MICROSOFT – EXHIBIT B

EXPERT REPORT

OF

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In the Matter of:

United States v. Microsoft

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I.   ASSIGNMENT.

1.   I have been asked by Microsoft to survey recent competitive changes in the Information Technology ("IT") industry since the Final Judgments were entered in *United States of America v. Microsoft Corporation* on November 12, 2002. Specifically, I have focused on (1) the state of the competition among products referred to as "middleware" in the Final Judgments, (2) the lack of foreclosure in the distribution of software by original equipment manufacturers ("OEMs"), and (3) the significance of client operating systems in light of the increasing popularity of internet-centric applications and platforms.

II.   QUALIFICATIONS.

2.   I am the David Sarnoff Professor of Business Administration and the Director of Research in the Technology and Operations Management Department of the Harvard Business School. I earned a Ph.D. in Physics from Harvard University in 1988, and joined the Harvard Business School faculty in 1989. Since 1989, my research focus has been the management of technical innovation, product development, and operations in the high technology sector of the U.S. economy.

3.   During my tenure at Harvard Business School, I helped create and co-chaired Harvard's Ph.D. program in Information Technology and Management. I have taught a variety of courses on technology management, product development, and operations. I have authored and co-authored a number of articles, papers, books, cases, and research notes that focus on technology and operations strategy, operations management, and product development. My articles have appeared in a number of leading management journals including the Harvard Business Review, the California Management Review, Management Science, and Research Policy. My two books,

"Technology Integration: Making Critical Choices in a Dynamic World," and "The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability" provide specific insights into corporate competitive dynamics in the IT ecosystem.

4.   I have researched the structure, processes, operations, and technology aspects of a large number of commercial enterprises for professional publications. I have worked with and advised a variety of Global 1000 firms in industries ranging from pharmaceuticals to electronics. I have also worked with and advised a number of software start-up companies. During a one-year leave of absence from Harvard, I was the Vice President of Products and Strategy at Model N, Inc., which focuses on enterprise software applications for pricing and contract management. Over the past seven years I have also prepared and presented expert testimony for the United States Department of Justice and Microsoft Corporation.

III.   SUMMARY OF CONCLUSIONS.

5.   The Final Judgments focused on a series of measures aimed at increasing the competition posed by software products referred to as "middleware" to Microsoft's client operating system on Intel-compatible personal computers. Since the Final Judgments went into effect, several important changes have occurred in the IT ecosystem. In broad outline, I classify these changes into two categories: 1) competitive advances achieved by products that compete with components of Windows; and 2) the reduced competitive significance of any market power held by Microsoft in Intel-compatible personal computer operating systems resulting from rapidly changing technologies in the IT ecosystem.

6.   The five "middleware" segments defined in the Final Judgments – web browsers, Java Virtual Machines, audio/video players, email and instant messaging - have become increasingly competitive. This is shown by the success of non-Microsoft products in these segments and by significant innovation in each segment. In four of the five middleware segments, non-Microsoft products gained share at the expense of Microsoft products. As an example, non-Microsoft web browsers have increased user share worldwide from 3.4% in 2002 to 17.0% in 2006. This growth stemmed largely from the success of Firefox.[1] The recent entry of Apple's Safari web browser for Windows could also accelerate the growth in non-Microsoft web browser user share. In instant messaging, Microsoft's U.S. share declined from 28.8% to 26.2%. This share is only half the number of users as segment leader AOL.[2] Microsoft also faces significant competition from other instant messaging vendors, including Yahoo!, Google and eBay's Skype. I address competition in each middleware segment in more detail in section IV.

7.   More importantly, alternative platforms are competing successfully with traditionally-defined client operating systems, altering their significance in the IT ecosystem. Specifically, client operating systems face competition from alternative platforms for several reasons: (1) consumer preferences are increasingly being met by internet-centric applications; and (2) internet-centric platforms have emerged that offer developers an alternative to the client operating system.

8.   Internet-centric applications now compete with a broad range of traditional applications (such as word processors, email clients, and tax preparation programs), deliver new functionality for users (for example internet search, social networking and position based mapping), and now

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[1] "Microsoft's IE 6.0 is the Most Popular on the Web According to OneStat.com," OneStat.com press release (Amsterdam, April, 29 2002). *See Also* "Global Usage Share Mozilla Firefox has Increased According to OneStat.com," OneStat.com press release (Amsterdam, July, 9 2006).
[2] Nielsen/NetRatings, May 2002, Top Instant Messaging Applications Among US at-Home Audience *see also* Nielsen/NetRatings, 2006, cited at "Google takes aim at chat rivals," BBC News, February 07, 2006.

perform functionality previously common in the domain of client-server computing (e.g. file sharing and collaboration). PC users are spending an increased amount of time using internet-centric applications. In the U.S. for example, PC users spend an average of 33.4 hours on internet activities a month in 2007 compared to 21 hours spent on internet activities in 2002.[3] The growth in media-rich internet-centric applications – sometimes referred to as Web 2.0[4] applications – illustrates this trend. Five of the top ten global web sites in 2007 fit the definition of Web 2.0, including YouTube, MySpace, Live.com, Orkut and Wikipedia, up from zero sites in 2003.[5]

9.   The growth in internet-centric applications is being fueled by emerging technologies that are competitors to the client operating system. These technologies include plug-ins (such as Java applets), add-ons (e.g. Google Toolbar), development technologies (e.g. Ajax) and software-as-a-service platforms. These technologies have evolved into a broad-based platform where applications operate independently of the operating system. Adobe's Flash is one well-known example of a widely deployed technology platform that allows ISVs to develop applications that run on virtually any web browser or underlying client operating system. This new generation of internet-centric applications operate one or two layers removed from client operating system making the underlying operating system less important in this context.

10.   The combination of these (and other) evolving trends has resulted in increased competition for the Windows client operating systems since the Final Judgments were put into effect. I now address each of these topics in more detail.

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[3] Nielsen / NetRatings, *Historical Internet Activity Analysis* August 2002-August 2003 / August 2006 – May 07, US NetView: Home/Work Combined, July, 2007
[4] Tim O'Reilly, What Is Web 2.0 – Design Patterns and Business Models for the Next Generation of Software, November 30, 2005, www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html
[5] Alexa.com, http://www.alexa.com/site/ds/top_500?qterm=, accessed July 11, 2007; Nielsen/NetRatings, Top 10 Web Sites by Parent Company and Top 10 Web Sites by Brand, November 2003

IV. "MIDDLEWARE" PRODUCTS HAVE MADE SIGNIFICANT COMPETITIVE ADVANCES.

11.   The first major category of transformation of the IT ecosystem has been the advances made by software products that compete with components of Windows. In my opinion, such so-called middleware products have made significant advances in recent years. In Section A, I consider advances made by five categories of middleware products: (1) web browsers; (2) Java Virtual Machines; (3) audio/video players; (4) email; and (5) instant messaging. For each category, Microsoft's share has declined or only slightly increased, and emerging platforms have expanded each category beyond traditionally defined boundaries. In Section B, I consider the distribution of middleware products by OEMs and show that the increased availability of distribution networks has contributed to the competitiveness of each of these middleware product segments.

A. Middleware Product Segments Have Become Increasingly Competitive.

1. Web Browsers.

12.   The first middleware product segment I consider is web browsers. This segment is competitive because several web browsers compete for end users and most web browsers can be downloaded for free by users directly to their PC in a matter of seconds. The increased competition among web browsers is illustrated by the change in Microsoft's share from 2002 to 2006. In April 2002, Internet Explorer had a worldwide share of 96.6%, leaving 3.4% for non-Microsoft web browsers, including Netscape's 2.1% share as the leading non-Microsoft web browser.[6] By June 2007, Internet Explorer's worldwide share had fallen to 84.7%, leaving

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[6] "Microsoft's IE 6.0 is the Most Popular on the Web According to OneStat.com," OneStat.com press release (Amsterdam, April, 29 2002).

15.3% for non-Microsoft web browsers, including Firefox's 12.7% share as the leading non-Microsoft web browser.[7] In the U.S., non-Microsoft web browsers succeeded in gaining even more share. In July of 2006, Internet Explorer had 79.8% share and by June of 2007 this had fallen to 75.7%.[8]

Figure 1: Percentage Point Change in Web Browser Share Worldwide from 2002 to 2007

Web browser usage share, Worldwide, April 2002 and June 2007

	Microsoft	Firefox	Netscape	Safari	Opera	Other
☐ Apr-02	96.6	0.0	2.1	0.0	0.4	0.9
☐ Jun-07	84.7	12.7	0.1	1.8	0.6	0.1
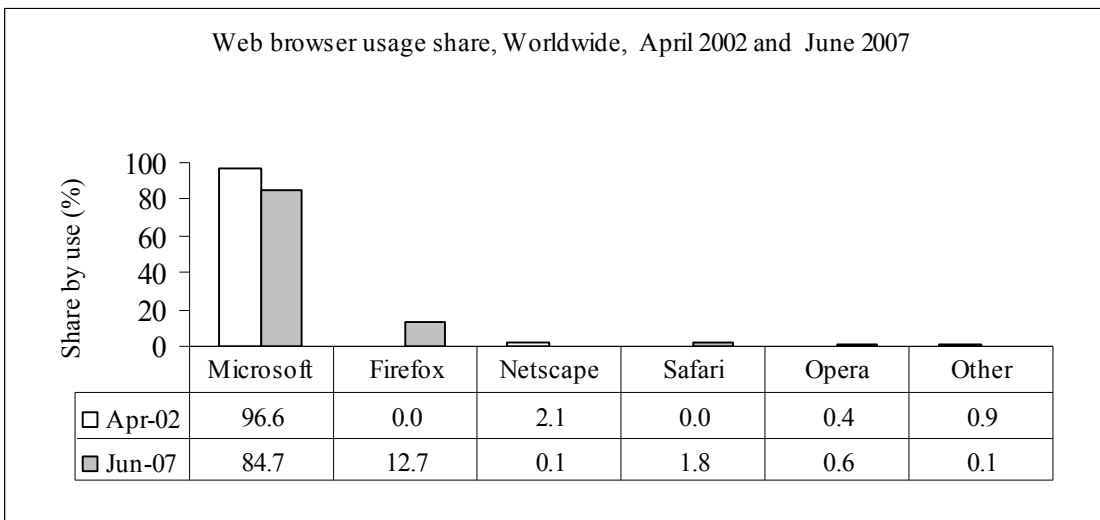
Source: OneStat[9]

13. Firefox is one of several web browsers with increasing users relative to Microsoft's Internet Explorer. Firefox is an open-source web browser that emerged from the release of the Netscape Navigator source code. It is available as a free download to end-users. Firefox claims that "[t]he award-winning Mozilla Firefox Web browser is enjoyed by tens of millions of people

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[7] "Mozilla's Firefox global usage share is still growing according to OneStat.com" OneStat.com press release (Amsterdam, July, 2 2007). OneStat calculates usage share for a browser by calculating the total number of visitors in the sample landing on any site tracked by OneStat using that browser, and then dividing by the total number of visitors landing on any site tracked by OneStat. All numbers mentioned in the research are averages of a week and all measurements are normalized to the GMT time-zone. Research is based on a sample of 2 million visitors each day (consisting of 20,000 visitors in each of 100 countries).

[8] "Global Usage Share Mozilla Firefox has Increased According to OneStat.com," OneStat.com press release (Amsterdam, July, 9 2006). "Mozilla's Firefox Global Usage Share is Still Growing According to OneStat.com," OneStat.com press release (Amsterdam, July, 2 2007).

[9] "Microsoft's IE 6.0 is the Most Popular on the Web According to OneStat.com," OneStat.com press release (Amsterdam, April, 29 2002). "Global Usage Share Mozilla Firefox has Increased According to OneStat.com," OneStat.com press release (Amsterdam, July, 9 2006). This usage data includes browsers running on non-Windows operating system such as Safari which up until June 2007 only ran on the Apple platform.

worldwide, and has re-ignited innovation and competition on the web."[10] Indeed, Firefox's claims are not without substantial support. As of February 2005, Firefox downloads were running at one million per week, with at least half deriving from Internet Explorer users.[11] Other data suggests this figure has increased significantly in recent years to nearly 3.1 million Firefox worldwide downloads per week, with as many as 63% coming from Internet Explorer users.[12] Firefox has experienced a 40% increase in U.S. share from November 2005 to June 2007.[13] W3Counter reports that on May 20, 2007, 66.4% of web hits to 4,489 websites worldwide were made by versions of Internet Explorer, and 24.8% of hits were made by versions of Firefox.[14] These data suggest that high traffic users are using Firefox in greater proportion than they are using Internet Explorer.

14.   Apple's Safari is another web browser that is an emerging competitor to Internet Explorer. Safari captured 3.68% of the U.S. market by January 2007 with availability limited to the Mac OS platform.[15] Apple Released Safari beta for Windows in June 2007. Apple claims Safari renders HTML faster than both Firefox and Internet Explorer.[16] Apple's investment in Safari for Windows indicates they believe the market for web browsers is open and competitive. Apple's announcement that Safari beta for Windows achieved one million downloads in the first two days it was available illustrates the impact of consumer preference in this market.[17]

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[10] Mozilla, Mozilla Company Web site, http://www.mozilla.com/en-US/about/, accessed May 22, 2007.
[11] Gartner, "Management Update: Firefox Usage Will Grow Until Microsoft Chooses to Respond." February, 2005.
[12] http://people.mozilla.com/~cbeard/downloads/ accessed June 15, 2007.
[13] "Mozilla's Firefox Global Usage Share is Still Growing According to OneStat.com," OneStat.com press release (Amsterdam, July, 2 2007). "Mozilla's Browsers Global Usage Share is Still Growing According to OneStat.com," OneStat.com press release (Amsterdam, Novemeber, 2 2005).
[14] http://www.w3counter.com/globalstats.php?date=2007-05-20. On June 20, 2007, w3counter reported that Firefox had 25.06% of the hits and on June 30, 2007, Firefox had 25.08% of the hits.
[15] "Mozilla's Firefox Global Usage Share is Still Growing According to OneStat.com," OneStat.com press release (Amsterdam, July, 2 2007).

[17] "Safari for Windows Public Beta Downloads Top 1 Million in First 48 Hours," Apple press release (Cupertino, CA, June 14 2007)

15.   Apple also made Safari the primary third party application platform for the new iPhone. By spanning Windows PCs, Mac computers and mobile devices with Safari, Apple appears focused on providing consistent consumer computing experiences regardless of operating system. Apple will expand distribution and share by bundling Safari with other popular Apple application downloads such as QuickTime, which is already bundled with Bonjour, Update, and iTunes products. While the current download of iTunes (version 7.3) does not include Safari, Apple plans to use iTunes as a distribution vehicle for Safari.[18] Safari should experience significant growth when it utilizes iTunes distribution due to iTunes' 1 million downloads per day.[19] Safari's expansion to mobile devices should further accelerate this trend.

16.   Opera is another web browser that is an emerging competitor to Internet Explorer. Opera is widely used in mobile devices in addition to PCs. Opera has seen a 53% increase in its worldwide web browser user share from April 2002 to June 2007 and overtook Netscape to become the fourth most popular browser for PCs.[20] Additionally, Opera has approximately 70% web browser share for Smartphone mobile devices.[21]

17.   In summary, Microsoft's share of web browser usage has declined in the last five years. Figure 2 illustrates the change in worldwide web browser usage share from 2002 to 2007:

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[18] Video of Keynote Speech, http://events.apple.com.edgesuite.net/d7625zs/event/. (Last accessed June 15, 2007)..

[19] Prince McLean,, "Apple Serving up 1 Million Copies of iTunes Each Day," June 12, 2007. (iTunes is downloaded approximately 1 million times per day.)

[20] "Microsoft's IE 6.0 is the Most Popular on the Web According to OneStat.com," OneStat.com press release (Amsterdam, April, 29 2002). "Mozilla's Firefox Global Usage Share is Still Growing According to OneStat.com OneStat.com press release (Amsterdam, July, 9 2006). During this time Opera's market share increased from approximately .4% to .6%.

[21] Opera internet browser is part of the Symbian OS for SmartPhones, which is the OS installed in 71.7% of SmartPhones worldwide. *See* Canalys Worldwide Total SmartPhone Device Market – Market Shares for Q1 2007 / Q1 2006. *See also* http://www.tornado-insider.com/ news/article.asp?id=3516. (Last accessed June 15, 2007.)

Figure 2: Percentage Point Change in Browser Share Worldwide from 2002 to 2007
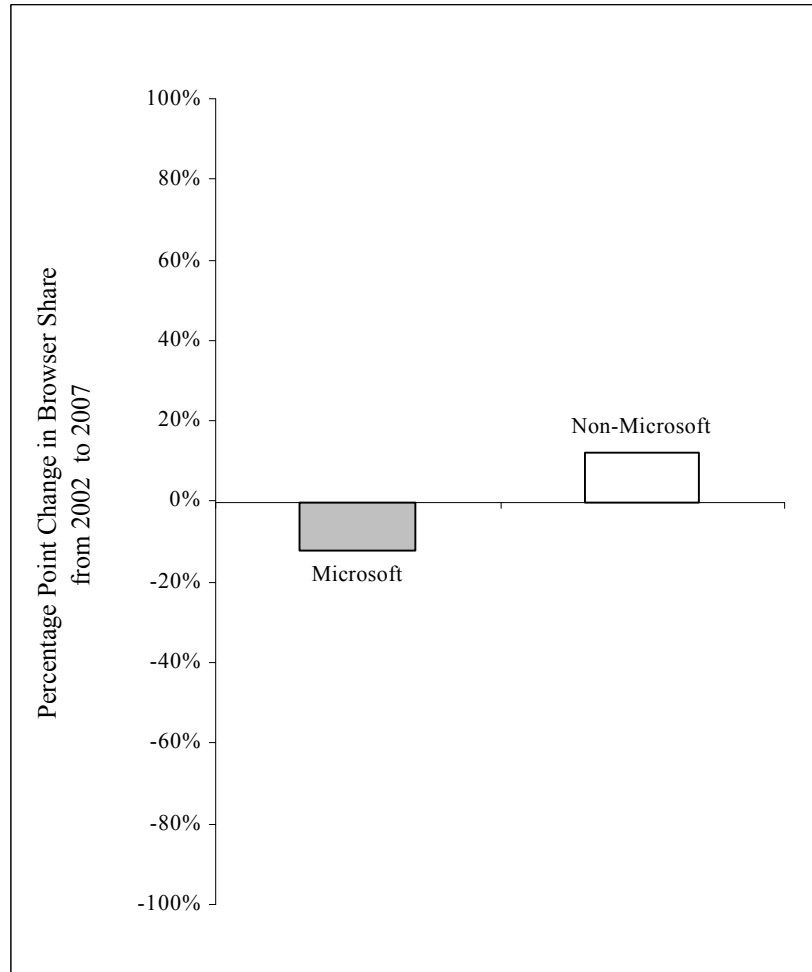
Source: OneStat.com[22]

This trend may continue based on continued demand for Firefox, the initial success of Safari for

Windows, and the ease in which consumers can freely download alternative web browsers.

Internet Explorer's usage share in Australia and Germany was 66.42% and 68.84% respectively

in June 2007.[23] This is significantly lower than the worldwide number of 84.66% and also lower

than the U.S.'s 75.69% share, illustrating how consumer preference drives web browser

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[22] "Microsoft's IE 6.0 is the Most Popular on the Web According to OneStat.com," OneStat.com press release (Amsterdam, April, 29 2002). "Global Usage Share Mozilla Firefox has Increased According to OneStat.com," OneStat.com press release (Amsterdam, July, 9 2006).
[23] "Mozilla's Firefox Global Usage Share is Still Growing According to OneStat.com," OneStat.com press release (Amsterdam, July, 2 2007).

selection.[24] Collectively the trends in Internet Explorer's share, the release of Safari for

Windows, and the impact of customer preference indicate that the web browser market is open

and competitive, meeting the goals of the Final Judgments.

2. Java Virtual Machines.

18.   The second middleware product I consider is Java Virtual Machines ("JVMs").[25] This

product has evolved in recent years as Microsoft ceased developing or offering a Java Virtual

Machine.[26] In 2001, Microsoft shipped a Java Virtual Machine with all Windows client

operating systems. This resulted in the installation of Microsoft Virtual Machines in greater than

85% of all PCs shipped.[27] In 2006, the Microsoft Virtual Machine did not ship on any PCs. In

its place, Sun's JVM reached installations on more than 91% of Windows-based PCs

worldwide.[28]

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[24] "Mozilla's Firefox Global Usage Share is Still Growing According to OneStat.com," OneStat.com press release (Amsterdam, July, 2 2007).

[25] Java technology has expanded to many other platforms beyond the PC, including mobile devices, smart cards, printers, games, navigation systems, lottery terminals, medical devices and many others. The Java development community is also extremely active. The Sun website reports that there are over 1,135 members of the Java Community Process (JCP), and 27,700 plus registered members on Java.net since June 2003. See Sun, Sun Company web site, "Java Technology at a Glance," http://www.sun.com/aboutsun/media/presskits/2006-1113/Java_aag_100306.pdf, accessed May 31, 2007.

[26] Microsoft has stopped developing and updating the Microsoft JVM and Microsoft has encouraged PC users to take proactive steps to switch to an alternative run-time environment. Microsoft lists five alternative run-time environments on its website at http://www.microsoft.com/mscorp/java/. There appear to be six closed source JVMs that are available, including Hewlett Packard, Bea, Oracle, Sun, NSIcom and IBM SDK. Additionally, I was able to identify sixteen open-source JVMs that are available, including JUICE, Lejos, CACAO, and Apache Harmony, among others.

[27] 85.2% of all PCs shipped in 2001 ran Windows OS. See Gartner, "New PC Shipments by Operating System, Worldwide 2001-2011."   According to Microsoft, Windows JVM shipped with Windows XP, Windows 2000, Windows 98, and Windows 95 prior to its agreement with Sun to stop shipping and supporting its Virtual Machine in 2002. See Microsoft, Microsoft Company website, http://www.microsoft.com/mscorp/java/faq.mspx, accessed June 15, 2007.

[28] Through 2006, there were approximately 881.2 million installed PCs worldwide. See Gartner, "Forecast: PC Market by Operating System, Worldwide, 2001-2010."   Sun claims that Java technology is installed on 800 million PCs worldwide through 2006. See Java Technology at a Glance, See Sun, Sun Company web site, "Java Technology at a Glance," http://www.sun.com/aboutsun/media/presskits/2006-1113/Java_aag_100306.pdf. accessed May 31, 2007. Therefore, an approximate percentage of Windows PCs that have Java technology installed is 91%.
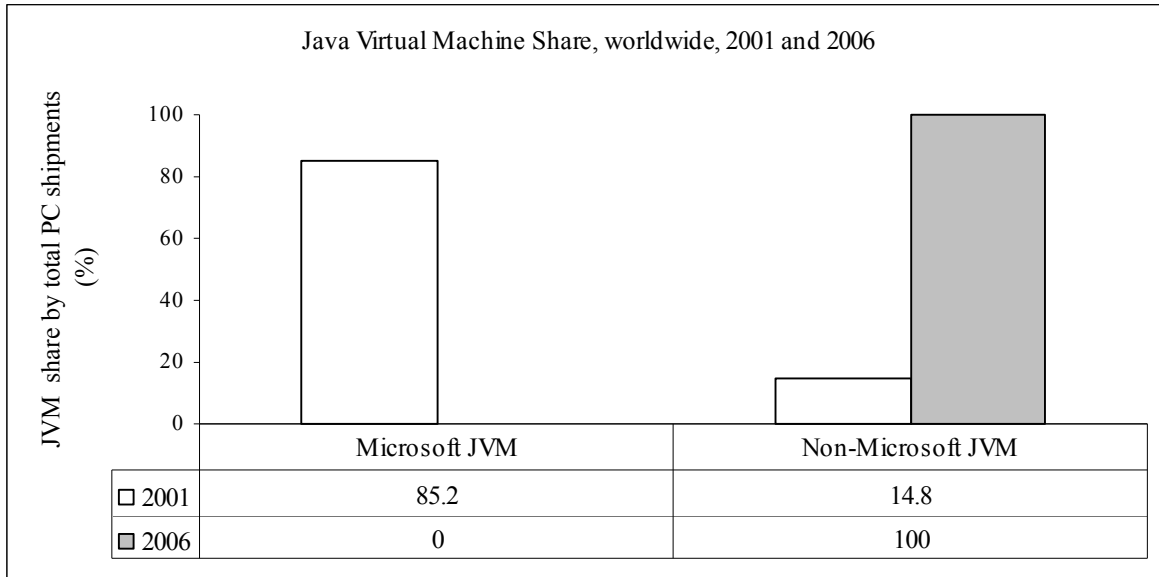
19.   Sun continues to be the leader in Java technology generally and the JVM segment specifically. The Sun website reports over 344 million downloads of the Java Runtime Environment, which includes Sun's JVM. Sun also reports that more than 800 million PCs now contain Sun's JVM.[29] The strength of the Java community virtually guarantees the sustainability of the Java Runtime Environment and JVMs. Again, according to Sun's website, there are more than 6 million Java developers worldwide. The same website represents that NetBeans, an integrated development environment that assists computer programmers in developing Java software, has been downloaded 3.8 million times.[30]

20.   In summary, Microsoft's share of JVM shipments has declined dramatically from 2001 to 2006. In 2001, Microsoft's Virtual Machine was installed on 85.2% of PCs shipped. In contrast, it was not shipped on any PCs in 2006. Figure 3 depicts this dramatic change:

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[29] Sun, Sun Company web site, "Java Technology at a Glance," http://www.sun.com/aboutsun/media/presskits/2006-1113/Java_aag_100306.pdf, accessed July 6, 2007.
[30] Sun Company web site,Java One 2007 Press Kit, *See* http://www.sun.com/java, accessed May 31st, 2007.

Figure 3: Percentage Point Change in JVM Share from 2001 to 2006

Java Virtual Machine Share, worldwide, 2001 and 2006

	Microsoft JVM	Non-Microsoft JVM
☐ 2001	85.2	14.8
◼ 2006	0	100

JVM share by total PC shipments (%)

Source: Gartner, "New PC Shipments by Operating System, Worldwide 2001-2011;" http://microsoft.com/mscorp/java/faq.mspx (Microsoft operating systems that shipped with Microsoft VM).
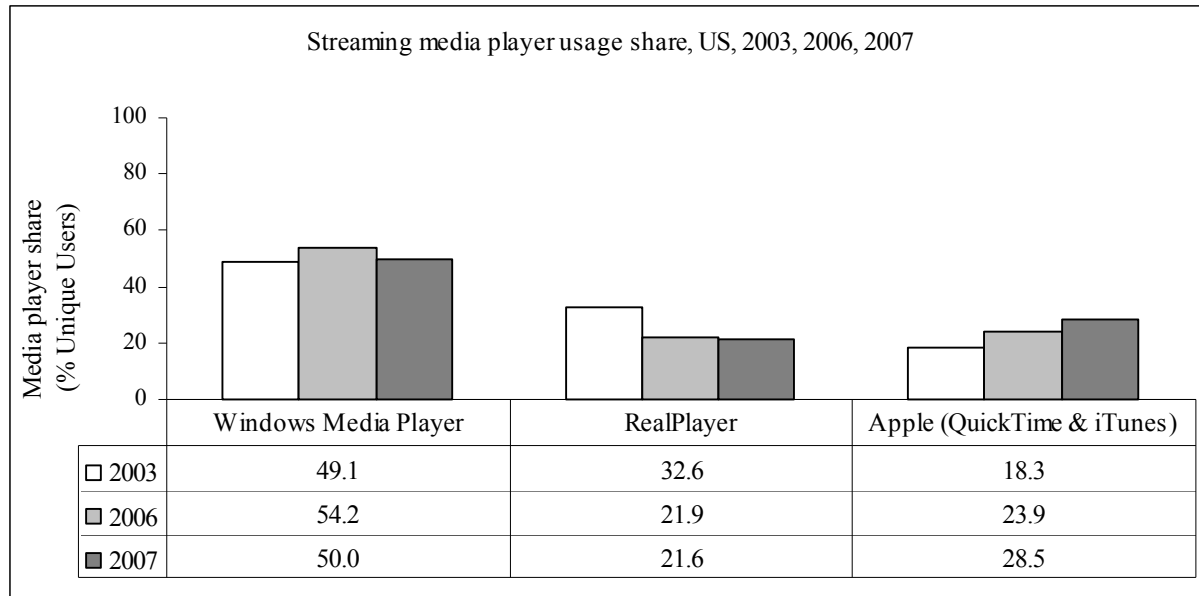
3. Audio / Video Players.

21.   The third set of middleware products I consider is audio / video players. These products are viable alternatives to Windows Media Player that are readily and freely available for download. In 2003, Microsoft's share of unique U.S. users of streaming audio / video players was 49.1%. By 2007, Microsoft's U.S. share of users increased slightly to 50.0%.[31] Moreover, new platforms including Flash technology and mobile devices have expanded the audio / video player segment.

22.   From January 2006 to January 2007, overall audio / video player usage increased by 10.6%. During this time period, non-Microsoft audio / video players grew faster than Microsoft players. Windows Media Players' share of users declined 7.8%, while iTunes' share increased

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[31] Nielsen/NetRatings,March 2006 via WebSiteOptimization.com. *See also* Nielsen/NetRatings February 2007 via WebSiteOptimization.com

33.3%. Both RealPlayer and Apple QuickTime shares fell slightly.[32] Figure 4 below illustrates this trend:

Figure 4: Percentage Point Change in Streaming Media Player Share 2003, 2006, 2007

Streaming media player usage share, US, 2003, 2006, 2007

	Windows Media Player	RealPlayer	Apple (QuickTime & iTunes)
2003	49.1	32.6	18.3
2006	54.2	21.9	23.9
2007	50.0	21.6	28.5

Sources: Nielsen/NetRatings,March 2006 via WebSiteOptimization.com, Nielsen/NetRatings February 2007 via WebSiteOptimization.com.[33]

23.   The installed base of non-Microsoft audio / video players also illustrates the strength of competition. Apple QuickTime and RealPlayer are installed on more than 50% of PCs.[34] Apple claims that its QuickTime version 6 was downloaded over 350 million times, with 98% of downloads coming from PC users.[35] iTunes software, which launched in 2001, is now downloaded more than 1 million times per day and has an active base of 500 million users, for a 56.8% installed base.[36]

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[32] Real player's usage share declined 1.4% and QuickTime's declined 1.7% *see* Nielsen NetRatings, February 2007. extrapolated by Website Optimation.com, February 2007.

[33] These usage shares are calculated by dividing the unique users of each leading client based application by the total unique users across the selected applications. This data does not represent the complete product set of media players. The same individual could be a unique user for more than one media player.

[34] Millward Brown commissioned by Adobe Systems, Inc. via eMarketer, December, 2006

[35] Apple, Apple Company Web site*,* www.apple.com/quicktime/whyqt/, accessed May 23, 2007.

[36] Prince McLean,, "Apple Serving up 1 Million Copies of iTunes Each Day," June 12, 2007. *See also* Gartner, "Forecast: PC Market by Operating System, Worldwide, 2001-2010."

24.   Other competitors are gaining users, including WinAmp and DivX. WinAmp is a media

player distributed by Nullsoft, a subsidiary of AOL Time Warner. From January 2005 to

September 2006, worldwide WinAmp users grew from 33 million to 57 million, making it one of

the most popular media players.[37] The DivX Media Player is another media player that has been

downloaded 220 million times since its introduction in 1999.[38]

25.   Adobe's Flash, another important technology in this segment, provides a strong example

of an alternate platform challenging Windows Media Player. Flash is now installed on over 98%

of all internet-enabled PCs. Flash technology is a plug-in that runs on web browsers, permitting

the display of video and other animation. The digital content is displayed through an embedded

player in the internet site. The rapid growth in the popularity of social networking websites

coupled with consumer's desire for video continue to fuel the use of Flash. In the U.S., five of

the top six websites primarily use Flash to enable video playback.[39] Both Yahoo! and Google,

the top two most popular portal websites, prominently provide video sharing that uses Flash

technology. YouTube is the fourth most popular and one of the fastest growing websites.   This

is especially notable since YouTube is dedicated to video sharing and exclusively uses Flash

technology. Social networking sites MySpace and Facebook rank third and sixth in popularity,

and provide users the ability to post videos through Flash technology.   The popularity of these

sites and consumer's interest in video has led to the near ubiquitous presence of Flash

technology.[40] The success of this alternative platform is a competitor to traditional media

players.

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[37] "AOL Unveils New Winamp Version with Enhanced Dashboard and Remote Features",
http://press.aol.com/article_display.cfm?article_id=1068&section_id=15, accessed May 31, 2007.
[38] Divx, http://www.divx.com/company/about/ accessed May 31, 2007.
[39] Alexa.com, http://www.alexa.com/site/ds/top_500?qterm=, accessed July 11, 2007
[40] See Knowledge@Wharton, "For Macromedia, the Future Belongs to Non-PCs," October, 2004

26.   The fourth middleware product segment is email. Since the Final Judgments were entered, this segment has expanded beyond client-based email to include web browser email, which has grown significantly in recent years. Indeed, web browser email usage has overtaken client-based email. In 2002, there were 501 million client-based email boxes and 447 million web browser email boxes worldwide.[41] By 2007, the number of client-based email boxes increased to 694 million worldwide, representing a CAGR of 6.7%. In contrast, the number of web browser email boxes increased to over 1.04 billion worldwide, representing a CAGR of 18.4%.[42] Consistent with these trends, the proportion of Microsoft Outlook Express users declined from 2001 to 2006.[43] While Microsoft Outlook and Windows Mail[44] continue to be the leaders for client-based email, other providers now have more users for their web browser email.[45] As of September 2006, for example, Yahoo! Mail is the most widely used email program in the U.S.

27.   The four primary types of email are proprietary email programs, post office protocol ("POP"), internet message access protocol ("IMAP"), and web browser email. From 2002 to 2007, web browser email grew at a CAGR of 18.4% while proprietary client and POP and IMAP

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[41] IDC, "Worldwide Email Usage 2007-2011 Forecast: Resurgence of Spam Takes Its Toll," March 2007. IDC identifies four specific email mailbox types, including: POP, IMAP, Proprietary and Web Browser. I have grouped POP, IMAP and Proprietary into client-based email applications based on the definitions used by IDC to arrive at these calculations.

[42] IDC, "Worldwide Email Usage 2007-2011 Forecast: Resurgence of Spam Takes Its Toll," March 2007. IDC identifies four specific email mailbox types, including: POP, IMAP, Proprietary and Web Browser. I have grouped POP, IMAP and Proprietary into client-based email applications based on the definitions used by IDC to arrive at these calculations. .

[43] ROI Research commissioned by Bluestreak, Inc., Email Program Used by US Internet Users, November 2006. NFO WorldGroup Research commissioned by DoubleClick, October 2001.

[44] Windows Mail was formerly called Outlook Express.

[45] The top internet-based email program as of September 2006 was Yahoo! Mail. It had 250 million accounts worldwide and 79 million U.S. accounts. Yahoo! Mail was followed by MSN Hotmail which had 228 million accounts worldwide and 45 million U.S. accounts. AOL Mail was third with 50 million worldwide accounts and 40 million U.S. accounts. Gmail was fourth with 51 million worldwide accounts and 10 million U.S. accounts. *See* ComScore, September 2006, via http://www.techcrunch.com/2006/11/09/single-ajax-interface-for-yahoo-mail-im-coming, accessed June, 2007

grew at smaller CAGRs of 8.6% and 5.3% respectively.[46] In September 2005, web browser

email accounted for 64% of all email accounts.[47] Since 2005, these proportions have evolved.

Figure 5 displays the comparative growth of web browser, proprietary client, and combined POP

and IMAP email from 2002 to 2007. As is evident in Figure 5, web browser email grew at a

faster pace than client email:[48]

[46] IDC, "Worldwide Email Usage 2007-2011 Forecast – Resurgence of Spam Takes its Toll," March, 2007.
[47] Radicati Group, *Worldwide E-mail Accounts by Type*, September 2005. via eMarketer, accessed June, 2007.
[48] IDC, "Worldwide Email Usage 2007-2011 Forecast – Resurgence of Spam Takes its Toll," March, 2007.

Figure 5: Worldwide email boxes by primary access method, in millions, 2002 and 2007
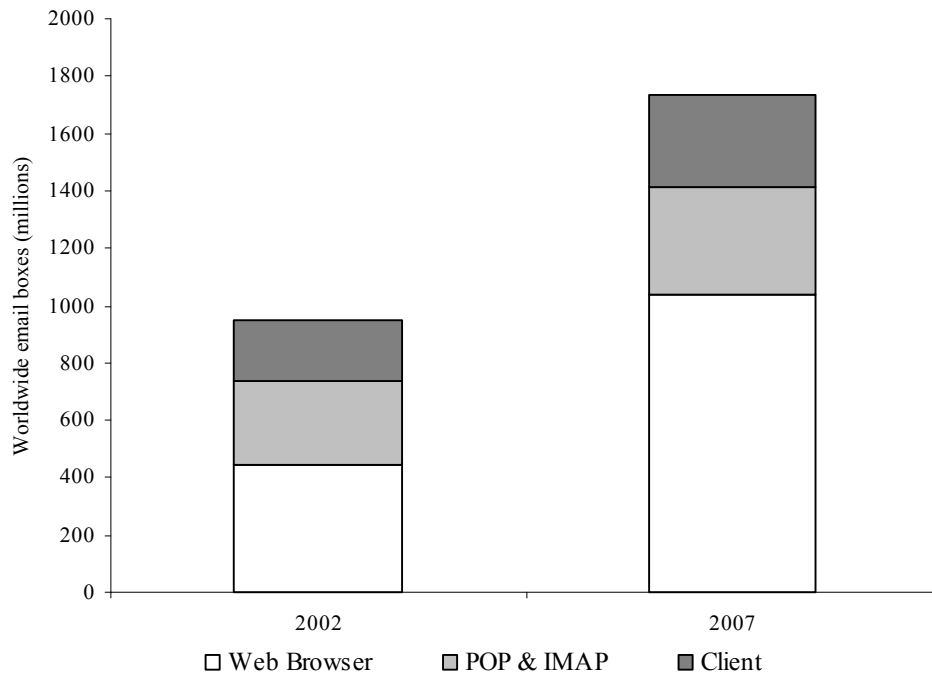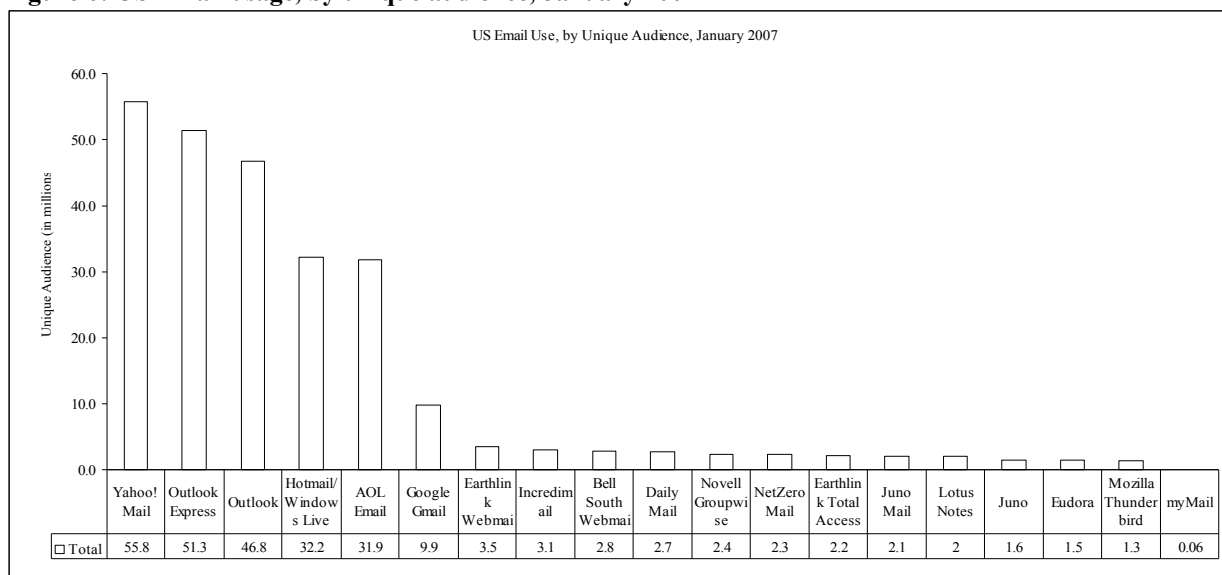

Source: IDC, 2007

28. The high growth in web browser email is likely due to the increase in consumer use. Consumers use web browser email at a higher rate than professional users.[49] From 2001-2007, consumer email use increased at a 24% CAGR, compared to a 15% CAGR for professionals.[50]

29. As a result of the significant growth in web browser email, Microsoft's Outlook Express email program has fewer U.S. users than internet-based Yahoo Mail, which is illustrated below in Figure 6:

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[49] Results from a one month study of application use by Nielsen NetRatings home and work panels, shows that Outlook and Outlook Express are used approximately 50% less at home than at work. *See* Nielsen NetRatings, Applications Affinity Report, US NetView Home and Work Panel, January 2007.
[50] IDC, "Worldwide Email Usage 2007-2011 Forecast – Resurgence of Spam Takes its Toll," March, 2007.

Figure 6: US Email usage, by unique audience, January 2007

US Email Use, by Unique Audience, January 2007

	Yahoo! Mail	Outlook Express	Outlook	Hotmail/ Windows Live	AOL Email	Google Gmail	Earthlink Webmail	Incredimail	Bell South Webmail	Daily Mail	Novell Groupwise	NetZero Mail	Earthlink Total Access	Juno Mail	Lotus Notes	Juno	Eudora	Mozilla Thunderbird	myMail
□ Total	55.8	51.3	46.8	32.2	31.9	9.9	3.5	3.1	2.8	2.7	2.4	2.3	2.2	2.1	2	1.6	1.5	1.3	0.06

Source: Nielsen/NetRatings, Application Affinity Report, January 2007, Nielsen/NetRatings, Standard Metrics Channel Report, January 2007

5. Instant Messaging.

30.   Instant messaging is the fifth middleware product that I consider. Today, instant messaging applications are readily and freely available. In 2002, Microsoft's instant messaging share was 28.8%, and segment leader AOL had a 40.5% share.[51] By 2006, Microsoft's share of instant messaging fell to 26.2% and segment leader AOL increased its share to 51.5%.[52]

31.   Instant messaging consists of real-time communication between internet users. It is available through several websites and across many platforms. The number of instant messages sent has grown substantially in recent years. As depicted in Figure 7, the total volume of instant messages has almost doubled between 2005 and 2007. The top three instant messenger services in the U.S., as of January 2006, were AOL with 52.8 million users, MSN messenger with 27.2 million users and Yahoo! Messenger with 21.8 million users.[53] Critically, users are becoming less restricted to a particular brand of instant messaging because of increased interoperability

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[51] Nielsen/NetRatings, May 2002, Top Instant Messaging Applications Among US at-Home Audience
[52] Nielsen/NetRatings, 2006 cited at "Google takes aim at chat rivals," BBC News, February 07, 2006
[53] MediaPost Communications, February 2006, via eMarketer.com, accessed June 2007

between providers. For example, Yahoo! and Microsoft instant messaging services are

interoperable, enabling users to communicate with a much broader range of other users.

Similarly, Google's and AOL's instant messaging services are interoperable. Other new instant

messaging services are presently being developed and will likely gain in popularity as more users

sign on to participate.[54]

Figure 7: IM Use by billions of Instant Messages, 2005 - 2009
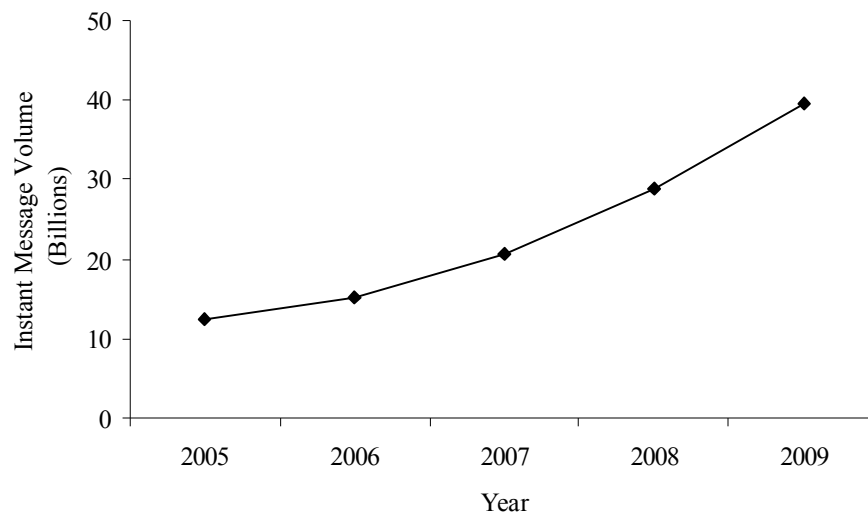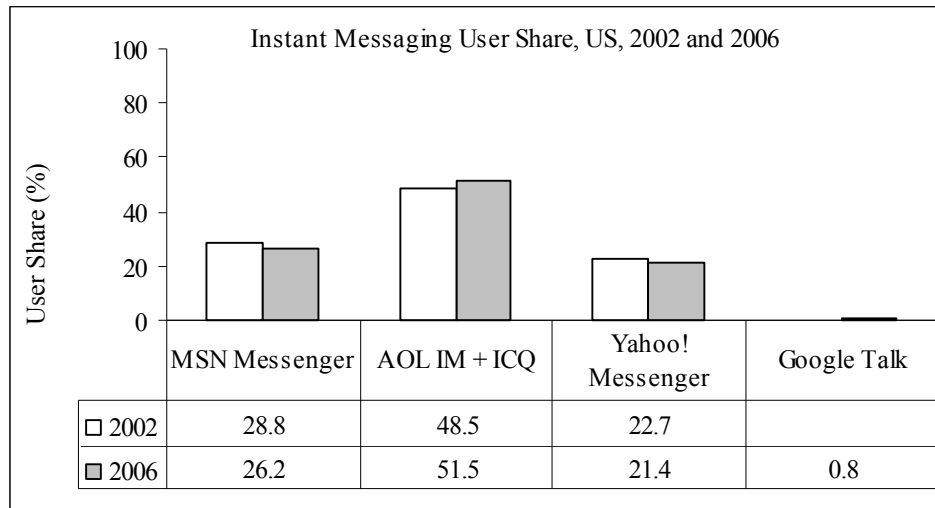

Source: Radicati Group

32.   It is telling that Microsoft's instant messaging share decreased slightly from only 28.8%

to 26.2% from 2002 to 2006. Segment leader AOL's share increased from 40.5% to 51.5% over

the same time period, and new entrant Google has begun capturing share.[55] This transition is

depicted in Figure 8 below:

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[54]MySpace messenger in beta release is one such example. *See* MySpace, http://myspacemessenger.com, accessed
May 31, 2007.
[55] Nielsen/NetRatings, June 2002, Nielsen/NetRatings, 2006.

Figure 8: Percentage Point Change in Instant Messaging Share from 2002 to 2006

Instant Messaging User Share, US, 2002 and 2006

	MSN Messenger	AOL IM + ICQ	Yahoo! Messenger	Google Talk
☐ 2002	28.8	48.5	22.7	
☐ 2006	26.2	51.5	21.4	0.8

Source: Nielsen//Netratings, 2002; Nielsen//Netratings, 2006[56]

B. Distribution of Software Products is Open and Competitive.

33.   The open nature of OEM distribution of products is facilitating increased competitiveness of the five middleware segments described above. OEMs today install and feature a broad array of non-Microsoft products, and users are providing greater input into which applications are pre-installed on their PCs. In addition, new software distribution channels are available and widely deployed. Both the OEM channel and these new software distribution channels are more open today than at the time the Final Judgments were entered.

1. The OEM Software Distribution Channel is Open.

34.   OEMs are a significant distribution channel for both Microsoft and non-Microsoft software products. This is evidenced by, among other things, announcements from ISVs and OEMs regarding the distribution of non-Microsoft products and by the large number of non-Microsoft software programs being pre-installed by OEMs.

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[56] These usage shares of these leading applications are calculated by dividing the unique users of each application by the total unique users across the selected applications. This data does not represent the complete list of instant messaging applications. The same individual could be a unique user for more than one instant messaging application.

35.   To take one example, in May 2006 Dell entered into a three year agreement with Google to pre-install Google applications on Dell machines. Forbes magazine estimates Dell will receive $1 billion from Google for configuring PCs to automatically run Google software upon system start.[57] Other examples are easy to find. In September 2006, PC maker Acer announced that it would install a customized Yahoo toolbar and start page, offering Yahoo! content such as Yahoo! Mail, Yahoo! News and Yahoo! Finance.[58] Later that month, Hewlett Packard announced a similar deal with Yahoo.[59]

<p style="text-align:center">2.   <u>Additional Emerging Channels of Distribution are Available and Widely Deployed.</u></p>

36.   New software distribution channels have emerged since the time of the Final Judgments. Independent Software Vendors (ISVs) previously distributed software primarily through retail channels or original equipment manufacturers. ISVs now have a number of viable software distribution alternatives including Electronic Software Distribution ("ESD"), Software as a Service ("SaaS"), and Platform-Specific Marketplaces. The growth of these emerging distribution channels has been facilitated by the Final Judgments, in particular Sections III.F and G, which assist software developers who seek to distribute software programs that compete with components of Windows. Moreover, Windows itself directly encourages alternative software distribution methods by providing end users with a built-in means of downloading new software programs or accessing them over the Internet. The presence of built-in web browsing functionality in Windows facilitates the downloading of third-party software products, including web browsers. It also makes it easy for users to access a wide range of internet-centric applications.

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[57] Chris Krauter, "Google, Dell Reach Deal, Says Report," Forbes.com, May 2006.
[58] Peter Judge, "Acer sets up home with Yahoo," ZDNET UK, September 14, 2006.
[59] "Yahoo! Delivers Online Services on HP Consumer Desktop and Notebook PCs," Yahoo! Inc. press release (Sunnyvale, CA, September 28, 2006).

a. *Electronic Software Distribution as a Software Distribution Channel.*

37.   ESD represents another distribution channel that has emerged in recent years. ESD refers to the practice of allowing users to electronically download software remotely rather than receiving physical media. Typically, users are permitted to preview or test software before purchasing it, thereby reducing search costs. IDC projects this market to grow rapidly, fostered by the broader trend toward the electronic procurement and distribution of digital assets. In 2004, ESD accounted for $2B in worldwide revenue, having represented a mere 1% of the overall $192.36B software market. Between 2004 and 2009, IDC anticipates that ESD will grow faster than the overall software market. The market research firm expects ESD to reach $8.66B by 2009, representing a 34% consolidated annual growth rate between 2004 and 2009 as compared with the 6.5% growth rate of the broader software market. By 2009, IDC projects ESD to account for 3.3% of the worldwide $263.45B software market.[60]

38.   The trend toward ESD is most pronounced in the consumer software market. Symantec is an independent software vendor known for its Norton Anti-Virus products. Symantec's revenues over the past two years exemplify the shift in consumer software sales from traditional distribution channels to ESD. According to SEC filings for the fiscal year ending March 30, 2007, Symantec reported that the ESD channel had grown by 24% to $1.1 billion in fiscal 2007 over 2006 and accounted for 70% of the company's revenues in the Consumer Products segment.[61]

39.   The growth in ESD has fostered new distribution outlets and intermediaries who provide electronic commerce and electronic software distribution infrastructure to ISVs. This infrastructure improves consumers' ability to search, find, and read reviews of various

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[60] IDC, "Worldwide Electronic Software Distribution 2005-2009," May 2005.
[61] Symantec 10-K, dated 3/30/2007.

applications. An example of one popular intermediary is C|Net's Download.com. Download.com provides an outlet for ISVs to distribute and promote their software through free, trial, and paid applications. Download.com reports that 15.3 million unique users per month download over 2.5 million products per day from a catalog of over 60,000.[62] In addition to Download.com, new outlets for the purchase of software have emerged for the Linux platform (www.linspire.com) as well as for mobile phones and personal digital assistants (www.handango.com). Intermediaries providing ESD infrastructure to ISVs and online retailers have been growing. Digital River is one such intermediary: the company increased its revenues from $154 million in 2004 to $308 million in 2006.[63] As of June 4, 2007, Digital River's market capitalization was $2.12 billion. This represents more than a 100% increase over the company's valuation three years prior.[64]

> b. *"Software as a Service" as a Software Distribution Channel.*

40.   Software as a Service's (SaaS) rapid growth in the software market segment will further decrease the significance of the OEM distribution channel. SaaS is a subset of the broader software market, and according to IDC includes the following two segments: (1) *Hosted Application Management* and (2) *Software on Demand*.[65] SaaS represented 2.98% of the total software market in 2006 ($6.78 billion of 226.9 billion) and is projected to grow to 6.4% ($21.1 billion of 329.2 billion) in 2011, for a CAGR of 25.5%.[66]

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[62] CNET, CNET company web site, http://www.cnetnetworks.com/advertise/properties/download.html, accessed June 15, 2007.
[63] Digital River SEC filings, 2007, 10-K (Eden Prarie, MN, 2007), p. 69.
[64] Yahoo Finance, http://www.Yahoo/finance, accessed June 3, 2007; Digital River 10-Q, dated 8/6/2004.
[65] IDC, "Worldwide and US Hosted Application Management Services 2007-2011 Forecast," March, 2007; IDC, "Worldwide Software on Demand 2007-2011 Forecast," April 2007; IDC "2007 Worldwide Software Market Forecaster – Preliminary Forecast," March, 2007.
[66] "2007 Worldwide Software Market Forecaster – Preliminary Forecast," March, 2007.

41.   The hosted application segment comprises traditionally packaged applications hosted as a service. Customers either purchase an application and have a service provider maintain and run it, or look for a service provider to take over and manage that application. Hosting of the application is provided by the ISV or by a third party. Worldwide hosted applications management revenue was $2.8 billion in 2006 and is projected to grow at a CAGR of 18.5% to $6.6 billion in 2011.[67]

42.   The software on demand segment is the fastest growing segment of SaaS. Providers deliver services over the Web, employing a subscription based pricing model instead of a traditional license. Worldwide software on demand revenue was $3.98 billion in 2006, a 54% increase over 2005, and is projected to grow at a 30% CAGR to $14.5 billion by 2011.[68]

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[67] IDC, "Worldwide and US Hosted Application Management Services 2007-2011 Forecast," March, 2007.
[68] IDC, "Worldwide Software on Demand 2007-2011 Forecast," April 2007, p. 1.

43.   The growth in this segment is evident from the results of its top vendor. Salesforce.com

became the market leader after growing by 86% from 2004 to 2005.[69] See Figure 9 below for

Salesforce.com's user growth from 2003 -2007.

Figure 9: SalesForce.com subscribers, 2003-2007
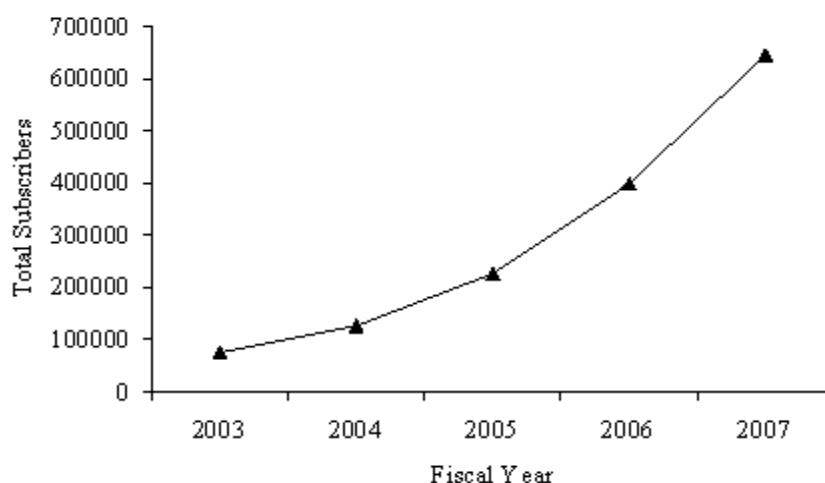
Source: SalesForce.com, 10-K filings (2003-2006).

The viability and attractiveness of software on demand can be further gleaned from its dramatic

growth and the number of rivals. The entire market grew at 54% from 2005 to 2006 and is

forecasted to grow at a compounded annual rate of 30% to 2011. The segment is competitive as

the top vendor grew at 86.5% from 2004 to 2005 and still captured less than 11% of the market.

c.   *Platform-Specific Marketplaces as a Channel for Software Distribution.*

44.   ISVs have recently developed online marketplaces that aggregate third-party solutions

designed for a specific platform. These marketplaces represent an opportunity for third-party

developers to promote and sell applications to a platform installed base, without relying on retail

or OEM sales and distribution channels. Specifically, these online marketplaces promote an

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[69] IDC, "Worldwide Software on Demand 2005 Vendor Analysis, " December 2006, p. 3.

ecosystem of developers around popular software platforms such as Salesforce.com's online CRM application and Intuit's financials application, QuickBooks.

45.   Salesforce.com's AppExchange and Intuit's Quickbooks Solutions Marketplace illustrate the dramatic growth in this distribution channel. Salesforce.com first launched AppExchange in June 2005, and by December 2006, featured an estimated 230 independent partners and a catalog of more than 400 solutions built on the Salesforce.com platform.[70] The company has been adding more than 100 applications per quarter, facilitated by tools such as its Apex Developer Network and online Publisher Toolkit. According to the Salesforce.com website, there are more than 29,800 customers and 646,000 subscribers as of January 31, 2007.

46.   Intuit's QuickBooks Solution Marketplace first launched in 2001, providing a catalog of solutions designed for QuickBooks users. QuickBooks Solution Marketplace now features more than 400 solutions in its catalog and claims to refer more than 360,000 visitors to its partners each year.[71] These 360,000 visitors represent qualified customer leads for the ISVs. Both the QuickBooks Solutions Marketplace and the leads it generates create a valuable distribution channel for ISVs.

47.   The popularity of online marketplaces has moved beyond enterprise applications and includes social networking sites. Facebook.com, the number two social networking site, announced on May 24, 2007, that it had established a website marketplace to allow companies to sell items to its 24 million users.[72] At the same time, Facebook opened its technology platform to developers and encouraged them to create applications and sell them on the Facebook

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[70] *Salesforce, Salesforce Company Web site,* http://www.salesforce.com/company/news-press/press-releases/2006/12/061212-1.jsp, accessed June 3, 2007.

[71] Intuit, Intuit Company Web site, http://web.intuit.com/about_intuit/press_releases/2006/09-25.html, accessed June 3, 2007; Intuit, Intuit Company Web site, http://developer.intuit.com/Marketing/Programs/QBSM.asp?id=79, accessed June 11, 2007.

[72] Rachel Rosmarin, "Facebook Opens Up", Forbes.com, May 25, 2007.

marketplace.[73] The number of services offered on Facebook's marketplace increased from 100 in May of 2007 to more than 800 in June 2007, illustrating the desire of ISVs to utilize this distribution channel.[74]

48.   Platform-specific online marketplaces represent a new model for the development, marketing and sale of third-party products. Companies like Salesforce.com, Intuit, and Facebook.com have created an environment for ISVs to bring innovative new solutions to market in a cost effective manner, thereby extending the utility of the core software platform and contributing to the diversity of the industry ecosystems in which they operate.

V.   THE INTERNET HAS FACILITATED THE EMERGENCE OF ALTERNATIVE PLATFORMS TO CLIENT OPERATING SYSTEMS

49.   The IT industry consists of a rapidly evolving and highly interconnected network of organizations, technologies, products and consumers, sometimes referred to as the "IT ecosystem." In recent years, the centrality of the client operating system has changed as consumers have shifted to reliance on the internet.

50.   More specifically, the position of the client operating system in the IT ecosystem has changed because of: (1) consumer preferences that are increasingly met by internet-centric applications; and (2) internet-centric platforms that provide developers with an alternative to client operating systems have emerged. These trends have impacted the competitive significance of client operating systems since the Final Judgments were put into effect.

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[73] The value of the Facebook marketplace is evident in examples such as iLike. iLike first went live in October 2006. From that time until May 2007, it signed on 3 million users. The company made a version for Facebook marketplace and within three weeks had signed up 3.7 million users and continues to add 1 million users per week. That current growth rate makes it the fastest growing digital music service on the internet and shows the value of the Facebook marketplace. *See* Antony Bruno *"Facebook helps iLike stand out in internet crowd,"* July 2, 2007.
[74] Vauhini Vara,,"Facebook gets help from its friends," WSJ.com, June 22, 2007.

A. Consumers Increasingly Use Internet-Centric Applications That Are Not Dependent on the Client Operating System.

51.   PCs have evolved from the source of client-based applications, to a portal for a broad array of applications that no longer reside on the PC itself. PC users spend less time running traditional client applications such as word processing, and now rely more on internet-centric applications.   These internet-centric applications operate one or more steps removed from the client operating system and often do not depend on the type of client operating system in place on the user's PC. As a result, internet-centric applications are decoupled from the influence of running on a particular client operating system.

52.   Currently, there are 1.3 billion individuals worldwide who have internet access, and this number is projected to grow to 1.8 billion by 2010. This represents a compound annual growth rate ("CAGR") of 11.5%.[75]   Today there are 211 million internet users in the U.S.[76] The average time spent on internet activities per user per week in the U.S. increased from an average of 5.25 hours in 2002 to 8.3 hours in 2007, representing a CAGR of 9.6%.[77] Table 1 tracks user participation by activity in 2006 compared with 2002:[78]

Table 1: Internet Usage in the United States, 2002 and 2006 (Use the following)

Type of Internet Activity	% Participants (2002)	% Participants (2006)
Email	87%	97%
Researching Products Online	20%	63%
Online gaming (alone)	34%	50%
Instant messaging	22%	34%
Use webmail	28%	42%

Source: Forrester, Benchmark North America. May 2002.; Forrester NACTAS 2006 Benchmarking Survey[79]

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[75] eTForecasts, February 2006; Morgan Stanley, November 2006; http://www.census.gov/ipc/www/worldpop.html
[76] IDC, "The Landscape of the Digital Marketplace in 2007," May 2007
[77] Nielsen / NetRatings, *Historical Internet Activity Analysis* August 2002-August 2003 / August 2006 – May 07, US NetView: Home/Work Combined, July, 2007
[78] Forrester, Benchmark North America. May 2002.; Forrester NACTAS 2006 Benchmarking Survey.
[79] 2002 data relies on survey prompt: "At least once a week." 2006 data relies on survey prompt: "Several times a month."

53.   Two further examples also illustrate the growing importance of the internet for consumers: (1) growth in Web 2.0; and (2) growth in the PC as a media device.

1.   Web 2.0 growth.

54.   An example of an internet-centric activity that does not require use of a particular client operating system is Web 2.0. Web 2.0 refers to internet-hosted applications that facilitate the collaborative creation, management and delivery of interactive, rich-media based digital content through a browser interface among remote user participants.[80] These internet-centric applications include the formation of self-organizing online communities that collaboratively produce and manage content through distributive computing networks and virtual "live" interactions. [81] Web 2.0 provides a new way of using PCs because the content is internet-hosted rather than client-hosted and the activities are therefore largely operating system agnostic.

55.   In 2006, 21% of all PC users reported making daily visits to online community forum sites, while only 10% reported making "several" weekly visits to similar online forums in 2004.[82] Well-known examples of such user-generated content[83]sites, which have witnessed exponential growth since 2002, include the well known Craigslist.org, Facebook, MySpace and YouTube sites.[84]

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[80] As a competitive differentiator, sites will gradually increase their use of sophisticated technologies that provide richer experiences to their user, either with richer content or with user interfaces that provide the look and feel of a desktop application without constant interaction with the servers." See IDC, "Worldwide Web Site Design and Development Tools 2007 – 2011 Forecast," May 2007, p. 4.

[81] Web 2.0 applications take various forms including social networking sites, interest-based community forums, message boards, auction sites, wikis, blogs, chat rooms, online dating sites, multi-player gaming sites, and other interactive data-exchange service platforms. Web 2.0 revenue models typically leverage the social interactions that form the site content through advertising and subscription fees that grow with user participation levels.

[82] CMG Market Research, Digital Lifestyles (2006), p. 48; CMG Market Research, Windows Client Household Tracking Study (Fall 2004), p. 41.

[83] This term is used by the research firm IDC to describe web-based business models that rely on collective user participation and collaboration to generate site content.

[84] To illustrate, consider two top Web 2.0 sites, MySpace and Facebook. MySpace.com has become one of the most well known and most visited social networking sites. Based on both user generated content and social networking, MySpace also made Web 2.0 tools such as Flash available to members. Members were allowed to use simple interfaces to customize their profiles with streaming media such as music and video as well as interactive content

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56.   Web 2.0 sites displayed the highest growth Web sites in recent years. Figure 10

illustrates the daily reach of the top 10 ranked sites in 2003 (Yahoo!, Microsoft, MSN, AOL,

Amazon, Google, eBay, Lycos Networks, About Network).[85] Daily reach is defined as the

percentage of all internet users who visit a given site.[86] With the exception of Google, the daily

reach of each of the top sites in 2003 has changed 1% or less. In contrast, Figure 11 traces the

daily reach of the seven sites that are ranked in the top ten in 2007 that were not on the 2003 top

ten list (Live, Baidu, Orkut, Wikipedia, QQ, YouTube, MySpace).[87] These sites can generally be

classified as Web 2.0. As is evident, there have been sharp increases in daily reach since 2003.

Notably, the user-generated-content site YouTube, founded in February 2005, had a daily reach

of less than 2% through early 2006. By June 2007, YouTube had a daily reach of 18%, for a

CAGR of 159%.

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such as surveys. MySpace has announced that it had 130 million user accounts in November 2006 with 8 million
members joining per month. Owner Rupert Murdoch predicted that MySpace would have 200 million registered
users by mid-2007. *See* (http://mashable.com/2006/11/14/myspace-worth-6-billion-youtube-copyright-fund-is-
200m/) Facebook currently has over 24 million registered users and is adding 150,000 users each day. *See*
"Facebook's Plan To Hook Up the World," CNN Money.com, May 29, 2007. This represents an annualized increase
of over 200% from Facebook's 7.3 million registered users as of mid-2006. *See "*MySpace, Facebook, and Other
Networking Sites: Hot Today, Gone Tomorrow?" Knowledge At Wharton, Managing Technology , May 3, 2006.
New users join the sites based on content postings and referrals from existing members which consequently
increases the total number of interactions and postings among members.

[85] Nielsen/NetRatings, Top 10 Web Sites by Parent Company and Top 10 Web Sites by Brand, November 2003
[86] Alexa.com, http://www.alexa.com/site/help/traffic_learn_more, accessed June 15, 2007.
[87] Alexa.com, http://www.alexa.com/site/ds/top_500?qterm=, accessed July 11, 2007. The top ten websites in 2007
included five social networking sites and user-generated content (YouTube.com, Myspace.com, Live.com,
Orkut.com, and Wikipedia.org) but there were no such sites in the top ten sites from 2003. *See* Neilsen, NetRatings,
and Alexa.com.

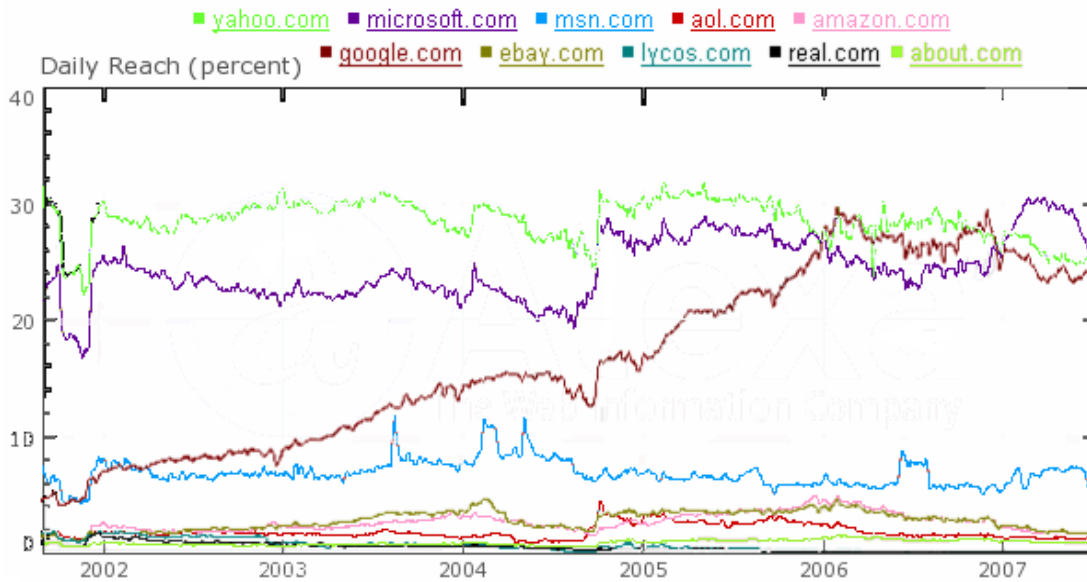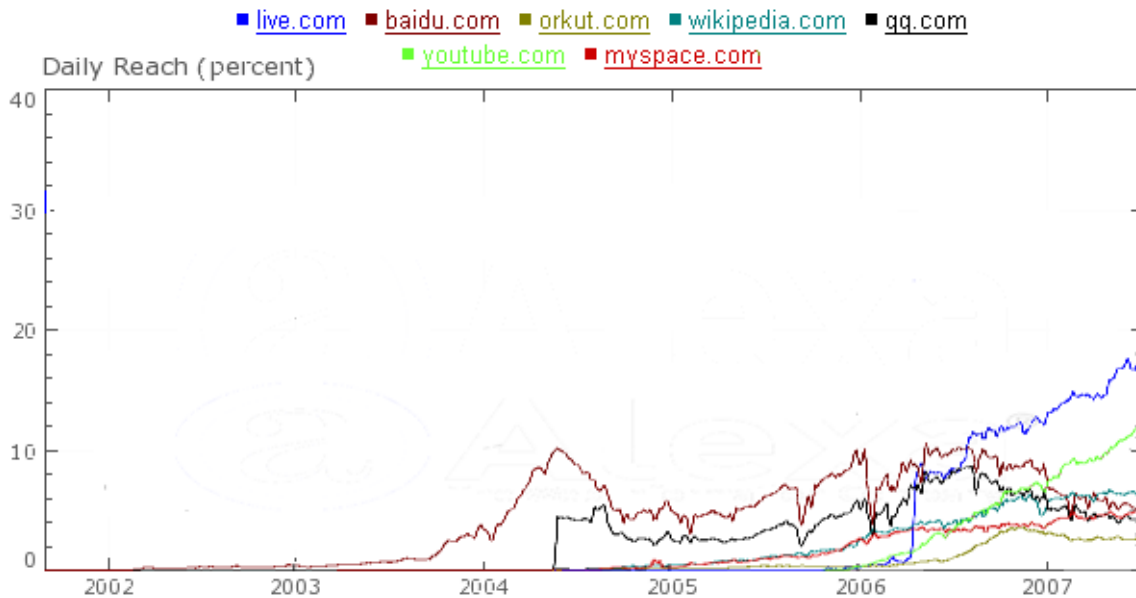**Figure 10: Daily Reach, for 2003 top ten web sites (2003-2007)**

Figure 11: Daily Reach, for 2007 top ten web sites excluding Yahoo!, MSN and Google (2003-2007)

57.   As shown in Nielsen NetRatings, the top two Web 2.0 activities are email and instant

messaging.[88]   These activities utilized client-based applications prior to the growth in Web 2.0,

but are now largely internet-based. Other Web 2.0 activities, including blogging, auction sites,

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[88] Nielsen NetRatings, May 2007.

multi-player gaming sites, and user-generated videos have also become popular internet-based activities that were previously unavailable on traditional client-based applications.[89]

2. The Growth in the Use of the PC as a Media Device.

58. The increased use of PCs as media devices and the growth of alternative media devices also illustrate that consumers are performing computer functions on devices that interoperate with the client operating system. Consumers regularly use their PCs for a variety of media centric applications, including uploading and viewing streaming video files, digital file storage and transfer, music listening, playback and recording. Users may download digital media directly to their PCs for playback on their PC, to a portable digital playback device such as an iPod, or simply to their television.

59. Video sharing sites such as YouTube have video players embedded into the site.[90] It is estimated that over 98% of worldwide users of internet-enabled PCs have installed Adobe's FlashPlayer, with which users can view digital video without relying on the client operating system other than supporting an internet browser.[91] Music download and playback sites such as iTunes also have music players embedded into the site so that users do not have to have a music player already installed on their PC.

60. The popularity of iTunes is an example of the widespread use of PCs as media devices. Since its launch in 2001, iTunes has experienced tremendous growth and, according to Apple,

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[89] Internet-centric applications have also evolved allowing uploading and viewing streaming video easier, which PC users are increasingly taking advantage of. Based on an IDC survey conducted in August and September 2006 of 1,000 eligible respondents, a third of respondents watched internet video in the past 3 months. The most popular internet video content sources that respondents used over the previous six months were Google (63%), Yahoo! (46.7%), MySpace (42.7%), iTunes (41.7%), and YouTube (23.8%.). *See* IDC, "US Internet Video Usage: 2006 Consumer Survey Results."

[90] As of December 2006, YouTube currently has over 50 million registered users, a significant increase from the 4 to 9 million users it served in January 2006 shortly after launch. *See* ComScore Media Matrix 2006-2007, Nielsen / NetRatings 2006 – 2007.

[91] Emarketer.com, "Video Platforms Installed On Internet-Enabled Computers Worldwide, Q4/2006," accessed June 15, 2007.

has an active user base of 500 million users as of June 2007.[92] While competing digital media outlets have emerged, iTunes has thus far dominated the digital music segment and has quickly gained traction in other digital media segments including digital television and movie downloads. The growth of digital music, reflected in the dramatic extension of digital music sales revenue, further illustrates the significant growth in this PC activity. Digital music sales revenue has grown from less than 1% of total revenues of the music industry in 2004, to more than 10% in 2006 according to an annual report of IFPI, the organization that represents the recording industry worldwide.[93] This revenue trend is presented in Figure 12:

Figure 12: Global Digital Music Revenue % of Retail Music Sales, 2004-2006
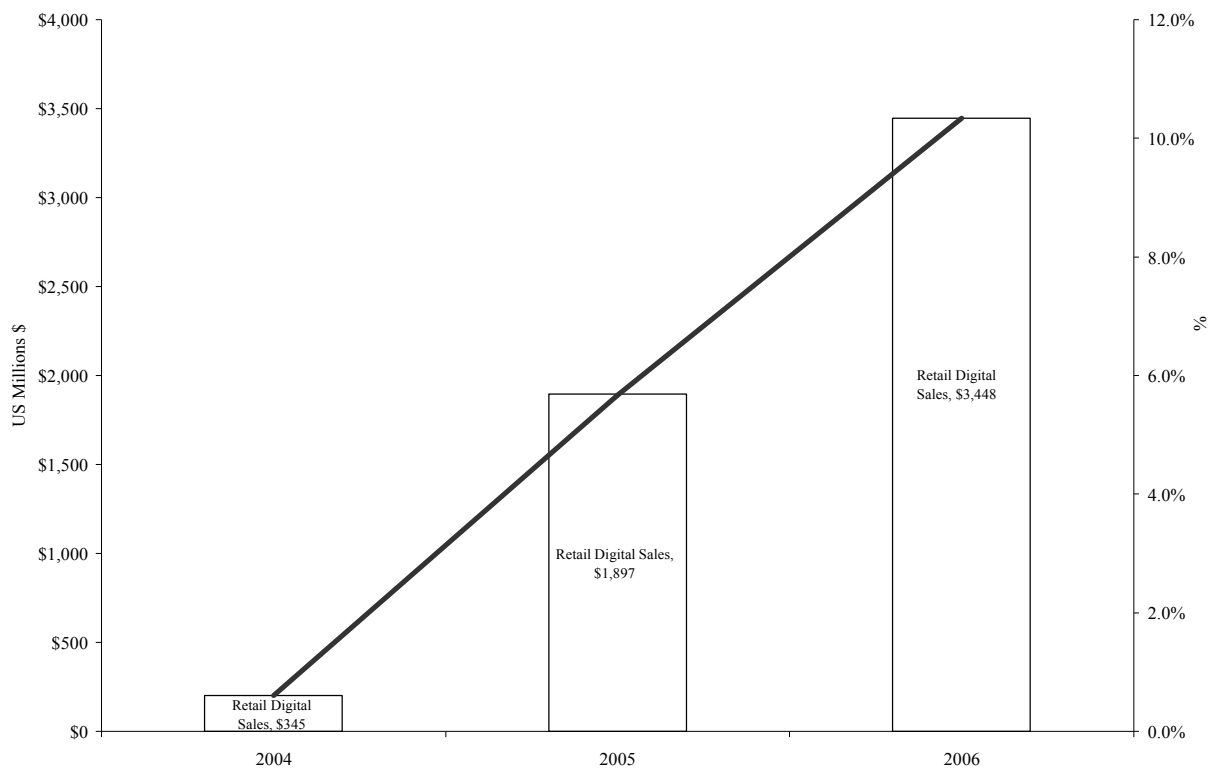
[92] Prince McLean,, "Apple Serving up 1 Million Copies of iTunes Each Day," June 12, 2007.
[93] Additionally, new business models for the distribution of digital music have emerged. Consumers can either "rent" digital music using the subscription model currently offered by Napster, Rhapsody, and MTV's Urge, or consumers can purchase the music through pay sites including iTunes.   Newer online digital music "jukebox" sites such as Pandora allow users to actively customize their listening preferences, and are also gaining traction with over 6 million registered users.

Need to walk through..

61.   Portable media devices offering substantially the same media functionality as PCs, such as the iPod, have emerged.[94] These devices can substitute for the use of the PC as a media device in some contexts. Apple's sales of the iPod increased from 381 thousand in 2002 to almost 39.4 million units in 2006, which represents a 219% CAGR from 2002 to 2006.[95]   iPods now permit consumers to watch downloaded music videos, television programs and feature films. As Figure 13 shows, iPod sales have dramatically escalated, fueling the use of the associated iTunes and QuickTime software on PCs which are required to load music on an iPod, as well as to shop for music in Apple's AAC format:

Figure 13: iPod Unit Sales in thousands of units, 2002-2007
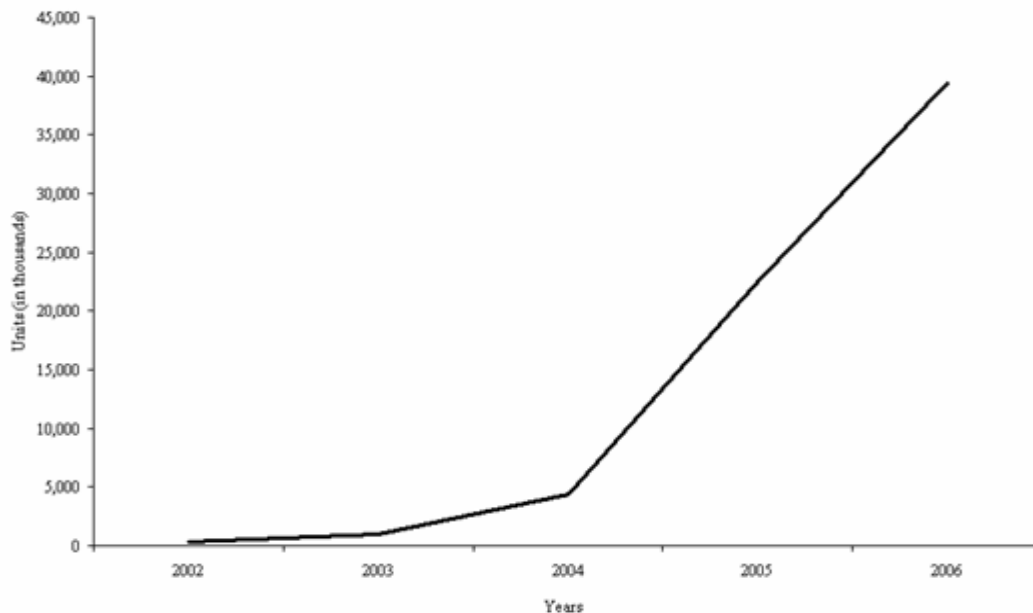
Source: Apple 10-K, 2002-2006

B. Internet-centric Platforms Compete With Client Operating Systems and Impact the Applications Barrier to Entry.

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[94] Other examples of portable digital media players include Sandisk's Sansa, Microsoft's Zune, iRiver's Clix, and Toshiba Gigabeat.

[95] Apple Computer, Inc., September 28, 2002 10-K (Cupertino: Apple Computer, 2002). *See also* Apple Computer, Inc., September 30, 2006 10-K (Cupertino: Apple Computer, 2006).

62.   Several emerging internet-centric platforms are now competing with client operating

systems. These internet-centric platforms eliminate reliance on client operating systems and

therefore break the link between applications and the particular application interfaces exposed by

an operating system. Thus as the number of OS-agnostic applications increase, the application

barrier to entry is reduced. The number of these OS-agnostic applications has risen dramatically.

The term "OS-agnostic" denotes an application that runs on multiple operating systems. For

enterprises, the number of newly developed OS-agnostic applications grew at 24% CAGR from

2000 to 2006 while Windows based applications grew at a 1% CAGR during the same period.

The percent of OS-agnostic applications is expected to surpass the percent of OS-specific

applications by 2011.[96] Figure 14 below illustrates the trend towards OS-agnostic applications

and away from OS-specific applications.

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[96] Gartner, "Why the Client OS Matters Well Beyond 2011," August 2006.

Figure 14: Percentage of OS-Specific vs. OS-Agnostic Enterprise Applications, 1996 – 2020 (installed base)
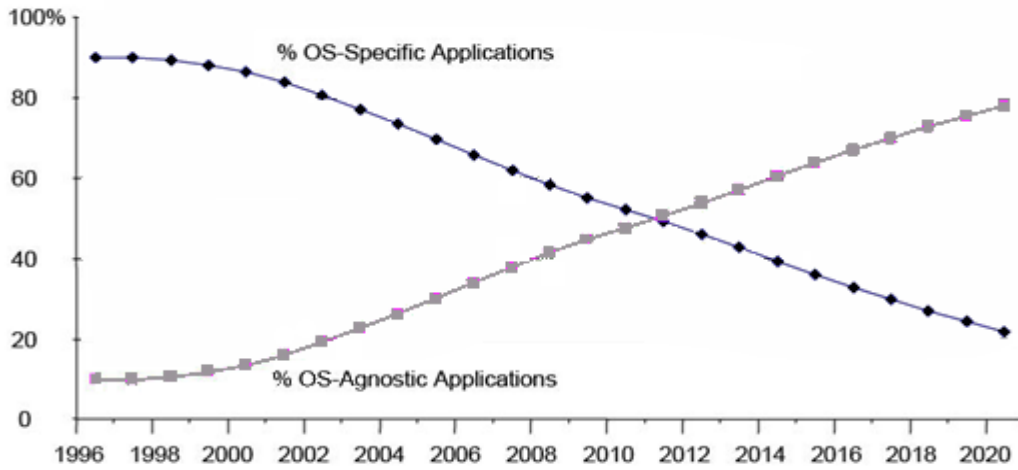
Source: Gartner, "Why the Client OS Matters Well Beyond 2011." August 2006.

63.   Figure 15 below illustrates the trend towards OS-agnostic applications through the development stage. Critically, 80% of new applications are being written to be OS-agnostic.[97]

Figure 15: Enterprise Application Development Mix, New Applications, 1997 - 2019
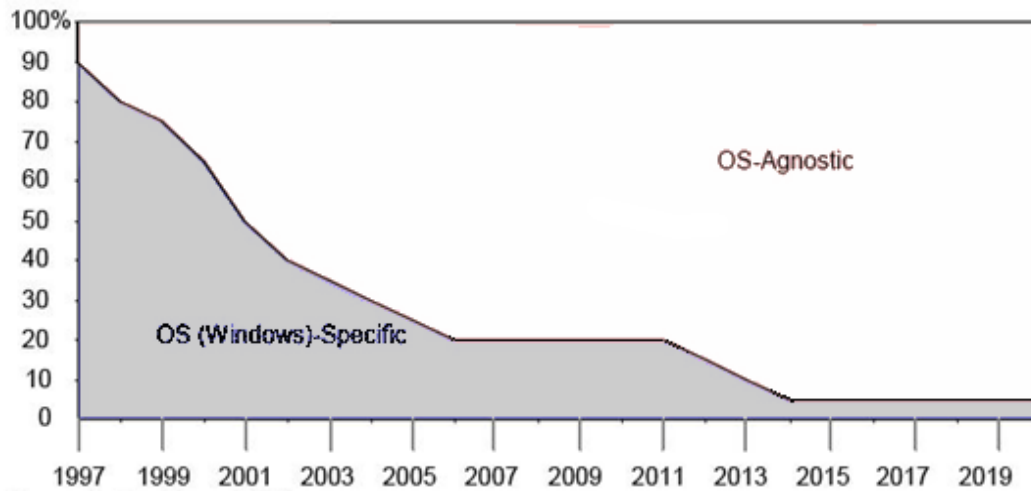
Source: Gartner, "Why the Client OS Matters Well Beyond 2011." August 2006.

64.   The Gartner analyst that authored the study cited in Figures 14 has stated that consumers will reach the crossover point, where they use more OS-agnostic applications than OS-specific,

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[97] IDC, "Why the Client OS Matters Well Beyond 2011," August 2006.

even sooner than enterprises. Indeed, for basic productivity applications, Gartner believes

consumers may already be using more OS-agnostic application than OS-specific applications.[98]

65.   As OS-agnostic applications become more popular, the competitive significance of client

operating systems is altered. This is because such OS-agnostic applications do not depend on the

application programming interfaces exposed by Windows. Instead, such OS-agnostic

applications could be accessed through multiple operating systems. Accordingly, the growth of

these OS-agnostic applications reduces the "applications barrier to entry."

66.   I discuss two OS-agnostic internet-centric applications below that are competing with

client operating systems: (1) expanded browser technology; and (2) SaaS.

1.   Expanded Web Browser "Plug-in" Technology as a Platform.

67.   As discussed previously, consumers are spending more time on the internet. Today a

broad range of "plug-in" technologies are enabling OS- agnostic applications to run on any

widely available web browser. Moreover, a range of add-ons and extensions enhance web

browser functionality and allow users to customize any popular web browser. Additionally, new

technologies that enable expanded off-line capabilities for internet-centric applications are

emerging. The combination of plug-ins, add-ons, extensions, and off-line capabilities are

creating alternative platforms that compete with traditional client operating systems.[99]

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[98] http://www.informationweek.com/story/showArticle.jhtml?articleID=197001813
[99] The growing stature of these technologies in the IT ecosystem can be gleamed from their collective revenue
growth. IDC tracks this segment which according to IDC, includes "web site design and development tools that
provide Web site and Web page layout and design, object integration for site and page development, and the tools
needed to create Web-based applications. Although HTML editing is often provided, tools in this category typically
offer visual abstraction away from HTML through WYSIWYG page editors, animation and other rich media,
JavaScript and XML (AJAX), simple data integration, and deployment scenarios." Using this definition revenue
grew from $751 million in 2003 to $928 million in 2006 representing a 7.3% CAGR. IDC forecasts this market
segment to grow to $1.28 billion in 2011, for a 6.6% CAGR. Adobe, the maker of Flash, Flex, and other browser
technologies captured 44.3% of this market segment, followed by Microsoft with 17.9%, SAS with 3.4%, and IBM
with 2.8%. *See* IDC, "Worldwide Site Design and Development Tools 2005 Vendor Shares;" IDC, "Worldwide
Web Site Design and Development Tools 2007-2011 Forecast."

68.   First, a plug-in is a component typically supplied by a third party vendor, which allows any popular web browser to display a specific type of content or execute a specific type of application code. The plug-in effectively contains and manages the application. These "execution containers" provide developers with a uniform environment to write internet applications (commonly referred to as Rich Internet Applications). It also gives developers the assurance that the applications will behave and appear the same regardless of the web browser employed by the user.

69.   Evidence of market acceptance of plug-ins as a platform is considerable. Adobe claims over 750 million connected PCs and mobile devices worldwide have the Flash player installed.[100] The Sun Microsystems website reports that over 91% of internet-connected PCs have Java enabled.[101] Other plug-ins with comparably high penetration include Adobe Acrobat Reader, Macromedia Shockwave Player, Real Player, Apple QuickTime, and Viewpoint Media Player. Figure 16 depicts the strong market acceptance of plug-ins:

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[100]Adobe, Adobe Company Web site, " Adobe Flash Player" http://www.adobe.com/products/flashplayer, accessed May 31, 2007.
[101] Sun, Sun Company Web site, " Java One 2007 Press Kit", http://www.sun.com/java. accessed May 31, 2007.

Figure 16: Plug-in Penetration, by % of total internet enabled computers, 2002 - 2005
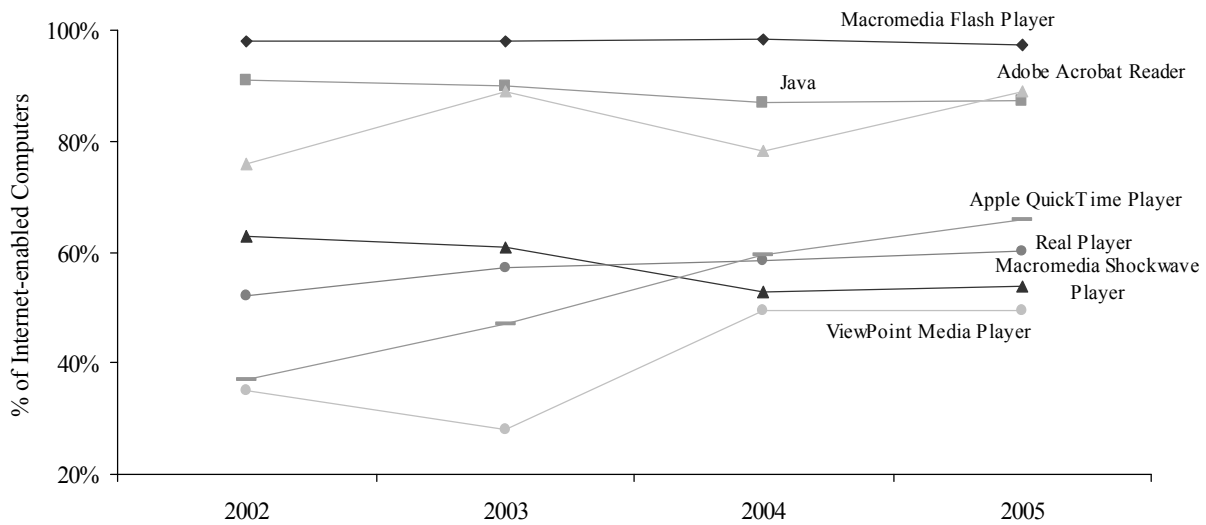
Source: NPD Group, Macromedia

70.   Flash and Java create a broad-based platform for developers to write applications wholly independent of the operating system. These web applications surpass the limits of traditional HTML and have the responsiveness and appearance of full-featured desktop applications. Developers write applications for Java called Java applets and utilize the toolkit Flex to write Flash applications. An application written in Flash or Java can run in any web browser that has the appropriate plug-ins installed, regardless of the client platform or operating system. Applications written using Flex are platform-independent because they run inside the Flash player client engine, and not directly on the client's operating system. Therefore, the only requirement for running a Flex application is that a version of the Flash player exists for the user's web browser and operating system.[102] Java applets are platform-independent because they

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[102] One example of a Flex application is the color visualizer offered by Sherwin-Williams, a supplier of paint and other wall coatings. The color visualizer allows users to view renderings of rooms and exteriors in any of the paint colors in the Sherwin-Williams catalog. When a user visits the Sherwin-Williams website (http://www.sherwin-williams.com/do_it_yourself/) and clicks on the color visualizer, the Flash player is launched inside the browser. An .swf file, containing the visualizer application is downloaded from the backend site and executed inside the Flash player. This application exhibits many common features of applications built with Flash: a full-featured user

run inside the container created by the Java plug-in and not directly on the client's operating system. Some of the most notable examples of Java applets take the form of interactive graphics and data visualization. For example, Yahoo! Games, MLB.com, and the real time stock tickers in many financial websites are implemented as Java applets.

71.   Second, add-ons are installable components that enhance the capability of the web browser and allow users to access functionality traditionally reserved for client operating systems. Web browser vendors do not typically provide these add-ons. Instead third parties such as Google, Yahoo!, eBay and many other vendors actively develop them. The Google Toolbar is an example of an extension that allows users to enter search text directly, create bookmarks that are stored in an online account, and receive warnings when visiting sites that pose security threats. Multiple add-ons can be installed together in the same web browser, essentially converting a generic web browser into a custom application containing a broad range of functionality. These "custom" applications can be created for any of the widely used browsers and operate a level removed from the client operating system.

72.   The advent of new technologies continues to provide alternatives to the client OS. The development technique coined Ajax (acronym for "Asynchronous Javascript and XML") facilitates the improved production, management and hosting of interactive digital content, allowing developers to create internet-centric applications that mimic the "look and feel" of traditional client applications. One of the key benefits of Ajax is that it allows partial page refreshes, which limits bandwidth usage and thus provides more responsive applications, especially on constrained devices such as mobile phones. Examples of internet-centric applications developed using Ajax include Google Maps, Google Suggest, Google Groups and

interface with rich graphics, drag and drop functionality, tabs, popups, and dynamic image rendering without page refresh delays.

Flickr.[103] Ajax increases the speed of websites, allowing developers to add functionality to their internet-centric applications. As developers capitalize on this technology, internet-centric applications will become increasingly viable competitors to traditional client applications.

73.   Finally, technological advances have allowed internet-centric applications to function off-line. For example, technology from Google called Google Gears, Adobe called Apollo, and Microsoft called Silverlight, gives users access to internet-centric applications while offline. Google Gears, in beta release since May 2007, is an open-source web browser extension. Developers can use Google Gears to create internet-centric applications that function offline using JavaScript APIs. The extension includes three key modules: a local server to cache and serve application resources, a database to store data locally in a fully-searchable relational database, and a worker thread pool to make internet-centric applications more responsive by performing resource-intensive operations asynchronously.[104] Through Gears, Google hopes to drive standards for offline application development.[105] These standards will encourage increased competition from internet-centric platforms by addressing the current inability of most internet-centric applications to run when a user is not online.

74.   The Final Judgments have encouraged the growth of "plug-in" technology and add-ons in several ways. Section III.C of the Final Judgments protects the ability of OEMs to install and promote plug-ins and add-ons on their new PCs. A number of OEMs are doing just that, adding toolbars from Google and Yahoo to Internet Explorer. In addition, Section III.D provides the

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[103] New toolkits for developers of website technologies have also become available. There are proprietary packages from Backbase, JackBe, and Tibco and open source packages from Dojo, Microsoft, Google, Atlas, Rico, Yahoo, and Zimbra.
[104] http://gears.google.com. (Last accessed June 15, 2007.)
[105] Google Gears has an impressive array of backers. Adobe Systems Inc., Mozilla Corp. and Opera Software ASA are backing Google Gears. *See* Juan Carlos Perez, "Google Gears Up Offline Access for Web Apps," IDG News Service, May 20, 2007.. Adobe is integrating Google Gears into their own tools, providing developers with the ability to build and deploy rich Internet applications to the desktop. *See also* http://labs.adobe.com/wiki/index.php/Apollo, accessed June 15, 2007.

developers of plug-ins with additional API disclosures that can be used to enhance the functionality of plug-ins. And finally, Section III.G ensures the ability of plug-in developers to get their software into the hands of consumers through methods other than OEM distribution.

2. Software as a Service as a Substitute Platform.

75.   SaaS also serves as a platform that competes with client operating systems. SaaS allows users to use software without downloading that software to their PC. Thus, SaaS is OS-agnostic as it operates one or more steps removed from the client operating system.

76.   Since SaaS shifts the location where the application resides from the client operating system to a server, developers are able to write software that can be used regardless of the client operating system in place. Because the application running on a server makes no use of application programming interfaces exposed by a specific client operating system, the application is truly OS-agnostic.

VI.   CONCLUSION.

77.   The IT ecosystem has become even more competitive since the Final Judgments were entered in November 2002. The overall IT ecosystem has also expanded, with alternative platforms that compete with Windows driving much of this growth.

78.   The competitive dynamic faced by client operating systems have been impacted over the last five years by the utilization of PCs for internet-centric activities. In 2006, U.S. households spent 31% more time on internet-centric applications than in 2001 while use of client-based applications dropped by 14%, a dramatic trend that is illustrated in Figure 17 below:

Figure 17: Hours Spent per Week on PC Related Activities by US PC Users
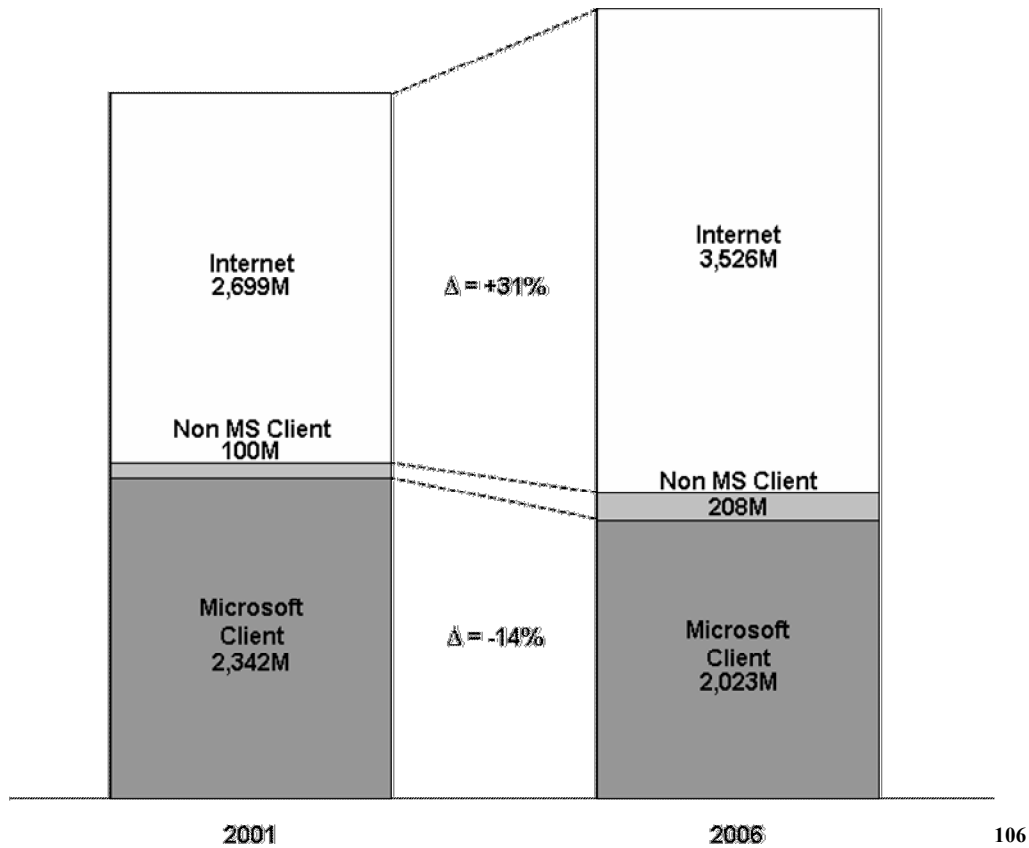
Based on the facts outlined in this report, I conclude that the five middleware product segments identified in the Final Judgments are more competitive than they were in 2002. Moreover, based on the new trends in internet-centric computing that I have described, I conclude that the overall IT ecosystem is more competitive today than it was in 2002.

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[106] Hours for internet usage calculated from average US Internet usage per week multiplied by total number of internet users in the US. Hours for Client usage calculated from average US non-Internet PC usage per week multiplied by total installed base of client computers. Sources: http://www.internetworldstats.com/am/us.htm: Internet users; Gartner, "Forecast: PC Market by Operating System, Worldwide, 2001-2010": Client users
CMG, "Microsoft Digital Lifestyles Study": 2006 Average Hours spent;
Clariom, "HRD US Windows Tracking Study": 2001 Average Hours spent.