

# Mobile Application Development Platforms

Evaluating iPhone, Blackberry, and Nokia (Symbian) platforms for application development

As networks grow in bandwidth and smartphones become main stream, applications are now in focus as an essential growth area. Vendors are racing to lower the entry barriers for application developers and this is evident in their move to simplify their SDK and development environment and roll out application stores. On the other hand, developers are faced with a choice of platforms, each with their own pros and cons and monetization models. The paper analyzes the current top 3 platforms—iPhone, Nokia (Symbian), BlackBerry (RIMM)—and how they affect application developers in making platform decisions and the problems associated with the development experience.

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## 1 INTRODUCTION

Mobile phone users increasingly expect more of their cell phone devices as their options grew with their appetite for mobile content and data. They are steering towards applications and emailing on the go. They want to access the internet more than they want to make calls. As the boundaries between mobile phones and computers blur, mobile phone users are shaping the industry with their ever-changing expectations, resulting in a boom of smartphones promising to deliver the ultimate mobile experience made possible by a broadening supply of bandwidth. Smartphones now enable users to be connected to the web virtually anywhere and turn their handheld devices into an entertainment platform. Because of user demands, trends in the market are optimistic for the lucrative smartphone industry and leads to a stifling competition between the key players.

While smartphones becomes mainstream, applications have become an extremely essential growth area for developers and smartphone manufacturers alike. Vendors are running a race to lower the barriers of entry for application developers<sup>1</sup>, evident from their move to simplify their SDKs and development environment while rolling out application stores following Apple's success in the field.

Mobile applications come in a myriad of selections, from games and entertainment to lifestyle, productivity, and social networking. Consumers obtain these applications through standalone application downloads as well as on-store and traditional channels. They can be either free or paid-for with no price consensus across the platforms. Application performance and response vary from one phone to another. Methods of delivering mobile applications are not without its shortcomings, where developers, OS providers, and operators are faced with challenges posed by application stores, as experienced by Apple. These problems create opportunities for other mobile corporations to succeed.

## 2 BACKGROUND

Mobile data has become a necessity for consumers, and applications are driving its growth, particularly for services such as mobile internet, e-mail, photo uploading, and multimedia messaging. The iPhone growing success can be primarily attributed to its robust platform which enables developers to benefit from selling their applications, which boost its revenue and market share. To capitalize on the growing demand, RIMM and Nokia followed suit to launch their respective application stores. Estimates sales of mobile applications hit \$7 billion in 2008; Juniper Research estimates it could hit \$25 billion in 2014.

In this rapidly growing industry, the smartphone giants are locked in an escalating competition. The iPhone OS has successfully built a lavish digital experience and a software ecosystem that revolutionize mobile as a platform whereas RIMM has established the benchmark for mobile email and messaging. On the other hand,

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<sup>1</sup> Forrester Research, 2009

Nokia tailors its devices for every budget, casting the widest net in the global competition. While the iPhone is well-received by a younger population due to its entertainment-centric platform, the BlackBerry caters to business consumers and Nokia to the general mass because of its competitive pricing. Ultimately, the successful platforms satisfy the user's demand for a constant stream of content and connectivity without sacrificing a great user experience.

IDC predicts that 20% of the 1.4 billion phones sold worldwide in 2013 will be smartphones. While smartphones grew 27 percent in Q2 2009, mobile phone sales declined 6 percent worldwide<sup>2</sup>, which clearly demonstrates the global trend that smartphones are moving into the mainstream. Mobile applications are clearly driving this trend. 67% of smartphone users surveyed reported that application availability drove them to buy the phones with smartphone users claiming that 40% of their phone use is on applications<sup>3</sup>.

### 3 TECHNOLOGY

With a rich selection of established and emerging application platforms to choose from, how do developers determine which one would benefit them most? Besides considering the market and how consumers will use the applications, developers weigh performance vs. scalability, complexity vs. flexibility, and cost of developing on any particular application platform. The iPhone application platform will be analyzed alongside its top competitors, Nokia (Symbian), and Blackberry (RIMM).

#### 3.1 iPhone *application platform*

The Apple App Store triumphs other of its kinds with the most number of applications at 25,000, and the most successful one with a billion downloads worldwide in less than a year after its launch in July 2008, leading to a widespread adoption among more developers.

##### *iPhone Operating System*

iPhone OS comprises the OS and technologies that we can run applications natively on iPhone and iPod touch devices. The iPhone OS is slightly different from the Mac OS X because of users' different needs, which on the other hand means that many developers who are familiar with the code for Mac OS can easily fit in with iPhone OS code writing. The iPhone SDK contains code, information and tools we need to develop, test, run, debug, and tune applications for the iPhone OS. Apple updates its Xcode tools to support the OS, and Xcode itself provides the launching point for developers to test the application on an actual device or on a virtual simulator based on a Macintosh computer.

##### *iPhone SDK Technology*

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<sup>2</sup> Gartner, 2009

<sup>3</sup> Gravitytank, "And then there were apps." Accessed December 2009. <<http://www.gravitytank.com/apps/>>

Apple's most recent SDK package available for free download is "Xcode 3.2.1 with iPhone SDK 3.1 for Mac OS X 10.6 Snow Leopard". The package includes Mac and iPhone SDK. It also includes Development Tools: Xcode, Instruments, Dash code and iPhone Simulator. With Xcode, developers can choose the specific Mac OS X SDKs to create applications run on particular versions of Mac OS X, and they can create iPhone apps using the iPhone SDK.

The iPhone OS technology layers include: Core OS, Core services, Media, and Cocoa touch<sup>4</sup>.



Figure 1. iPhone OS Technology Layers

**Core OS Layers:** Contain fundamental interfaces most of which are C-based, support technologies such as SQLite, CFNetwork, and access to UNIX sockets among others.

**Core Services Layers:** Provide fundamental system service that all applications use. Core Foundation framework, security framework,

**Media Layers:** mixture of C-base and Objective-C based interfaces. Contains technologies which support for 2D and 3D drawing, audio, video, OpenGL ES, Quartz and other advanced technologies. The media layer also contains Core Animation.

**Cocoa Touch layers:** Most of them are Objective-C based. The framework at this level supports for the file management, network operations and many more functions. The UIKit framework provides the visual infrastructure, and other frameworks at this level can grant user their access to the features like contact book, photo collection and accelerometers.

### *Application Development Process*

Developers are required to have an Apple ID to download the SDK and developing tools, complimentary with download but the developer needs to have a Macintosh computer or a computer with legitimate version of Mac OS to run those developing tools. The code is based on Objective C programming, and you can monitor and compile your code using the Xcode developing tool.

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<sup>4</sup> iPhone Reference Library. Accessed November 2009. <<http://devworld.apple.com>>

After compiling, the developers can test their applications by running the app on an actual iPhone/ iPod touch or on the simulator using Xcode and Dashcode. They can also evaluate the performance using Instruments and then optimize their application. If developers want to test their application over the air by using Wi-Fi or 3G, they have to pay for the developers' program that Apple offers.

Apple offers three developer's programs: Standard Program (\$99), Enterprise Program (\$299) and University Program (free). The differences among these programs are, the Enterprise Program and University Program do not have the option to sell the application on Apple's app store, and the registration for these two programs requires information about legitimate supervisors of the organization, and only they can use in-house applications features.

#### *Application approval process*

Once enrolled in Apple's standard program, individual developers can upload their application to Apple and wait for at least a week to have the feedbacks. Apple will issue the developer the certification to offer the application in the app store to download. The 70% of the revenue will be given to the developer every month. Even if the application is for free to download, the individual developer has to pay \$99 one-time fee to be enrolled into the standard program to have the right to upload their application on the app store.

### **3.2 Competitors**

#### **3.2.1 Nokia (Symbian) application platform**

Rolled out in Q2 2009, the Ovi store is Nokia's application outlet for its Symbian handsets and offers 4,500 free and paid applications for all devices combined. With 1 out of 4 mobile phone users using a Nokia phone worldwide, a characteristic that sets the Ovi Store apart from the other application stores is perhaps that it supports the greatest number of devices worldwide, translating to a potentially high application market share in the near future. Instead of launching on a market-to-market basis like the Apple App Store, Nokia opened its doors to the Ovi Store across multiple countries, available in a range of languages. Touted as the most open of all the app stores, Ovi does not charge a developer fee, and app listing is currently free and unlimited.

Given its high global penetration rate, the Ovi store underperformed at 10 million downloads in 5 months, compared to Apple's 100 million downloads in 2 months. Its Ovi store is deemed to be "clunky" and not as visually appealing as the iPhone user interface.

### *Symbian Operating System*

Symbian's largest shareholder is Nokia, in which Nokia developed its own user interface with the operating system (OS). The Symbian OS comprises three main layers, from top to bottom: OS layer, middleware layer, and application layer<sup>5</sup>.

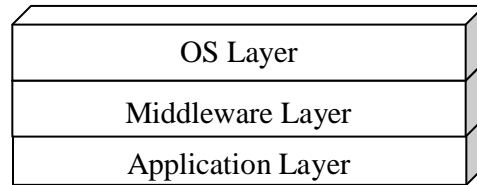


Figure 2. Symbian System Model

**OS Layer:** Provides high-level OS services such as communications, networking, multimedia, and graphics.

**Middleware Layer:** Provides services to applications and other higher-level programs. Specific application technology such as messaging, multimedia, web and IP services can run on this layer.

**Application Layer:** Contains all applications that are part of the Symbian platform, such as multimedia applications, device settings control etc. Nokia has access to this layer and allow developers to build application for handsets.

### *Software Development Kit (SDK)*

Nokia has released the Ovi SDK Beta and Ovi APIs, solutions for developers to build applications with integrated services easily that runs as an extension to the PC browse, enabling them to build programs based on standard web technologies such as HTML, CSS, and JavaScript. To attract more developers, the company launched Ovi for Developers beta program that provides fast access to the SDK and APIs.

The APIs integrate the Ovi Maps Player API and the Ovi Navigation Player API, enabling their partners and developers to create social location solutions and context-relevant applications that consumers will find highly appealing.<sup>6</sup> These APIs integrate maps from over 180 countries and location-based search, adding features such as pedestrian navigation and route planning. Launching these APIs clearly marks Nokia's focus to prioritize and mobilize its plan to attract developers in building location-based applications.

### *Application development process*

Developers choose between popular technologies like Java, C++, Standard C/C, Python, and even Flash, depending on the devices they are targeting. Device specifications are made available in the Forum Nokia Developer Community site, which also offers technical support and access to the vast Nokia developer community.

<sup>5</sup> Symbian Foundation. Accessed November 2009. <<http://developer.symbian.org>>

<sup>6</sup> Nokia Press Release, September 3, 2009

After the development phase, developers may test their applications through the Remote Device Access, a complimentary service enabling developers to test remotely on various Nokia devices. Applications must meet the Symbian Signed or Java Verified Program criteria<sup>7</sup> to gain entry to the Nokia sales channels such as the Ovi Store.

#### *Application approval process*

Nokia tries to woo developers with its relatively simple application approval process, spanning at most two weeks from submission to publication. After developers create a new content and upload it, they define device compatibility and submit the content for review to Nokia's Quality Assurance department. After a week or so, they are notified about the outcome (pass or fail), and the content goes public a few days after. Finally, developers can track download and revenue statistics.

#### *Application distribution process*

Developers may publish their applications via consumer and enterprise channels or work with operators and aggregators like AT&T, Verizon, and GetJar.com. Nokia's distribution channel enables developers to publish via the Ovi Store and offers a 70% revenue share if they distribute through the Ovi Store instead of other channels such as GetJar.com.

#### *Application delivery method*

When consumers access the Ovi Store on their mobile browsers, applications are served to them based on IP address or regions, a feature which highlights Nokia's widespread smartphone adoption globally. The mobile giant is planning to integrate location-based services and social applications into its devices. Location-based services are gaining more popularity with smartphone users embracing local alert services (e.g., gas price or traffic jam alerts) if they knew how to use them, a study conducted by market research firm Compete shows, which may lead to developers investing in where the trend leads.

Applications are displayed based on user habits, made possible by Nokia's Relevancy Engine, recommending applications on users' device types and what the users' contacts have installed on their own Nokia devices. Nokia is also deploying an auction system for developers to pay for placement based on users' device and network type.

#### *Revenue sharing*

Application developers earn 70% of net revenues from the Ovi Store, which is potentially lucrative for developers, taking into consideration Nokia's wide global reach. Consumers purchase applications through credit card or operator billing, in which the latter would reduce developers' earnings per transaction.

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<sup>7</sup> Nokia Forum. "Testing and Signing." Accessed November 2009.  
<[http://www.forum.nokia.com/Technology\\_Topics/Application\\_Quality/Testing/](http://www.forum.nokia.com/Technology_Topics/Application_Quality/Testing/)>

### *Partners*

In addition to incumbent mobile operators, Nokia has partnered with organizations such as National Geographic, Lonely Planet, Associated Press, Qype, Deutsche Bahn, Deutsche Telekom Medien, and Langenscheidt to build sample applications on the Nokia Ovi platform. Facebook is also working closely with Nokia and has produced one of the most popular applications on the Ovi store.

### **3.2.2 BlackBerry application platform**

BlackBerry is the world's second most popular smartphone platform, capturing 21% of worldwide smartphone sales in Q2, 2009. On 30 May 2009, RIMM (Research in motion) announced the number of BlackBerry subscribers has reached approximately 28.5 million.

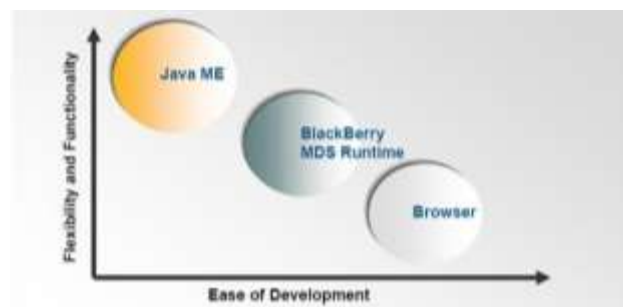
#### *BlackBerry Operating System*

BlackBerry OS is the proprietary software platform made by Research In Motion for its BlackBerry line of handhelds. RIMM keeps its OS architecture model under wraps making it difficult for hackers to break into the system. The OS supports the WAP and the MIDP allowing wireless synchronization with Lotus Notes or Microsoft Exchange Server.

#### *Software Development Kit (SDK)*

The blackberry application platform offers the “BlackBerry Internet Service” which is an integrated wireless, phone and data solution for the individual users and small businesses. It supports the e-mail, instant messaging, HTML web browsing and interconnectivity between the Java applications. BlackBerry also offers the “BlackBerry Enterprise Solution”, which is a business tool to deploy wireless solutions to enterprises thus improving their productivity and competitiveness. It includes the BlackBerry Enterprise server installed behind the firewall and integrated with corporate e-mail and instant messaging servers. It provides a secure connectivity to intranet for browser applications.

The three main components of the BlackBerry application platform as are follows<sup>8</sup>:



<sup>8</sup> Blackberry Developer Center. “Frequently Asked Questions.” Accessed November 2009. <<http://na.blackberry.com/eng/developers/appworld/faq.jsp>>

Figure 3. BlackBerry Application Platform<sup>9</sup>

BlackBerry Mobile Data System (MDS) – It is a set of development tools, device runtime environments and connectivity services for development, deployment and management of wireless applications in the enterprise.

BlackBerry Browser – It provides standard mark up support using HTML, WML etc. as well as Dynamic Content Support using JSP, ASP and PHP. It also detects devices and its capabilities as well as optimizes content based on device capabilities.

BlackBerry Java ME – All the built in applications and API's of the BlackBerry smartphone are written in Java as it supports cross-platform development and connectivity for rich custom client applications

#### *Application development process*

Developers install the BlackBerry's mobile development studio (MDS). Once the development tool is in place, they can select the web services definition language and database, create the layout and code the application. The testing and deployment of the application is done using the MDS.

Figure 4. Application Development process<sup>10</sup>

<sup>9</sup> “Wireless Application Development Track.” Accessed November 2009. <<http://www.blackberry-cwte.com/madrid/Ponencias/Introduction%20to%20the%20BlackBerry%20Development%20Platform.pdf>>

<sup>10</sup> Josh Schiffman. “BlackBerry OS Report.” Accessed November 2009. <[http://www.cse.psu.edu/~enck/cse597a-s09/slides/appmodel\\_blackberry.pdf](http://www.cse.psu.edu/~enck/cse597a-s09/slides/appmodel_blackberry.pdf)>

### *Application approval process*

Application developers sign up as a vendor in the Vendor Portal to enter into the BlackBerry app World. For selling paid applications, developers should agree to the terms and conditions of the Digital River. They need to provide specific information while submitting an application i.e. an application name, the category, description, license type, price, supported OS, application version etc. Developers can also specify the carrier networks that the application would be made available on. Once the application is submitted, RIMM would review the application and send a confirmation to developers to publish the application for it to appear in the catalog.

### *Application distribution process*

Developers publish their applications using the BlackBerry application catalog which can be accessed by the users through their BlackBerry smart phone.

### *Application delivery method*

Users can access the applications by using the “web icon” which is provided by the developers for promoting and distributing the web based content services on the BlackBerry App world. The web icon is a small Java application code file which provides a dedicated icon on the smartphone taking the user to the mobile website. BlackBerry also supports localization to enable the use of applications in different languages.

### *Revenue sharing*

A \$200 USD administration fee is imposed to complete registration and submit applications. With this fee, the developer can submit up to 10 applications. For paid applications, BlackBerry App World will allow the developers to select a suggested retail price in US dollars for their application. The US dollar price is associated with a pricing tier.

- Tiers increment by \$1 USD from \$2.99 to \$19.99
- Tiers increment by \$10 USD tiers from \$19.99 to \$99.99
- Tiers increment by \$50 USD tiers from \$99.99 to \$599.99
- Tiers increment by \$100 USD tiers from \$599.99 to \$999.99

### *Partners*

Unlike Apple’s iPhone, BlackBerry is compatible with AT&T, T-Mobile, Verizon, and Sprint, the major U.S. carriers which offer the Smartphones. BlackBerry also offers the “Alliance Program” where any company or individual can gain access to resources in areas such as application development, sales and marketing.

### 3.3 Interoperability and Other Platform Issues

Developers often encounter challenges when designing and implementing their applications. Challenges include managing many different device targets within a platform, followed by a lack of consistent standards, managing special API versions, and even resource constraints of mobile devices<sup>11</sup>. Furthermore, more resources would be required if developing across multiple platforms. With many platforms to choose from, mobile developers maximize their available market by developing for multiple platforms, which can be time-consuming and challenging if they are not well-versed with all the development environments. They resort to building different code streams for each platform while porting features between them.

While vendors are diverging on their platforms, they are converging on the web browser rendering engine, WebKit, adopted as the core rendering engine in embedded browsers across mobile devices. Developers can thus build a single code stream for web based applications that implement standards such as HTML and JavaScript, which would function across major mobile platforms. Custom libraries are then required to invoke native phone functions from JavaScript.

To address custom libraries challenges, device-agnostic frameworks like PhoneGap leverages WebKit's functionality to connect applications and mobile devices. The framework enables developers to take advantage of core features in major platforms and saving time from having to implement logic in different development paradigms<sup>12</sup>. For example, the framework simplifies the development process by providing an XCode project directory with Obj-C classes that enables iPhone application development in HTML/JavaScript<sup>13</sup>. Rhomobile is another framework that enables developers to build native mobile applications for smartphone platforms, adopted by both independent and enterprise developers alike. Applications built on this framework are true native device applications that take advantage of device features such as GPS and camera.

Application interoperability relies on community efforts, especially the open-source community, since vendors and telecommunication providers have no incentives to build such a platform. As more efforts are invested in increasing interoperability, third-party platform agnostic stores may be likely in the future. To alleviate interoperability challenges, industry initiative Pulsar<sup>14</sup> aims to create a standard mobile application development platform based on open-source Eclipse framework. BlackBerry and Nokia are already on board this initiative, whose goal is to implement a common set of tools in a packaged distribution that interoperates with vendors' SDKs.

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<sup>11</sup> Stephen D. Drake, Steve McClure, 2007. "Key Criteria in Selecting Wireless Application Development Platforms." IDC

<sup>12</sup> Phonegap. Accessed November 2009. <<http://phonegap.com/>>

<sup>13</sup> Using PhoneGap as xCode template. Accessed November 2009. <<http://phonegap.pbworks.com/Using-PhoneGap-as-xCode-template>>

<sup>14</sup> Eclipse Pulsar. Accessed December 2009. <<http://www.eclipse.org/pulsar/>>

Additionally, vendor policy can impede application success. Although Apple claims to approve 94% of application submission, its approval criteria is unclear, causes financial lost to many developers with long periods of silence, and impose risks of submissions getting rejected. Most recently, a prominent Facebook application developer announced that he would be quitting iPhone application development and that Apple is acting gatekeeper to their software ecosystem<sup>15</sup>. An independent firm claimed to risk losing as much as \$600,000 just from waiting for a response for 6 months from Apple<sup>16</sup>. A startup firm which developed an App store recommendation system risked rejection after the vendor introduced its own recommendation tool called App Store Genius. Yet another case involves an independent developer's podcast downloader application getting rejected, accused of duplicating the functionality of the iPod, although the iPhone did not offer this feature when the application was submitted<sup>17</sup>. Furthermore, updated operating system firmware renders certain applications obsolete when the vendor rejects the application update because of SDK modifications<sup>18</sup>.

LeftRight Studios, application development startup firm based in Pittsburgh, PA, informed us that the biggest challenge developing for the iPhone platform is undocumented API usage. This issue further challenges application interoperability across platforms if Apple renders third party frameworks a violation, which will result in applications built on such frameworks to be automatically rejected. Unity3D is one such framework that got rejected because of undocumented API usage but the problem has been resolved. PhoneGap, as discussed earlier, also met with similar obstacles and they have since resolved the issue with Apple.

During the submission process when Symbian (Nokia) developers await approval, submitted files are kept in a locked state. This issue has prevented developers to update their files or withdraw their submissions<sup>19</sup> if they had fixed a bug and wish to upload the new version, resulting in time and efficiency lost.

However, interoperability and other issues should not overshadow the potential of the platform to drive innovation, increase user satisfaction, and ultimately generating profits for developers.

### *3.4 Mobile Application Platform analysis*

Vendors have achieved considerable success by developing their own operating systems, delivering distinct devices and interfaces, leaving the problems to porting applications across these platforms. Even though

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<sup>15</sup> Joe Hewitt. Blog post on November 13, 2009. Accessed December 2009. <<http://joehewitt.com/>>

<sup>16</sup> Apple's Delays could Cost iPhone Developer \$600K. Accessed December 2009. <<http://www.wired.com/gadgetlab/2009/03/developer-inves/>>

<sup>17</sup> To Play with Giants, App Devs Risk getting Squashed. Accessed November 2009. <<http://www.wired.com/epicenter/2009/11/appstores/>>

<sup>18</sup> Interview: Jared Brown, iPhone developer about having his app rejected. Accessed November 2009.

<<http://www.crunchgear.com/2009/06/22/interview-jared-brown-iphone-developer-about-having-his-app-rejected/>>

<sup>19</sup> Nokia developer discussion board. Accessed November 2009. <<http://discussion.forum.nokia.com/forum/showthread.php?t=185330>>

Apple only holds 8% of global market share<sup>20</sup>, it is garnering the most attention among the developer community and enjoys positive network effects, while its competitors are just catching up.

Nokia (Symbian) has moved to open source while Apple iPhone is closed with open components. Nokia's move to open source is well-grounded as it encourages transparency, flexibility, and community power. Their decision is fueled by its declining popularity as the industry move towards Apple's iPhone and other new players such as Google's Android. Furthermore, the vendor is strengthening its platform by integrating relevant components such as geo-web technologies into its API<sup>21</sup>, meant to drive long-term sustainability. An open source platform for Nokia also implies a greater incentive for carriers and device manufacturers to deliver richer and more flexible content to end users, although challenges are posed by mobile carriers with strict lock-in strategies.

BlackBerry has been adamant about keeping its platforms closed and does not let developers gain easy access to their SDK, allowing most of the application development to be in a J2E environment. Significant problems in porting applications have resulted with phone devices offering varying screen sizes, requiring icon changes, incompatibility issues with older phone sets, etc. BlackBerry's close platform has led to developers shifting to other friendlier platforms. The vendor is adopting alternative methods to generate interest in the platform, including hosting a developer's conference which a focus on hands-on tutorials for developers and encouraging killer applications development.

In terms of development environment, Apple's Cocoa programming environment automates many aspects of application development to comply with Apple's human interface guidelines, giving a distinctive feel to the final product. In contrast, Java handles the user interface aspects poorly, although its garbage collection and memory management are more effective than Apple's Objective-C. Therefore, although Java is more popular in general in the sense that it provides a lower learning curve, its challenges for mobile devices deter application developers and drive them to the iPhone platform, which has a richer framework.

## 4 APPLICATION USAGE

We explore the application market for iPhone, Nokia, and BlackBerry to determine trends that may enable developers to make informed decisions about selecting development platforms.

### 4.1 iPhone

The main channel for the customer to get the iPhone application is the iTunes Apps store. In addition, the Apple has announced the in-App purchase support in the iPhone SDK 3.0. The total amount of the program being downloaded is counted into the iTunes Store.

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<sup>20</sup> AdMob report. Accessed November 2009. <<http://www.metrics.admob.com>>

<sup>21</sup> Nokia announces the acquisition of Plazes. Accessed November 2009. <<http://blog.plazes.com/?p=242>>

In total, there are currently 103,336 iPhone Applications in total according to the iPhone Apps activity aggregator APPTISM<sup>22</sup> and the downloads of the iPhone applications has outnumbered 1 billion at April 24, 2009<sup>23</sup>, after Apple had launched the App store for 9 months. Amongst all applications, 25.4% (26,338) applications are free while 75.5% (76,998) applications require the payment from customer. While both Apple website and APPTISM did not provide exact number of application with respect to each category, we refer to i[App]phone, which tracks part of the applications for the analysis under the assumption that the trend will not deviate too much. The most popular category among all applications is the Games, which indicates that developers incline to develop games, the second popular application category is Entertainment. Most applications are priced less than \$1.00. And the application priced less than \$5.00 has reached 94.5% (including free apps).

The current data reflects the trend that most application are developed by the company rather than individuals given the complexity of the apps are increasing, and companies are seeing the profits reside in the Apps marketplace and they simply entered the market.

In terms of the number of applications, the top 50 developers does not include individual developers and on average they each developed approximate 290 applications<sup>24</sup>. From this point, it is very rare for individual developers to develop more than 200 Apps. And top 50's has covered nearly 17.3% of total apps inside iPhone Apps store.

However, there are also some individual developers produce lightweight programs. For the small program, the development cycle is approximate one month excluding the approval process from iPhone according to Dave Taylor, the developer of the Voyeur and an application architect from a large corporation<sup>25</sup>.

#### *4.2 Nokia (Symbian)*

Two main outlets for Nokia applications are the official site Ovi store and content aggregator GetJar.com, the latter experiencing 13 million downloads a month and approximately 51% attributed to Nokia market share<sup>26</sup>. For the purpose of this project, Ovi store serves as our data source for Nokia applications as GetJar.com has yet to monetize application downloads<sup>27</sup>. Since limited data can be drawn from the Ovi store as download statistics have not been published, data analysis for Ovi store is constrained to pricing and genre

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<sup>22</sup> About Aptism. Accessed November 2009. <<http://www.apptism.com/about>>

<sup>23</sup> Apple's Revolutionary App Store Downloads Top One Billion in Just Nine Months. Accessed November 2009. <<http://www.apple.com/pr/library/2009/04/24appstore.html?sr=hotnews>>

<sup>24</sup> I[App]Phone. "Entire iTunes App Store Statistics." Accessed November 2009. <<http://www.iappphone.com/stats/>>

<sup>25</sup> The Business Blog at Intuitive.com. "iPhone App Developer Spotlight." Accessed November 2009. <[http://www.intuitive.com/blog/iphone\\_app\\_developer\\_spotlight\\_mark\\_moseley\\_voyeur.html](http://www.intuitive.com/blog/iphone_app_developer_spotlight_mark_moseley_voyeur.html)>

<sup>26</sup> Manufacturer Market Share. Accessed November 2009. <<http://stats.getjar.com/statistics/>>

<sup>27</sup> "Paid-for apps on GetJar?" Accessed November 2009. <<http://www.mobile-ent.biz/news/32713/MWC-Paid-for-apps-on-GetJar>>

availability. This deficiency in the store makes Nokia official application store the least attractive for developers.

Ovi store offers 2322 applications available for download for the touch-screen device Nokia N97, with 1869 paid (80.5%) and 453 free (19.5%). Total number of downloads is at 10 million shared among 1.67 million unique users. Graphs in Appendix A summarize our findings of Nokia applications at the Ovi store. Data results derived from Nokia Ovi store show that developers have a strong preference to develop games on the Nokia platform, while utilities are next preferred. Most games are priced at either \$2.99 or \$4.99, a combined total of 73.6% of all paid games. Among applications, 42% of paid entertainment is priced at \$1.99 and 24% of paid utilities are priced at \$4.99. The references category holds the most number of highly priced applications at \$29.99, or 24% of paid references, mostly in the form of multi-lingual dictionaries.

### ***4.3 BlackBerry***

BlackBerry applications are made available on the official blackberry website, commonly known as "BlackBerry App World". A simple development platform and easy accessibility to the users makes it relatively easier for the developers to promote their application.

Of the 3347 applications available for download, 835 (24.95%) applications are free and 2512 (75.05%) applications are paid. The number of blackberry users has crossed 12 million already. The maximum free applications are available in the News category while the maximum paid applications are available in the Games category. The developers seem to be interested in developing games on the RIMM platform, while Reference and eBooks being the next preferred. The pricing of the applications falls under a wide range from \$2.99 to \$349.99 with the business applications being the most expensive. However, 31.6% of the applications (excluding the games) are priced at \$2.99, which is quite affordable to the users. 82.61% of the paid games are priced between \$2.99 and \$4.99.

### ***4.4 Application trends implication***

Analysis on the three application stores reveals that developers tend to prefer developing the following applications in order of preference: games, entertainment, reference, utilities. But this observation does not necessarily imply that any of these categories receive the highest downloads or retention rate. For example, news-based applications enjoy the highest retention rate with the highest frequency of use per week<sup>28</sup>. Although games may be populating the application store, they have one of the lowest retention rates among users. While the top downloaded paid applications in the Apple App Store are entertainment and games<sup>29</sup>, the

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<sup>28</sup> Mobile apps: Models, Money and Loyalty, <http://blog.flurry.com/bid/26376/Mobile-Apps-Models-Money-and-Loyalty>

<sup>29</sup> Top 10 iPhone Application Downloads for 2008, <http://tech.blorge.com/Structure:%20/2008/12/03/top-10-iphone-application-downloads-for-2008/>

top paid applications in the Nokia Ovi Store is a utility application called Digital Alarm Clock with a social-networking tool following close.

Enterprise application developers are highly likely to produce applications for all three platforms as they have more resources to do so, an example being location-based application Yelp.com. Certain applications are shown to be priced differently, where it is offered free in the Apple App Store and charged at a price on the Nokia Ovi Store<sup>30</sup>. Noting that the Ovi Store is a late entrant to the field, it may be inferred that developers could have a change in mind in pricing strategy, and possibly even face regrets for offering the applications free in the Apple App Store. Examples include popular newspaper USA Today and music-identifying tool Shazam.

## 5 SOCIAL AND REGULATORY IMPACTS

### 5.1 Platform impact on developers

The interviews of the developers reflect their reasons of choosing iPhone platform to develop their applications.<sup>31</sup>

*1. The technology-driven versatility of the application can be deployed on the platform excites developers, it can transform iPhone into many things: locators, instruments.*

- a. Streaming technology: watch TV, sports game on iPhone became possible
- b. The network applications: real-time monitoring of the patient, transferring data.

*2. Technology advancement of the API, SDK increases programmer's preference to use it.*

- a. It renders iPhone/iPod Touch similar to Mac on-the-go, they can be used for day-to-day life because synchronization with Mac is possible.
- b. The SDK provide same animations like the built-in apps produced from Apple, which facilitate the app to be intuitive to use.
- c. The UI elements can be taken out of the box and customized to cater developer's needs, which facilitates the creativity.
- d. Small team size is achievable by flexible development
- e. Makes developer focus on the developing of the apps.

*3. The applications are easy to publish.*

- a. It shortens the product development cycle.
- b. The developer is able to develop their applications to the entire world, the multi-language support gains more opportunity: it helps sales and is valued by customers.
- c. Apple provides a single distribution channel which makes the distribution relatively cost-saving.
- d. Opens door to every developer and customer, it cut the cost for marketing so small-budget companies can survive.

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<sup>30</sup> Ovi Store's Top Download is a Paid App. Accessed November 2009. <<http://moconews.net/article/419-ovi-stores-top-download-is-a-paid-app/>>

<sup>31</sup> iPhone developer program. Accessed November 2009. <<http://developer.apple.com/iPhone>>

### 5.3 Potential developer-vendor problems

Developers may resort to Apple's native applications to get user's permission. The iPhone built-in application using the location service will pop up a dialog informing users that their location information will be used and retrieved and ask for permission. This implementation contains two elements preventing Apple from prosecutions:

1. Apple has provided clear indications of what information will be used.
2. Apple has offered users opportunities to opt out from this service.

However, the developer could be trapped into a dilemma when they are referring to this method. The application may involve many information, and prompting user that their information will be used and gaining user's permission is liable to be an excessive process, and may cause user to simply close and delete the applications from their device.

- Copyright and Patent Infringement

1. Other device maker recognizes the iPhone as a threat.

Because the iPhone is more than the ordinary mobile phone with many applications, it interferes with the market of traditional devices. And some devices maker is defending their products. Monec Holding has sued Apple for the patent infringement for their application. Amazon's Kindle e-Book reader has advanced the iPhone/iPod touch into an E-Reader which violates its patent.<sup>32</sup>

2. The content's burgeoning prosperity increases the possibility of the content's copyright infringement  
Duplicating digital content is relatively easy in the information era. People have no problem using it privately and for personal use, but distributing the application on iPhone's platform is indicating the commercial deployment. And developer frequently uses the unauthorized content unconsciously and is tracked by the source holder of the subjective content. Cartier recently sued and dropped the prosecution against Application "The Fake Watch" for the application has put one of the Cartier's watch photos and trademarks in their application.<sup>33</sup>

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<sup>32</sup> Apple hit with lawsuit over iPhone as e-book reader. Accessed November 2009. <[http://reviews.cnet.com/8301-19512\\_7-10203135-233.html](http://reviews.cnet.com/8301-19512_7-10203135-233.html)>

<sup>33</sup> Cartier drops lawsuit against Apple over iPhone app. Accessed November 2009. <[http://blogs.computerworld.com/cartier\\_apple\\_lawsuit\\_iphone\\_app\\_third\\_party](http://blogs.computerworld.com/cartier_apple_lawsuit_iphone_app_third_party)>

#### 5.4 Developer-vendor responsibilities alignment

Currently any applications being distributed through iTunes has passed Apple's censorship and are certified by Apple. So that is why someone deemed Apple and developer will both be responsible for the any issue of the application. While Geographic photographer Psihoyos has accused Apple for one of the application in App Store called "i.TV" has used one of his copyrighted picture.<sup>34</sup>

Is Apple really responsible for this content? We doubt that whether Apple is able to check the possible copyright violation in every distribution due to the overwhelming applications submitted every day. But Apple cannot exempt itself from this responsibility completely due to that it shares 30% revenue of the applications, and it lays limitations on the applications. The Apple may need to enacted implicit policy to clearly indicate the responsibility alignment between Apple and developers in the future.

- The revenue policy of the Apple will affect developers' benefits; Apple is maintaining a dominant place over developer?

Apple takes 30% of the revenue from developers, as does Symbian. But Apple has the tradition of being predominant. Steve Jobs' apology letter to the customer of iPhone after the price drop reflects the arrogance of the Apple in their technology and their product. Same situation has extended to the App's world. In the contract with the developer, it has specified that when the customer refunds the application (give up the license they have purchased) within 30 days, the developer has to give the full selling price back. However, 30% of the full price goes to Apple, which means the developer has to pay additional 30%. What's more, current approval of an application does not involve any transparent procedure visible to the developers. The developers have no knowledge about the application approval procedure and the rejection report is sometimes unclear. Apple's competitor, Microsoft, has came out with a plan requiring an annual fee of \$99 just for giving utter transparency of their application's approval processes.

## 6 CONCLUSION

In selecting a mobile platform for application development, connectivity, mobility, and market share contribute to the selection criteria. Similarly, the device of choice varies in terms of processing power, memory management and screen size, which would have an overall effect on the user experience and performance, therefore contributing to the success or failure of the application. While application interoperability issues and vendor policy impose challenges to managing development projects, ongoing efforts such as platform-agnostic frameworks attempt to alleviate application development issues.

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<sup>34</sup> Psihoyos v. Apple, Inc. et al. Accessed November 2009. <<http://docs.justia.com/cases/federal/district-courts/colorado/codce/1:2007cv01353/102799/4/>>

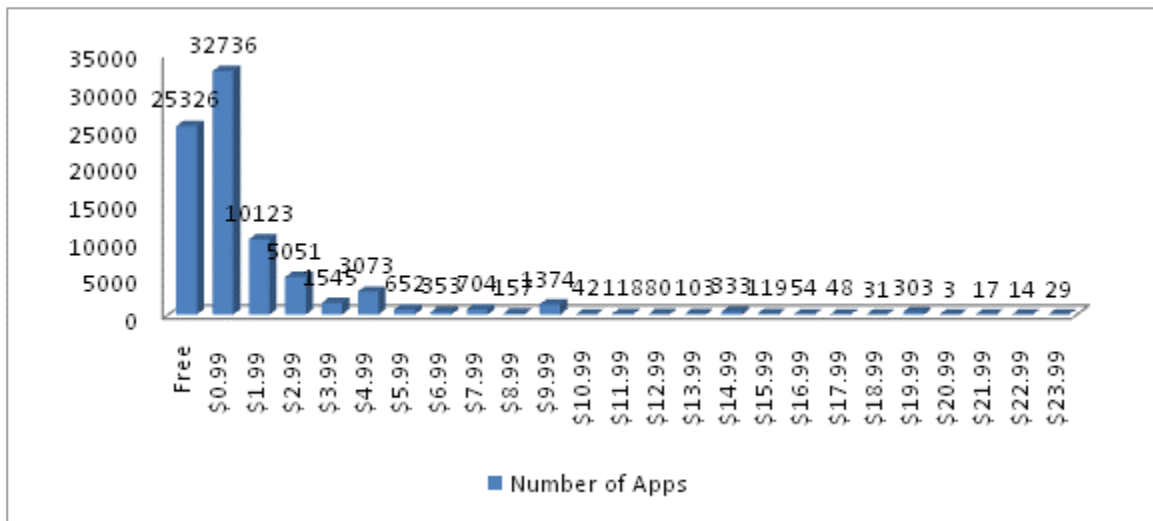
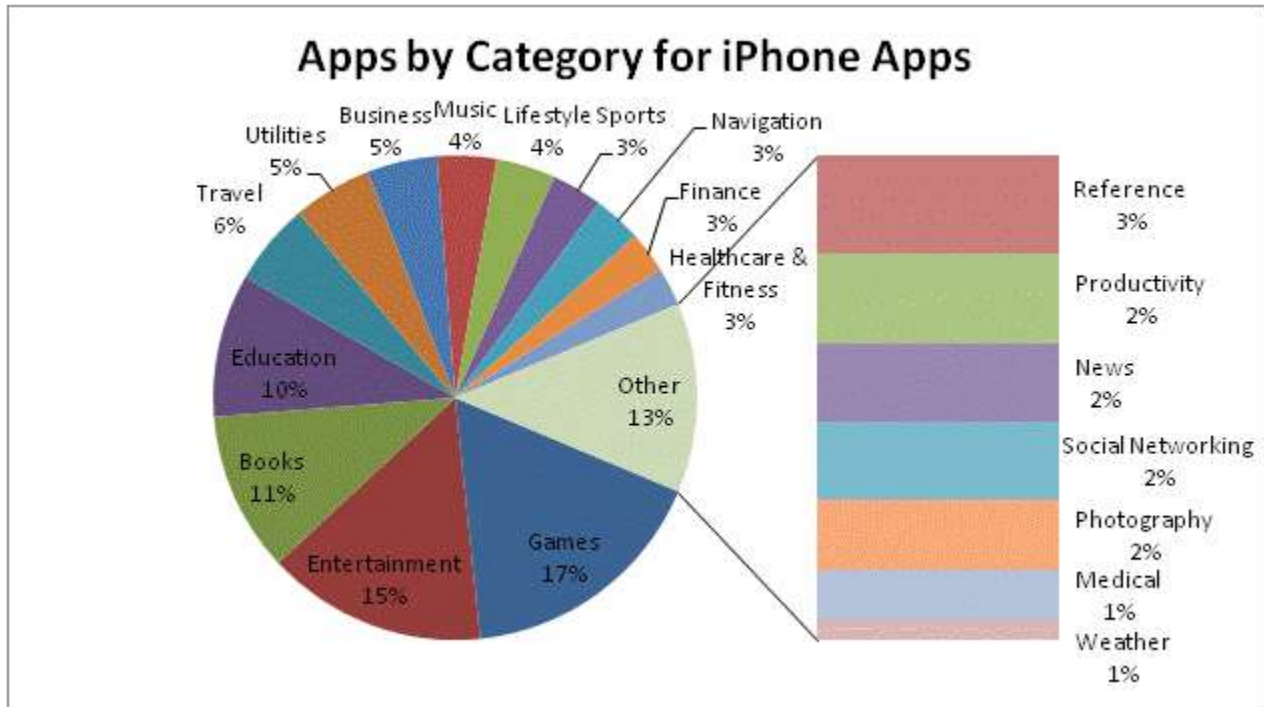
Besides the mentioned factors, understanding the target users plays a critical factor that determines the application success. While the iPhone tops the mobile web and application usage in the US<sup>35</sup>, Nokia (Symbian) holds 45% of worldwide smartphone share and is the preferred handset in many countries because of economical and availability factors. Therefore, if the proposed applications are aimed at increasing productivity in developing nations, for example, then it would be more profitable to select popular devices in that region. Conclusively, developers need to consider application trends while making platform decisions in addition to the strengths, weaknesses, and monetization models of each platform.

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<sup>35</sup> AdMob Mobile Metrics Report (September 2009). Accessed November 2009. <<http://metrics.admob.com>>

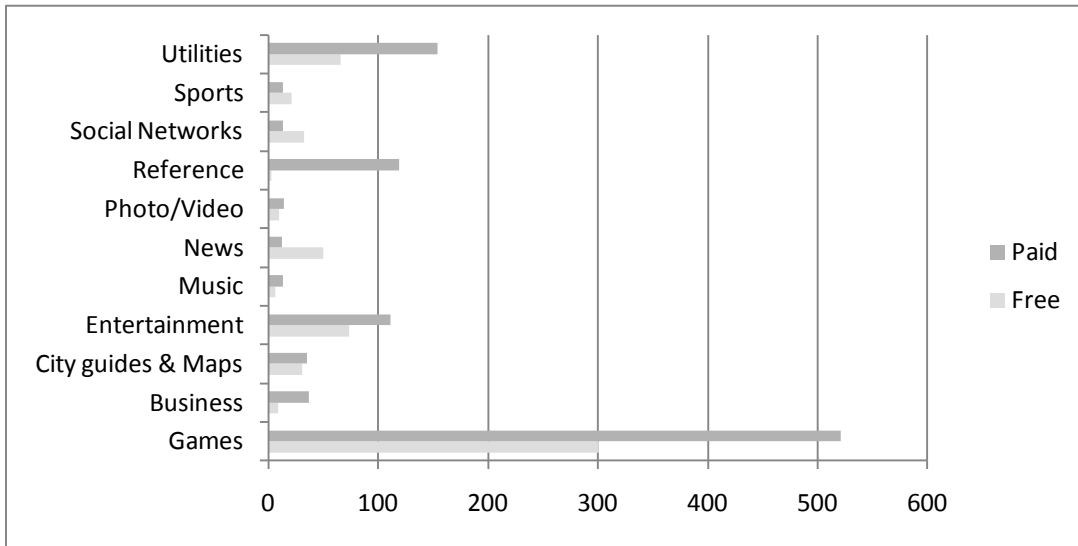
APPENDIX

Apple App Store

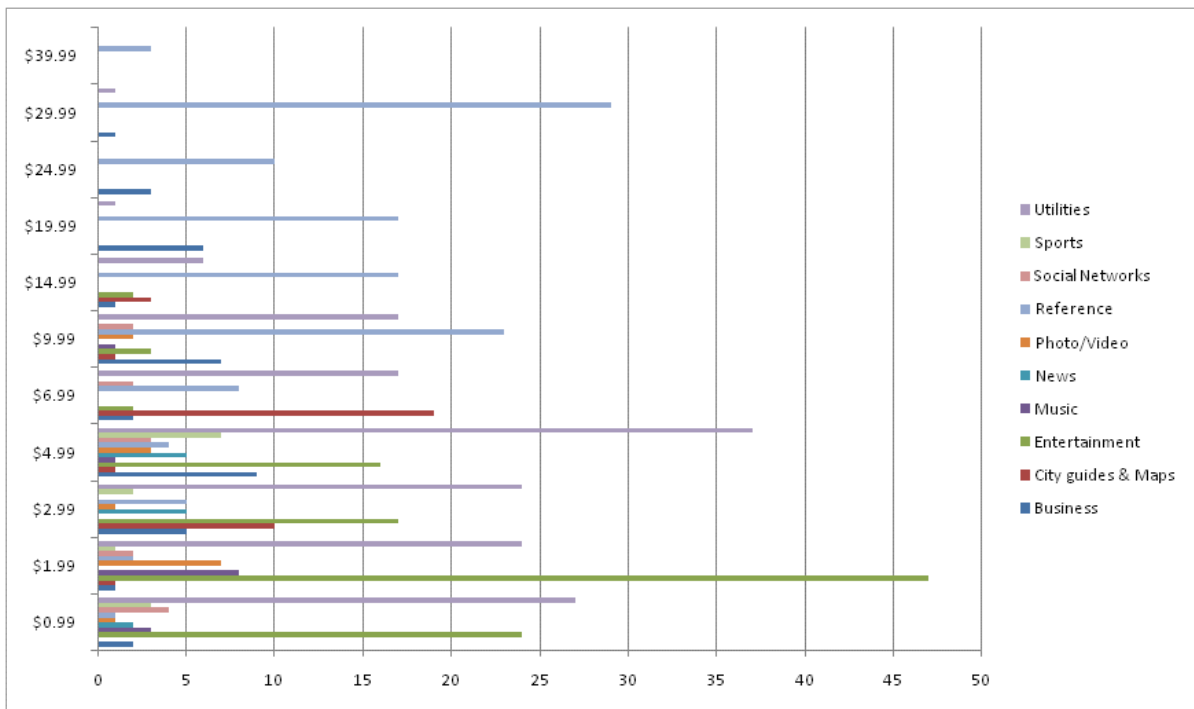


Source: [www.apple.com](http://www.apple.com), <http://www.apptism.com>, <http://www.iappphone.com/stats/>

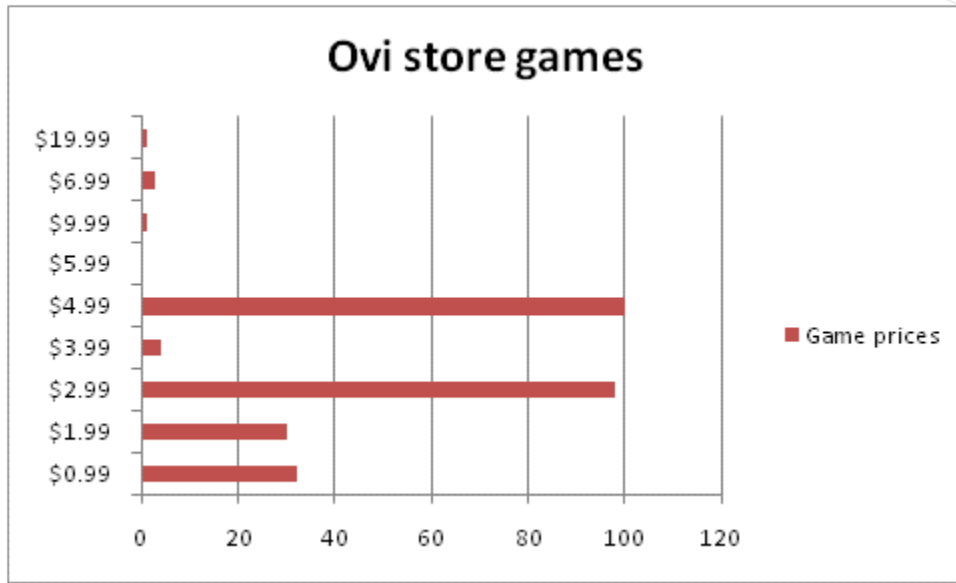
*Nokia Ovi Store*



Paid vs. free applications by genre



Application pricing



Game pricing shows a preference for developers to set their prices at \$4.99 and \$2.99

**Paid**

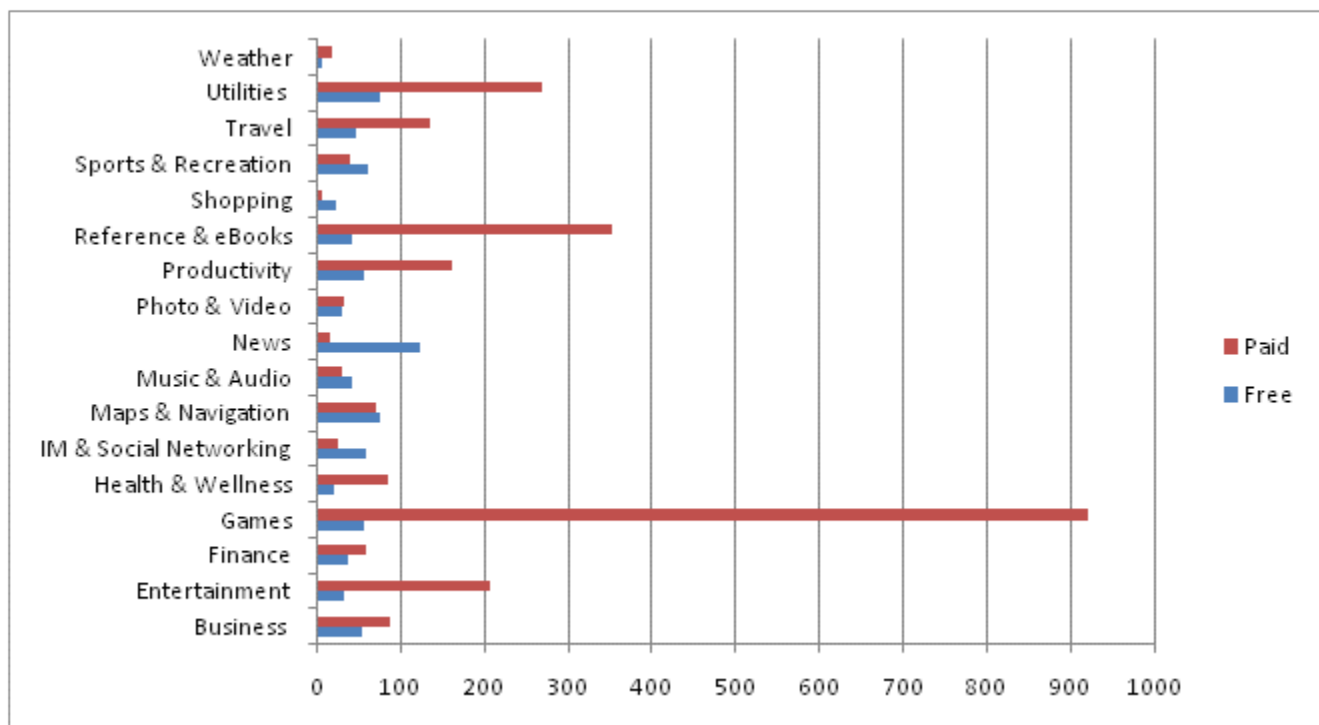
	\$0.99	\$1.99	\$2.99	\$4.99	\$6.99	\$9.99	\$14.99	\$19.99	\$24.99	\$29.99	\$39.99
Business	2	1	5	9	2	7	1	6	3	1	
City guides & Maps		1	10	1	19	1	3				
Entertainment	24	47	17	16	2	3	2				
Music	3	8		1		1					
News	2		5	5							
Photo/Video	1	7	1	3		2					
Reference	1	2	5	4	8	23	17	17	10	29	3
Social Networks	4	2		3	2	2					
Sports	3	1	2	7							
Utilities	27	24	24	37	17	17	6	1		1	

	Free	Paid
Games	301	521
Business	9	37
City guides & Maps	31	35
Entertainment	73	111
Music	6	13
News	50	12
Photo/Video	10	14
Reference	3	119
Social Networks	32	13
Sports	21	13
Utilities	66	154

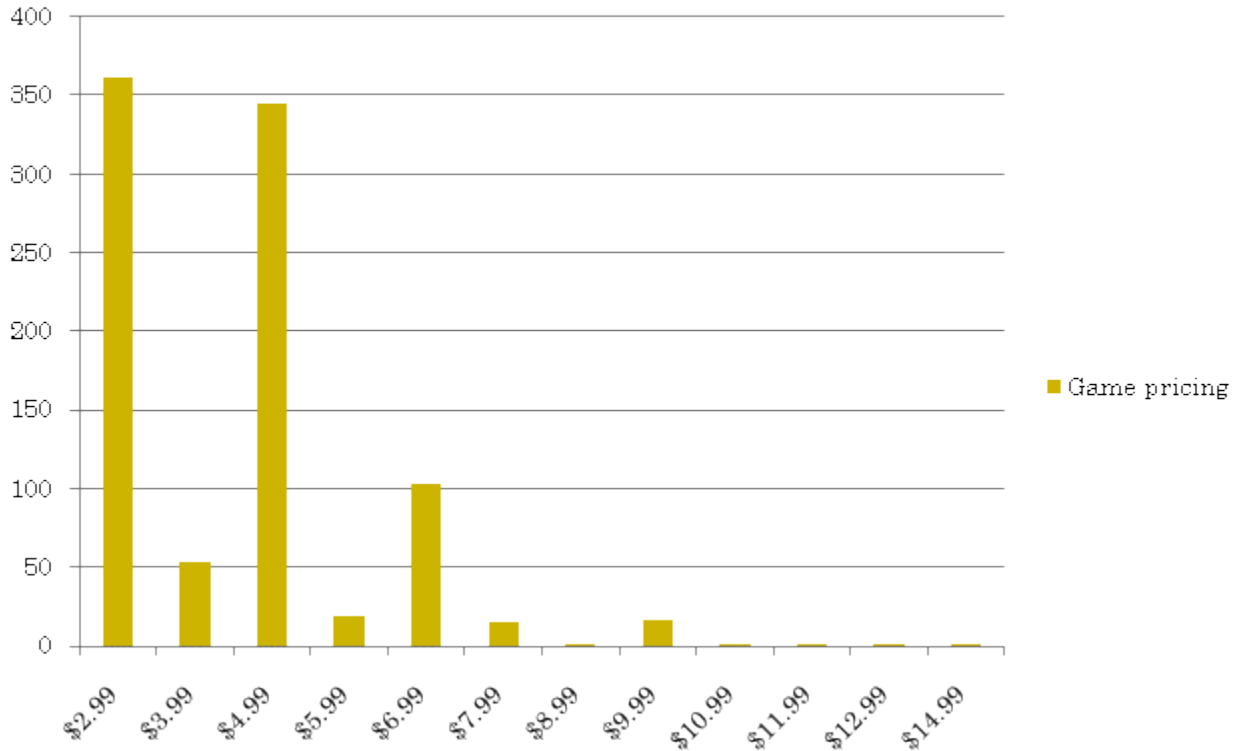
Game price	
\$0.99	32
\$1.99	30
\$2.99	98
\$3.99	4
\$4.99	100
\$5.99	
\$9.99	1
\$6.99	3
\$19.99	1

Source: <http://store.ovi.com>

*BlackBerry App World*



## Game pricing



## Application pricing

Other apps	\$2.99	\$3.99	\$4.99	\$5.99	\$6.99	\$7.99	\$8.99	\$9.99	\$10.99
Business	27	1	13	3	1	3	2	14	2
Entertainment	118	22	20	7	10	3	3	16	
Finance	16	5	13	2	1	2		9	1
Health & Wellness	30	6	8		3	3	2	6	1
IM & Social Networking	14	1	2	2				3	
Maps & Navigation	18	8	9	1	2	1		9	
Music & Audio	10	2	6		1			6	
News	6	1	1	2		1		1	
Photo & Video	21	2	5		1				
Productivity	28	9	29	3	6		7	25	
Reference & eBooks	60	21	37	9	3	10	4	35	1
Shopping	4							1	
Sports & Recreation	13	1	5	2		1	1	3	
Travel	8	4	5	4	11	1		15	
Utilities	128	22	31	11	9	5	2	24	

Mobile Application Development Platforms

2009

Weather	2	1	2	1	4			3	
<b>Total</b>	503	106	186	47	52	30	21	170	5

\$11.99	\$12.99	\$13.99	\$14.99	\$15.99	\$16.99	\$17.99	\$18.99	\$19.99	\$29.99	\$39.99	\$49.99
		1	2					1	6	1	2
	3			1	2						1
	3		1					3	1		
1	1	1	1	1				7	2	2	3
								1	2	1	
1	1	1						10	3	1	4
						1		4			
					1			3			
								1	2		
	2		8	1	2	1		17	15	2	2
20	3	12	3	6	6	1	5	64	40	8	4
	2		1				2	4	4	1	
50								28	7		1
	2		9	3	2	1		9	3	3	3
			1	1				1			1
72	17	15	26	13	13	4	7	153	85	19	21

\$59.99	\$79.99	\$99.99	\$149.99	\$199.99	\$299.99	\$349.99
2	1	2	2	1		1
		1				
1						
1	2	1	1		1	
1	1					
1						
4	1					
1						
1						
12	5	4	3	1	1	1

Paid vs. free applications by genre

Category	Free	Paid
Business	54	88
Entertainment	31	207
Finance	37	58
Games	55	920
Health & Wellness	20	84
IM & Social Networking	58	26
Maps & Navigation	76	71
Music & Audio	42	30
News	123	16
Photo & Video	30	33
Productivity	56	162
Reference & eBooks	42	353
Shopping	23	5
Sports & Recreation	61	40
Travel	46	134
Utilities	76	268
Weather	5	17

Game pricing shows a preference for developers to set their prices at \$2.99 and \$6.99

Game Price	No. of apps
\$2.99	361
\$3.99	54
\$4.99	345
\$5.99	19
\$6.99	103
\$7.99	15
\$8.99	2
\$9.99	17
\$10.99	1
\$11.99	1
\$12.99	1
\$14.99	1

Source: <http://appworld.blackberry.com>