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Research In Motion: The Mobile OS Platform War

1. Introduction

New details are emerging about the rowdy behavior of two Research In Motion executives who were fired for disrupting an intercontinental flight – including that they managed to chew their way out of restraints after being handcuffed by crewmembers. . . . [E]ach pleaded guilty to mischief for disrupting an Air Canada flight from Toronto to Beijing last week. The plane landed instead in Vancouver, where a court later ordered them to pay \$72,000 in restitution.

– CBC News¹

At the end of 2011, this was not the sort of publicity that Research In Motion (RIM) needed. The company's stock price, valued at over \$70 a share in February, had plummeted to a low of \$12.45 in December. Its leading market share had been eroded by major competitors Apple and Google, and its most recent product, the BlackBerry PlayBook tablet released in April, had flopped. Analysts were beginning to question whether the company had the capacity to survive, let alone thrive, in the very market that it had created.

RIM's flagship product, the BlackBerry smart phone running the company's BlackBerry Operating System (OS), had enjoyed phenomenal success since its release in 2003. Focused primarily on business and government users, the BlackBerry had gained a 45% U.S. market share by 2008, making it the most popular smart phone in the country.² More recently, however, things had changed. Google's Android OS, released in 2008, had supplanted BlackBerry OS at the top (see **Exhibit 2** for market shares); another newcomer, Apple's iPhone (released in 2007), was right behind it and enjoyed higher customer satisfaction ratings (see **Exhibit 1** for ratings). Both operating systems were better supported by application developers (see **Exhibit 3** for the most popular apps). Further, Nokia, the world's leading manufacturer of handsets, had recently begun developing its smart phones around Microsoft's Windows Phone platform.

¹ "RIM execs 'chewed through restraints' on flight," CBC News, December 9, 2011, <http://www.cbc.ca/news/canada/story/2011/12/09/rim-execs-flight.html>.

² A. Sacco, "A Closer Look at RIM's BlackBerry Market Share Gain Over Apple iPhone," *CIO*, June 2, 2008.

HBS Professor Alan MacCormack, Doctoral Candidate Brian Dunn (University of Pittsburgh), and Professor Chris F. Kemerer (University of Pittsburgh) prepared this case. This case was developed from published sources. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

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Not all was bleak, however. The company had experienced phenomenal growth in unit sales, which had carried on through 2010.³ While Apple and Google had beaten the company to the punch by releasing next-generation operating systems first, RIM was on the verge of releasing its own long-awaited next-generation OS, QNX, which was expected to make available many of the same features found in iPhones and Android devices. The company was in fine financial shape, with a balance sheet showing \$3 billion in available cash and no outstanding debts (see **Exhibits 4** and **5** for financials).

Still, the stock price and analysts' negative outlook pushed RIM to make a change at the top. In January 2012, the company fired its co-CEOs, Jim Balsillie and company founder Mike Lazaridis, and replaced them with former COO Thorsten Heins, whose job now was to face down the negative prognostications and restore luster to the company's name.

Heins and RIM had a number of crucial decisions to make. In the short term, the company needed to address whether it would be better to narrow or expand its product and marketing focus as well as determine where its resources could best be focused. For the long term, many wondered whether RIM would be better off making itself an attractive target for acquisition rather than continuing independently. Though denied by the company, rumors had surfaced linking RIM to possible suitors. The early phase of Heins's term as CEO looked to be an eventful one.

2. RIM History

First-generation Canadian Mike Lazaridis had a passion for wireless communication. A *Star Trek* fan since his youth, he was particularly fond of the futuristic electronics equipment used on the show, such as the communicator device used by Captain Kirk. In 1984, Lazaridis dropped out of college to found RIM, a company he hoped would one day fulfill his dream of creating a real-life *Star Trek* communicator. The company cut its teeth on notable projects from General Motors and Kodak (the latter eventually earning the company both an Emmy and an Oscar for technical achievement⁴), before deciding it was time to begin working in wireless.

RIM initially worked with Rogers CanTel, Canada's largest cellular phone provider, to develop software to support one-way sending of text messages to mobile pagers. It then partnered with Swedish handset maker Ericsson to develop mobile e-mail devices: true two-way wireless communication. While RIM worked on developing the software for the devices, a third partner intervened, causing Ericsson to sever ties with RIM. Thus jilted, Lazaridis and RIM decided they no longer wanted to have their dreams of wireless communication subjected to the willingness of hardware partners to cooperate. They decided to build their own devices: first, a PCMCIA wireless radio model for use with laptops, then, in 1996, the RIM 900 Inter@ctive Pager, the "world's first pocket-sized two-way pager,"⁵ with a QWERTY keyboard and wireless capability that allowed textual data transmissions.

By the time the Inter@ctive Pager came out, RIM was confident in its decision to build in-house. According to one of the company's earliest and most influential engineers, Gary Mousseau:

³ IDC.

⁴ A. Sweeny, *BlackBerry Planet* (Mississauga, Ontario: John Wiley & Sons Canada, Ltd., 2009).

⁵ Ibid.

RIM built everything themselves (except the wireless network itself) and we fine-tuned every piece to make it work fantastically. With Mobitex, our first wireless network, RIM suggested key changes and improvements to allow it to work better. Then we educated the wireless network carriers and fine-tuned everything to work even better.⁶

RIM worked with wireless carrier BellSouth (later part of Cingular Wireless and eventually part of AT&T) to bring the product to market. But, while the product had been a hit with internal employees, the market's initial reception was tepid. RIM used the experience, however, to identify key problems to address in its next device. One major improvement was the development of a method to mirror a user's e-mail address, allowing for clean coordination between the user's device and a PC-based e-mail box. RIM also enabled its follow-up device, the Inter@ctive Pager 950, to receive regular (non-text) pager communications. The product was aimed at corporate accounts and succeeded in attracting business from some large firms such as IBM and Panasonic, which signed up at a price point of \$249 per device and \$25 a month.⁷

RIM felt its devices were becoming increasingly capable, but were disappointed that they were used mostly for two-way paging. Seeking to connect with a more tech-savvy audience and to broaden the appeal of its device beyond mere paging, RIM hired a California marketing agency to come up with a new, more marketable name for its product. The name the agency recommended was "BlackBerry." The new name was intended to be "natural" and "joyful" and to potentially "decrease blood pressure";⁸ RIM hoped that this less pager-centric name would encourage customers to view the product as something that went beyond mere two-way texting.

Working in the company's favor was the concurrent development and adoption of the Internet, both in corporations and in homes. Due to this rapid adoption, the business and consumer worlds changed fundamentally between the time the Inter@ctive Pager 950 was launched and the time that the same product, now renamed BlackBerry, came onto the market in 1999. Unlike its almost identical predecessor, the BlackBerry arrived in a world of people that not only knew what e-mail was, but also wanted to take it with them wherever they were. RIM targeted the product at high-end business users,⁹ and the strategy worked. Customers and business partners, many of them famous and influential, signed up. Said Lazaridis,

And here we are, with [BlackBerry] really being one of the top one or two pre-eminent brands in handhelds, and certainly the No. 1 brand in wireless data, so far. The senior executives at Intel use it, so do the senior executives at Microsoft. And very well-known people like Mike Dell, Gerald Levin and Al Gore love it.¹⁰

The BlackBerry offered owners a new level of connectivity previously unknown to cell phone and personal digital assistant (PDA) users. The re-launched device could interact with corporate e-mail servers via owners' wireless providers. Thus encouraged, RIM went on to develop new functionalities for new versions of its device. It added cell phone capability, Internet browsing, and highly secure instant messaging via BlackBerry Messenger, and was soon enabling its device to host third-party productivity and entertainment software. These third-party developers further extended

⁶ Ibid.

⁷ Ibid.

⁸ "How did the BlackBerry get its name?," *Ottawa Citizen*, November 5, 2006, <http://www.canada.com/topics/technology/story.html?id=85473082-02e8-4296-80a8-d8bdd4901496>, accessed August 2011.

⁹ J. Martinson, "Mr BlackBerry — \$2bn geek who started with Lego," *The Guardian*, March 2, 2007.

¹⁰ Sweeny, *BlackBerry Planet*.

the usefulness of the device, adding applications for news feeds, social media, gaming, and a host of other functions that ran on top of the device's BlackBerry OS.

Sales boomed. Early-adopting technology enthusiasts could be seen cradling the device underneath conference tables and while waiting at bus stops. As the device became more popular, medical practitioners began comparing its persistent use to alcohol and nicotine addiction.¹¹ Detractors referred to the device as a "crackberry." For better or worse, it had changed the way its users could interact with technology and each other.

Lazaridis, on the other hand, looked at users' affinity for his product in a strictly positive light: "Until you use a BlackBerry you just don't get it. You are connected for both the crisis and the opportunity. You can respond to your boss, but at the same time you have the freedom to walk to the corner store and get a cup of coffee."¹² RIM had made the Internet mobile. People could read their e-mail while waiting at stoplights, evaluate their stock portfolios while in a staff meeting, even listen to music or read books while stranded in the airport. It was the early leader in an industry poised for explosive growth.

3. Personal Digital Assistants: BlackBerry's Roots

While the BlackBerry owed its immediate origin to the pager market, as the device began to take on computing power and grow into a platform for online applications, it began to resemble the pager less and devices such as the personal computer (PC) and PDA more. Of the two, many considered the PDA to be the BlackBerry's most direct immediate ancestor. For RIM, understanding the development of the PDA offered insight into what the company might expect for the future of the smart phone market and how it should move forward.

Apple's Newton

In his 1987 autobiography, *Odyssey*, former Apple CEO John Sculley introduced his idea for a new concept in computing, "Knowledge Navigator." This new concept would be more like working with a human assistant. Users could simply tell the device what they wanted, using everyday language, and the device would handle the request or, even better, have already anticipated the user's need based on contextual clues. To probe the concept further, Apple created a series of video clips, which tantalized viewers with human-looking onscreen agents and foldable flat-panel screens controlled with simple gestures.

None of that was technologically possible in 1987. By 1992, though, Sculley felt that Apple was ready to take a major step toward his vision. In his keynote address at the winter Consumer Electronics Show (CES) in Las Vegas, Sculley excited attendees with his talk of "digital convergence." He explained how three previously disparate markets—PCs, interpersonal communication, and content publication—would soon become one. By the early 2000s, he predicted, this converged market would be worth \$3 trillion and Apple would be at its forefront. Attendees buzzed with excitement; had the future finally come?

¹¹ J. Stern, "BlackBerry Addicts Can't Shake the Habit," *Laptop*, December 4, 2007.

¹² Martinson, "Mr BlackBerry."

Sculley's speech pointed to the upcoming release of Apple's new computing product, the Newton, a device for which he coined the term "personal digital assistant."¹³ The Newton had been developed as a stand-alone mobile product that users would take with them everywhere; it weighed less than a pound, could fit in the user's hands, and ran 14 hours on four AAA batteries. The Newton came with an infrared port by which to communicate with other Newton devices. Although it didn't have a human-looking assistant and couldn't be operated through hand gestures, it did allow users to input everyday language commands and information through their natural handwriting by using a stylus to write directly on the screen. The Newton would then parse the handwriting to detect commands and, where appropriate, launch applications and/or bring up new screens of information.

When it was released in August 1993, the Newton MessagePad 100 carried a price tag of \$699, similar to the cost of a 27-inch television at the time.¹⁴ The screen had a contrast ratio of only 6.4-to-1, which, especially in low-light situations, could be difficult to see. The handwriting recognition input feature, arguably the most innovative concept in the device, presented significant issues. In order to keep Newton's price below \$1,000, Apple had opted for a relatively economical CPU for the device. However, handwriting recognition was processor-intensive. As a result, after handwriting a command on the screen, there was a noticeable lag as the device processed the input before re-displaying it as typed text on the screen. Making the situation worse, Newton's handwriting recognition required weeks to calibrate itself to a user's writing and, even then, was often inaccurate.

The Newton's handwriting recognition issues were widely mocked. The comic strip *Doonesbury* depicted characters surprised by how their Newton devices misinterpreted inputs (even though *Doonesbury* cartoonist Gary Trudeau had never used the device¹⁵). The television show *The Simpsons* showed a bully taking a note on his Newton to "beat up Martin," only for the device to misinterpret the input as "eat up Martha." Referring to suspicions that Apple had rushed the product to market, even some Apple devotees came to deride the MessagePad 100 as a "grand public beta test."¹⁶

Sales were poor and the initial perceptions of the device's shortcomings doomed it to market failure. Though follow-on versions of the product improved its handwriting-recognition feature considerably, the public stayed away. *PC World* later awarded the Newton "dishonorable mention" in its list of the worst all-time tech products.¹⁷ Apple's board fired Sculley before the end of 1993, and, in 1998, newly returned CEO Steve Jobs canceled the Newton line altogether.

Palm and the Pilot

In January 1992, the same month Sculley made his Las Vegas pronouncements, a former Intel engineer, Jeff Hawkins, founded Palm Computing. With backing from Tandy Corporation and a group of venture capitalists, Hawkins sought to create a device that would "respond to human impulses" using insights he had discovered while researching human intelligence and neural networks as a PhD student in California.¹⁸ Palm's initial focus was software, and its first major

¹³ O. Linzmayer, *Apple Confidential 2.0: The Definitive History of the World's Most Colorful Company* (San Francisco: No Starch Press, 2004).

¹⁴ <http://www.tvhistory.tv/tv-prices.htm>.

¹⁵ <http://applemuseum.bott.org/sections/computers/omp.html>.

¹⁶ T. Brand, "Choosing a Newton," <http://eggfreckles.net/tech/choosing-a-newton/>, accessed July 8, 2011.

¹⁷ D. Tynan, "The 25 Worst Tech Products of All Time," *PC World*, May 26, 2006.

¹⁸ P. Dillon, "The Next Small Thing," *Fast Company*, May 1998.

product was the personal information management (PIM) code for an early PDA, the Zoomer, manufactured by both Tandy and Casio.

Like the Newton, the Zoomer models were released in 1993. The Zoomer was like the Newton in other ways: it also had problems with handwriting recognition and it also failed to have an impact on the market. In retrospect, Hawkins wasn't surprised, later calling the Zoomer "the slowest computer ever made by man" and commenting that it had been too big (it was seven inches long and an inch thick and weighed a pound) and too expensive (it retailed for \$700).¹⁹ Postlaunch analysis also revealed that the Zoomer had targeted the wrong audience. Hawkins' vision had focused on consumers, who he thought would use the device instead of a PC. Actual purchasers, however, had largely been corporate users who wanted a small device that interacted with and complemented their PCs.²⁰ Said Palm CEO Donna Dubinsky,

The approach we were all taking before was to say "We're going to take the PC and shrink it into this little box." There was this implication that it had to do everything the big box did. What we realized after having some failures was there was a different approach, which was to assume the handheld is a component of the bigger system.²¹

Lessons in hand, Palm went to work creating its next generation. In order to have more control over its product's success or failure, Palm decided to build its own device rather than partnering with Tandy or Casio again. The product it was developing needed to work seamlessly with PCs and act as part of the greater PC "ecosystem." As it would not be a stand-alone computer capable of most things a PC could do, however, the product needed to be cheaper, lighter weight, and more responsive. This meant solving the handwriting by creating a new, simplified alphabet that users would have to learn, but that would not require as much processing power.

By 1996 and then owned by modem maker U.S. Robotics, Palm was ready to release its new lighter-weight, more responsive device. Dubbed the PalmPilot, it was small enough to fit in a shirt pocket and weighed less than six ounces. It included the new handwriting recognition system and was available for \$299. The product was a success. Palm shipped over 1 million units in the 18 months after the product's launch, making it, until then, the fastest-selling computer product ever.²² Adoptees were passionate, with some claiming that their purchase of a Palm PDA was a life-changing, even "religious" event.²³

Not only did the Pilot capture the attention of media and consumers, but, like the PC before it, it launched a new market for third-party applications. The Pilot ran on Palm's newly developed operating system, PalmOS, which the company considered to be an "open architecture."²⁴ The company provided developers with tools needed to code Palm applications initially on full-sized PCs and then transfer them into the Palm ecosystem. As more applications were developed and people saw that the new Palm alphabet was not too difficult to learn, the product flourished.

¹⁹ Ibid.

²⁰ Ibid.

²¹ E. Ramstad, "In handheld program, Microsoft's challenges are clear," *Sarasota Herald-Tribune*, July 3, 1996.

²² Dillon, "The Next Small Thing."

²³ D. Colman, "Palmistry," *New York Times*, August 12, 1999.

²⁴ U.S. Robotics press release, January 29, 1996.

Its golden period, however, was short-lived. In 1998, U.S. Robotics (and Palm along with it) was bought by technology company 3Com. Hawkins felt the new owners were hindering development of Palm, so he left later that year to form another PDA manufacturer, Handspring. With 3Com doing little to improve the PalmPilot, and Handspring needing time to start up operations, neither company manufactured an Internet-capable device until 2002. The two companies merged soon thereafter, but by that time they had not only lost the initiative on Internet-capable smart phones, but their core PDA market had become fully enveloped by the smart phone market and devices like RIM's BlackBerry. Palm had made the transition into the smart phone world, but by 2011, and after its acquisition by Hewlett-Packard, the Palm operating system could claim only 4% of the market and was no longer seen as a viable mobile OS.

4. The Mobile OS Competition

By 2011, the mobile OS competition had become more heated than the PDA competition ever had. With viable options from industry heavyweights Apple, Google, and Microsoft, RIM needed to understand its competition's market positions. Would it make sense for RIM to mimic what had been successful for Apple and Google, or would it be better for the company to forge its own path?

Apple iOS

After deciding to kill the Newton in 1998, Steve Jobs, newly returned as Apple's CEO, explained that "to realize our ambitious plans, we must focus all our efforts in one direction."²⁵ The company put Newton's technology on the market, but could not find a worthwhile suitor. Industry observers saw the product's demise as a sign that the company was in dire straits and that it represented a "loss of momentum" for Apple.²⁶

Then, in August 1998, Apple released its new consumer-focused desktop computer, the iMac. Industry pundits called the launch a "do-or-die" for Apple.²⁷ The iMac, unlike the generally beige-box Microsoft-based PCs of the day, focused on design and was available in five translucent colors. The company marketed the iMac with an aggressive advertising campaign, including a television spot featuring the Rolling Stones' "She's a Rainbow" accompanying a kaleidoscope of gyrating iMacs.²⁸

While the iMac did not propel Apple to the top of the desktop computer world, it exceeded sales expectations and boosted the company's stock price.²⁹ Perhaps more importantly, it marked the start of the "modern Apple." The company's well-coordinated emphases on industrial design, functionality, and marketing savvy made owning a Macintosh hip and trendy, if perhaps still problematic due to incompatibility with Windows.

With the iMac established, Jobs and Apple were confident enough to again look into other markets. The rise in popularity of MP3 music files had created a market need for portable MP3

²⁵ T. Murphy, "Apple dropping Newton products," <http://www.marketwatch.com/story/apple-dropping-newton-products>, accessed July 9, 2011.

²⁶ Ibid.

²⁷ V. Gonzales, "Apple Pins Hopes On iMac Appeal," <http://www.cbsnews.com/stories/1998/08/16/tech/main16073.shtml>, accessed July 10, 2011.

²⁸ <http://www.youtube.com/watch?v=lcBpXYI1r3Q>.

²⁹ "New iMac selling like hotcakes," <http://news.bbc.co.uk/2/hi/business/153396.stm>, accessed July 12, 2011.

players. While these were quickly coming into the market, most were built by smaller companies, were bulky and heavy, and, due to the limitations of using 32 or 64 megabyte (MB) memory chips, could carry only a limited number of songs. A few models could store more songs thanks to a newly available 2.5-inch hard drive, but suffered other critical flaws.

Apple responded by creating the iPod. Using the same small-format hard drive of some of its competitors, the iPod was sleek and lightweight and, with a 5 gigabyte (GB) capacity, could hold 1,000 songs. The iPod added to Apple's growing image as a design-savvy company. As subsequent generations of the product could be used by either Macintosh or Windows PC users, consumers who had never owned an Apple product before were drawn to the iPod.

Apple also seized on an opportunity made available by the closure of Napster, a popular illegal music-sharing site. With record companies looking for a way to distribute songs digitally and consumers looking for a way to acquire songs, Apple stepped in with the iTunes store. Apple, already with a large installed base of iPod users who used the company's iTunes software to manage their music, offered songs for \$0.99 each or albums for \$9.99; users could then listen to the songs on their PCs or iPods. The service took off, with Apple eventually becoming the largest music retailer in the U.S.³⁰

Buoyed by such successes, Apple's reputation and stock price soared. The company that had been at death's door in 1998 was now a technology juggernaut. When, in 2007, Apple announced the iPhone, a smart phone based on its purpose-built iOS operating system, the market expected a winner. The product offered a new way of interfacing with a smart phone; instead of trackballs and keypads as had become the norm for the BlackBerry and Palm smart phones, the iPhone had a touch screen as its primary interface. A virtual keyboard would appear when users needed to type. In order to launch an application, the user would touch its icon on the screen. The approach opened up considerable display space on the device that would otherwise have been expended on a physical keyboard. With this extra screen real estate, users could see and do more without having to access additional screens. While previous smart phones had been about e-mailing and telephoning, the touch screen focused users' attentions on the device's software—"apps" in the parlance of the iPhone.³¹

The iPhone contained a number of other key innovations, such as "multi-touch" to zoom in and out of a screen. Observers were stunned by the device. When shown a pre-production version of the unit, AT&T's head of wireless, Stan Stigman, called it "the best device I have ever seen."³² Perhaps even bigger than the device's technological innovations were the business innovations Apple brought to the smart phone industry.

Apple's brand perception gave it considerable leverage in negotiating with wireless carriers, which had previously dictated terms to phone manufacturers. Using this leverage, Apple initially offered the iPhone through one wireless provider, AT&T. The newfound affinity customers felt for Apple created the expectation that consumers would buy the iPhone regardless of which wireless carrier it worked with. Whereas wireless carriers had required past smart phone applications to be

³⁰ S. Smith, "Apple iTunes Store holds music retail lead as Amazon jumps," <http://www.thetechherald.com/article.php/200832/1668/Apple-iTunes-Store-holds-music-retail-lead-as-Amazon-jumps>, accessed October 20, 2010.

³¹ D. Frommer, "History Lesson: How the iPhone Changed Smartphones Forever," <http://www.businessinsider.com/iphone-android-smartphones-2011-6>, accessed July 10, 2011.

³² F. Vogelstein, "The Untold Story: How the iPhone Blew Up the Wireless Industry," *Wired*, January 9, 2008.

purchased through the wireless carrier, Apple was allowed to bypass AT&T and sell third-party apps directly to iPhone owners. Further, Apple convinced AT&T to allow purchasers to activate their phones through Apple rather than AT&T. What's more, the phones shipped without any carrier identification logos, ensuring that iPhone users were iPhone users first and AT&T customers second. When Apple later began offering iPhones through other carriers, the continued high demand meant it could attain similar concessions from them as well.

Another fundamental smart-phone business change was Apple's "App Store." Apple's success with the iTunes store led the company to extend the concept to software for iOS. Customers seeking to extend the capabilities of their iPhones could do so by buying and downloading apps directly through the App Store. Apple retained a 30% commission on all apps sold, giving application developers a 70% cut, considerably more generous than the payments developers had received from wireless carriers. Mobile application developers were thus encouraged to divert resources away from developing apps for other mobile operating systems and to instead focus on the iPhone, cutting carriers out of the third-party app revenue stream altogether. Apple used the App Store as the focus of its advertising campaign, leading to the tagline, "there's an app for that," coming into everyday usage. Not only did the App Store serve as a money generator for the company, its existence also drove customers to adopt the phone.

Finally, Apple set a new standard in terms of pricing. While previous smart phones had run upward of \$400, even after being subsidized through wireless contracts, Apple's product eventually settled at \$199 after subsidy, despite higher demand compared to many rival models. The fact that Apple could make additional money on purchasers through its App Store meant that the company had more latitude in discounting the phone up front.

Despite Apple's failure to win the PC platform competition, the iPhone represented a (closed) architecture similar to that of the company's computers. Apple made the operating system, Apple made the devices, and Apple controlled the distribution of third-party software onto the device. This was, however, the same approach that Apple had taken with its iPod, which had proven wildly successful and made a very positive impact on the company's financial status.

Google Android

Not everyone, however, was excited by the iPhone. Many customers preferred other wireless carriers over AT&T due to the perceived superiority of coverage or flexibility of wireless plans. The wireless carriers themselves were concerned about the amount of control Apple had negotiated and fretted over the loss of secondary revenue through the sale of third-party applications. Some application developers were discouraged by Apple's insistence that all apps be sold through its proprietary App Store and be subject to Apple's approval, which was neither universal nor guaranteed. Many of these concerns were addressed in 2009 when another new-generation mobile OS was released: Android.

Google had acquired Android, Inc., in a relatively inconspicuous buyout in 2005. At the time of the acquisition, little was known about the company aside from the fact that it was rumored to be working on an operating system for cell phones. These rumors proved accurate. The Android OS was an offshoot of the open-source Linux OS, itself derived from AT&T's Unix operating system. True to its Linux roots, Google elected to make Android open source as well, meaning that it published the source code so that others could make alterations to it as they saw fit under a free license.

In 2008, third-party handset OEM (original equipment manufacturer) HTC released the first commercially available Android-powered phone, the G1, sold through T-Mobile in the U.S. and

Rogers Wireless in Canada. Given the free license, HTC was not required to pay fees to Google for use of the OS. In 2009, a number of other manufacturers followed suit. LG, Motorola, and Samsung all had Android-powered devices available in time for the holiday season. As more Android devices came to market, all major U.S. wireless carriers eventually had Android phones available. Given the openness of the OS, these wireless carriers could modify the operating system. Many included pre-installed software that drove customers to buy from the growing library of Android-compatible apps through the carriers' own application stores.

The Android OS-based phones offered many of the same features that had been introduced by the iPhone. They had touch screens, and subsequent versions could support multi-touch controls. Unlike Apple, however, applications could be downloaded through a number of app stores and anyone who wanted to publish and sell apps for the devices could do so. While Android-based phones proliferated, Google saw little direct profit.

Thus, in 2010, Google made its next move and introduced its own phone and its own phone store. The phone, the Nexus One, was Google-branded. While the phone made some key technical strides—it came with an innovative speech-to-text feature for texting and instant messaging—the true innovation came in Google's marketing plan. Instead of marketing the phone through wireless carriers, Google set up its own phone store. By doing so, customers could opt to buy the Google experience, rather than that of the wireless carriers. Google offered the phone for \$529 with no strings attached; customers could then sign up for a data plan with any of the major U.S. wireless carriers. Alternately, customers could buy the phone from Google and simultaneously sign up for a T-Mobile data plan; under this option, the subsidized price of the Nexus One would be only \$179.

Some observers were impressed by the bold move. By offering a contract-free phone, Google's plan could potentially liberate consumers from long-term tie-ins with wireless carriers. Others were hopeful, but more skeptical. Veteran technology pundit Robert X. Cringely wrote:

If there was ever an industry ripe for disrupting, the notoriously unpopular yet massively profitable wireless telecom industry is it. And it would require somebody with Google's cash and cojones to pull it off. . . . So I'm hoping the Nexus One Store will prove to be the first step in the Great Wireless Disruption. But freedom won't truly ring until you can buy one phone that works on all the major telecom networks. When Google pulls that off, then we'll talk.³³

As it turned out, Cringely was right to be skeptical. In typical Google fashion, the store announcement was low key. While technophiles were aware of the new phone and store, many in the general consuming public failed to take notice. Google abandoned its Nexus e-store concept less than five months after launching it, citing users' need to handle the device before purchasing. Industry observer Matt Hamblen wrote, "The ramifications of the reversal will resonate in a U.S. smart phone market that is still obviously dominated by the carriers."³⁴

After abandoning the e-store, Google attempted to sell its branded phone through wireless carriers. In that setting, however, the Nexus One was merely one Android phone among several that were available. The majority of Android OS phone sales continued to come through third-party manufacturers.

³³ R. X. Cringely, "Google's Nexus One: It's the store, stupid," <http://www.infoworld.com/d/adventures-in-it/googles-nexus-one-its-store-stupid-479?page=0,1>, accessed July 19, 2011.

³⁴ M. Hamblen, "Nexus One online store's failure shows wireless carriers still rule," *ComputerWorld*, May 18, 2010.

While Google's own-product adventure proved to be a failure, the OS itself proved to be a success. In 2010, there were more Android OS phone activations in the U.S. than either RIM's BlackBerry or Apple's iOS. In two years, it had come to be the most widely adopted mobile OS in the smart phone market. While Google did not receive license fees for most sales, it benefited from the overall growth of the mobile Internet through its success in advertising sales and it continued to operate its own Android Market for the sale of third-party apps.

On the other hand, its hands-off, open-source approach opened Google to criticism of its mobile OS strategy. Because handset makers and wireless providers were free to do what they wished with the operating system, the experience of Android users could be disjointed. Some Android-based devices were relatively powerful, while others had slower processors or lower-resolution screens. As a result, not all Android devices were capable of making effective use of some of the most popular mobile apps, such as the Netflix video app or even some of the most popular games.

While Google portrayed Android's open approach as a means to make an advanced OS available to all and encourage the development of more apps than would otherwise be available, not everyone agreed. Steve Jobs cast Android's architecture in a particularly disparaging light:

In reality, we think the open versus closed argument is just a smokescreen to try to hide the real issue, which is what's best for the customer: fragmented versus integrated. We think Android is very, very fragmented and getting more fragmented by the day. . . . When selling to users who want their devices to just work, we believe integrated will trump fragmented every time.³⁵

Google's approach received further criticism when other companies began making patent infringement claims against the OS. Since the OS was open source and Google was not profiting directly from it, patent claims were instead filed against the manufacturers of Android-powered handsets, which were left to fend for themselves without Google's help. To what extent, then, did Google support the Android platform? Said Microsoft chief attorney Brad Smith, "Google says it stands behind its products, but some days they stand so far behind, I'm not sure anyone can see them."³⁶

Regardless of Google's support, however, Android had become the mobile OS market share leader. It had allowed wireless providers and app developers freedom from Apple's leverage. Advanced smart phone technology could now be had on whichever major wireless network the customer chose. Would the free-for-all approach prove to be the indomitable force in the industry? RIM hoped not.

Microsoft and Nokia

Microsoft was also hopeful that Android's position would prove insecure, and by the start of 2012, the company had a long history with mobile operating systems. In 1998, six years after Sculley announced the Newton, Bill Gates found himself at the podium at Consumer Electronics Show in Las Vegas. Like Sculley, he was there to announce the upcoming release of a new mobile computing product. Unlike Sculley, however, he struck a relatively cautious tone. He warned that not all breakthrough technology products introduced at trade shows go on to great success. He named the failure of the Newton as well as his own company's "Bob" (a product intended to simplify the

³⁵ M. Helft, "Jobs Says Apple's Approach Is Better Than Google's," *New York Times*, October 18, 2010.

³⁶ S. P. Chan, "Is Android Microsoft's next cash cow?," *Seattle Times*, July 8, 2011.

Windows interface) as examples. With that in mind, he announced Microsoft's entry into mobile computing, a new, slimmed-down operating system that could be used in what he termed "PC companions." The new OS would be licensed to OEMs for use wherever they saw fit.³⁷

While Gates may have been circumspect regarding the outlook for his company's new product, Microsoft's competitors sounded notes that were more alarmist in tone. Gary Reback, attorney for Netscape, complained that Microsoft was "hell-bent on dominating the entire information infrastructure of the world."³⁸ With its new mobile operating system, was Microsoft destined to dominate another computing market?

By 2012, such fears had not yet come to fruition. Gates's 1998 warning about the difficulty of successfully selling new technology appeared prescient. The Microsoft mobile operating system, Windows CE, had been used in a number of devices: vehicle navigation systems, PDAs, smart phones, and more. Its smart phone product, initially named Windows Mobile, had little trouble in attracting the attention of OEMs such as HTC, LG, and Samsung, but had yet to capture the imagination of the consuming public, leaving the company a distant fourth in U.S. market share (and fifth worldwide).³⁹

In late 2010, attempting to rejuvenate its prospects and respond to the buzz created by the iPhone and Google's Android, the company released a major overhaul of Windows Mobile, Windows Phone 7. The new OS addressed some of the issues that many felt had been holding Windows Mobile back: the continued use of a stylus for input and the lack of cut-and-paste functions, for instance. Further, the new operating system attempted to better leverage Microsoft's dominance in productivity software, such as Microsoft Outlook and Microsoft Word as well as Microsoft's Xbox video game console.⁴⁰ Like Android, Microsoft would license Windows Phone 7 to a variety of OEMs. However, the company sought Apple-like control of design quality by taking a hands-on interest in the development of OEM devices and by not allowing third-party alterations of the software.⁴¹

Despite these moves, many in the industry were negative about Microsoft's prospects. At the time of Windows Phone 7's release, observers wondered at the lack of available apps for the OS. Both iOS and Android had hundreds of thousands of applications available,⁴² but Microsoft's at-launch catalog was relatively meager. Relatedly, applications developers were giving mixed reviews regarding the ease of use of the software development kit Microsoft had provided.⁴³ Adding to the negativity, Gartner Group projected that, despite the release of the new OS, Microsoft's share of the worldwide smart phone market would fall from 4.7% in 2010 to 3.9% by 2014. Microsoft needed a boost to strengthen its position at this critical time, and it received one from Nokia.

³⁷ "Gates' strategy for digital devices," *New Straits Times*, January 15, 1998.

³⁸ S. Hamm, "Microsoft's Future," *Business Week*, January 19, 1998.

³⁹ C. Boulton, "Android Took 36% Smartphone Share in Q1: Gartner," <http://www.eweek.com/c/a/Mobile-and-Wireless/Android-Took-36-Smartphone-Share-in-Q1-Gartner-375805/>, accessed June 23, 2011.

⁴⁰ R. S. Anthony, "Windows Phone 7: Microsoft Antes Up in Smartphone Race," *PCWorld*, October 11, 2010.

⁴¹ I. Paul, "5 Ways Windows Phone 7 Puts Microsoft Back on Top," *PCWorld*, October 12, 2010.

⁴² R. Wauters, "Android to Surpass Apple's App Store in Size by August 2011: Report," *TechCrunch*, <http://techcrunch.com/2011/05/05/android-to-surpass-apples-app-store-in-size-in-august-2011-report-exclusive/>, accessed October 4, 2011.

⁴³ P. McDougall, "Windows Phone 7 Will Flounder, Gartner Predicts," *Information Week*, October 6, 2010, <http://www.informationweek.com/news/security/reviews/227700245?itc=ref-true>, accessed July 8, 2011.

Nokia, still the world's leading manufacturer of cell phones in 2011, had its own history with smart phones. In the late 1990s, Nokia joined with Swedish mobile phone maker Ericsson and U.S.-based Motorola in creating Symbian, a company to develop a mobile OS based on a platform developed by British company Psion. They hoped Symbian would allow them to compete with Microsoft's then-nascent Windows CE.⁴⁴ Over time, other electronics and wireless firms became shareholders in the company, including Siemens and Samsung; still others, such as Kenwood, Fujitsu, and Sony, licensed the OS. By 2008, Symbian, largely guided by Nokia, grew to control about half the global smart phone market even though it had yet to find a foothold in the U.S.⁴⁵ However, its product had become splintered; different licensees had demanded different interfaces and functionalities, and the OS had been developed for use in both regular cell phones and smart phones, and thus was not optimized for smart phone capabilities. Eyeing the new threat posed by Apple as well as Google's soon-to-launch Android, Nokia, in 2008, decided it needed to seize control if Symbian were to continue to thrive. The company bought out its remaining Symbian partners and announced the operating system would soon be made open source.

The move did not work out. Symbian needed more work to be ready to compete with the next-generation OSes for smart phone use. Handset makers like Motorola moved off the Symbian platform to focus exclusively on Android- and Windows Phone-based platforms. Nokia's already minimal presence on the American smart phone landscape grew even smaller and, as Android and Apple proved their mettle, Nokia saw its global presence begin to falter.

The company struggled to make the open-source Symbian competitive. It needed a way to combine its global presence and competence in hardware manufacture with a capable platform. The company announced in early 2011 that it was abandoning its own platform and would begin using Windows Phone exclusively. With Nokia now in the fold, Microsoft had a partner that it hoped could help it defy Gartner's prediction and contend for market dominance. The Nokia Lumia 800, running Windows Phone 7.5, received good reviews. Its Lumia 900 would later be called a "great phone" that a buyer would feel "lucky to own."⁴⁶ With quality mobile hardware now available for Windows Phone and with the company eyeing the coming release of its next-generation PC OS, Windows 8, the year 2012 looked to be a promising one for Microsoft.

5. Conclusion

As Heins began his new role, RIM's challenges were clear. It had lost territory to two of its chief rivals and all three had released platforms that enabled features that were as yet unavailable on a BlackBerry. Android had become the market share leader, partly due to Google's decision to make it an open platform. Apple's iOS appeared exceptionally profitable, thanks, in part, to its company-owned and exclusive App Store and to the hundreds of thousands of apps available there. With a new CEO on board, RIM had an opportunity to re-position itself in the marketplace, in both the short and long terms. Should it stay the course or find a new way forward?

⁴⁴ A. Orlowski, "Symbian, The Secret History: Dark Star," *The Guardian*, November 23, 2010.

⁴⁵ M. Perez, "Multiple Android Phones Expected in 2009," *Information Week*, December 22, 2008.

⁴⁶ J. Crook, "Nokia Lumia 900 Review: This One's a No-Brainer," <http://techcrunch.com/2012/04/15/nokia-lumia-900-review-this-ones-a-no-brainer/>, accessed April 22, 2012.

Appendix

A Short History of the PC OS Platform Competition

The PC OS competition started, in essence, in 1975 when a calculator maker called MITS began marketing the Altair, a hobbyist computer available via mail order. The Altair was nothing more than a build-it-yourself box with lights and switches; it had no keyboard, hard drive, or input or output ports. The machine, however, was relatively affordable and available to any enthusiast who wanted one. Early computer hobbyists around the country flocked to the machine and found ways to trick it into completing rudimentary tasks. In the decades that followed, some of these hobbyists went on to become the titans of the technology industry.

Two of these were Steve Wozniak and Steve Jobs. Wozniak was a skilled computer technician and was inspired by the Altair to design and build an even better computer. Jobs, excited by the commercial possibilities of computers, persuaded Wozniak to build a computer they could sell. He then convinced a local computer shop to place an order for 50 units, a promise he used to talk suppliers into giving him 30-day payment terms.⁴⁷ The result was the Apple I, a computer that shipped complete with everything but an external keyboard and a television. Wozniak and Jobs built the machines in Jobs' parents' garage, all the while working on their next creation, the Apple II.

The Apple II included a number of innovations; running a proprietary Apple OS, it was the first personal computer to look as if it belonged in the home. It could render color graphics and made floppy disk drives a standard peripheral. The Apple II became one of the first successful, mass-market personal computers. Apple's success, though, was not necessarily evident in its market share. While the Apple II sold over 4.5 million units between its 1977 introduction and eventual discontinuation in the early 1990s, it was never the best-selling computer in any given year, bested by Atari and Radio Shack in the late seventies, by Commodore in the early eighties, and eventually to IBM and IBM compatibles running Microsoft's operating systems.⁴⁸ What it lacked in unit sales, however, the Apple II made up for in premium pricing: at \$3,000 fully equipped, the Apple II was the most expensive home computer on the market. Despite the price point, Apple built a large enough user base to attract software developers, whose products extended its usefulness. Following the success of the Apple II, the company went public in 1980, generating more capital than any initial public stock offering since the Ford Motor Company went public in 1956.⁴⁹

Not all PC innovators were small startups. Seeing the success of Apple and the other early computer manufacturers, IBM decided in 1980 that it wanted in on the personal computing bonanza. Although it had manufactured and marketed large-scale mainframe computers for years, IBM had limited experience with personal computing. Further, the company felt it needed to get a product to market as soon as possible. With this in mind, the company went against its usual protocol of developing technology in-house and instead sourced components for its personal computer from a number of suppliers. Seeing the head start enjoyed by existing firms, IBM decided to make its computer "open architecture," meaning that third parties could create accessories and software for the machine without purchasing licenses from IBM.

⁴⁷ S. Wozniak and G. Smith, *iWoz* (New York: W. W. Norton & Company, 2007), p. 178.

⁴⁸ J. Reimer, "Total Share: Personal Computers," <http://jeremyreimer.com/postman/node/329>, accessed July 13, 2011.

⁴⁹ J. Livingston, *Founders at Work: Stories of Startups' Early Days* (New York: Apress, 2008).

In addition to a central processing unit (CPU), motherboard, monitor, and keyboard, IBM needed an operating system for its machine. Here, it selected Disk Operating System (DOS) 1.0, an operating system marketed by another, eventually titanic duo that had been inspired by the early Altair computer: Paul Allen and Bill Gates. Allen and Gates had provided the Altair with its first BASIC programming language. After founding Microsoft, the two moved to Seattle and continued to create software.

One of their early projects was an operating system called Xenix. This OS was a variant of AT&T's Unix OS. While various forms of Unix enjoyed significant adoption rates in mainframe computing and while there was, in fact, nothing stopping it from becoming a PC OS, AT&T was expressly forbidden from marketing it as such due to antitrust regulations handed down in the wake of the Bell Company's breakup. AT&T, in fact, was legally required to provide Unix source code to anyone who asked, including Microsoft and a range of other entities. As a result, Unix was adapted into multiple versions that made writing compatible software difficult.

With Microsoft's DOS as a standard across most IBM PCs, however, this difficulty was eliminated. IBM quickly gained traction in the marketplace: since IBM was a known, stable brand, would-be customers felt an immediate trust that they might not have felt for a company like Apple, an important factor when considering that most consumers were unfamiliar with computing. Within two years of its 1981 release, nearly three times as many IBM PC 5150s were being sold as Apple IIs. IBM's open architecture strategy appeared to have worked.

Responding to the challenge, in 1984 Apple came out with another line of computers, the Macintosh. The Mac (as it came to be known) not only used a completely new operating system, but also introduced a new metaphor for using a computer. The Mac was the first widely marketed personal computer to use the "desktop" interface. Inspired by a demonstration given to Steve Jobs and other Apple executives during a tour of Xerox's Palo Alto Research Center, the new interface allowed users to interact with their computer in a way that seemed more intuitive. Instead of having to type text commands to delete or move files, users would use a device called a "mouse" to "drag" files into graphically displayed "folders." Software written for the Macintosh followed a new paradigm called "what you see is what you get" (WYSIWYG). Under WYSIWYG, a user typing a word processing document would see the actual font that was going to be used, the actual margins that would appear on the printed page, and actual line spacing (whereas previous word processing software would display only the text that had been entered, without obvious formatting cues). More than 25 years later, this desktop metaphor would still be the de facto PC interface. Most of those users, however, would not be using Apple computers.

As with previous Apple products, the Mac was a closed-architecture system. The machine itself was built by Apple and the operating system belonged to Apple; no licenses were granted to third parties to build Mac hardware. In fact, Apple also developed much of the software and peripheral hardware initially available for the Mac OS; MacWrite was the computer's original word processor and Apple's ImageWriter II printer was the usual printer of choice.

While the Mac was supported by a memorable advertising campaign—Apple ran a television ad during the 1984 Super Bowl that likened the IBM PC's growing dominance to the totalitarian world of George Orwell's novel *1984*—it did not stop the IBM PC's growth. However, as the IBM PC's popularity grew, IBM's decision to outsource all its components came back to haunt it. Since components were purchased from external suppliers, all a third party needed to do in order to build a machine that was functionally the same as the IBM PC was to buy those same components from the

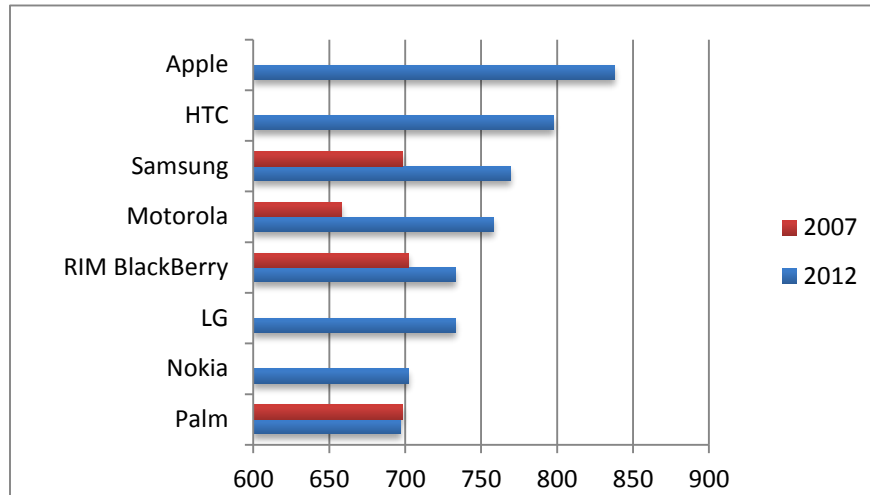
same suppliers. Further, since IBM had not secured exclusive rights to Microsoft's DOS,⁵⁰ these third parties could license the same OS that IBM licensed and, thus, ensure compatibility with software intended for the IBM. The phrase "IBM-compatible" came into the common computer lexicon as brands like Compaq and Dell began profitably selling desktop computers. For each of these machines sold (at increasingly lower prices and at lower margins), Microsoft received its steady, stable licensing fee for the use of what came to be called MS-DOS.

Having seen the usefulness of the Mac interface, and concerned for what might happen should it catch on, Microsoft came out with a similar interface in 1985 called Windows. While Versions 1.0 and 2.0 were met with only limited adoption as most software continued to be written for the simpler DOS interface, in 1992 Microsoft released Windows 3.1. The OS made use of many of the same metaphors as had been demonstrated to Apple by Xerox: there were folders, there was a mouse, and files could be selected and dragged. Further, as Microsoft had made significant gains in the productivity software market, it could now support adoption of the new interface by releasing Windows-specific versions of its popular Word and Excel, and this availability spurred sales of the new OS. Since it was also written by Microsoft, software that ran under text-based MS-DOS could also be used under Windows 3.1, thus enabling Windows adopters to continue using the software in which they had already invested.

Already troubled by declining market share in 1985, Apple's board of directors effectively fired Steve Jobs and replaced him with former PepsiCo executive John Sculley. Under Sculley, sales for the Macintosh grew every year from 1985 to 1995. However, by 1995, Microsoft had gained 91% of the PC OS market share,⁵¹ a figure that would continue to rise as Windows improved and became more widely distributed through the release of Windows 95, Windows 98, and Windows XP. As more and more users adopted Microsoft's Windows, it became an increasingly attractive platform for software developers. Windows established itself as the dominant standard in personal computing.

⁵⁰ Due in part to IBM's belief that the value of its computer was in the IBM brand name; for its part, IBM offered the PC with a choice of operating systems, of which Microsoft's was merely one.

⁵¹ Reimer, "Total Share: Personal Computer."

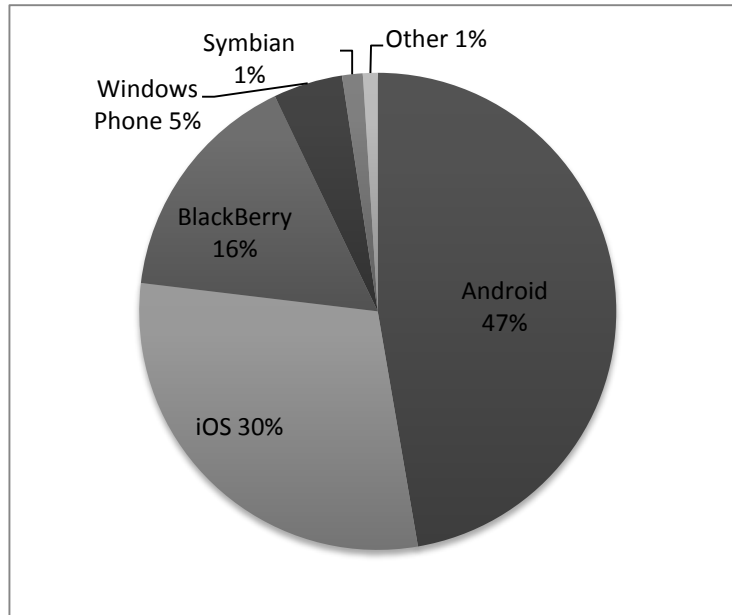
Exhibit 1 Smart Phone Manufacturer Customer Satisfaction Ratings, 2007 versus 2012

Source: J. D. Power and Associates, from <http://www.prnewswire.com/news-releases/jd-power-and-associates-reports-blackberry-devices-rank-highest-in-inaugural-business-wireless-smartphone-customer-satisfaction-study-58980452.html>; and <http://www.jdpower.com/content/press-release/py6kvam/2012-u-s-wireless-smartphone-and-traditional-mobile-phone-satisfaction-study--v1.htm>, accessed April 21, 2012.

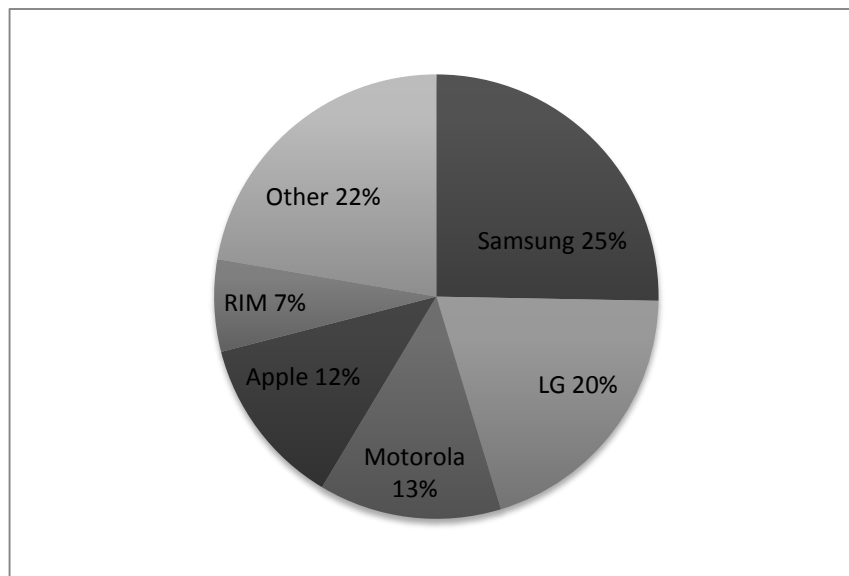
Note: Based on a 1,000-point scale.

Exhibit 2 Mobile Market Shares

U.S. Smart Phone Market Share by Operating System (3-month average ending December 2011)



U.S. Wireless Phone Market Share by Manufacturer (3-month average ending December 2011)



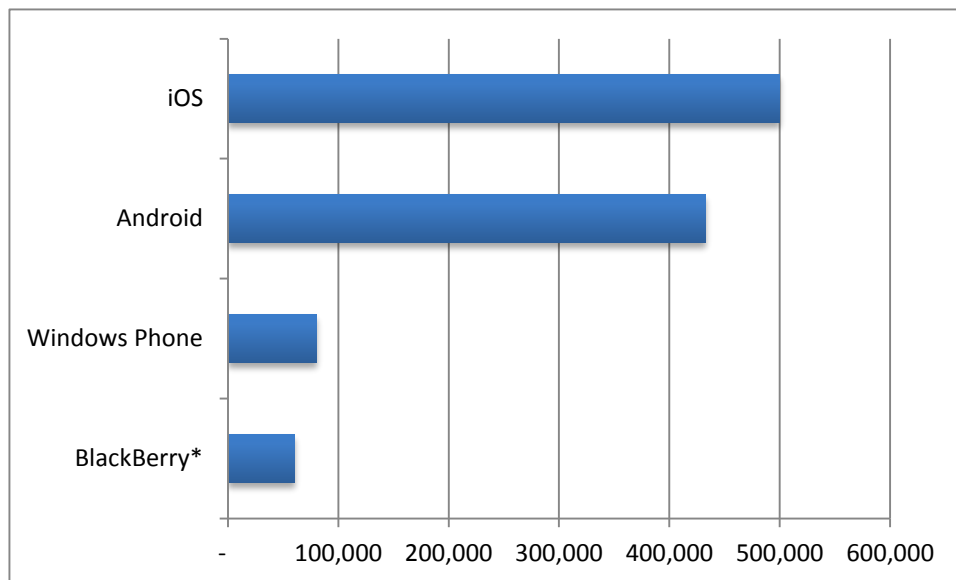
Source: comScore, http://www.comscore.com/Press_Events/Press_Releases/2012/2/comScore_Reports_December_2011_U.S._Mobile_Subscriber_Market_Share, accessed April 21, 2012.

Exhibit 3 Most Popular Mobile Apps, 2011 (with availability by OS)

Rank	App	Android	BlackBerry	iOS	Windows Phone
1.	Angry Birds	x	x	x	x
2.	Facebook	x	x	x	x
3.	Skype	x	x	x	
4.	Angry Birds Rio	x	Tablet Only	x	
5.	Google Maps	x	x		
6.	iBooks			x	
7.	Angry Birds Seasons	x	Tablet Only	x	
8.	Fruit Ninja	x	x	x	x
9.	Talking Tom Cat	x		x	
10.	Twitter	x	x	x	x

Source: Distimo, <http://www.businessinsider.com/here-are-the-most-popular-mobile-apps-of-2011-2011-12>, accessed April 21, 2012.

Number of Available Apps by OS, April 2012*



Sources: AppBrain.com, <http://www.appbrain.com/stats/number-of-android-apps>; Crackberry, <http://crackberry.com/blackberry-app-world-stats-devcon-europe>; Apple, <http://www.apple.com/iphone/built-in-apps/app-store.html>; and Forbes, <http://www.forbes.com/sites/ewanspence/2012/04/03/windows-phone-passes-80000-mobile-applications/>, accessed April 21, 2012.

* BlackBerry data current as of February 2012.

Exhibit 4 Research In Motion Consolidated Statement of Cash Flows (in millions of US\$)

	For the Year Ended		
	February 26, 2011	February 27, 2010	February 28, 2009
Cash flows from operating activities			
Net income	\$ 3,411	\$ 2,457	\$ 1,893
Adjustments to reconcile net income to net cash provided by operating activities:			
Amortization	927	616	328
Deferred income taxes	92	51	(37)
Income taxes payable	2	5	(7)
Stock-based compensation	72	58	38
Other	1	9	6
Net changes in working capital items	(496)	(161)	(769)
Net cash provided by operating activities	4,009	3,035	1,452
Cash flows from investing activities			
Acquisition of long-term investments	(784)	(863)	(507)
Proceeds on sale or maturity of long-term investments	893	473	432
Acquisition of property, plant and equipment	(1,039)	(1,009)	(834)
Acquisition of intangible assets	(557)	(421)	(688)
Business acquisitions, net of cash acquired	(494)	(143)	(48)
Acquisition of short-term investments	(503)	(477)	(917)
Proceeds on sale or maturity of short-term investments	786	970	739
Net cash used in investing activities	(1,698)	(1,470)	(1,823)
Cash flows from financing activities			
Issuance of common shares	67	30	27
Tax benefits (deficiencies) related to stock-based compensation	(1)	2	12
Purchase of treasury stock	(76)	(94)	—
Common shares repurchased	(2,077)	(775)	—
Repayment of debt	—	(6)	(14)
Net cash provided by (used in) financing activities	(2,087)	(843)	25
Effect of foreign exchange gain (loss) on cash and cash equivalents	16	(6)	(3)
Net increase (decrease) in cash and cash equivalents for the year	240	716	(349)
Cash and cash equivalents, beginning of year	1,551	835	1,184
Cash and cash equivalents, end of year	\$ 1,791	\$ 1,551	\$ 835

Source: Research In Motion, 2011 Annual Report.

Exhibit 5 Research In Motion Consolidated Statement of Operations (in millions of US\$)

	For the Year Ended		
	February 26, 2011	February 27, 2010	February 28, 2009
Revenue			
Hardware and other	\$ 16,416	\$ 12,536	\$ 9,411
Service and software	3,491	2,417	1,654
	19,907	14,953	11,065
Cost of sales			
Hardware and other	10,516	7,979	5,718
Service and software	566	390	250
	11,082	8,369	5,968
Gross margin	8,825	6,584	5,097
Operating expenses			
Research and development	1,351	965	685
Selling, marketing and administration	2,400	1,907	1,495
Amortization	438	310	195
Litigation	—	164	—
	4,189	3,346	2,375
Income from operations	4,636	3,238	2,722
Investment income, net	8	28	79
Income before income taxes	4,644	3,266	2,801
Provision for income taxes	1,233	809	908
Net income	\$ 3,411	\$ 2,457	\$ 1,893
Earnings per share			
Basic	\$ 6.36	\$ 4.35	\$ 3.35
Diluted	\$ 6.34	\$ 4.31	\$ 3.30

Source: Research In Motion, 2011 Annual Report.

Exhibit 6 Apple Consolidated Statement of Cash Flows (in millions of US\$)

Three years ended September 24, 2011	2011	2010	2009
Cash and cash equivalents, beginning of the year	\$ 11,261	\$ 5,263	\$ 11,875
Operating activities:			
Net income	25,922	14,013	8,235
Adjustments to reconcile net income to cash generated by operating activities:			
Depreciation, amortization and accretion	1,814	1,027	734
Share-based compensation expense	1,168	879	710
Deferred income tax expense	2,868	1,440	1,040
Changes in operating assets and liabilities:			
Accounts receivable, net	143	(2,142)	(939)
Inventories	275	(596)	54
Vendor non-trade receivables	(1,934)	(2,718)	586
Other current and non-current assets	(1,391)	(1,610)	(713)
Accounts payable	2,515	6,307	92
Deferred revenue	1,654	1,217	521
Other current and non-current liabilities	4,495	778	(161)
Cash generated by operating activities	37,529	18,595	10,159
Investing activities:			
Purchases of marketable securities	(102,317)	(57,793)	(46,724)
Proceeds from maturities of marketable securities	20,437	24,930	19,790
Proceeds from sales of marketable securities	49,416	21,788	10,888
Payments made in connection with business acquisitions, net of cash acquired	(244)	(638)	0
Payments for acquisition of property, plant and equipment	(4,260)	(2,005)	(1,144)
Payments for acquisition of intangible assets	(3,192)	(116)	(69)
Other	(259)	(20)	(175)
Cash used in investing activities	(40,419)	(13,854)	(17,434)
Financing activities:			
Proceeds from issuance of common stock	831	912	475
Excess tax benefits from equity awards	1,133	751	270
Taxes paid related to net share settlement of equity awards	(520)	(406)	(82)
Cash generated by financing activities	1,444	1,257	663
(Decrease)/increase in cash and cash equivalents	(1,446)	5,998	(6,612)
Cash and cash equivalents, end of the year	\$ 9,815	\$ 11,261	\$ 5,263
Supplemental cash flow disclosure:			
Cash paid for income taxes, net	\$ 3,338	\$ 2,697	\$ 2,997

Source: Apple, 2011 Annual Report.