Kontagent launches its kSuite DataMine analytics tool for monetizing mobile games – By Dean Takahashi
Information Warehouses