Mobile Marketing Strategies for B2C Companies

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Submitted to the System Design and Management Program
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Dedication

This Thesis is dedicated to

my loving wife, Shamal &

our beloved daughter, Asmi

-- Samir Sawant
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ABSTRACT

Mobile application (‘apps’) development is a recent pandemic phenomenon; companies that are not associated with mobile technologies are noticing it and want to develop their own mobile apps. However, these companies do not realize that they need to have a mobile strategy in place, just like their IT strategy. Mobile technology is a new paradigm for businesses. The mobile device is emerging as a powerful sales channel and marketing medium, which these businesses must strategize and plan for. Companies need to be equipped with a framework within which they can develop marketing initiatives through mobile technologies. The world is reaching a point where developing a viable mobile strategy is an imperative for small and large businesses to enable their long term growth and sustenance.

Recently, the iPhone and its app store have created a vibe in industry with almost 1 billion mobile apps being downloaded from the iphone app store by July 2009. However, many marketers still doubt iPhone’s reach to a larger, and, more importantly, a targeted audience. Also, there is increasing complexity with a variety of architectures, platforms and processes being adopted by each player, for example: iPhone App store, Blackberry App world, Palm’s App Catalog, Microsoft’s Windows Mobile Marketplace, Nokia’s ovi, Google Android Market and more in the pipeline by various players in the market ecosystems, mainly device manufacturers—Samsung, LG, Motorola—as well as service providers – AT&T, T-Mobile and O2, to name a few.

The purpose of this thesis is to analyze the mobile application development framework and its implications for marketers, and try to answer some of the questions regarding mobile application development strategy. The author will attempt to address the lack of knowledge that companies have available today when deciding whether to develop mobile applications for marketing and how to choose which platform(s), and provide a reference document that companies can use in order to be successful.
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Chapter – 1: Introduction

Mobile application ('apps') development is a recent pandemic phenomenon; companies that are not associated with mobile technologies are noticing it and want to develop their own mobile apps. However, these companies do not realize that they need to have a mobile strategy in place, just like their IT strategy. Mobile technology is a new paradigm for businesses. The mobile device is emerging as a powerful sales channel and marketing medium, which these businesses must strategize and plan for. Companies need to be equipped with a framework within which they can develop marketing initiatives through mobile technologies. The world is reaching a point where developing a viable mobile strategy is an imperative for small and large businesses to enable their long term growth and sustenance.

Recently, the iPhone and its app store have created a vibe in industry with almost 1 billion mobile apps being downloaded from the iphone app store by July 2009. However, many marketers still doubt iPhone's reach to a larger, and, more importantly, a targeted audience. Also, there is increasing complexity with a variety of architectures, platforms and processes being adopted by each player, for example: iPhone App store, Blackberry App world, Palm’s App Catalog, Microsoft’s Windows Mobile Marketplace, Nokia’s ovi, Google Android Market and more in the pipeline by various players in the market ecosystems, mainly device manufacturers—Samsung, LG, Motorola—as well as service providers – AT&T, T-Mobile and O2, to name a few.

At the same time, various mobile applications architectures have been traditionally native, thin client based, so as to match small screen size, however, with netbooks becoming popular and equipped with more computational power, as well as becoming lighter weight, it would be interesting to see consumer adoption behavioral trends towards netbooks in lieu of mobile and laptop/desktop. At the same time, there has been a battle of standards evolving between Apple and Adobe over Flash v/e HTML5. We will also explore the various options for marketing in this standards battle as well as exploring additional roles for carriers, who have been providing only bandwidth, and see how they can provide more value to the mobile applications, which would be very important for marketers.

The purpose of this thesis is to analyze and discuss the mobile application development framework and its implications for marketers, and try to answer some of the questions regarding mobile application development strategy. The author will attempt to address the lack of knowledge that companies have.
available today when deciding whether to develop mobile applications for marketing and how to choose which platform(s), and provide a reference document that companies can use in order to be successful.

1.1 Literature Search

There have been a large number of research papers available about Mobile Marketing Strategies for B2C companies. However, much of the literature discusses mainly various mobile technologies and how to use those for marketing efforts. Little of the literature talks about the systematic approach for developing and implementing a B2C Mobile marketing strategy. Recently, there have been publications by Forrester Research, which stand out from the rest. The first one ‘The POST Method: A Systematic Approach To Mobile Strategy’ (Julie A. Ask, April, 2009) discusses understanding customer mobile technographics profile and then matching it with business strategy to increase revenue or cut cost for implementation. However, the key point being missed is how can any B2C company collect the data required for a customer mobile technographics profile? Many B2C companies are aware of the need to match business strategy with customer profile, but the companies still don’t know how to figure out the customer mobile device profile. This is very important for B2C marketers; otherwise, if company is deciding to launch an application for the iPhone and the end customer is not using an iPhone, then the company risks losing all development effort, and, more importantly, reach to customers. The second article published by Forrester Research, ‘The ROI of Mobile’ (Julie A. Ask J. S., January, 2010) discusses primarily how companies calculate the ROI of mobile services or mobile marketing campaigns? The article offers a framework for ROI calculations, and acknowledges that there are difficulties forecasting consumer adoption or usage as companies are not able to figure out customer mobile technographics profiles. Considering these difficulties, it is imperative that B2C companies require better marketing approaches which will have cross platform reach, and will provide richer inputs for marketing campaigns so that companies can target customer with largest impact. The thesis will provide the information to companies about how to do that considering the fast rate of evolving technologies as well as business ecosystems of the mobile applications.

1.2 Organization of Thesis

In Chapter 2, we will discuss various mobile applications architectures, as well as their relative advantages and disadvantages. We will go on to discuss which of the architectures is suitable
for Mobile marketing applications. Then, in chapter 3, we will discuss various mobile applications development tools, their advantages and disadvantages and the frameworks for selecting technologies/tools for mobile applications. In the end, instead of supporting all mobile development technologies, companies can select a few, which will result in greater customer reach. In chapter 4, we will discuss evolving mobile application store ecosystems and the challenges being faced by the various applications stores, and how these challenges will impact the future of these stores. This is important for companies, as they need to understand the future of mobile application stores, as application stores are the primary distribution channel for the mobile applications. In chapter 5, we will offer analysis of mobile applications, so that companies can benefit by becoming aware of consumer behavior concerning various mobile applications, aiding them in deciding which applications categories to target. Chapter 6 discusses roles of the operator in the ecosystem, and how they could provide value to mobile applications, which will be important to develop trust-based marketing for companies via the applications. Finally, chapter 7 will discuss summary analysis and future work.
Chapter – 2: State of Art – Mobile Application Architectures

2.1 Motivation:

Any B2C company developing Mobile Marketing application will need to start thinking about state of mobile application architectures styles and various trade-offs involved among these architectures. There is no architecture which fits all sizes and markets. Based on the needs of market, the companies need to decide which architecture is suitable and, many times, companies will need to support more than one architecture style.

2.2 Mobile Application Architectures:

Since the availability of mobile networks, companies have been using them for marketing campaigns run over SMS; however, as devices are becoming powerful, several new opportunities have developed. We have noted that the mobile application architectures range from browser based clients to fat client systems synchronizing with a central server occasionally. There are mainly six mobile application architectures (Nick Jones, William Clark, September 2006), which have been dominant in practice, mainly –

1. Thick Client
2. Rich Client
3. Streaming client
4. Thin Client
5. Messaging Client
6. No Client

We will briefly describe each architecture style, as well as advantages, restrictions and use context for each style.
1. Thick Client Architecture

In Thick Client Mobile application architecture, both code and data are stored on the device. This architecture needs sophisticated application management as well as some form of database management system or file management system.

Advantages:
The main advantage of thick client architecture is that it can operate independent of signal coverage area. Also, as the systems requires sophisticated application management as well as database management, the architectures are mostly implemented on PDAs and/or smartphones and so it enables implementing and supporting sophisticated features and excellent user interface by use of support peripherals. As data and code is mainly residing on the device, the implementation requires good security management; however, since the implementation is mainly on PDAs and smart phones, a wide range of security strategies can be supported.

Disadvantages:
The implementation is complex, mainly because of the implementation of data synchronizations between devices and central servers. This adds to business complexities due to information updates in devices and should be resolved with business and technical rules, which adds to extensive support.

Use-Context:
This architecture is mainly used in a situation which demands out of signal operation, or when network performance or latency creates problems with application requirements. So, it is mainly used in warehouses, with bar code readers or other complex vertical applications.

2. Rich Client Architecture

In Rich Client application architecture only code is stored on the device. These application architectures normally require no data access (e.g. utility applications, games) or limited data storage.

Advantages:
The implementation offers lower total cost of ownership (TCO) in comparison with thick client mobile application implementation; however the local code offers a sophisticated computation
and excellent usability. The local code implementation offers custom-made security strategies, such as encryption at application level and it could be a proprietary implementation.

**Disadvantages:**
Although it could be powerful implementation at lower TCO, this architecture could be most difficult to design because of the logical partitioning between the server and the client. However, if the application requires access to data on server, then out of signal operation cannot be supported.

**Use-Context:**
This can be only used when the application doesn’t require real-time data processing, as well as when local or proprietary processing is acceptable.

3. **Streaming Client Architecture**

Streaming client architecture can be treated as special case of the Rich Client Architecture involving media. The most popular streaming clients are Microsoft Media Player, Apple Quicktime, Real Player, and Nokia Visual Radio. Companies are not generally using streaming for their mobile apps, although with 3G network deployment, there could be more applications using streaming.

**Advantages:**
These clients are optimized for delivery of Audio/Video media and support various streaming protocols.

**Disadvantages:**
Digital media requires support for digital rights management (DRM); In addition, the network must support low latency for a better user experience. Also, because of the nature of the media, the bandwidth as well as processing power requirement is high. Because of high bandwidth, data usage cost goes up.

**Use-Context:**
The client is mainly used for real-time or stored Audio/Video streaming.

4. **Thin Client Architecture**
In thin client implementation, applications use a generic client, which renders the application. Web-browser, micro-browser or flash-lite are commonly used thin client architectures. Normally, no data is stored in the device. Browsers allow mainly form-based user interactions, and flash allows much more sophisticated user experience through the use of multimedia.

Advantages:
Since there is no code or data storage required on the device, TCO is low. Browsers and flash are widely known and used, so the learning curve is not high for users or for developers. The access to established web-architectures is easy to implement and scalable.

Disadvantages:
Since all functionalities have to be provided at the server end, network coverage has to be good. The device needs to have pre-installed browser or flash client. Although browsers are standardized implementations and provide cross-platform compatibility, there are significant challenges because of different screen resolutions and sizes on various devices.

Use-Contexts:
Thin client architecture is useful when there is an existing infrastructure supporting web application, as well as good network coverage.

5. Messaging Client Architecture

The messaging client architectures use SMS, MMS, and mobile email to send information to the client devices. The user can choose to respond the messages.

Advantages:
The main advantage of using messaging client application is its simplicity and low cost. Also, it is supported on wide range of devices.

Disadvantages:
The user experience is poor; also if the user decides to reply to a message with proper actions, there is the additional need for parsing between the application server and SMS-C gateway. Also, delivery guarantee is questionable, so it can most reliably be used only for one way messaging.

User-Context:
Messaging client architecture is useful for notifications and simple transactions that need to be supported by large number of client devices.
6. No Client Architecture

The ‘no client’ architecture is used when tone dialing or interactive voice recognition (IVR) is viable option.

Advantages:
Since, there is no client architecture is needed, this architecture provides low TCO. Also, user learning is minimal, as everyone is aware of making voice calls. Also, this architecture can be supported by a large number of devices.

Disadvantages:
IVR or voice control is suitable for simple transactions, but the server side products can be expensive.

Use-Contexts;
This architecture is useful when there are large number of untrained users using variety of different devices.

2.3 Choosing Mobile Application Architecture for Marketing

As seen above in section 2, Mobile Application Architectures, each architecture has different tradeoffs, such as – security, integration, network availability, usability, business requirements, as well as TCO. However, it is clear that Thick Client and Rich Client Mobile Architecture Implementation are not practical for marketing. Companies therefore have to select between Streaming, Thin Client, Messaging and No Client Application implementations. The table below shows key characteristics of these four (4) architectures.
Table 1: Characteristics of Mobile Architectures (Nick Jones, William Clark, September 2006)

<table>
<thead>
<tr>
<th></th>
<th>Streaming Client</th>
<th>Thin Client</th>
<th>Messaging Client</th>
<th>No Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usability</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Sophistication</td>
<td>Low</td>
<td>Moderate</td>
<td>Very Low</td>
<td>Low</td>
</tr>
<tr>
<td>Typical TCO</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Access to Devices</td>
<td>No</td>
<td>Partial</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>APIs and Peripherals</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Out of Signal Operation</td>
<td>Inflexible, Limited</td>
<td>Inflexible, Limited</td>
<td>Inflexible, Limited</td>
<td>Inflexible, Limited</td>
</tr>
<tr>
<td>Security</td>
<td>Inflexible, Limited</td>
<td>Inflexible, Limited</td>
<td>Inflexible, Limited</td>
<td>Inflexible, Limited</td>
</tr>
<tr>
<td>Device Range</td>
<td>Moderate</td>
<td>Broad</td>
<td>Very Broad</td>
<td>Very Broad</td>
</tr>
</tbody>
</table>

Based, on the table-1, we can clearly see that “Thin Client” Mobile Application Architecture is better than Streaming Client, Messaging Client and No Client Mobile Application Architecture. We will briefly discuss the characteristics used for the comparison below –

- **Usability**: Usability means not only application usability, but also end-to-end user experience including connectivity.
- **Device Range**: The more the number of devices can be supported by a particular architecture; the effective will be marketing campaign.
- **Security**: For businesses like banks, the security is utmost important. The thinner client gives less security; e.g., the browser based client can support only https.
- **Typical Cost of Ownership (TCO)**: Typically, as the client becomes thinner TCO reduces, the main reason is the application clients used for thinner client architectures are “off-the-shell” applications, which are normally available free or comes with devices.
- **Access to Devices APIs and Peripherals**: There thin client technologies like mobile Ajax can access handset services (address book) and hardware (camera & GPS). Although there are no widely acceptable standards; W3C is actively working on it.

Now, we will start analyzing various tools and applications available for Thin Client Implementation. Chapter – 3 will give overview about various tools and applications, as well as their capabilities.
Chapter – 3: State of Art: Mobile Application Development Tools

3.1 Motivation:

As discussed in chapter 2, the organization would most likely need to select “Thin Client” mobile architecture implementation for mobile marketing campaign. Then, the next decision would be which technologies and development tools are suitable to implement “Thin Client” mobile application architectures. This chapter will give overview about different mobile application development tools and technologies and discuss the trade-offs with each tool.

3.2 Various Mobile Application Development Tools:

Many times, the question being asked is which Mobile application tool is best? The answer is – “It depends”. Actually, there is no best mobile application tool. No single tool can provide the optimum balance between agility, flexibility and reach to target audience. So, based on the requirements and various trade-offs, the organizations need to decide which portfolio of application tools they would need to support to drive mobile application development.
As shown in fig.1 above, there are many tools available; however, there is essential trade-off between ‘usability and sophistication’ v/s ‘Addressable Audience’, as well as cost of development and support. As noted in fig. 1, as usability and sophistication increases addressable audience decreases. And, as the cost of application development increases addressable audience decreases. And, there is no tool, which can optimize the performance on all 3 characteristics.

As seen in the figure.1, the technologies like SMS and MMS have low development cost and supports any devices, however, it lacks sophistication and user experience. Then, there are technologies like native iPhone code, which can work only on an iPhone, so have limited addressable audience and provides greater usability and sophistication, however, the development costs are very high in comparison to SMS and MMS development.

So, companies developing mobile marketing applications will probably need to look at ‘sweet spots’, which balances cost of development with sophistication and addressable audience size. The examples of these technologies are web technologies (mobile ajax), full web browser, flash lite, java platform, micro edition, ‘widgets’, HTML, CSS. Also, devices are becoming faster with more processing power and bigger displays, and the faster network deployment is also increasing user experience with traditional mobile web browsing and so, Mobile web Technologies are able to offer similar to web technologies performance in Mobile Web.
However, the next obvious question being asked is – which of these tools or technologies are most useful? However, each of these technologies has some special technical capabilities and so no single tool or technology can satisfy all business requirements and volatilities.

Instead of selecting a single mobile web technology tool, the organization can choose the smallest effective set which can satisfy all business requirements and degree of volatility. The organization can choose to have modular architecture, so that the different tools can be pluggable and compatible with the requirements. The next sections will discuss the framework (Nick Jones, November 2008) that can be used by an organization to decide which technologies or tools they need to support.

3.3 Framework to Mobile Web Application Selection Tools:

The goal of this framework is to choose the set of application tools, which can be used for developing Mobile web applications based on Thin Client Architecture. There are few important characteristics, as discussed in (Nick Jones, November 2008), can be used for development of framework. Please note that this not “the” list, however, can be used as reference and based on organization needs, it can be modified.

- **Flexibility/Agility**: How often the application needs to be changed? e.g., it can be measured by update frequency, which could be daily, weekly, monthly, quarterly, etc.
- **Strategic Importance**: What is strategic importance of the application to the organization? Basically, based on this, organization needs to select technology or tool provider and factors to mitigate issues if the technology provider ceases operations or is disrupted, to minimize inconvenience to the organization or its customers?
- **Expected Life Span**: How long the application will be used? e.g., it could be measured in weeks, months, quarters, years, etc. Basically, the organization needs to decide about back-end systems, as well as mobile device life span, etc.
- **Complexity**: How complex is the application? Some applications need to be used only for data collection or for non-transactional operations and can be developed in short time. However, there could be some applications which require back end servers, as well as complex application logic, and it could take sufficiently longer time to develop them. The complex application teams would need expertise within team, causing dynamics associated with experienced developer availability to shape decisions. Also, in complex applications, the organization would require more sophisticated application tools, driving vendor support to the top of the list of important factors.
• **Interfaces:** The organization also needs to verify business and technical interfaces required for the applications. Many times, the existing infrastructure (e.g. back end systems – SAP, Oracle, SharePoint) could drive decisions regarding the mobile web application tools.

• **Special Technical Requirements:** Although not often a major factor for marketing, the organization could be developing productivity applications to be used by their internal staff members. If these applications require use of hardware capabilities within the device, such as GPS or interface with external barcode reader, the organization needs to select mobile web application tools that support these requirements.

• **Device and platform:** Since the devices available in market are based on multiple platforms, the organization would need to develop mobile web applications which can be supported across multiple platforms. This could be one of the main considerations when choosing the mobile web application tool.

These are few of the parameters that could be considered to develop the framework for selecting Mobile Web Applications. In the next section, we will discuss the framework which can be used by organizations to decide the clusters of tools that are needed to support the development.

### 3.4 Framework for Clustering:

When the organization has created a roadmap for the applications required to support future plans, then, based on the characteristics as discussed in section-3, the organization can create a table as shown in table-2 below.
Once the table is populated with values, the organization can cluster needs based on various methods like DSM and k-means clustering algorithms, which will cluster or group various requirements to identify groups of applications with similar characteristics. For example, some application groups could be updated daily, but are simple, with a life-span of less than a month v/s there could be a group of applications requiring complex business process maps with longer life spans. Clustering applications having similar characteristics could identify common mobile development tools.

**Identifying Tools and evaluating the tools:**

Once, we identify the clusters, then, the organizations can identify the groups of tools which can deliver the requirements for the clusters. This will enable companies to shortlist tools and begin further evaluations. There could be other factors that need to be identified and evaluated as necessary.

- As mentioned earlier, the list of the characteristics mentioned above is not “the’ list. Each organization needs to adapt the list per their requirements.
- There could be different approaches to clustering. The companies need to try different approaches and check for the group. Sometimes, the factors could include cost of
development tools, licensing and royalty fees, learning curve and disruption to adopt the technology.

- Also, it is very important for organization to do proper planning with a roadmap. This becomes a very important factor for applications, which require short delivery time and considerably longer expected life span (typically more than two years).
- Also, it is very important to check developers’ skills. Many times, developers’ skills may have a larger impact on cost than cost of web technology tool.
- Also, sometimes development tools cannot coexist with tools from other vendors. Organizations will need to be aware of the technical incompatibility between tools, as well as inconsistent user experience. Organizations would need to consider total life cycle cost of application – developing, debugging, distribution, upgrading, training etc in addition to development cost.

Also, it would be useful for organizations to do sensitivity analysis about the assumptions being made in Table-2 above. e.g. what will happen if the expected life span of applications happens to be only 6 months, instead of initial assumption of 3 years. The reasons for such disruptions could be eroding vendor support or any disruption in the market place. Such sensitivity analysis will help companies to test their assumptions and develop mitigating strategies.

3.5 Emergence of Flash and HTML5:

Around 2000, with advent of widely available broadband Internet, web technologies and runtime were not emerging fast enough to support rich browser based internet applications. To fulfill the need, Macromedia Flash, a.k.a an animation and motion graphics engine, evolved into a real application platform and rich client runtime to support media (text, audio, images, video), communications and interactivity¹. Around 2003-2004, web technologies and runtime emerged with HTML/JavaScript (Ajax) as a competing approach for building browser based web applications. In June 2004, the Web Hypertext Application Technology Working Group (WHATWG) started developing specification for HTML5, which aims to reduce the need for proprietary plug-in based rich Internet applications technologies such as Flash, Silverlight, and Java FX². In addition to markup, HTML5 supports new APIs for 2D drawing, media playback, document editing, cross document messaging, MIME type and protocol handler registration. Although a lot has been seen in the media about the HTML5 taking over from Flash³ in the near

future, as mentioned by Jeremy Allaire, founder and CEO of BrightCove\(^4\), the battle is not about who is technical superior or whether the competitors are open source or proprietary. The battle is mainly about who will dominate embedded video and animation on the Internet. Consequently, for web productivity applications such as email, online documents, spreadsheets, presentations, notepads, collaborative wikis, organizers, chat, CRM, PMS, web-meetings, etc, support by HTML+Javascripts (Ajax) or HTML5 framework would be preferred technology over Flash. However, HTML5 supports video per user preferences, so each user may use different video formats that suit their needs. This will have impact on ubiquitous adoptions of HTML5 for media manipulating web productivity applications, data visualization applications and rich media applications. There are also issues with royalties payments associated with H.264, as well as other compatibility issues associated with video codecs, which currently gives the advantage to Flash, which supports video and audio codecs, unless future smartphone operating systems start supporting standard video codec distribution. Depending upon the mobile application which needs to be developed, the B2C company needs to decide which technology to support and commit to the right platform.

Consequently, when it’s comes to distribution of rich media content, FLASH will be winner in near to medium term because of its cross platform implementations. HTML5 will be useful for cross platform mobile application development for various platforms and devices. When the browsers on mobile devices start supporting HTML5, mobile applications development will probably move towards HTML5 instead of native applications.

Chapter 4: State of the Art: Mobile Application Stores

4.1 Motivation:

In previous two chapters explored application architectures as well as technologies used for Mobile Web Application development. This chapter will discuss the Mobile App store ecosystem; this is the place where customers would gain access to any B2C applications. There are mainly two avenues, where customers can get access to B2C application or contents:

- On-deck
- Off-deck

On-deck contents:
Traditionally, the mobile operators have restricted direct consumer access to contents and have preferred that consumers access the contents – music, video, games, applications – only through the network operators. The content available through mobile operators’ applications stores is called On-deck contents – primarily because the content could have been brought directly from the handset using mobile phone’s browser. This On-deck strategy was not popular with the consumers and, post-iPhone era, the market has rapidly changed.

Off-deck contents:
Services, websites, contents that are not controlled by operators are called Off-deck contents – primarily because the mobile device was not generally used during content discovery and purchase. Although, operators don’t prefer Off-deck contents, the iPhone era has changed the scenario. Now, many operators are allowing access to Off-deck contents and seeking revenue growth by increased use of data plans.
Now, On Deck and Off Deck content providers use a rich-client strategy, where a dedicated client is used to manage all contents and access to consumers. What does this imply for the mobile application value chain and current trends?

4.2 Mobile Applications Stores

Mobile application store can be defined as the retail channel for distribution of mobile content and services to end consumers. The application developers develop applications and submit them to applications stores and store providers take responsibility for marketing, sales, revenue settlement, etc.

There mainly two types of mobile applications stores – independent and device/platform specific mobile applications stores. Independent applications stores include third party application stores, such as Handango, Handmark, PocketGear, etc., as well as carrier applications stores, such as AT&T’s Media Mall, Verizon’s Media Store, Sprint’s Software Store and T-mobile’s web2go stores. Device/platform specific applications stores include Apple’s App store, Google’s Android Marketplace, Nokia’s Ovi Store, RIM’s Blackberry App World, Palm’s App Store, Microsoft’s App Store or Window’s Mobile, etc.

The independent applications stores offer rapid deployment and distribution of applications, while the device-specific applications stores offers contents/applications targeted to a particular class of devices, which are dependent on factors, such as – device manufacturer, operating system, platform provider, etc. These device specific applications stores support for application development and testing by distributing their respective Software Development Kits (SDKs) and simulators, as well as distribution and revenue settlement. The independent applications stores may develop some of their applications for device/platform specific applications stores by implementing policies of the particular device/platform specific applications store.

Mobile Application Value Chain:
There are principally four participants in Mobile Application Value Chain – Mobile Application Developers, Application Store Providers, Mobile Operators and Mobile Subscribers/Consumers (An Insight into the U.S. Smartphone Application Storefront Market, May 2009). Sometimes, Application Store Providers could be Mobile Operators if it is carrier launched Application store. We will now briefly discuss about each of the participants.
1. Mobile Application Developers:
Mobile application developers are mainly software application developers as well as designers handling UI development. The developers implement compelling applications and distribute them through the application stores. The application stores help with distribution as well as the revenue settlement process.

2. Application Store Providers:
Application store providers deliver comprehensive catalogs of mobile contents, services and products. The store providers handle distribution, marketing, sales and the revenue settlement process on behalf of application developers. Also, the providers help to increase data traffic and revenue for mobile operators.

3. Mobile Operators:
Mobile operators can increase data traffic and derive revenue from increased data volume. Also, since consumers need to buy data plans to download contents from application stores, mobile operators can offer more related services and products to consumers.

4. Mobile Subscribers:
Mobile subscribers can get access to contents and applications from their devices. The contents could be free as well as paid. However, since they need to buy data plans to access the contents, there are other value-add features; services which can be used.

Now, we will discuss briefly about key participants in the value chain discussed above.

4.3 Mobile Store Providers:
Observations in this section of the thesis are derived from (An Insight into the U.S. Smartphone Application Storefront Market, May 2009) as well as the author’s analyses.
1. Apple’s App Store
Apple’s App store allows iPhone™ and iPod™ users to access and download applications. These applications are specifically created for these devices using Apple’s iPhone SDK. Apple provides a one-stop solution for application developers in terms of development support, SDK, testing, certification, marketing, distribution, sales, as well as revenue settlement. The new iPhone3.0 SDK release contains API support for in-app purchase, peer-to-peer connections, app to accessories interface, new maps APIs, push notifications, etc. iPhone users can buy applications directly from the iTunes store or app store. The developer is free to decide the price of applications available in the Apple App store. For the paid applications, the revenue is share is 30:70 between Apple and the Developer. There are more than 100 thousand applications available in from the different categories – Books/Education, Business, Entertainment, Finance, Games, Fitness, Music, Navigation, News, Productivity, References, Social Networking, Sports, Travel, Utilities, Weather, etc. Leading Ad-networks, such as – Quattro Wireless, AdMob, Videoegg, have enabled iPhone App store advertising service capabilities in their platforms. The platform SDKs are made available to developers, so that developers can integrate relevant and targeted advertisement within their applications.

2. Google Android Market
Android is based on the open Linux Kernel, primarily developed by Google, and the software stack includes the operating system, middleware, and applications, mainly for mobile devices. The Android platform provides access to device capabilities for application developers, thereby enabling them to develop compelling applications. Also, the platform uses custom virtual machines, which optimize the handset resources, such as memory, processor, and other critical resources. In addition to the platform, Google also offers the app store – Android Market, which provides the developer community a channel to connect with end users and deliver applications for various products and services. However, unlike Apple, Google allows developers to also use other channels to distribute the applications to the end users.

Google has made the required SDK and the associated Eclipse IDE available. However, developers are free to develop applications using other IDEs. Also, application developer can either use either android powered phones from mobile operators or an unlocked Android Development Phone. The Android SDK also consists of an extensive set of tools, which can be useful during application debugging. Similar to the Apple App Store, Google Android Marketplace also offers various services to app developers in terms of marketing, distribution and sales, as well as revenue settlement. The applications store has following categories – Communication, Demo, Entertainment, Finance, Games, Lifestyle, Multimedia, News, Productivity, References, Shopping, Social Networking,
Travel and Weather. The paid applications are revenue shared in 30:70 proportionate with 30% going to carrier and operating costs and 70% going to the developer. Leading advertising networks, such as AdMob, have already enabled their platform with Android capabilities and the SDK is also available for developers to integrate it with applications

3. Blackberry App World
Blackberry App world is an application distribution channel by RIM for their Blackberry devices. The Blackberry app world provides a wide range of enterprise, business and productivity applications and services for its corporate users. Similar to the Google Android Market, the applications can be distributed using other distribution channels, such as third party application stores, online/mobile stores of application developers, etc. RIM offers three application frameworks for development, mainly – Blackberry browser development, Rapid application development and Java application development. The Blackberry browser is a web-based UI for App world, where subscribers can access using wireless connectivity provided by the network operators. The application architecture for Blackberry browser development supports a thin client and RIM supports the development process by providing the Blackberry MDS simulator and Blackberry Device Simulators. The Rapid application development (RAD) framework uses a device runtime environment with backend web services. This is also called the Blackberry Mobile Data System (MDS) runtime. A developer can install the RAD locally, or over the air (OTA) or via an enterprise administrator. The Blackberry also supports Java-based rich client implementations, which can use device hardware functionality. RIM also supports the Blackberry Java Development Environment (JDE), which includes APIs, device simulators; and IDE support by using Eclipse IDE and Blackberry plug-in. RIM insists on a robust application testing and certification process to ensure that applications are run across various Blackberry devices while providing a consistent user experience. The main application categories are as follows – e-books, Entertainment, Games, Maps and Navigation, Music, News, Personal Finance, Health and wellness, Productivity, Professional and business, Reference, Social networking, Sports, Travel, Video, Weather, etc. For paid application, 80% of revenue is shared with developer.

4. Ovi by Nokia
Ovi is Nokia’s consumer Internet service brand. Ovi offers a consistent online experience via mobile devices and PC. Apart from organizing contacts, calendar, photos, videos, routes and locations, as well as sharing photos/videos with others, Nokia offers maps, music, media, games, messaging and other utilities. Application developers can develop
applications for both S40 and S50 devices by using Nokia-provided tools and services. This offers a unique opportunity to reach millions of Nokia users around the globe through the Ovi store. Similar to other platforms, Nokia shares 70% of resulting revenue with developers for paid applications.

5. Handango Application Store
Handango is a global leader for mobile applications and has multiple distribution channels, such as - client on mobile devices - InHand™, Handango.com, as well as almost 50 channel partners, and more than 1000 stores of content provider. The leadership in application stores has enabled Handango to develop partnerships with players like Alltel, AOL, AT&T, Microsoft, Nokia, RIM, Samsung, Sony Ericsson, T-Mobile and Verizon Wireless. Handango offers applications for almost all mobile operating systems – Android, Blackberry, Palm, Pocket PC, Symbian S60 and Windows. The applications are categorized in various categories, mainly – business and productivity, health, entertainment, games, productivity, travels, utilities, and many more. Handango has developed the AMPP platform, which manages the discovery, delivery, and downloading contents on phone, as well as payment settlement.

6. Handmark Application Store
Handmark is the leading developer of mobile game and applications, which it distributes via a dedicated mobile store. Handmark’s Pocket Express, an on-device mobile client, offers comprehensive contents in the form of breaking news, movie listing, search, sports, stock updates, and weather. The subscriber can buy the content through the Pocket Express client. The client is currently available on Blackberry, BREW, Java, Palm, Symbian, Windows Mobile platform. An additional offering – Handmark Studios – offers mobile games such as Hellfire, Solitaire, Sudoku, and Zap! 2016. Leading media companies, such as Associated Press, BNET, Forbes.com, Reuters, The Wall Street Journal, ZDNet, and many other players leverage on Handmark’s publishing platform for content delivery on mobile handsets. Handmark provides rich user experience with content delivery with almost 80% less key strokes. Handmark offers various services to application developers, mainly – e-commerce toolkits, application testing, certification, developer support, marketing, promotion, etc.

7. PocketGear Application Store
The PocketGear store delivers third party smartphone applications through direct channels such as AndroidGear.com, PalmGear.com, PocketGear.com, RimGear.com, Smartphone.net, and SymbianGear.com, as well as partnerships with players like AOL,
Palm, and T-Online. Developers can submit applications to PocketGear and 60% of revenue is shared with developers. The applications are offered under various categories, such as - education, entertainment, finance, games, medical, productivity, professional, reference, tools, travel, as well as free applications.

Apart from these leading stores, each carrier/mobile operator has their own application stores to distribute various contents. Many of operators have formed alliances with 3rd party application stores, such as Spint and GetJar, or HandMark and Handango partnerships with leading operators in US.

4.4 Industry Challenges for Application Stores:

As key industry participants are improving user experience across their application stores, Strategy Analytics developed guidelines about the 21 best practice guidelines to provide superior user experience for application stores, as well as analyzed various leading application stores on following factors (Mobile Application Store Best Practices, 2009):

- Discoverability & Accessibility
- Structure & Organization
- Content Relevance and Context
- Download Process
- Billing
- Portability

The analysis on various application stores user experience as done by Strategy Analytics is shown in figure.2
Billing:
Based on the table in fig. 2, it is very clear that the Apple App Store is performing exceptionally well in almost all aspect except billing. With its closed ecosystem, the Apple App Store needs consumers to pay via an iTunes Account. This could be an impediment for Apple moving ahead. If we follow Roger’s bell curve analogy\(^5\), then the Apple iPhone is ready to cross the Early Adopters phase or is already in Early Majority. However, based on surveys and interviews conducted during the underlying research, it was suggested that the Buying process has to be linked with centralized billing through credit card or carrier billing. This feeling was also echoed with Vision Mobile Research regarding their findings on the future of App Stores\(^6\). As show in fig. 3 below, as the App Stores phenomenon is becoming a commodity and entering early majority market phase, we will see that subscribers will push for simplified billing process in terms of carrier billing or subscription models using a credit card. Based on the existing relations of carrier or operators with customers, this is more likely to be the winning method in near future.


### Key building blocks

<table>
<thead>
<tr>
<th>Building block</th>
<th>Developer market</th>
<th>Billing &amp; settlement</th>
<th>Distribution surface</th>
<th>Delivery &amp; in-life mgmt</th>
<th>Retailing &amp; Merchandising</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Process for submission, certification, targeting and pricing of applications</td>
<td>Mechanism for billing, settlement and reporting of application sales</td>
<td>Size of addressable market across handset OEs, operators and regions</td>
<td>App download, silent install, in-place access, app licensing and in-life mgmt</td>
<td>App discovery, app promotion, premium placement, search and recommendations</td>
</tr>
</tbody>
</table>

**Evolution**

<table>
<thead>
<tr>
<th>Period</th>
<th>Description</th>
<th>Evolution</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-7</td>
<td>Open APIs, closed route to market</td>
<td>Complex, undocumented &amp; fragmented approach for certification and pricing</td>
<td>MNO unique value add: none, established billing relationship and credit line&lt;br&gt; OEM unique value add: platform certification, developer tools, developer communities&lt;br&gt;</td>
</tr>
<tr>
<td>2008-9</td>
<td>The iTunes Store closing era</td>
<td>Single websites for submission, certification, targeting and pricing of applications</td>
<td>MNO unique value add: n/a&lt;br&gt; OEM unique value add: n/a&lt;br&gt;</td>
</tr>
<tr>
<td>2010-2012</td>
<td>The app stores everywhere era</td>
<td>Ubiquitous operator billing approaching 70% rev share and multitude of revenue models</td>
<td>MNO unique value add: can aggregate apps across device/store and promote preferred apps&lt;br&gt; OEM unique value add: on-device integration for transparent app install, access &amp; lifecycle mgmt&lt;br&gt;</td>
</tr>
</tbody>
</table>

**Free to Paid Applications Downloads:**

Although the number of applications downloaded from App stores is staggering, a closer look by a few industry experts indicates that the ratio of paid to free apps is estimated to be in the range of 1:15 to 1:40. This means that although the number of applications downloaded is high, the app store provider gets revenue from the download only when the applications are paid apps. Thus only around 2.5% - 6% of application downloads generate some revenue for Applications providers.

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Also, as mentioned by www.distimo.com, the two most popular categories of applications that are downloaded from App stores are Games and Reference\(^9\). However, further analysis of these download categories revealed some interesting findings. As shown in fig. 4, more than 50% of these paid downloads for the popular categories are at sub $1 prices. The analysis reveals that although there is wide spread belief and gold-rush to cash in on App Stores economies, the picture may not be rosy as it is depicted. Although more than 1Billion applications have been downloaded from the Apple App store, it is estimated that - only around 25 Million – 60 million were actual paid applications. within that number, more than 50% are sub $1 price applications, in which Apple revenue share is 30%. So, the gross profit numbers for Apple App store may be around $50 million.

As discussed earlier through use of Roger’s bell curve analogy, the innovators and early adopters are comparatively less price sensitive than majority of customers. In fact, innovators and early adopters are ready to pay a premium and, if that is the case, then going forward, revenues from app stores will become less attractive. With the current service model of the applications store, where the distribution, certification, marketing and payment settlement are

\(^9\)http://www.distimo.com/report/archive
handled by the Applications store provider, the operations overhead for the applications store will increase. Additionally, as the number of applications grows, the infrastructure to support will likely need to be upgraded, which could require significant capital investment to maintain a similar user experience. So, the app store provider’s margin will go down and the pressure to continue capital investment will force the industry to consolidate in the near future. These phenomena have been captured in fig.5, the business dynamics of Application stores.

4.5 Future of App Stores:

As we can see from the analysis above, the current market for App Stores is very fragmented. There will be pressure to consolidate with Applications stores as costs increase and profits erode. We will see the following scenarios happening in near-medium future:

- With entry of each new player in application stores ecosystem, the industry will become more fragmented, with significant technical differences. However, this will add to the
difficulties of applications developers and influence their costs. So, there will be emergence of aggregators or cross-platform implementations, which will interface application stores providers and applications developers. This is already the case with Handango.

- Although the current App store ecosystem is largely without carrier participation, carriers are profiting through increased use of data plans, so regardless of application sales revenue levels, the carriers are generating money. In addition to this, the standardization of payment settlement through carrier billing will increase the importance of carriers in the Application store ecosystem.

- Currently, consumers interested in accessing free or inexpensive applications, as well as premium applications, are using same stores. Quality of Service expectations from each category of customer will be different at different price levels. There should be a growing trend of segmentation, where high quality and premium applications may be available in different stores. There will be emergence of specialized stores – like everything on sale – free stores, cheap – $ 1 stores, medium price stores and premium applications stores. The quality of service may also differ in each store, with premium stores having 24x7 customer support for each application.

- There will likely be co-existence of multiple App stores serving the same mobile handset. Already, we have seen that some LG and Samsung handsets shipping in 2009-Q4 in Korea have multiple app stores; one from the OEM, another from platform provider (Windows Mobile) and a third from the network operator (SKT). If we hypothesize, then in the future, the Motorola Droid on Verizon Wireless may have three application stores – Google Android Market, Verizon Media Store, as well as Motorola App Store (If Motorola decide to launch one). And, Motorola Droid on AT&T would replace Verizon Media Store with AT&T Media Mall. In addition to that, there will be third party App stores, as well as specialist stores. Now, imagine the user experience in this complex marketplace. Consumers will have questions like – Which App store should I select to buy a App? In Which category? Is it also available on different app store? Will the price be same? Which app store has latest version?

As discussed earlier, there will likely be emergence of specialty stores with cross platform implementations. The specialty stores have multiple distribution networks, as well as specific developers associated with specific stores. The developers are aware of customers needs in the target market and accordingly they can make targeted applications.
Chapter 5: Analysis of Mobile Applications

B2C companies need to be aware of mobile Application distribution channels, i.e. Applications stores, how the applications are browsed and searched by consumers, what the typical characteristics of applications include and what types of applications are favored by consumers.

5.1 How Do Consumers Discover the Applications?

It is important for B2C companies to know how consumers discover the mobile applications? The discovery of applications could take place by any of the following ways:

- Searching for Specific Application
- Word of Mouth – Recommendation by Friends
- Browsing through Top Rankings
- News Articles/Blogs about Applications
- Ads while using other Applications
- A Familiar Brand
- Other

![Figure 6: Applications Discovery Methods](image)

Searching for a specific type of app: 62%

Browsing through top rankings: 50%

Recommendations from friends: 32%

Seeing ads while using other apps: 23%

News articles or blogs: 13%

A familiar brand reached out: 12%

Other: 18%
Based on Admob survey in 2009 for iPhone Application\textsuperscript{10}, consumers discover about the applications, as shown in fig.6, mainly by searching specific types of applications, browsing through top rankings/top featured rankings in applications stores or by use of recommendation by friends (word of mouth). This is important for B2C companies, because based on this B2C companies can focus the promotions campaigns for mobile applications so that they can get the maximum exposure by optimal effort.

5.2 Loyalty of Consumers towards Applications

The analysis of various mobile applications stores (Exhibit A), mainly platform-specific store like iPhone, Android Market, Skymarket by Microsoft, Blackberry App World by RIM, Ovi by Nokia; Third part App Stores like GetJar, Handmark, Handango, etc and Carrier-specific App stores like AT&T MediaNet, Verizon, O2 Litmus, Orange Partner, Vodafone betavine revealed that there are the following main categories of applications:

1. Games
2. Productivity/Tools/Utilities
3. Entertainment
4. Reference
5. Health
6. Multimedia
7. News/Weather
8. Social Networking/Messaging
9. Themes & Personalization
10. Finance
11. Navigation
12. Travel
13. Education
14. Sports
15. Business
16. Lifestyle
17. Shopping

Please note that these are not ‘the’ names of categories. As shown in exhibit-A, fig.14, each of the above categories have different names on different app stores, for example Games have name such as ‘Games’ and ‘Just for Fun’ in different application stores. Also, as shown by

\textsuperscript{10} \url{http://www.slideshare.net/guestc0de5a/admob-iphone-apps-survey-2009}
analysis performed by flurry\textsuperscript{11}, this shows customer loyalties for various applications categories as shown in fig.7.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{loyalty_by_app_category.png}
\caption{Customer Loyalties by various Applications categories}
\end{figure}

\textsuperscript{11} http://blog.flurry.com/bid/26376/Mobile-Apps-Models-Money-and-Loyalty
As shown in fig. 7, the quadrant-I application categories consists of applications, such as News and References, which are most frequently used over a longer period of time. Consumers access these applications very frequently and the applications offer very high value to consumers. On the other side of the spectrum, quadrant-III applications categories have applications such as Entertainment, which are typical downloaded and used few times before being abandoned by consumers (e.g., Fart, Lighter, IQ Test, RingTone, etc.).

The analysis above is very important to B2C companies. Based on this knowledge, companies can decide which categories of mobile application they want to target and, based on that, the application strategies can be defined. This will also help companies to make budget allocations based on the target categories.

Similarly, when we analyzed top applications from various mobile applications stores for their features (Exhibit-B), it revealed that common features of Top Applications as follows:

1. Cross Category Usefulness
2. Novel Inputs
3. Multiplayer (games)
4. Location/GPS
5. Economical
6. Multimedia Integration
7. Push Notification
8. Simplicity
9. Device Transformer
10. Account Syncing
11. Addictive
12. Offline Usability
13. Uniqueness

The features when mapped to benefits the application delivers for more frequently downloaded/used applications, as well as whether the features are possible to implement cross-platform, we get the matrix shown in fig. 8.

As illustrated in fig. 8, if B2C companies decide to develop cross-platform applications, then companies need to concentrate on features, such as Addictive, Uniqueness, Push Notifications, Cross Category Usefulness, Simplicity, etc. This analysis will be useful for B2C companies to decide the target audience, as well as helping them with budget allocation for development and defining Application Life Cycles.
Figure 8: Matrix of Common Features of Top Applications
6.1 Role of Operator

As discussed in section 4.5, operators had a monopoly for content delivery over mobile network in the US until fairly recently. Apple disrupted the monopoly of operators and now, as discussed in section 4.3, several application stores have emerged and developers have changed their loyalties towards these platforms, mainly because of better revenue sharing terms, freedom to control the selling price for the app, as well as marketing and payment settlement being handled by app stores. Many developers’ programs have made available a pool of funding to subsidize their learning for adoption of platforms. Now, to regain the developers’ mindshare, many operators have started launching their own app stores by implementing better revenue sharing terms, developer-controlled pricing, etc. Also, as discussed earlier in section 4.5, there could be industry consolidation happening in the near-to-medium term, which will lead to emergence of cross platform applications stores or aggregators. As discussed in section 3.5, with the emergence of cross platform technologies like Flash and HTML 5 for mobile applications, there is a stronger case for cross platform stores as well as aggregators.

Even with the current ecosystem of platform-centric application stores, as well as the future cross-platform and aggregator applications stores, the operators are able to capture value by selling data plans riding on marketing and sales driven by applications stores. However, operators need to continuously upgrade infrastructure by investing large amounts of capital and are under pressure from shareholders, as the voice ARPU (Average Revenue per Unit) are decreasing and operators need to justify the capital investments. As a result, mobile operators are launching their own application stores to support the secondary revenue stream, which requires significantly less capital investment than infrastructure. However, in the application stores battle, operators need to provide value to the main ecosystem participants – the developer community. One of the mechanisms for this could be to provide cross-platform
stores; however, since consumers have low switching costs to switch the application stores\textsuperscript{12}, any advantage of one store will drive more consumers to the stores. Because of that, operators will likely use Network APIs to attract more developers, so that the quality of applications on operators’ applications stores is better than applications at other stores.

6.2 Network APIs:

Currently, operators generate revenue from a “one sided” business model, which is focused on selling voice, video, data and other services directly to retail consumers. However, the operators have a wealth of information about consumers and their usage, which can be categorized as follows –

- Personal Data
  - Name
  - Address
  - Gender
  - Preferences
- Credit History
  - Average Balance
  - Bad Debt
  - Payments
- Relationships
  - Home
  - Friends
  - Workplace
  - Banks, Credit Cards
- Devices
  - Device details – OEM, Model, Serial Number
  - SIM
- Identifiers
  - Number
  - IP Address
  - SIP Number
- Use Context

\textsuperscript{12} http://www.visionmobile.com/blog/2010/01/the-mobile-app-store-landscape-5-years-ai-after-the-iphone/
- Location
- Roaming
- Presence Information

- Personal Contents
  - Address Book
  - Calendar
  - Images/Videos

- Interactions
  - Call Patterns
  - Browsing History

This can be represented in diagram as shown below in fig. 9; however, in contrast in web-domain, Google or similar search engines have knowledge about only “search terms and URLs” and are still able to capture more value by use of two sided business models by creating platform for advertisers as well as publishers.

![Diagram of consumer data assets](image)

**Telcos have a wealth of untapped data assets...**

**Figure 9: Consumer Data Assets with Operators**

Similar to the successful two-sided internet domain companies, such as Google, Amazon, ebaY, Microsoft, match.com, VISA, and network operators will create two-sided business models by opening their network APIs, so that other players in ecosystem can also pay to operators, as shown in fig.10 below.

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13 http://www.slideshare.net/simontorrance/telco-20-twosided-business-model-intro-presentation
As operators have started realizing importance of Network APIs, operators have realized the importance of being ‘Network As A Service’ (NAAS) enabler rather than traditional stovepipe operator. Already Telenor and Orange Partners have opened these APIs for developers and enterprise customers. Although, network APIs have offered secondary revenue opportunities for operators, it would be culturally challenging to use the APIs for business applications. The two-sided business model will offer mobile operators the ability to charge upstream as well as downstream in the value chain.

Downstream - As usual, mobile subscribers are charged for access, traffic and service revenue for mobile operators.

Upstream – Mobile operators become network service enablers for third parties. This will offer significant revenue for enterprises, governments for applications such as fleet management, CRM and sales support.

6.3 Trust Based Application Development

Prof. Glen Urban at MIT Sloan has developed a framework for trust-based marketing in the Internet domain (Glen L. Urban, 2009 Summer). The hypothesis developed is that if the message delivery style matches the cognitive style of recipient (or customer), then the seller can build trust and empathy, which should help to increase sales. As mentioned the article, the research validates the hypothesis: companies were able to increase sales by matching content delivery to the cognitive style of customer.

Current applications available on various mobile application stores are actually ‘dumb’ applications. The applications have same user experience for all users and have no ability to understand the context or the person using it. Although there are increasing numbers of applications that are using locations as one of the contexts, there is still a lot more potential. In order to harness that potential, mobile operators would need to open the “Network APIs’ for the application developers, which seems to be more of cultural challenge for operators15, as they need to embrace the developer community and relax traditional ways of doing business by tightly controlling developers’ agreements.

Today, when a consumer runs application, it offers the same user experience regardless of the user’s age, sex, income, usage pattern, handset capabilities, data plans, etc. With an open API, and using the contextual information available, if the customer does SIM swapping among his various handsets (eg, Blackberry for email, iPhone during vacation, netbook via 3G dongle), depending on handset, the application could offer different user interfaces. Also, depending on customer location and available network speed, an application could choose to decide whether the customer is on 2.5G, 3G, 4G or WiFi and then adjust bit rate and resolution for rich media content. Issues such as forcing high quality rich media content on slower 2.5G network or low quality content on 3G network on capable smartphones can be avoided. Also, based on customer demographics, applications can be personalized or configured. In parallel, application owners (or companies) can get ‘usage analysis’ (such as Google analytics) from mobile operators about who are their end customers, what are those customers’ usage behaviors, and when and where they access the application and for how much time.

This will enable companies to develop trust and empathy with the customer, enabling companies to offer marketing campaigns that suit customers’ cognitive styles, driving adoption, longevity and profitability for the companies. However, the key to this will be the business practice of opening network APIs.

As discussed in section 3.5, emergence of HTML5 for mobile application development will provide technical capability enabling the carrier to offer cross-platform application stores which will offer scalability across various phones; however, since the APIs are not standard for each phone/platform, the device-specific hardware features, like camera, mic, accelerometer, etc., may not be harnessed. There are certain features that offer great advantages through the use of HTML5 for mobile applications development:

1. **Improved UI and Support for Native Content**: HTML5 supports various new tags, such as `<audio>`, `<video>`, `<canvas>`, `<header>`, `<menu>`, and `<nav>`, which allow applications developers to write new, native content types for browsers, as well as having improved UI across different sizes of mobile phone screens.

2. **Improved Graphics and Animation**: HTML5 supports Canvas and SVG, which allows developers to dynamically generate programmable, interactive animation and visuals (aka Flash type) without a browser plug-in. Also, the evolution of CSS3 in HTML5 gives developers ability to create visual effects, animations and transitions, as well as embedded fonts.

3. **Local Storage**: As per draft specifications of HTML5, it allows persistent storage, which acts as a ‘cookie’, allowing for a large cache of key/value pairs to be stored locally. Also, the Local databases of HTML5 will provide the opportunity to store rich media content by enabling offline viewing. As discussed in (Glen L. Urban, 2009 Summer), the persistent storage will be helpful to determine the consumer behavior to develop a Trust-based application framework.

4. **Location**: With HTML5, the browsers have ability to access device geographical locations by GPS. This will enable all searches to serve location-aware web experience.

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16 [http://ymobileblog.com/blog/2010/04/15/is-that-html5-in-your-app/](http://ymobileblog.com/blog/2010/04/15/is-that-html5-in-your-app/)
17 [http://dev.w3.org/html5/spec/Overview.html](http://dev.w3.org/html5/spec/Overview.html)
Chapter 7: Strategies for B2C Companies and the Way Ahead

As discussed in chapter-1, many B2C companies are finding it hard to find technographical profiles of their customers and want to develop cross-platform applications; however, the cross platform application may not have the same impact as that of native application development. B2C companies are therefore trying to figure out the best way possible to develop their application development strategy by using real options. Based on the discussion in earlier chapters, we feel that they can adopt the following strategies:

1. B2C Companies need to focus on cross-platform technologies using the framework defined in chapter 3.
2. While, there is still substantial debate happening with respect to HTML5 v/s FLASH, companies can use HTML5 capabilities for browser-based implementation for a better UI, graphics and animations; additionally, they can use HTML5 and FLASH interfaces to define browser plugs-ins for video or rich media contents.
3. Companies can work carrier applications stores and the evolving APIs to define the context of applications to enable development of trust-based applications, so they can direct application promotions by taking into consideration details like user profiles, demography, income and credit history.
4. At the same time, B2C companies can enable data mining through operators’ APIs to determine customer handset capabilities and develop customer technolographic profiles and choose to select native application development for customers in order to provide a customer experience enriched by additional use of platform APIs and the hardware capabilities of each handset.

7.1 Future Work:
B2C companies need to test the trust-based application framework for mobile applications using carrier APIs and monitor resulting customer response and impact on customer behavior. More research along these lines must to be done, so that the gain with trust-based application development for mobile application development ca be unambiguously quantified.
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Figure 13: Application Categories for Carrier Specific App Stores
Exhibit B: Applications Features Analysis

Figure 15: Top List of Applications

- Cross-category Usefulness
- Novel Inputs
- Multiplayer
- Location/GPS
- Economical
- Web Familiarity
- Multimedia Integration

Figure 16: Common Features of Various Top Applications

- Push Notification
- Simplicity
- Device Transformer
- Account Syncing
- Addictive
- Offline Usability
- Uniqueness
Bibliography


