



AT FORDHAM LAW SCHOOL

THE IMPACT OF THE ACQUISITION AND USE OF PATENTS ON THE SMARTPHONE INDUSTRY

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AUTHORSHIP

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I. INTRODUCTION

A. Description of the Project

In 2011, WIPO published a report prepared by Fordham Law School's Center on Law and Information Policy (Fordham CLIP) that summarized trends in the economic and legal literature related to the effects of intellectual property (IP) rights as a barrier to market entry.¹ The report found very limited empirically focused literature and among the recommendations for a future research agenda, the report suggested a set of empirical studies to analyze barriers to entry in a given technology marketplace, including a study of the effects of IP rights on market entry in relation to a specific market. This study responds to that recommendation with an empirical analysis of the use and effects of patent rights in a specified industry – the smartphone industry. As a case study, the smartphone industry offers an opportunity to discover valuable insights because there is no single dominant firm in the market, competitors have aggressively defended their patent rights, and the market is rapidly evolving with new entries and exits of competitors. At the same time, there is a dearth of empirical work that measures or analyzes the actual impact that patents and patent litigation have on the smartphone market.

This study, thus, sought to obtain and analyze empirical data from patent records, litigation records, industry reports, corporate public records and a survey concerning the acquisition and use of patents in the smartphone industry. The study looked to identify similarities and distinctions in practices across organizations and across subsets of the marketplace. Through this analysis, the study also sought to make an assessment of the openness of the smartphone market and the impact that the ownership and enforcement of large patent portfolios has on the market.

B. Roadmap of the Study

In order to analyze how patents are used in the smartphone industry and to determine the openness of the market, this study first sets out in Part II a definition of the smartphone market to identify the scope of the study. The definition is drawn from research in news media and market research reports. In Part III, the study identifies key market participants in order to focus on their practices. These companies are identified based on market research reports and patent holdings. Part IV explains the empirical data obtained for the key market participants consisting of market shares, patents held, publicly available licenses and assignments, and litigation involving the patents. Fordham CLIP compiled the data from a variety of sources including the USPTO patent grant database,² the SEC Electronic Data Gathering, Analysis and Retrieval (“EDGAR”) database,³ the United States Federal Public Access to Court Electronic Records (“PACER”) system,⁴ and a questionnaire circulated to the companies identified.

¹ World Intellectual Property Organization, *Report on an Analysis of the Economic/Legal Literature on Intellectual Property (IP) Rights: a Barrier to Entry?* CDIP/8/INF/6 CORR.(Geneva, Switzerland: World Intellectual Property Organization, 2012) available at http://www.wipo.int/edocs/mdocs/mdocs/en/cdip_8/cdip_8_inf_6_corr.pdf

² USPTO Bulk Downloads: *Patent Grant Bibliographic Data*, Google, <http://www.google.com/googlebooks/uspto-patents-grants-biblio.html>. Fordham CLIP reviewed the data by converting the XML into an Excel Spreadsheet containing the fields required for the analysis.

³ *Filings & Forms*, SEC, <http://www.sec.gov/edgar.shtml> (last modified 02/21/12).

⁴ <http://www.pacer.gov/>. Fordham CLIP accessed the PACER data through Bloomberg Law.

Part IV, then provides a detailed analysis of practices and market trends. In Part V, the study identifies criteria to draw conclusions regarding the relationship between patents and the openness of the smartphone market and provides an assessment based on those criteria and the study findings.

In the sections below the study describes the research methodology for each step and the relevant findings.

II. DEFINING THE MARKET

At present, there is no clear and universally accepted definition of the smartphone marketplace.⁵ Because smartphones are at the boundaries of computing, telephony and telecommunications services, the lines between smartphones, mobile phones, and notebook computers have become blurred through the introduction of tablets and tablet-phone hybrids. In order to narrow the scope of the study to exclude non-phone tablet devices and other types of phone devices, this study focuses on hand-held computing devices that (a) have the ability to make phone calls over cellular networks and (b) can transfer data and run applications over mobile computing networks. These features capture the key components inherent in most colloquial uses of the term smartphone and enable the study to distinguish “smartphones” from other mobile and network computing devices.⁶

Within this broad definition, further refinement is needed to identify the various market segments such as hardware and operating systems in order to collect appropriate empirical data. Fordham CLIP conducted an initial news search that indicated the market was likely comprised of distinct sectors revolving around specific features and components of smartphones. Identifying and characterizing the market segments was, thus, critical to defining the market as a whole and to eventually identifying and gathering information on key market participants. Hence, in order to define relevant market segments, Fordham CLIP conducted a set of three searches:

Patent use

The first search looked for general news related to smartphones and patent usage. This search sought out articles on events that were covered broadly in the news media to identify the areas in which active market participants have been clashing, and to ascertain groupings of companies in various market segments. This research was conducted through various online news databases. The primary database searched was Lexis Advance from LexisNexis with filters applied to find legal articles related to North America published within the past year. Similar searches were

⁵ Market research firms have yet to establish a clear definition of the smartphone market. See, e.g., Nielsen, *State of the Media: The Mobile Media Report Q3 2011* 9 (2011), available at <http://www.nielsen.com/us/en/insights/reports-downloads/2011/state-of-the-media--mobile-media-report-q3-2011.html>; Some firms define smartphones in terms of operating systems. See, e.g., comSCORE, *2012 Mobile Future in Focus* 3 (2012), available at http://www.comscore.com/Press_Events/Presentations_Whitepapers/2012/2012_Mobile_Future_in_Focus (defining smartphones as “mobile phones that use the Google Android, Apple iOS, RIM Blackberry, Microsoft, and other similar platforms”).

⁶ While the distinction may in some instances seem a bit arbitrary, choosing a definition is necessary to proceed with any empirical data collection. The definition of the market for the purposes of this study is, thus, not necessarily consistent with the definition of the market for antitrust purposes or any other purposes.

executed on various technology websites and legal blogs, such as ArsTechnica,⁷ Wired,⁸ and PatentlyO.⁹ The search terms used were:

- (1) “patent, lawsuits, smartphone,”
- (2) “patent smartphone,”
- (3) “smartphone wars.”

These searches returned duplicative results, suggesting that the searches were fairly comprehensive.

The results provided numerous articles and studies that helped in the identification of different market segments. Some results uncovered substantial patent disputes related to handset manufacturers, as well as software providers, such as operating system vendors. Additionally, the results showed disputes related specifically to aesthetic design, both of software interfaces and handsets. The results also contained articles and studies that provided overviews of the patent and patent litigation landscapes.¹⁰ These overviews showed patent disputes involving the companies and types of technologies listed below in Table 1.¹¹ Repetition among certain types of technologies was useful for flagging that technology as a potential key market segment.

Table 1
Companies and Market Segments

	Company	Market Segment
1	Amazon.com	Consumer electronics
2	Apple	Handset Provider
3	Barnes & Noble	Consumer electronics
4	Ericsson	Communications systems and technology provider, including handsets
5	Foxconn	Electronic component manufacturer
6	Google	Software
7	HTC	Handset provider
8	Huawei	Communications systems and technology provider, including handsets
9	Inventec	Original Device Manufacturer for consumer electronics, including handsets

⁷ <http://arstechnica.com/>

⁸ <http://www.wired.com/>

⁹ <http://www.patentlyo.com/>

¹⁰ See, e.g., Thomson Reuters, Mobile Patent Suits – Graphic of the Day, available at <http://blog.thomsonreuters.com/index.php/mobile-patent-suits-graphic-of-the-day/> (visually mapping patent related suits between mobile device and component manufacturers); Sascha Segan, *Infographic: Smartphone Patent Wars Explained*, PC Magazine (Jan. 19, 2012, 2:46 PM). <http://www.pcmag.com/article2/0,2817,2399098,00.asp> (providing infographics courtesy of Verizon illustrating patent assertions and the largest patent holders in the smartphone area).

¹¹ See Thomson Reuters, Mobile Patent Suits – Graphic of the Day, available at <http://blog.thomsonreuters.com/index.php/mobile-patent-suits-graphic-of-the-day/>.

10	Eastman Kodak	Photographic equipment and components
11	LG Electronics	Consumer electronics, including handsets.
12	Oracle	Computer database development
13	Nokia	Handset provider
14	Motorola	Handset provider
15	Microsoft	Software
16	ZTE	Handset provider
17	Sony	Consumer electronics
18	Samsung	Electronics and information technology
19	RIM	Telecommunications and wireless equipment, including software and handsets
20	Qualcomm	Mobile, computing and connectivity technologies

Another patent study was particularly helpful in identifying key market segments because it listed the following primary technology clusters as critical to the industry:¹²

1	Mobile data access
2	Touch screen technology
3	Mobile data transmission
4	Object oriented operating system
5	Image Processing
6	Positions system
7	Antenna
8	Speech signal compression
9	Method of ciphering data transmission in a radio system
10	Object oriented multi-tasking systems
11	Data structures
12	Quality of speech representation
13	Virtual machine instructions
14	System for transporting information objects
15	Even distribution in operating system
16	Improved system for initializing static arrays

Market Share

¹² See Mike Lloyd et al., *The Smartphone Patent Wars*, Ampercite 12 (March 2011), available at http://www.ampercite.com/downloads/The%20Smartphone%20Patent%20Wars%20whitepaper_March%202011.pdf.

The second search looked for smartphone market share data. Market share analyses would show categorizations of technologies as they exist in the marketplace. This information could demonstrate groupings of companies and contextualize them within market segments. This research was conducted through various news databases, such as Lexis News Search. The principal search terms were: “smartphone,” “2012,” and “market share.” The resulting articles referenced relevant market share research reports in major market segments.¹³ A review of these results revealed that market share analyses almost exclusively relate to two primary consumer market segments: handset providers and operating system vendors.¹⁴

Supply Chains

The third and last search in this series was for data relating to smartphone manufacturer supply chains. Reviewing the supply chains for major devices would illustrate the categories of companies that participate indirectly in the smartphone marketplace. Furthermore, an understanding of the types of products supplied to smartphone manufacturers is necessary to better understand the dynamics of the market. This research was conducted through internet searches. The principal search terms were the keywords: “smartphone” and “supply chain.” Fordham CLIP found substantial data from the market research firm IHS, and their iSuppli website.¹⁵ The results provided information on the supply chains for several popular smartphones.

Although the search only gave supply chain data for several smartphones and did not provide a comprehensive list, the data did highlight components of handsets that were mentioned in the patent dispute literature, but not in the market share research. Finding some of the smaller component segments mentioned in two of the searches confirmed their importance for the market as a whole. The results for these smaller component segments, though, indicated companies that might not be solely focused on supplying the smartphone industry. Nonetheless, these segments are important for an analysis of the smartphone market as a whole.

Based on the combined results of these searches, Fordham CLIP divided the smartphone marketplace into a series of segments for the purposes of data collection. The news searches identified several broad aspects of the market, namely participants involved in hardware such as HTC, Kodak or LG, those involved in software such as Google, Oracle and Microsoft, and those combining the two such as Apple and RIM. The hardware companies highlighted in the market share research tended to be handset providers, but general patent use and litigation news stories also focused on several companies that produce hardware components that were distinct from the handset providers. Specifically, technologies integrated into handsets, such as touch screens, antennas, cameras and batteries, were discussed in the news and were often not attributed to the large handset providers. This division in manufacturing suggested that the

¹³ See, e.g., Nielsen, *State of the Media: The Mobile Media Report Q3 2011 9* (2011), available at <http://www.nielsen.com/us/en/insights/reports-downloads/2011/state-of-the-media--mobile-media-report-q3-2011.html>; comSCORE press releases, presentations, and whitepapers related to the comSCORE MobiLens service, available at http://www.comscore.com/Products_Services/Product_Index/MobiLens; Nielsenwire blog posts related to Online + Mobile markets, available at http://blog.nielsen.com/nielsenwire/category/online_mobile/.

¹⁴ See, e.g., Nielsen, *State of the Media: The Mobile Media Report Q3 2011 9* (2011), available at <http://www.nielsen.com/us/en/insights/reports-downloads/2011/state-of-the-media--mobile-media-report-q3-2011.html>.

¹⁵ See <http://www.isuppli.com/Pages/Home.aspx>.

hardware segment should be divided into handset providers and hardware component suppliers.

News focused on the software segment concentrated on operating systems and aspects such as image processing and smartphone applications, often with the same companies mentioned in reference to each other, indicating that software companies could more easily be grouped together for data collection purposes. Finally, market share data and lawsuit news stories additionally reflected important distinctions in the consumer oriented aspects of handsets and operating systems including distinctions in aesthetic design such as those found in the products of Apple and Samsung.

As a result, the study adopted the following four segments to frame the data collection:

1. Handset providers: Companies that provide smartphone devices to consumers.
2. Software developers: Companies that develop operating systems, communication protocols, and other applications governing the behaviors of smartphones. Software developers provide software packages to handset providers in the form of operating systems and applications as well as to consumers in the form of applications. Operating system vendors represent a subset of the software developer market segment.
3. Hardware suppliers: Companies that provide hardware integrated into the handsets, including computer chips, batteries, antennas, and many other significant components. Hardware suppliers primarily sell integrated hardware, such as chipsets, to handset providers, but also provide parts and accessories, such as extended life batteries and cases, directly to consumers.

Designers: Companies that focus on aesthetic design as a selling point for their products. Designers represent a subset of the handset providers and software developers, and generate hardware designs and designs for visual displays for smartphone handsets.

III. IDENTIFYING KEY MARKET PARTICIPANTS

To focus on corporate practices, the study identified key market participants. The companies were identified based on market research reports and patent holdings. This identification consisted of four steps: (a) general news and market share searches to generate a list of companies that seemed significantly active in the smartphone market; (b) a review of the patent holdings of those companies in order to determine the common classifications for patents within the industry; (c) patent searches in those patent classifications in order to identify the most significant patent holders; and (d) the combination of the companies identified in the patent searches with several other companies identified in market research to generate a final list of the key market participants. Each step of this process is outlined in greater detail below.

A. General News and Market Share Research

The research to develop the initial list of companies followed the approach used to define the market in Part II. The first search looked for news related to patent usage and disputes in the smartphone marketplace. Companies mentioned frequently in the news media would more

likely be significant market players than companies rarely or never mentioned. This research was conducted in a news database¹⁶ as well as in IP and technology blogs and websites.¹⁷ The results showed several companies were consistently in the news over the past year for patent use in the smartphone industry, including Apple, Google, HTC, LG, Microsoft, Motorola, Samsung, Nokia, and Sony. The results also included references to several patent oriented market studies that were then examined. These studies provided comprehensive lists of patent holders in the portable electronic device industry.¹⁸

A second search looked specifically for market share data. Market share analyses would show the most significant companies in terms of consumer sales. The results included several broad based market share analyses¹⁹ and articles archived on technology news sites and blogs reporting on data where the primary sources were no longer available. This research provided a preliminary list of the most substantial players in the smartphone industry over the past four years, and provided a general view of market movement within the industry during that time.²⁰

In addition to the patent use, patent dispute and market share research, a third general news search gathered information relating to smartphone manufacturer supply chains. This research sought to identify the supply chains for major devices as a way of identifying the leading component supply categories and companies.²¹ The identification of companies within the smartphone supply chain enables an examination of the hardware segment of the marketplace. By identifying companies within market supply chains, their patent portfolios can be reviewed to identify relevant patent classifications for the hardware segment of the market. The results of these keyword searches identified supply chain data for several popular smartphones.²² The component suppliers for several popular smartphones were based on three different operating systems, the Apple iPhone 4S, based on iOS, the Nokia Lumia 900, based on Windows 7, and the Samsung Galaxy SIII, based on Android. Several previously unidentified companies appeared in the supply chain research, including Toshiba, Qualcomm, Intel, and Broadcom, and

¹⁶ Lexis Advance, from LexisNexis, <http://www.lexis.com>, to find news articles related to “patent lawsuits smartphone,” “patent smartphone,” and “smartphone wars.” In doing so, we used Nexis filters to narrow the search to legal news from the past year in North America.

¹⁷ See, e.g., ArsTechnica, <http://www.arstechnica.com>; Wired, <http://www.wired.com>; PatentlyO, <http://www.patentlyo.com>.

¹⁸ See, e.g., Chetan Sharma Consulting, *Mobile Patents Landscape: An In-Depth Quantitative Analysis*, at 17, available at http://www.chetanisharma.com/Mobile_Patents_Landscape_Chetan_Sharma_Consulting.pdf.

¹⁹ See, e.g., Nielsen, *State of the Media: The Mobile Media Report Q3 2011*, at 9 (2011), available at <http://www.nielsen.com/us/en/insights/reports-downloads/2011/state-of-the-media--mobile-media-report-q3-2011.html>; comSCORE press releases, presentations, and whitepapers related to the comSCORE MobiLens service, available at http://www.comscore.com/Products_Services/Product_Index/MobiLens; Nielsenwire blog posts related to Online + Mobile markets, available at http://blog.nielsen.com/nielsenwire/category/online_mobile/.

²⁰ One company that held substantial market share, but that did not appear regularly in the initial news searches, was Research In Motion (RIM).

²¹ See, e.g., Andrew Rassweiler, *Nokia 900 Carries Bill of Materials of \$209*, iSuppli (Apr. 11, 2012), [http://www.isuppli.com/Teardowns/News/Pages/Nokia-900-Carries-Bill-of-Materials-of-\\$209.aspx](http://www.isuppli.com/Teardowns/News/Pages/Nokia-900-Carries-Bill-of-Materials-of-$209.aspx) (identifying Samsung, Qualcomm, Micron Technology, and others as component providers for the Nokia Lumia 900 smartphone). See also *Samsung Galaxy S III Teardown*, ifixit, <http://www.ifixit.com/Teardown/Samsung-Galaxy-S-III-Teardown/9391/1> (identifying Samsung, Broadcom, Intel, and others as component providers for the Samsung Galaxy S smartphone); Andrew Rassweiler, *iPhone 4S Carries BOM of \$188*, IHS iSuppli *Teardown Analysis Reveals*, iSuppli (Oct. 20, 2011), [http://www.isuppli.com/Teardowns/News/Pages/iPhone-4S-Carries-BOM-of-\\$188.-IHS-iSuppli-Teardown-Analysis-Reveals.aspx](http://www.isuppli.com/Teardowns/News/Pages/iPhone-4S-Carries-BOM-of-$188.-IHS-iSuppli-Teardown-Analysis-Reveals.aspx) (identifying Qualcomm, Avago, Hynix, Samsung and others as component providers for the Apple iPhone 4S).

²² In particular, Fordham CLIP found substantial data available from market research firm IHS, and its iSuppli website, <http://www.isuppli.com/>.

these companies were added to our initial sample list. Although the research related only to several smartphones and did not provide a comprehensive list, these supply chains were sufficient to identify several key companies that appear in the supply chains for the major market participants.

B. Patent Classifications

The aggregation of the results of the general news and market share research created a significant list of companies in the different market segments in the smartphone market (handsets, hardware, software, and design). Research into the patent holdings of the companies on the list then sought to identify the USPTO classifications that were repeatedly used for the majority of the patents relevant to the smartphone market and those patents relevant to each of the four segments of the marketplace. Relevant patent classifications were determined by a review of the results of a sample of patents held by those companies in conjunction with a review of the USPTO’s published class definitions for the identified classes in those patents.²³ This research showed that the most relevant classification was class 455, telecommunications, and that a total of fourteen classes were relevant. Table 2 below provides the classifications:

Table 2
Relevant Patent Classes

Class	Description
320	Electricity: Battery or Capacitor Charging or Discharging
341	Coded Data Generation or Conversion
349	Liquid Crystal Cells, Elements and Systems
361	Electricity: Electrical Systems and Devices
370	Multiplex Communications
375	Pulse or Digital Communications
379	Telephonic Communications
398	Optical Communications
455	Telecommunications
704	Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression
706	Data Processing: Artificial Intelligence
707	Data Processing: Database and File Management or Data Structures
715	Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing
719	Interprogram Communication or Interprocess Communication (IPC) (Electrical Computers and Digital Processing Systems)

²³ CLIP reviewed U.S. patent classifications available at the USPTO classification database: <http://www.uspto.gov/web/patents/classification/>.

C. Patent Holding Research

With the relevant patent classifications determined, the number of patents held by a company in each of the classes provides an indication of the prominence of the company in the smartphone technology market. A search looked to find the twenty companies holding the rights to the largest number of patents in each class.²⁴ This research was conducted using USPTO research reports and the results offered a set of companies with the most significant patent holdings in the different market segments. Because the patent classifications may encompass patents that are also tangential to the smartphone industry, the results may capture companies that are not typically considered as part of the smartphone market.

D. List of Key Market Participants

For inclusion as a key market participant on the basis of patent holdings, the final list incorporated any company:

1. **appearing as one of the top twenty assignees in three or more of the relevant classes which would reflect leadership in a focused area of the marketplace,**²⁵
2. **appearing as one of the top twenty assignees in the set of patents aggregating all fourteen relevant classes which would reflect overall leadership in the marketplace,**²⁶ or
3. **appearing as one of the top twenty assignees in class 455, the single classification determined to be most relevant.**²⁷

In addition, the final list includes companies that appeared frequently in the initial news searches, but did not appear in the patent data set. These companies were included in order to understand the difference between major market participants with substantial patent portfolios and those without significant holdings. This additional group consisted of HTC, Huawei, and Philips.

Thus, the final list of key market participants consisted of a set of 37 companies.²⁸ The companies are shown in Table 3.

²⁴ See Appendix II.

²⁵ See Appendix III.

²⁶ See Appendix IV.

²⁷ See Appendix II.

²⁸ As a result of the inevitable breadth of the patent classifications used to identify these companies, some may not consider themselves key participants in the smartphone market and may not, in fact, be key participants. They are captured here because the patent classifications may encompass patents tangentially or not relevant to the smartphone industry.

**Table 3
Key Market Participants**

1	ALCATEL / LUCENT	19	MICROSOFT
2	APPLE	20	MOTOROLA
3	AT&T	21	NEC
4	BROADCOM	22	NOKIA
5	CANON	23	NORTEL
	CISCO	24	NTT DOCOMO
	ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE	25	ORACLE
7	ERICSSON	26	PANASONIC
8	FUJITSU	27	PHILIPS
9	GOOGLE	28	QUALCOMM
10	HEWLETT-PACKARD	29	RESEARCH IN MOTION
11	HITACHI	30	SAMSUNG
12	HTC	31	SAP
13	HUAWEI	32	SIEMENS
14	INTEL	33	SONY
15	INTERDIGITAL TECHNOLOGY	34	SPRINT
16	IBM	35	TEXAS INSTRUMENTS
17	LG	36	TOSHIBA
		37	YAHOO

IV. DYNAMICS OF THE MARKETPLACE

This Part describes the dynamics of the smartphone marketplace as seen through the activities of the 37 identified key market participants. This Part first describes the empirical data that was collected to provide insight into patent usage by the 37 companies. The Part then analyzes trends and patterns in the corporate use of smartphone patents.

A. Construction of the Data Sets

The data used to identify trends and patterns consisted of (1) market share data; (2) information on patent use practices from a survey of the 37 companies; (3) US patent bibliographic data on all patents granted in the identified classifications during the time period reviewed; (4) publicly available patent licenses and agreements of the 37 companies; (5) litigation involving the smartphone patents of the 37 companies.

1. Market Share Data

Market share data consisted of the current market shares of the 37 identified leading smartphone industry companies, data related to the expansion and contraction of those market shares, and observations of companies entering and exiting the marketplace over the last 5 years. The data on market share by market segment was compiled from the research used to

determine market leaders in Parts II and III. In addition, Nielsen,²⁹ Comscore,³⁰ IDC,³¹ and Gartner³² studies provided basic data on market share gains and losses by participants in both the handset marketplace and the operating system marketplace within the software segment. These market studies and press reports also provided data on new market participants and further information on market movement to correlate with patent holdings. The available market share data in these reports goes back five years.

2. Survey

Fordham CLIP developed and distributed a survey to the 37 target companies (see Appendix I). The questionnaire sought information related to corporate patent practices in connection with generation, holdings, management, acquisitions, sales, licensing, and litigation. The questionnaire specifically targeted data related to the four primary market segments identified in the preliminary research.

Unfortunately, almost all of the 37 companies declined to participate or did not respond to the survey. Stated reasons included corporate policies against participation in surveys, particularly those connected with intellectual property, and sensitivity to ongoing litigation in the smartphone industry. As a result, there is no survey data included in the empirical data sets.

However, in response to the survey, representatives from several companies agreed to interviews or discussions. These informal responses provided information on several trends related to corporate practices.

3. US Patent Grant Bibliographic Database:

The patent bibliographic data consisted of the following information for all patents granted since 2006 in each of the 14 identified classifications:

- (1). **Abstract** – summarizing of the contents of the patent.
- (2). **Patent Type** – determining whether the patent is a utility or design patent.
- (3). **Patent Number** – identifying the relevant patent.
- (4). **US Classification** – identifying the primary classification used for the relevant patent.
- (5) **Title** – identifying the contents of the patent.
- (6) **Number of Claims** – identifying how many claims were included in the issued patent.
- (7). **Assignee** – identifying the current patent holder for the issued patent.

²⁹ See, e.g., Nielsen, *State of the Media: The Mobile Media Report Q3 2011*, at 9 (2011), available at <http://www.nielsen.com/us/en/insights/reports-downloads/2011/state-of-the-media--mobile-media-report-q3-2011.html>; Nielsenwire blog posts related to Online + Mobile markets, available at http://blog.nielsen.com/nielsenwire/category/online_mobile/.

³⁰ comSCORE press releases, presentations, and whitepapers related to the comSCORE MobiLens service, available at http://www.comscore.com/Products_Services/Product_Index/MobiLens.

³¹ IDC press releases related to their Worldwide Quarterly Mobile Phone Tracker reveal data from individual reports. http://www.idc.com/tracker/showproductinfo.jsp?prod_id=37.

³² Gartner press releases, available at http://www.gartner.com/it/section.jsp?type=press_releases&format=xhtml&year=2012&show_archived=true.

The data was extracted in XML format from the USPTO patent grant bibliographic database hosted by Google.³³ Data for utility patents and data for design patents were extracted into separate databases.

The classifications in the utility patent data were then grouped into three categories: hardware, software, and communications. These three categories are slightly different from the original four market segments that were used to identify the key companies. The purpose of the initial market segment classifications was to ensure the scope and breadth of the companies identified. The goal for the revised groupings was to identify the focus of the patent filings. The regrouping was necessary because the communications patent grouping contains elements of both software and hardware related directly to the field of communications and handset providers were found to have held patents in several categories. For the identified companies, the balance of their patent portfolios will tend to indicate the focus of their research.

The groupings of the classifications within these categories are as follows:

Hardware Patents: These patent classifications represent underlying hardware technology, including major components that are integrated into handsets. These patents are primarily owned by handset manufacturers and component providers. However, because some smartphone related hardware is also used by other types of devices, the key leading companies owned a smaller percentage of hardware patents as compared to other patent classes. Hardware patents, for the purposes of this study, are patents primarily classified under the following classes shown in Table 4:

Table 4

Class	Description
349	Liquid Crystal Cells, Elements and Systems
361	Electricity: Electrical Systems and Devices
320	Electricity: Battery or Capacitor Charging or Discharging

Software Patents: These patent classifications represent general software technology and data processing that are applied to smartphones. The technology includes individual applications, operating systems, and assorted data processing technologies such as database management and logic. Software patents, for the purposes of this study, are patents primarily classified under the following classes shown in Table 5.

Table 5

Class	Description
341	Coded Data Generation or Conversion
704	Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression
706	Data Processing: Artificial Intelligence
707	Data Processing: Database and File Management or

³³ *USPTO Bulk Downloads: Patent Grant Bibliographic Data*, available at <http://www.google.com/googlebooks/uspto-patents-grants-biblio.html>. CLIP reviewed the data by converting the XML into an Excel Spreadsheet containing the fields required for the analysis.

	Data Structures
715	Data Processing: Presentation Processing of Document, Operator Interface Processing, and Screen Saver Display Processing

Communications Patents: These patent classifications represent technologies related specifically to the communications aspects of smartphones. The patents include both hardware and software developed. For purposes of this study, communications patents, are patents primarily classified under the six classes shown in Table 6.

Table 6

Class	Description
370	Multiplex Communications
375	Pulse or Digital Communications
379	Telephonic Communications
398	Optical Communications
455	Telecommunications
719	Interprogram Communication or Interprocess Communication (IPC) (Electrical Computers and Digital Processing Systems)

These patent classes capture a range of “communications” patents that go beyond the commonly used restrictive terminology referring only to transmission protocols such as 3G or 4G.

4. Publicly Available Licenses and Assignments

Patent licensing and assignment data consisted of illustrative information from publicly available sources as no comprehensive compilation was possible. The examples were obtained from a review of SEC filings made by the 37 leading companies as available on EDGAR, press releases issued by those companies and press reports. The data on significant patent licenses and assignments is more thorough for the companies in the group that were listed on American stock exchanges due to the nature of US securities law disclosure requirements.

Companies varied dramatically in the practice of publicizing their licensing agreements. Certain companies actively pursue licensors. Some of those companies, such as Qualcomm³⁴ and AT&T³⁵ are very open about their licensing practices. Many companies, however, do not publicize their licensing agreements. Many of the agreements reported were the product of

³⁴ Qualcomm often posts press releases announcing new licensing agreements on their website. See, e.g., *Qualcomm and Digibras Group Sign 3G/4G License Agreement*, Qualcomm (May 10, 2012), <http://www.qualcomm.com/media/releases/2012/05/10/qualcomm-and-digibras-group-sign-3g4g-license-agreement>; *Qualcomm and CK Telecom Sign WCDMA Subscriber Unit and Modem Card/Module License Agreement*, Qualcomm (May 20, 2010), <http://www.qualcomm.com/media/releases/2010/05/20/qualcomm-and-ck-telecom-sign-wcdma-subscriber-unit-and-modem-cardmodule-li>; *Qualcomm and GlobalWireless Sign 3G Femtocell License Agreement*, Qualcomm (Sept. 10, 2009), <http://www.qualcomm.com/media/releases/2009/09/10/qualcomm-and-globalwireless-sign-3g-femtocell-license-agreement>.

³⁵ AT&T maintains licensing programs for technology groups at fixed per unit fees for their standards based patents. See *Patent Licensing*, AT&T, <http://www.att.com/gen/sites/ipsales?pid=19116>.

litigation settlements, and many licensing agreements were due to cross licensing arrangements.

Additionally, many companies are involved in patent pools, and companies often join together to form coalitions for the generation and acquisition of patents. These were not readily identifiable from available public information.

5. Litigation

The litigation data set consisted of the patent bibliographic data for each patent (within the 14 classifications) that was the subject of an infringement law suit by or against any of the 37 companies over the past seven years.³⁶ The patents were identified from a search of all legal complaints involving the 37 companies as found in the United States Federal Public Access to Court Electronic Records (“PACER”) system.³⁷ This data enables analysis of the patent assertions for trends and patterns including the identification of characteristics associated with both the asserted patents and the asserting parties.

B. Trends and Patterns in the Market

Correlations of market share, patent grants, licensing and litigation are critical to an understanding of the strategies and directions taken by the market leading companies and to the competitiveness of the smartphone market. Various trends and patterns emerge from empirical analysis of the data sets.³⁸ In particular, the data shows four significant trends: (1) an increase in patent grants and a stable concentration of grants over time; (2) a close relationship between patent holdings and market share; (3) specificity of business practices of acquisition and sales, pooling and licensing; (4) a typology of patent litigation.

1. Increases in Patent Grants and Concentration of Grants

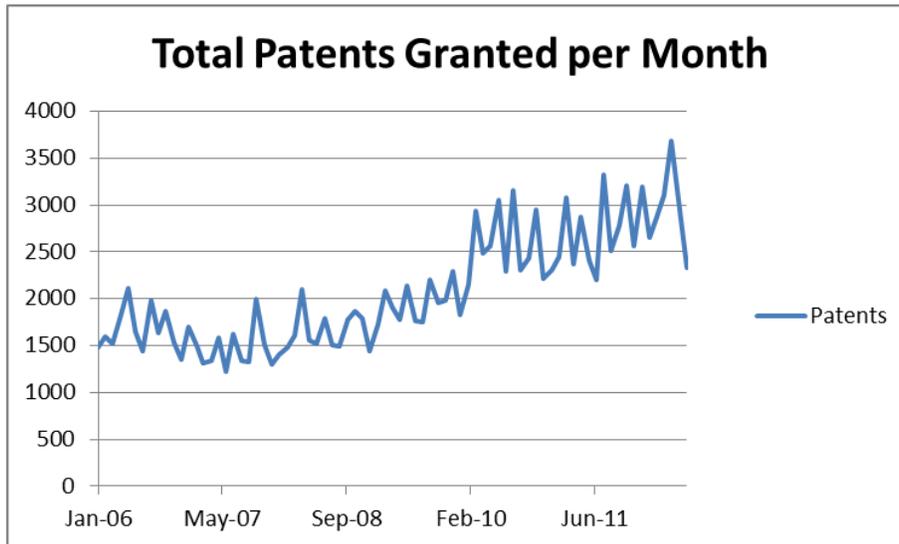
Patent grants have been steadily increasing in the smartphone market over the past seven years. Figure 1, below, illustrates that the number of patents granted in the 14 relevant classifications has gradually increased from approximately 1,500 grants per month in 2006 to almost 3,000 grants per month in 2012.

³⁶ By including data from patents that were asserted against companies in the market leader group, the data set includes information on additional companies outside the group of 37 market leaders.

³⁷ See <http://www.pacer.gov/>. CLIP accessed the PACER data through Bloomberg Law.

³⁸ Depending on the earliest available data, the analysis will cover 5 to 7 years as noted.

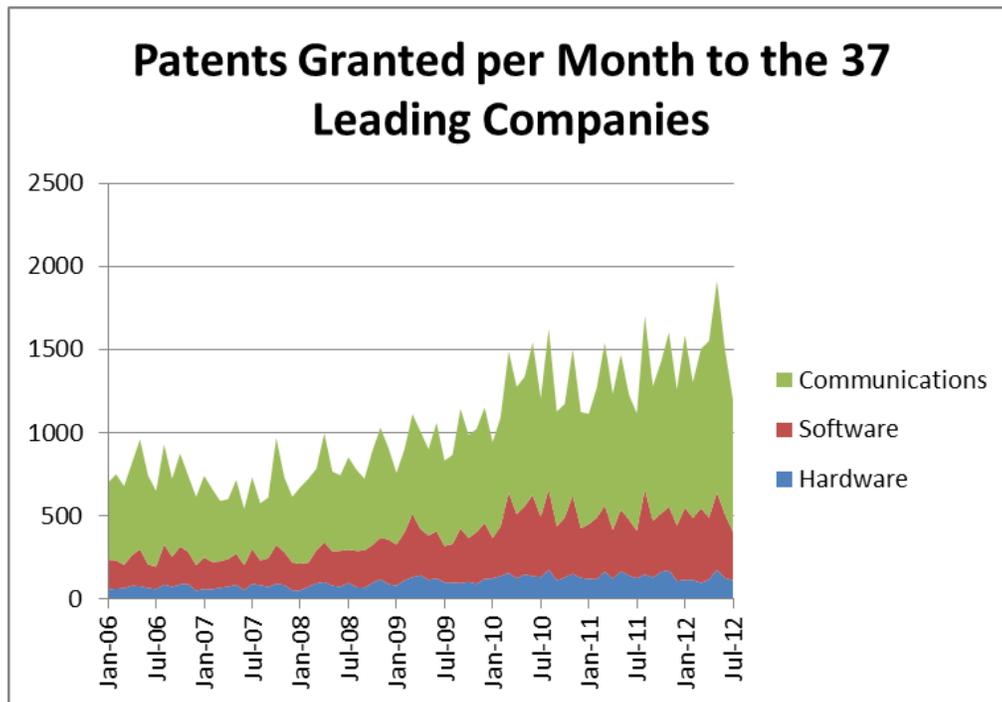
Figure 1
Total Patents Granted per Month



The target group received approximately 50% of the total patents granted in the selected classifications during the seven year period and the patent growth among these companies reflects the steady increase seen in the market as a whole. Figure 2, shown below, indicates that the number of patents granted to the 37 target companies doubled from approximately 750 patent grants per month in 2006 to 1,500 patent grants per month in 2012. This tracked the overall growth rate in smartphone patent grants. In other words, the 37 market leaders continued to hold a concentration of the relevant patents. Figure 2 also shows that these companies experienced the most significant growth in the area of communications patents, followed by some growth in the number of software patents and just a slight overall increase in the number of hardware patents.³⁹ This variation among the different patent categories may demonstrate a greater interest by the market leaders in communications technologies and a reduced focus on general hardware.

³⁹ Samsung may be the outlier of this general observation as the company saw a significant increase in both hardware and communications patents, but minimal growth in the area of software patents. The company will be discussed in greater detail later in the analysis.

Figure 2
 Patents Granted per Month to the 37 Leading Companies



There was a similar increase in the area of design patents, but the growth in that category was only experienced by a small subset of the companies.⁴⁰ The target companies collectively held approximately 8% of all relevant design patents issued over the past seven years, but the bulk of these patents were issued to only a few companies. As Figure 3, below, illustrates, there is a small cluster of companies with significant holdings in the design area, and the remainder have very few holdings.⁴¹ Among the companies with large design patent portfolios, those with the most substantial holdings have varied businesses and may hold design patents that are relevant for a number of related technologies. For example, Samsung, Microsoft, Sony and LG are the largest holders of design patents⁴² and each company also holds large and varied technology portfolios. Companies with large design patent portfolios also tend to be companies that operate in highly visible market segments like operating system development and handset design.⁴³ The significance of this finding is that these companies may be highly sensitive to the protection of their aesthetic designs because they seek to use the designs to differentiate themselves to the public. Other companies with sizeable holdings seemed to focus their design patents on one specific phone feature. For example, RIM has a number of design patents focused on “keypads” and “keyboards.”⁴⁴ The differing views on the scope and enforceability of

⁴⁰ For example, Apple showed an increase from receiving approximately 3 design patents monthly at the beginning of the period to receiving approximately 15 per month towards the end of the period. Similarly, HTC and Huawei both received no design patents until late 2008, before building modest portfolios. Huawei currently receives one grant monthly and HTC receives approximately three grants monthly.

⁴¹ The largest design patent holders and their holdings are Apple (5%), LG (11%), Microsoft (13%), Nokia (7%), RIM (4%), Samsung (27%) and Sony (10%). All other companies hold 1% or less of the total patents issued.

⁴² *Id.*

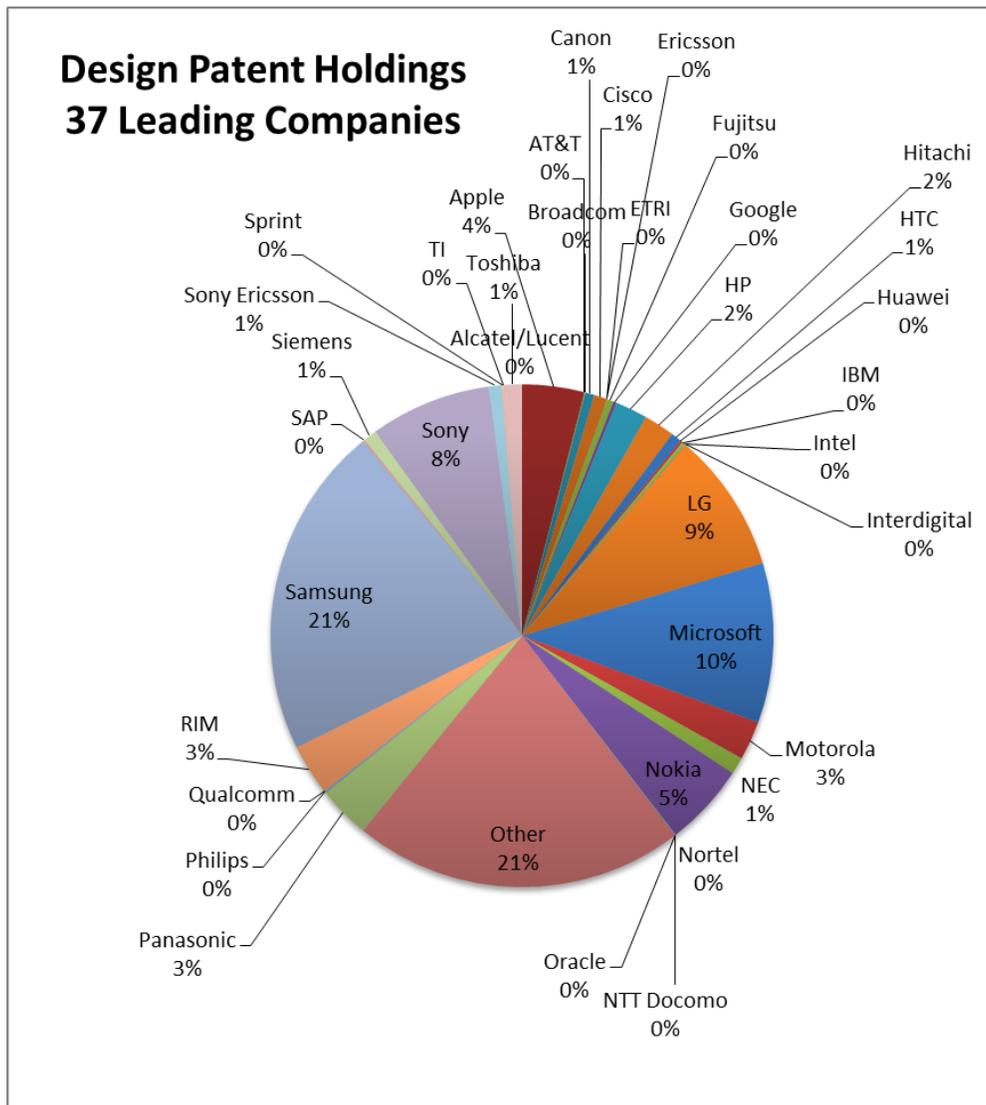
⁴³ The nine largest design patent holders in our dataset were, in order, Samsung, Microsoft, LG, Sony, Nokia, Apple, Panasonic, Research in Motion, and Motorola. All provide either operating systems or handsets.

⁴⁴ The data set included 105 patents granted to RIM with the term “key” in the title.

design patents could be one factor influencing why many companies in our sample decided not to significantly invest in this area.⁴⁵

Figure 3

Design Patent Holdings
37 Leading Companies

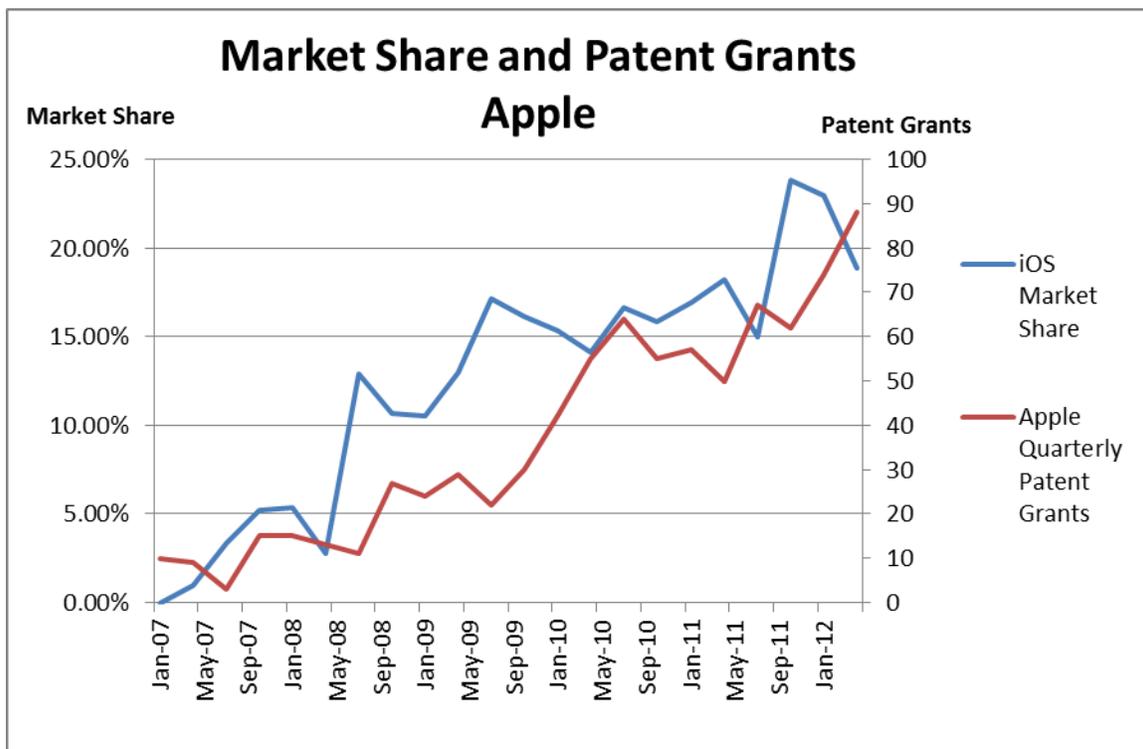


⁴⁵ See, e.g., *Google VP: Rush to Patents Was Our 'Wake Up Call'*, Bloomberg TV (Sept. 12, 2012), available at <http://www.bloomberg.com/video/google-vp-rush-to-patents-was-our-wake-up-call-GiDRIXmCTS~ytZ9A5~Tekw.html> (In an interview, Google Vice President for corporate development David Lawee says that Google was slow to pursue patent protection because they didn't have "a sufficient number of patents" because they "didn't really believe that rounded corners were patentable.").

2. Close Relationship between Patent Holdings and Market Share

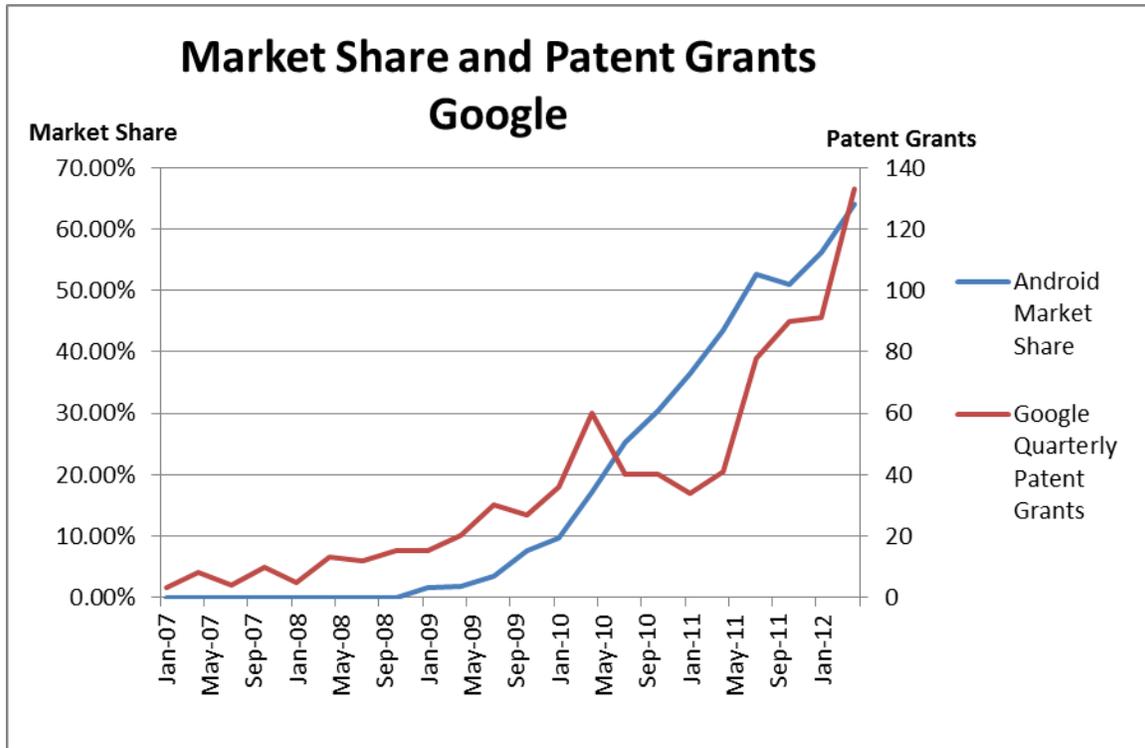
The data demonstrates a correlation between increases in a company's patent grants and a shift in market share. Typically, when a company experienced an increase in its market share, the company's patent grant level increased approximately 1-3 years after its market position began to escalate. This indicates that both innovation and market share precede patent awards. Figure 4, shown below, illustrates this trend for Apple. The rise of Apple's iOS began in 2007 and Apple's patent grants increased dramatically beginning in 2009.

Figure 4
Market Share and Patent Grants
Apple



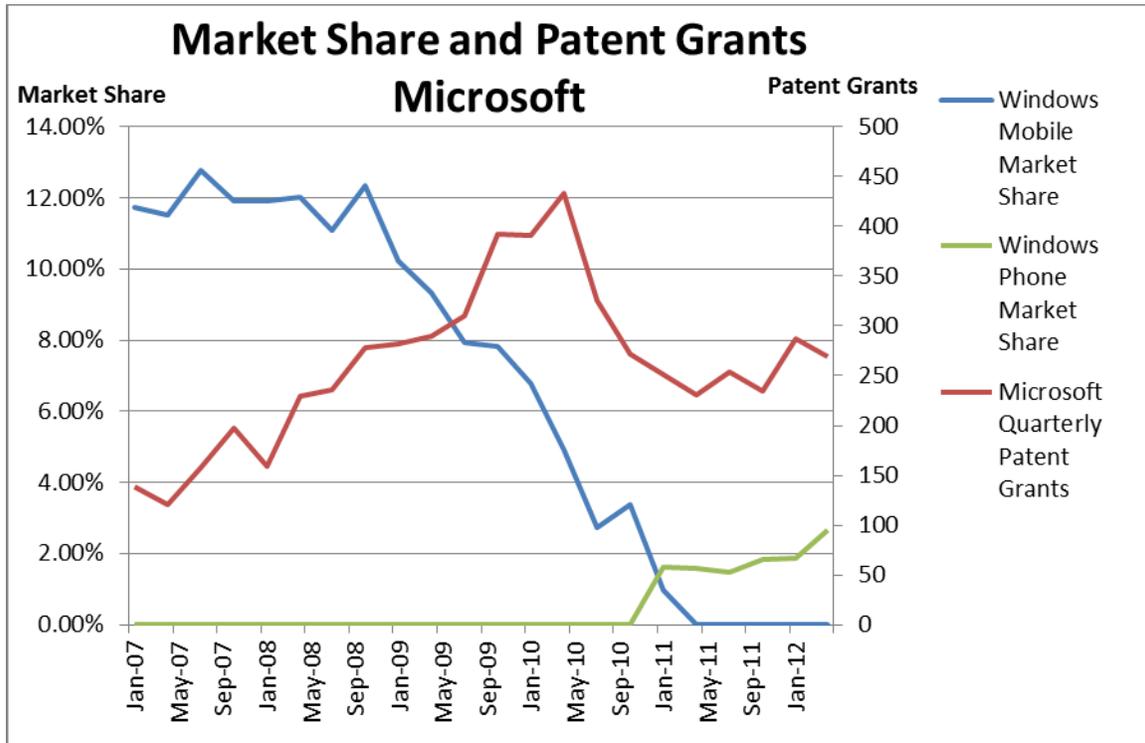
Similarly, Figure 5 shows that Android saw an increase in market share beginning in 2009 and Google patent holdings began to rise dramatically in 2011.

Figure 5
Market Share and Patent Grants
Google



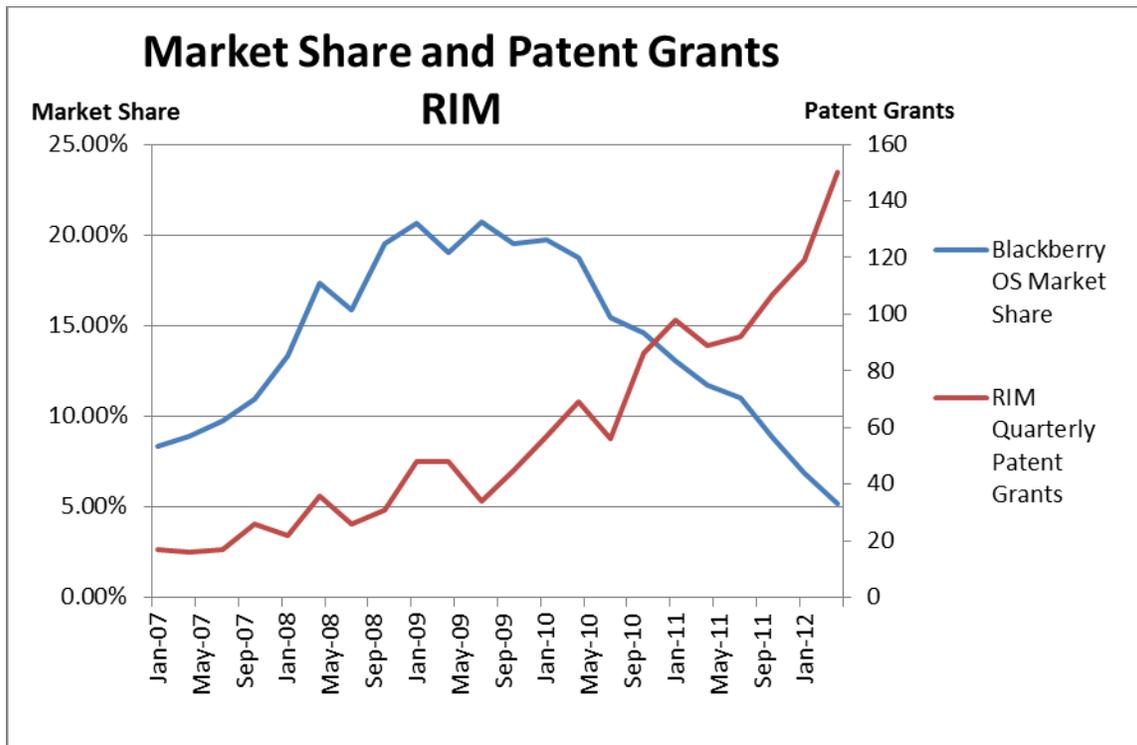
In some cases, however, the lag time meant that the patent grant rate would increase after a firm had already lost market share. Figure 6 shows, for example, that Windows Mobile had substantial market share in 2007 and 2008, but by the time Microsoft experienced a patent grant increase in 2010, the Windows Mobile market share was already on the decline. However, as Microsoft launched the Windows Phone, its patent grant rate began to rise again.

Figure 6
Market Share and Patent Grants
Microsoft



Similarly, Figure 7 reports that RIM shows a doubling of its market share from 2007 to 2009 and a doubling of its patent grants two years later from 2009-2011. Yet, RIM continued to have an increase in patent grants despite dramatic losses in market share beginning in early 2010.

Figure 7
Market Share and Patent Grants
RIM



Overall, the timing lag between increases in market share and increases in patent grants may be related to the average pendency period of almost three years for patent applications at the USPTO. The shorter 1-2 year lag observed in the smartphone patent data may be associated with the use of accelerated prosecution processes and active prosecution by the patent holder.

This close relationship appears within the software and handset segments of the market, but not within the hardware segment.

a) Patent Holdings and Software Market Share

The data indicates an important correlation between increases in software market share and increases in patent holdings. In the operating system market segment, increases in patent holdings appear critical to building market share. Many of the newer entrants to the smartphone market, like Apple and Google, had relatively small software patent holdings compared to firms that had been in the market for longer, yet these new entrant companies substantially grew their software patent portfolios during the time period that their market shares began to escalate.⁴⁶

⁴⁶ RIM is the exception to this particular trend because it appears to have built its early market share on communications patents based on its proprietary network rather than on software patents. It is possible that as data networks become ubiquitous, software patents indicate a focus on user friendly software and efficient processing and RIM's loss of market share may have been tied, in part, to its decision not to invest in software development.

Once these operating system firms established a significant software patent portfolio, they then typically increased their communications patent portfolios. The data indicates that this occurred both through filings and purchases. Indeed, many of the largest patent portfolio acquisitions during the past seven years, were deals comprised largely of communications patents.⁴⁷ The eventual shift from software to communications may be due, in part, to a new focus on vertical integration.

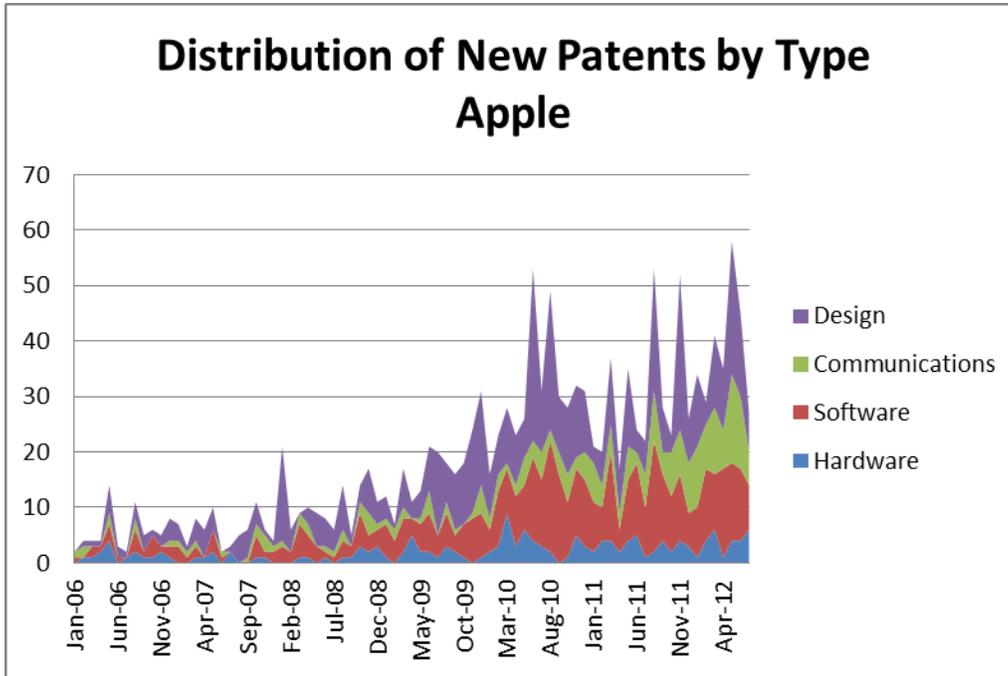
Apple provides a first example of a company that obtained substantial software patent grants as its operating system market share was beginning to grow. Figure 8 below shows how Apple dramatically increased its relevant utility patent grants from a negligible number in 2006 to approximately 25-30 grants monthly in 2012.⁴⁸ Although the gains were relatively modest, they represented significant increases within all three utility categories, as well as an increase of design patent grants. In addition, Apple recently led a consortium of companies including RIM and Microsoft to acquire Nortel's patent portfolio.⁴⁹ Nearly all Nortel patents were in the communications category, supplementing an area that Apple had only recently begun to grow.

⁴⁷ For example, Google's purchase of Motorola Mobility and Microsoft's partnership with Nokia will both be discussed in greater detail below.

⁴⁸ In addition to utility patent grants during that time period, Apple has increased their design patent grants following a similar trend. Design patents are included in the plot of Figure 8.

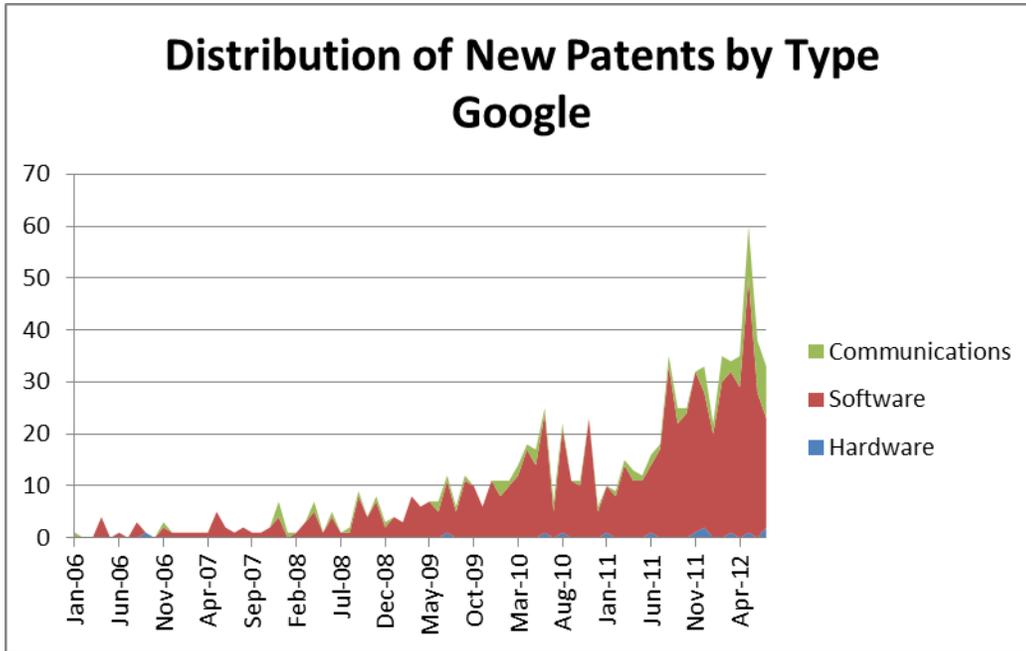
⁴⁹ See, e.g., Alastair Sharp and Sinead Carew, *Apple/RIM group top Google in \$4.5 billion Nortel sale*, Reuters (July 1, 2011, 6:23 PM), available at <http://www.reuters.com/article/2011/07/01/us-nortel-idUSTRE7600PF20110701>.

Figure 8
 Distribution of New Patents by Type
 Apple



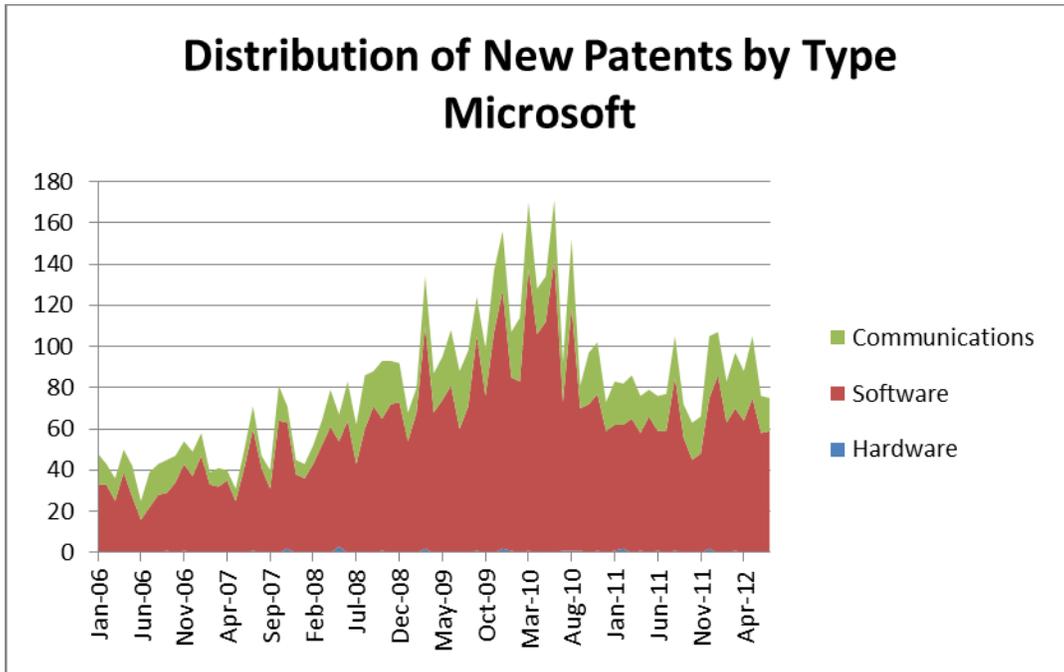
Google represents another example of an operating system firm that saw substantial patent growth as its market share increased and followed the pattern of increasing its communications portfolio after increasing its software holdings. Figure 9 below illustrates that Google increased its relevant patent grants dramatically over the past four years, from a negligible number to 30-40 patent grants monthly. Although Google increased its holdings at a significantly faster rate than Apple, Google's patents were more focused on software, rather than the broader set of categories represented by the Apple grants. As Google's internally generated patents focused on software innovation, the company's recent acquisition of Motorola Mobility provided a substantial portfolio of communications patents.

Figure 9
 Distribution of New Patents by Type
 Google



Microsoft is a third example of this trend and it provides a useful illustration because the company owns two of the operating systems that appeared in the market share research: (1) the Windows Mobile operating system associated with Microsoft's first generation smartphones and (2) the operating system used in the new Windows Phone. Figure 10 below shows that Microsoft experienced an increase in software and communications patents around 2009-2010 followed by a slight decline and then another small increase in grants around 2011-2012. The figure demonstrates that, like Apple and Google, Microsoft established a strong software portfolio and then enhanced its communications patent portfolio.

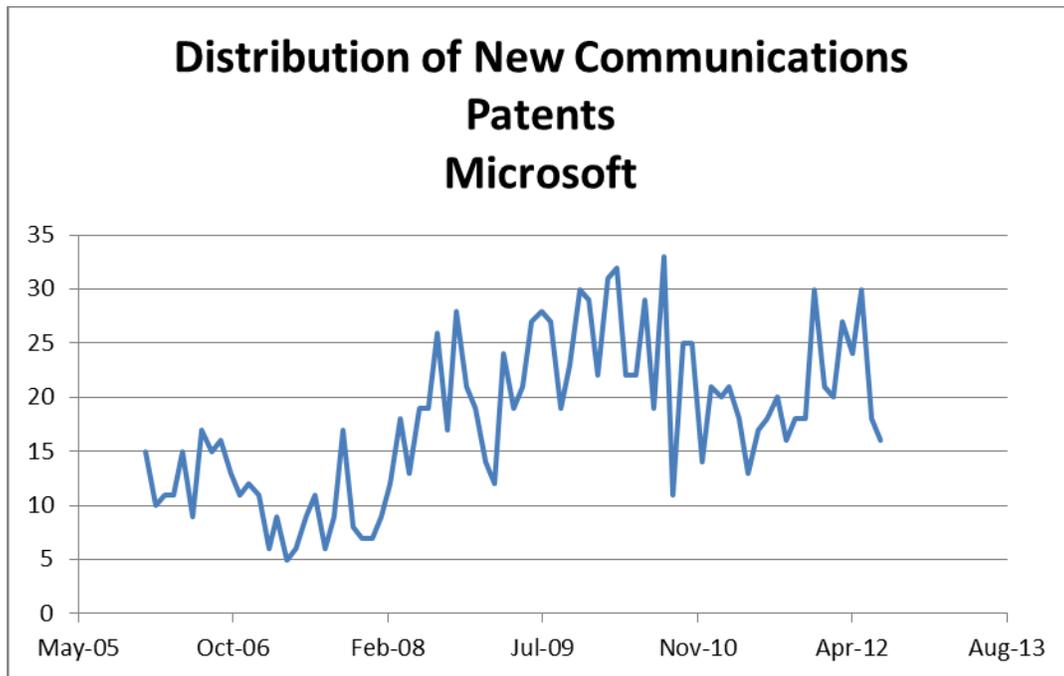
Figure 10
 Distribution of New Patents by Type
 Microsoft



Because Microsoft is engaged in several technology markets, the higher volume of patent grants as compared to the other companies is not surprising. Since some of the patents identified may be connected to Microsoft’s notebook computer and tablet products, Figure 11 below isolates Microsoft’s communications patent grants in order to focus more specifically on the patent growth that is most relevant for its smartphone products. Figure 11 demonstrates an increase in patent grants until the middle of 2009 from approximately 10 patent grants annually to approximately 30. This growth may correspond to Microsoft’s pursuit of patents related to the Windows Mobile operating system which had a market peak in 2007.⁵⁰ The initial increase was followed by a lull and a new increase beginning in 2011. This second period of growth may correspond to the first set of patent grants related to the new Windows Phone, which launched in 2010.

⁵⁰ See, e.g., Zach Epstein, *Apple and Google Dominate Smartphone Space While Other Vendors Scramble*, BGR (Dec. 13, 2011 9:05 AM), available at <http://www.bgr.com/2011/12/13/apple-and-google-dominate-smartphone-space-while-other-vendors-scramble/> (indicating U.S. market share annually from 2006 – 2011 for smartphone operating systems).

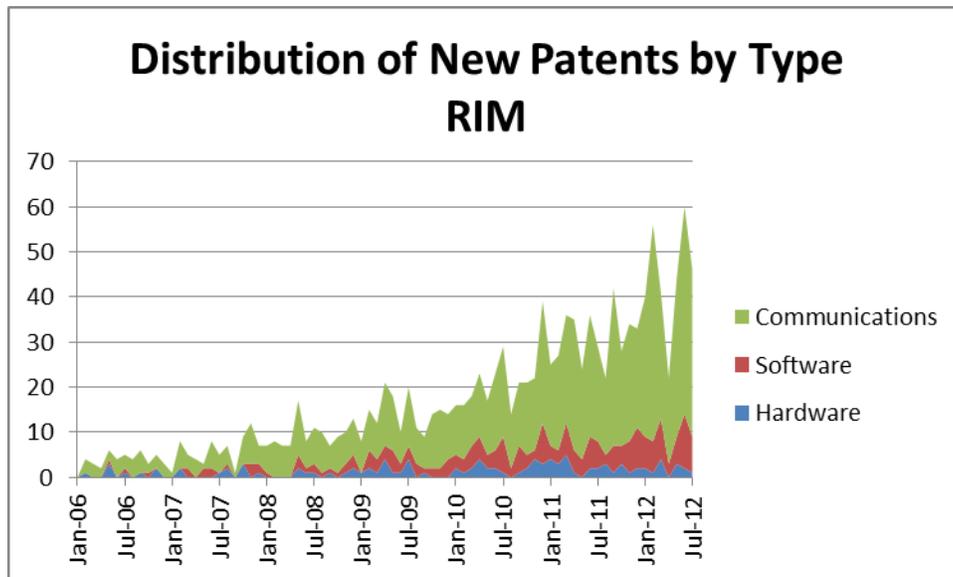
Figure 11
Distribution of New Communications Patents
Microsoft



Finally, RIM offers a contrasting example within this trend because it has seen a decline in its once prominent market share and its patent growth model looks slightly different from the other three market competitors. As Figure 12 below illustrates, RIM had an increase in patent grants over the past 7 years even though its market share has declined over the last 4 years. The significant difference between RIM and the other three companies is that, while Google, Apple, and Microsoft migrated towards communications patents after maintaining a steady baseline of software patent grants, RIM heavily emphasised communications patents throughout the observed time period and experienced very little growth in its software patent portfolio. This distinction may indicate that RIM saw its platform primarily as a communications platform rather than as a software system. As networks became more reliable in general and the market focus shifted to improved operating systems, RIM continued to push its improved communications network rather than shift focus to software interfaces. That business strategy may have contributed to RIM's market share loss as data networks became ubiquitous and RIM's investments were not geared toward software development for user friendly interfaces and for processing efficiency.

RIM's strength in the communications patents area also may suggest that RIM would do well to purchase an operating system or could be a good acquisition target for a software company.

Figure 12
Distribution of New Patents by Type
RIM



b) Patent Holdings and Handset Market Share

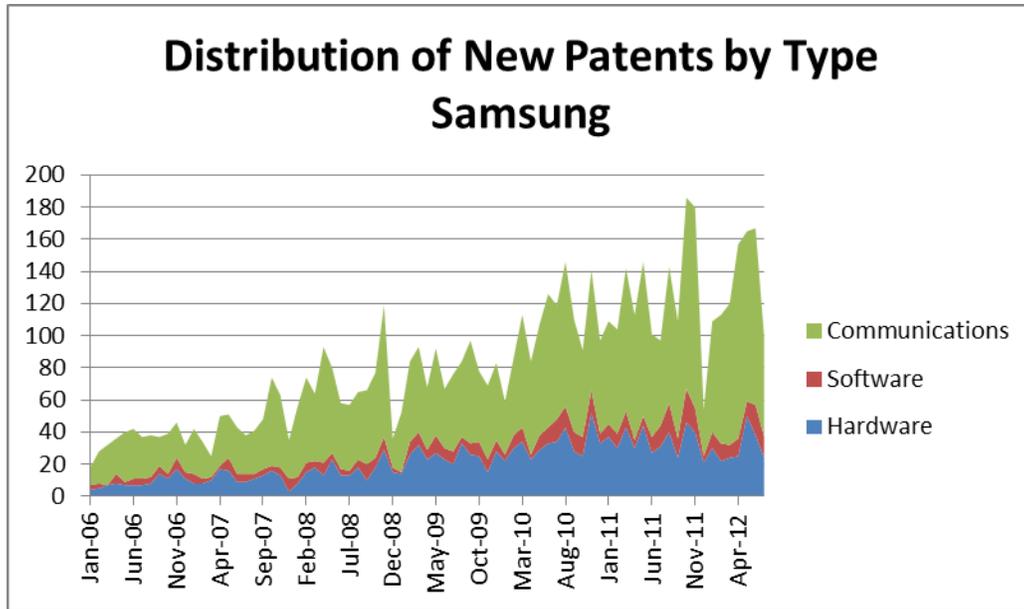
The data shows that in the handset market segment the leading companies also experienced patent grant growth in parallel to market share. As a general trend, the companies engaged in handset development tended to have patent portfolios comprised mainly of hardware and communications patents. Among many of these companies, the focus also shifted from hardware patents to communications patents. Although communications patents do include patents for hardware related specifically to communications, this increasing focus on communications patents may indicate that handset providers are focused less on generic hardware components, such as improved batteries or displays, and more on technologies related to the communications aspect of the smartphones. In addition, among the handset providers, the data suggests that design patents may correlate more with handset manufacturing than operating systems.

Samsung, for example, showed the most dramatic increase in market share over the past four years and it also experienced a dramatic increase patent grants. Figure 13 below reports the data that shows Samsung has had continuous growth in its hardware patent portfolio, but much more substantial growth in the area of communications patents.⁵¹ The increase in the communications patent area is consistent with the market trend for handset providers and Samsung’s continued growth in hardware patents reflects its secondary role as a component supplier for other smartphone manufacturers.⁵² Interestingly, Samsung also holds the greatest percentage of design patents out of all the companies in the sample.

⁵¹ Samsung handsets primarily use Google’s Android software so Samsung’s minimal amount of software patents is expected.

⁵² Samsung provides its display technology and microprocessor technology to other handset providers.

Figure 13
 Distribution of New Patents by Type
 Samsung



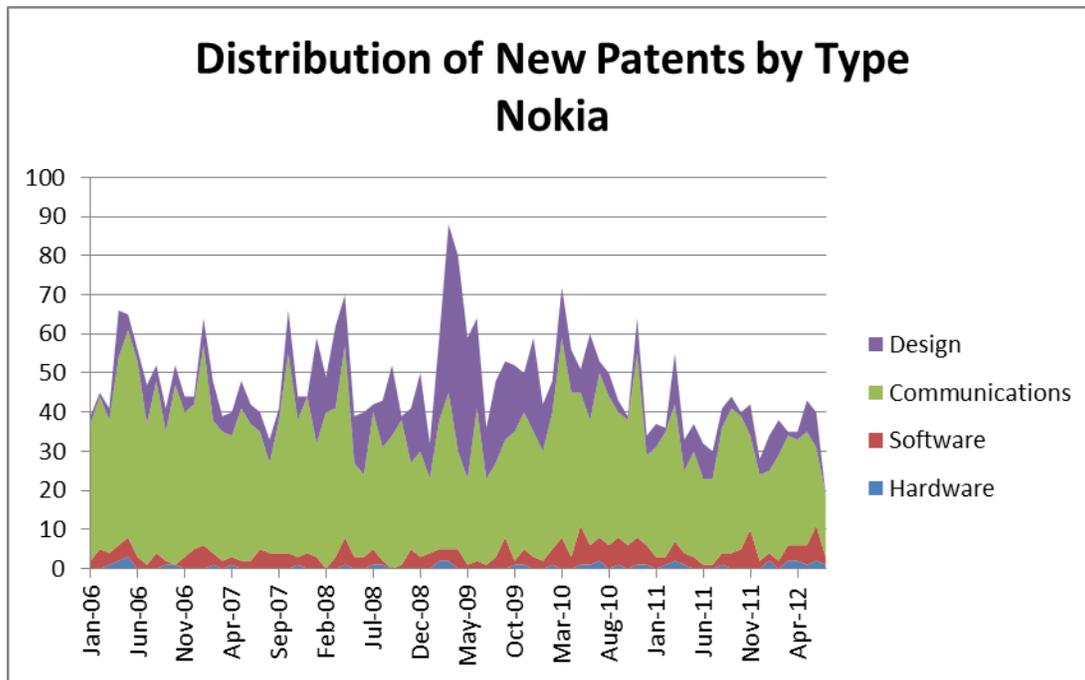
Apple has also experienced an increase in market share in the handset market segment and has shown some gain in hardware patents and significant increases in communications and design patents. Although it is difficult to distinguish exactly which patents may correlate to Apple's operating system versus those that correlate to its handsets, it is notable that Apple's growth in the hardware and design areas mirrors Samsung's development over the past several years more so than it mirrors the growth of Apple's competitors in the operating system market.⁵³

In contrast, both Nokia and RIM have experienced a decline in their market position in the handset market segment in recent years. Figure 14 below illustrates that Nokia's market decline tracked a decrease in patent grants over the past four years. In addition, while Nokia did have significant holdings in the communications and design patent classifications, those areas of Nokia's patent portfolio have experienced the largest dips recently.⁵⁴

⁵³ RIM, which acts both as an operating system provider and handset provider, perhaps has the most similarities to Apple among the other OS developers.

⁵⁴ After the spike in 2009, Nokia's design patent grants began to decrease as reflected in Figure 14.

Figure 14
Distribution of New Patents by Type
Nokia



RIM, on the other hand, has maintained patent growth in the communications and design area despite its market share loss and many of the recent design patents specifically refer to “keyboard,” “keypad,” “hand-held,” “handheld,” or “handsets.” This growth may indicate that the company has decided to focus on its handset development rather than its operating system as a way to regain a competitive market position. It may also indicate that the company is considering a patent portfolio sale or a shift to a competitor’s operating system in the future.

This trend of looking toward increases in communications and design patents can also be seen in some companies that are new entrants to the handset market and in some foreign handset manufacturers that may be looking to make a more pronounced expansion into the U.S. market. For example, both Sony and Huawei have announced plans to enter the handset market and both companies have simultaneously begun to expand their communications and design patent holdings.⁵⁵ Figure 15 below shows Huawei’s recent patent growth and Figure 16 shows the patents granted to Sony either as an independent company or as a part of the Sony Ericsson joint venture. With respect to design patents, Sony is currently the fourth largest design patent holder in the set and Huawei has been increasing its design patents in the past three years, with no grants prior to November of 2008.

⁵⁵ See, e.g., *New Xperia smartphone series with Sony’s best HD experiences deliver next step in connected entertainment*, Sony Press Release: Mobile (Aug. 29, 2012), available at <http://www.sonymobile.com/cws/corporate/press/pressreleases/pressreleasedetails/somcifapressreleasefinal-20120829>; Peter Burrows, *The New Smartphone Powerhouse: Huawei*, Bloomberg Businessweek (July 19, 2012), available at <http://www.businessweek.com/articles/2012-07-19/the-new-smartphone-powerhouse-huawei>.

Figure 15
Distribution of New Patents by Type
Huawei

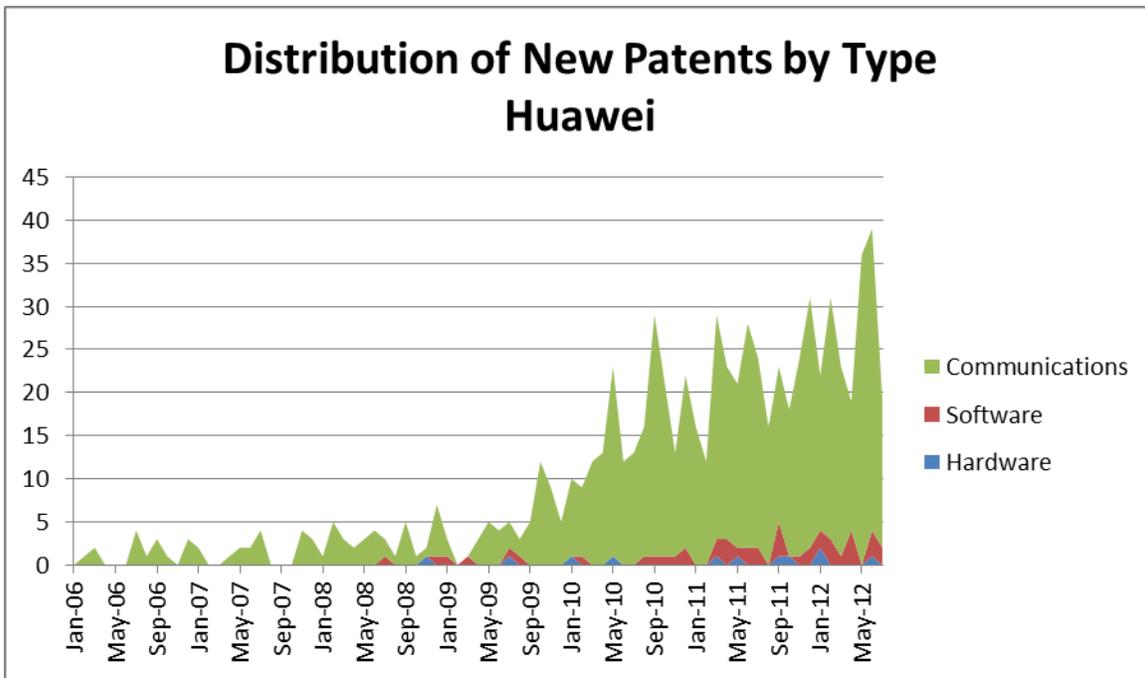
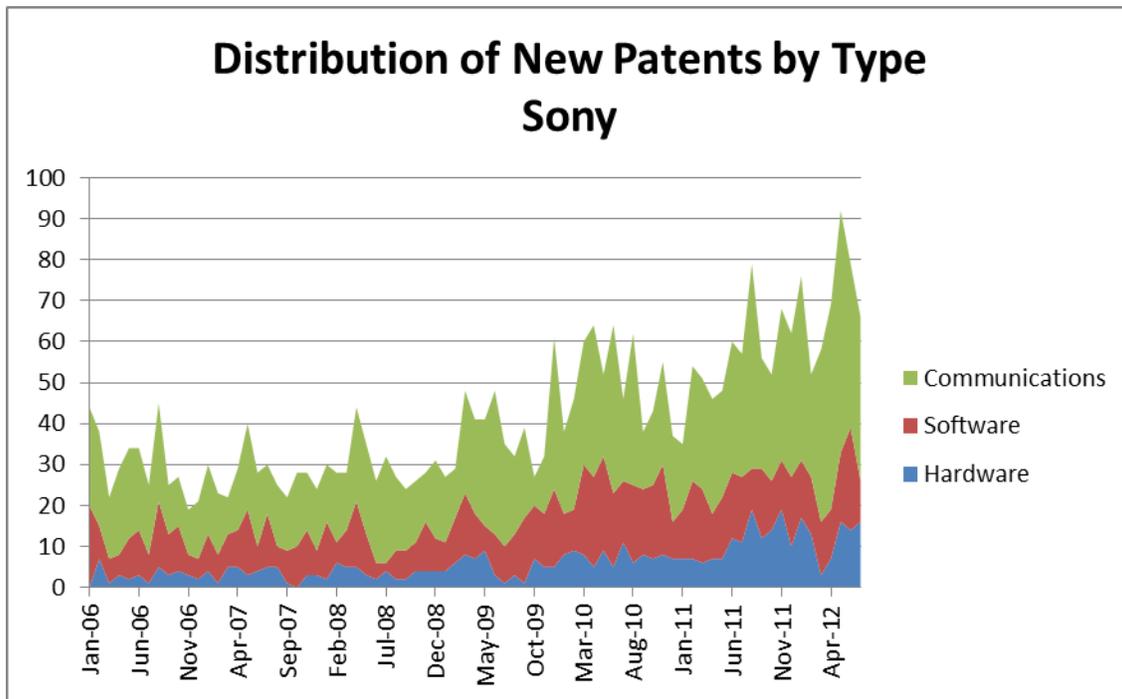


Figure 16
 Distribution of New Patents by Type
 Sony



Similarly, foreign handset manufacturers Panasonic, LG, and Fujitsu, have recently launched new products overseas and have begun to increase their US communications patent holdings.⁵⁶ This new focus may be part of a business strategy to expand into the US market.

c) Patent Holdings and Hardware

The data did not reveal clear trends in patent practices among the companies that manufacture component hardware for smartphones or among the companies that provide handset software other than operating systems, such as database companies and application providers. These companies made up the bulk of the sample and each company’s patent growth and market dominance tended to be unique or neutral. As a result, examination of the hardware segment did not yield observations of general segment trends.

⁵⁶ Fujitsu, LG, and Panasonic have all dramatically increased their communications grants while continuing to receive hardware grants like other handset manufacturers. Fujitsu, for example, showed a steady increase in grants, from 25 monthly at the beginning of the period to 60 monthly towards the end. Panasonic received very few relevant grants prior to early 2009, and then jumped almost immediately to 20 monthly, and increased to 50 monthly. LG showed a very similar trend to Samsung in shifting a focus from hardware patent grants to communications grants and LG’s communications grants have sharply increased.

3. Business Practices: Acquisition and Sales, Pooling, Licensing

The informal responses to the survey of companies suggested a number of trends associated with business practices. Companies in the smartphone industry appear to consider their patent portfolios as central to maintaining a competitive advantage in a dynamic marketplace. With respect to acquisition and sale of patents, companies appear to view specific purchases as strategic and they are often effected for the purpose of accessing a new market or filling perceived gaps in patent holdings related to a new or existing market. Organizations seem to actively consider the quantity of patents held, and are unlikely to sell patents unless the sale is part of the divestiture of a business area. In building patent portfolios, companies consider both the quantity of patents held and the quality of those holdings. For companies holding patents in multiple entities, the company actually holding any particular patent often has specific obligations related to the patented technology. With respect to pooling, companies are beginning to form smartphone patent pools, but the mechanics of these emerging patent pools are non-transparent at the moment.

Lastly, with respect to licensing, many organizations engage in cross-licensing relationships and may engage in cross-licensing portfolio-wide. As a result of cross-licensing, public information on expenditures and profit from licensing may not fully reflect the value of the rights that are exchanged. Similarly, licensing may result from the adoption by a standards body of patented technologies. If patented technology is adopted as a standard, the patent holder must license the standards-essential technology according to standards bodies' rules and FRAND.

4. Typology of Patent Litigation

The data showed that communications patents were the most frequently litigated patents among the smartphone classes. This is not surprising in light of the major interest in generating and acquiring communications patents for both the operating system and handset market segments. Figure 17 below shows the distribution of litigation by type of patent. The first column provides a baseline and shows the distribution of patents granted to the companies in the study among the three classes: hardware, software and communications.⁵⁷ This column illustrates that communications patents make up the majority of the patents issued to the market leaders. The second column shows the distribution of litigated patents in the hardware, software and handset classes that involved any of the 37 market leaders.⁵⁸ This column reflects the type of patents involved in litigation and not the number of lawsuits filed. The column illustrates that communications patents are also more frequently involved in lawsuits compared to hardware and software patents. The third column, labeled "Assertions," reflects each instance in which one party alleged that another party infringed a single, particular patent.⁵⁹ This third column recognizes that lawsuits often involve multiple patents and that claims of infringement are

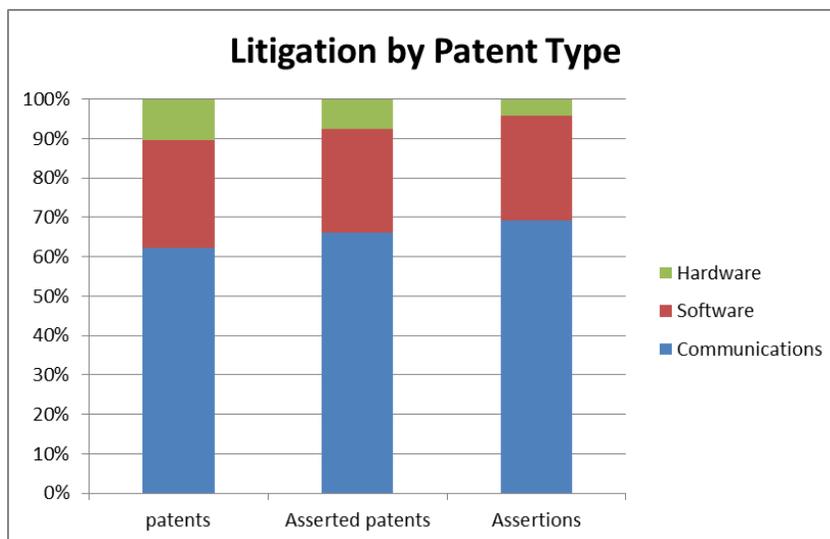
⁵⁷ This distribution was calculated from all the utility patents granted to the 37 market leading companies (approximately 80,000).

⁵⁸ This distribution was calculated as follows: any litigated patent involving any of the 37 market leading companies (whether plaintiff or defendant) was identified; those identified patents were filtered against the database of all of the approximately 160,000 patents granted by the USPTO within the fourteen classes to any company; these results represented all litigated patents in the smartphone classifications relevant to the market leaders. Because the set of design patents were not clearly distinguished for smartphones and were such a small subset of litigated patents, they are not reflected in the distribution.

⁵⁹ This distribution was calculated by taking the list of smartphone patents used to form the distribution in the "asserted patents" column and multiplying each of those patent by the number of times the patent was asserted in each lawsuit. The resulting distributions are shown as "assertions."

frequently brought against numerous defendants. By reflecting the number of times a particular patent was asserted in litigation, this column demonstrates that communications patents were similarly more likely to be involved in a number of different lawsuits as compared to patents in the other categories. For example, while the majority of the patents in the dataset were asserted fewer than five times, several communications patents were asserted ten or more times.⁶⁰ The frequency of litigation with multiple parties involving communications patents may indicate that communications patents are particularly valuable compared to the other types of patents in the smartphone marketplace.⁶¹

Figure 17



The large number of lawsuits involving communications patents may also help to explain why the data showed both handset providers and operating system providers were investing heavily in their communications patent portfolios. In the context of heightened litigation surrounding communications patents, a larger portfolio of communications patents would allow the acquiring companies to react defensively when patents are asserted against them. For example, the acquisitions of the Nortel and Motorola Mobility portfolios appear to reflect a litigation-based business strategy.

In general, the litigation data also showed that the majority of the 37 leading companies tend to act defensively, with lawsuits being filed against them almost three times as often as they file suits against others.⁶² In other words, the leading companies are more often defendants than plaintiffs.⁶³ One reason appears to be that patent lawsuits are often filed against a host of companies so that for every one plaintiff there are multiple defendants.⁶⁴ In parallel to this

⁶⁰ As an example, U.S. Patents No. 7570614 and 7027418 were each asserted 20 times by Bandspeed. Similarly, several patents were each asserted by Apple against at least ten companies.

⁶¹ Out of 18 patents asserted ten or more times, 16 were in communications classifications, while the remaining two were in software.

⁶² As an example, the three operating system vendors other than Apple filed only 15 utility patent infringement lawsuits in the dataset. Over the same time period, 118 patent suits were filed against them. Apple's involvement in litigation is an outlier of this trend and will be discussed in greater detail below.

⁶³ This analysis does not consider counterclaims separately. A counterclaiming defendant is treated as defending claims and not counted as simultaneously asserting claims.

⁶⁴ For example, the lawsuits filed by Apple in April 2011 against IBM, Intel, Interdigital, Microsoft, Motorola, Nokia, Samsung, and others each involved the identical set of patents.

trend, more companies outside the group of 37 market leaders asserted patent claims against the market leaders than the market leaders asserted against companies outside the group of 37. The data showed that 137 companies acted as plaintiffs in patent actions against a total of 60 defendants.⁶⁵ The data also showed that only 24 companies outside the group of market leaders were sued by those market leaders for the infringement of a patent held by a market leader. This suggests that the market leaders will act defensively because there are a large number of outside companies suing them.

Those bringing infringement suits appear generally to be either small companies defending a specific innovation,⁶⁶ or assertion companies bringing infringement suits for a large number of patents.⁶⁷ Approximately 63% of the companies asserting patent claims brought two or fewer suits each, and approximately 44% brought only one suit. The majority of these companies (which include individuals, research laboratories, consortiums or large company spin-offs) appear to actively develop technologies. However, approximately two-thirds of these isolated litigants did not appear to produce or sell the patented technology that was at issue in the law suit.

The most frequent plaintiff in the dataset, though, was Apple. Apple has a uniquely aggressive litigation history when compared to the rest of the market leaders and Apple's stance may have effected a more general increase in litigation within the market. First, Apple has filed more lawsuits than other market share leaders.⁶⁸ Second, Apple began asserting its design patents related to its smartphone in 2011 and prior to these lawsuits, design patent suits were very rare in the market. Finally, patent infringement litigation saw a substantial increase after Apple's broad patent litigation was filed in 2011.⁶⁹ Apple's aggressive litigation posture may be spurring litigation throughout the market and may be motivating competitors to acquire additional patents in order help them strengthen their defensive position.

Table 7, below, provides information regarding the companies that have filed at least 10 claims of patent infringement involving any of the 37 market leaders. The table shows the companies that are the most litigious and illustrates different litigation strategies used by differing entities. The first column sets forth the number of "assertions" made by the company, or the number of times the company filed a claim of patent infringement regarding any specific patent against another party.⁷⁰ The second column provides context for those assertions and shows the total number of law suits filed by each company. The third column provides the aggregate number of

⁶⁵ This represents cases involving any patent within one of the fourteen classes brought by or against one of the 37 market leading companies.

⁶⁶ Examples include Netview Technology, Microlog Corporation, Internet Machines, and Airbiquity. These companies sell products and technologies and have asserted small numbers of patents.

⁶⁷ Examples include Helferich Patent Licensing, Smartphone Technologies, Aloft Media, and Intellect Wireless. These companies do not sell products using the patents that they assert and they assert a large number of patents against a large number of companies. Many companies like these actively market themselves as vehicles for monetizing intellectual property.

⁶⁸ For Apple, the ratio across the utility dataset of assertions by versus assertions against is 1.62. The ratio is 1 or less for all other parties except Canon and NEC, who have not asserted any patents.

⁶⁹ Patents within the dataset were asserted between 2007 and early 2012. The patents asserted were granted between 2006 and early 2012. Because of that dataset, there is an expected increase in assertions across the dataset.

⁷⁰ As with Figure 17 above, the term "assertions," as used in this table, refers to a single instance in which one party alleged infringement of a single patent by another party. Therefore, for example, if a company filed a complaint against three defendants alleging patent infringements of a set of six patents, that activity would count as 18 assertions. Likewise, if a company filed a complaint against two defendants alleging patent infringements of a set of 9 patents, that activity would also count as 18 assertions.

patents at issue in all the law suits filed by the company. Finally, the fourth column categorizes the company by type based on the publicly available information about the entity.

Table 7
Patent Assertions by Company

Company	# of Assertions	# of Law Suits	# of Patents Asserted	Type of company
Apple	144	22	26	Technology company
Helferich Patent Licensing	43	7	12	Assertion entity
Bandspeed	40	20	2	Technology company
Softview	30	14	2	Technology company
SmartPhone Technologies	25	12	5	Assertion entity
GPNE	24	8	3	Telecom research and licensing company
Adaptix, Inc	23	11	4	Former technology company. Divested equipment business in 2008, and now focuses on licensing
Cisco	22	5	14	Technology company
Aloft Media	20	14	9	Assertion entity, owned by zilka - Kotab, which also owns Stragent, and Azure, two additional assertion entities
Intellect Wireless	18	9	2	Assertion entity
Lochner	17	17	1	Individual
Washington Research Foundation	17	5	8	Assertion entity. Foundation for assisting research institutions in asserting their technologies.

Motorola	16	3	13	Technology company
SPH America	16	16	1	Assertion entity. Asserting ETRI patents.
WIAV Solutions	16	8	8	Assertion entity.
Americans for Fair Patent Use	15	3	5	Limited liability partnership of attorneys
Affinity Labs of Texas, LLC	14	5	8	Inventor/Association of attorneys
Microsoft	14	3	14	Technology Company
Cyberfone Systems	13	13	1	Assertion entity. May have sold technology in the past.
Atwater Partners	12	3	4	Unknown (patents acquired from Symmetricon)
H-W Technology	12	12	1	Unknown
X2Y Attenuators, LLC	12	3	4	Assertion entity. Development and licensing of technology
Broadcom	11	2	11	Technology company
ClassCo Inc.	11	11	1	Company developed and licenses a single innovation
Nokia	11	6	7	Technology company
Semiconductor Energy Laboratory	11	10	3	Development and licensing of technology
Golden Bridge Technology	10	10	1	Development and licensing of technology

Interdigital	10	3	6	Development and licensing of technology
Mobile Enhancement Solutions	10	5	2	Unknown
Walker Digital	10	7	6	Development and licensing of technology

The table illustrates that only 6 of the 37 market leaders (16%) are among the group of frequent plaintiffs and they comprise only 20% of the most frequent litigants. Apple leads the pack by a substantial margin, but only a few other market leaders appear among this group.

Non-practicing entities, also known as assertion entities, make up a much larger percentage of the list.⁷¹ Companies that appear to be assertion companies represented 30-40% of the most frequent litigants.⁷² The most frequent plaintiff after Apple was Helferich Patent Licensing,⁷³ followed by a mix of large and small technology companies and by companies that appear to be non-practicing-entities. Although the majority of the frequent plaintiffs do not sell their own products, they appear to generate and acquire patents for very different reasons. Of the patent assertion entities, several appear either to be spinoffs from companies that develop products or to be affiliates of companies that have divested their production divisions.⁷⁴ The companies also have varying business models. Some non-practicing entities acquire and assert portfolios directly, while some work directly for clients. Some companies market themselves specifically towards research laboratories and educational institutions.⁷⁵ In addition, some of the assertion companies appear to be subsidiaries of larger assertion companies or share ownership.⁷⁶ As a result, there may be a higher concentration of real parties in interest among the assertion companies than first reflected in Table 7.

Some of the larger assertion companies tend to file actions on patents purchased from a third party.⁷⁷ These may be cases of leading market participants using third parties to assert their

⁷¹ Non-practicing-entities tend to market themselves either as pure licensing companies or as development and licensing companies. Many appear to be shell companies created by patent attorneys to assert a specific set of patents.

⁷² These companies are: Helferich Patent Licensing, SmartPhone Technologies, Aloft Media, Intellect Wireless, Washington Research Foundation, SPH America, WIAV Solutions, Cyberfone Systems, and X2Y Attenuators. In addition, the following companies were included as insufficient information was available to classify them, but they appeared as possible assertion entities: Atwater Partners, H-W Technology and Mobile Enhancement Technology.

⁷³ Helferich advertises as a “patent management and licensing company specializing in the licensing of multimedia delivery technology.” This is not uncommon for entities that primarily commercialize patents.

⁷⁴ Some of these are pooling entities that work with the market leaders such as Mosaid Technologies. See, e.g., Zach Whittaker, Google accuses Microsoft, Nokia of patent ‘trolling,’ ZDNet (June 1, 2012) *available at* <http://www.zdnet.com/blog/btl/google-accuses-microsoft-nokia-of-patent-trolling/78806> (detailing an antitrust suit filed by Google).

⁷⁵ For example, Washington Research Foundation specifically markets itself as asserting patents for research institutions and asserting patents for the University of Washington.

⁷⁶ Several companies are subsidiaries of known large assertion entities, such as Acacia Research Group, LLC, General Patent Corporation, or Intellectual Ventures.

⁷⁷ This is reflected in the data that shows asserted patents were originally assigned to companies uninvolved in the litigation.

patents. For example, some asserting entities appear to form specifically to assert a set of patents.⁷⁸ Some of these are spinoffs of larger technology companies, while some appear to be compilations of related patents or targeted portfolio purchases.⁷⁹

Table 7 also shows that the market leaders tend to use different litigation tactics than the assertion companies or the licensing entities. Many of the assertion and licensing companies appear to identify a number of patents that are being infringed throughout the marketplace and bring multiple suits against all of the offending parties. For example, X2Y brought lawsuits against 3 companies alleging infringement of the same 4 patents for a total of 12 assertions. Similarly, Intellectual Wireless brought lawsuits against 9 entities alleging infringement of 2 patents for a total of 18 assertions. In contrast, the market leaders that appear in the list seem to identify specific unique instances of infringement and bring lawsuits based on those circumstances. For example, Motorola brought lawsuits against 3 entities for the infringement of 13 different patents but only had 16 total assertions. This indicates that the 3 entities were each infringing different sets of Motorola patents.

This difference in litigation practice could suggest a number of things about the marketplace. First, it could be argued that small companies and inventors are not shut out of the market because when they have valuable technology the market leaders need to obtain a license or face litigation. Litigation may be used by smaller actors or innovators as a bargaining chip. Second, it could also demonstrate that the market players do not tend to uniformly infringe patents held by the market leaders. In other words, instances of infringement of a patent held by a market leader tend to be isolated and dealt with in specific unique lawsuits.

The litigation data also showed another trend related to companies in the market areas that are most visible to consumers. Firms involved in more consumer oriented market segments, such as the operating system and handset segments, tend to initiate more litigation than companies that focus on hardware components and non-operating system software.⁸⁰ The component companies typically market their products to other smartphone manufacturers rather than to the general public and therefore may not perceive as much benefit in filing an infringement suit. A company marketing towards consumers may benefit from regular publicity, even if it is in the context of a lawsuit. Additionally, a consumer oriented company may have an additional incentive to maintain distinctions from competitors. Component providers may compete more on quality and price for their goods, while consumer devices are often marketed based on distinctive features.

Overall, the litigation trends do not indicate any strong concentration of lawsuits either from small or large companies or from companies asserting small or large numbers of patents. The results do, nonetheless, indicate that the companies bringing larger numbers of patent suits are typically large technology companies or assertion entities. Conversely, the companies with only one or two assertions tend to be research laboratories or smaller technology companies.

⁷⁸ For example, Hopewell Culture & Design, and Minerva Industries appear to have been formed to assert specific patents.

⁷⁹ For example, Adaptive, Inc., and Merced Technology appear as spin-offs, while Americans for Fair Patent Use and Helferich appear as representatives of a compilation of related patents or as targeted portfolio purchases.

⁸⁰ Hardware providers on the list not involved in another market segment (Broadcom, Canon, Cisco, HP, Intel, Siemens, and TI) asserted only 49 patents from the dataset. 89 patent assertions were filed against them.

V. OPENNESS OF THE MARKET

The relationship of patents to the openness of entry in the smartphone market is difficult to isolate. While patents in the smartphone industry appear to be clustered in the hands of the 37 market leaders, the dynamics of the market nonetheless appear to be very complex.⁸¹ Criteria or metrics need to be established for any assessment of market openness. The observed trends suggest that three critical aspects of the smartphone marketplace can provide some insight into its openness: (A) innovation and patents; (B) market entry and exit; and (C) litigation and enforcement of rights.

A. Innovation and Patents

The historical trends shown in Part IV provide two significant indicia evidencing openness in the smartphone marketplace. First, the market share and patent grant cycle indicates that innovation rather than patents were the important drivers in the marketplace for the leading companies. Second, the shift toward communication and design patents indicates a migration of innovation toward new areas rather than a consolidation of existing positions.

1. Market Share / Patent Grant Cycle

For the leading smartphone companies, the patent grants generally lagged several years behind market share gains.⁸² In other words, companies appeared to gain market share and then received patent grants several years later. This is an important indication that company innovations are what generated increased market share rather than the patents themselves and that companies appear to innovate in order to gain market share. Those gains are then followed by patent grants on the original innovations.

By way of example, the operating system marketplace illustrates this openness to new innovation. As shown in the data, four major companies (Apple, Google, Microsoft, and RIM) have been jockeying for position.⁸³ All four companies held the largest market share of the group at some point during the time period of the study. The shift of leadership in market share seems to illustrate a shift of consumer preferences for the innovation that each particular company was able to offer rather than a set of market freezing patents. For example, RIM's decline in market share occurred despite a significant increase in patent grants.⁸⁴ As RIM lost market share, the company continued to focus on communications patents, but consumers looked for other aspects in smartphones. By contrast, Google, Apple, and Microsoft showed a substantial focus on software innovations that included operating systems and Apple also emphasized design to distinguish its product offering. This is reflected in these companies' patent distributions.

2. Market and Innovation Migration

Important migrations in innovation strategies by the leading companies affected their market positions. Companies that shifted their technological focus were able to capture market share, while companies that innovated in the wrong area waned. Like the market share and patent

⁸¹ See Part IV.B. See also Part IV.B.1 for a discussion of market concentration.

⁸² See Part IV.B.3.

⁸³ See Part IV.B.3, Figures 4 through 7.

⁸⁴ See Part IV.B.3, Figure 7.

cycle, this effect also indicates that an innovation rather than a patent is critical to a company's position in the marketplace.

RIM along with Nokia provide instructive examples. Both companies experienced declines in their position as handset leaders. Nokia also saw declines in its overall patent grant rate with the most significant drops in communications and design patents.⁸⁵ While RIM had increased patent growth in those areas, RIM did not develop extensively other areas of smartphone technology⁸⁶ and its design patents were focused on keyboards.⁸⁷ Apple and Samsung, on the other hand, emphasized more general design patents, had stronger positions in the other smartphone categories, and grew while the others declined.⁸⁸

B. Entry and Exit

Although the 37 market leading companies have a high concentration of patent ownership and market share, a close look at the marketplace over time shows a state of constant flux with companies entering and exiting the market during the historical period. This is an indication that the market is not ossified and that entry is more open than one might expect.

The patent and market share shifts also illustrate that a company's market entry and exit can occur quickly as technological emphasis shifts. For example, Microsoft's Windows Mobile had a strong market share until 2008 when it began a steep decline following successes of Apple's iOS and Google's Android.⁸⁹ Microsoft then exited the marketplace and, with changing technology, recently re-entered with the new Windows Phone operating system. Similarly, market share for Nokia and RIM fell dramatically and Motorola exited the market with the sale of its patents to Google. Over the same period, Samsung saw enormous growth and Sony and Huawei began to enter the US handset market, while Nokia entered into a partnership with Microsoft to advance the new Microsoft operating system.

Market entry further appears to be open to companies that sell related products and technologies or have a history in the telecommunications fields. For example, two of the most recent entrants into the U.S. smartphone handset marketplace, Sony and Huawei, are both entering from related technology fields. Sony has provided a variety of consumer electronics, including laptops, tablets, and substantial telephone experience based on a partnership with Ericsson, while Huawei is a large telecommunications company. Both companies, however, appear to have dramatically increased their U.S. patent grant rate in preparation for their launches.⁹⁰ Sony may also be starting with substantial intellectual property due to its earlier relationship with Ericsson.

The data also shows that the market is accessible through multiple routes to entry. The conventional approach is a substantial investment in research and development of technology by a company to target the market. For example, Apple's and Google's investments in the development of the iOS and Android operating systems aimed specifically at the smartphone field. Nonetheless the data indicated at least two alternate routes. First, companies entered

⁸⁵ See Part IV.B.3 (b).

⁸⁶ See Part IV.B.3, Figure 12

⁸⁷ See Part IV.B.3 (b)

⁸⁸ Compare Part IV.B.3 (b) Figures 8 and 13 with Part IV.B.3(b) Figure 14.

⁸⁹ Compare Part IV.B.3 Figure 6 with Figures 4 and 5.

⁹⁰ See Part IV.B.3(b) Figures 15 and 16.

the market from related fields such as such as Microsoft coming from the operating system marketplace or Samsung coming from the hardware world. And second, companies appear to use strategic purchases of technology instead of home grown development as a way to enter and secure market position. For example, Apple purchased Siri technology to break into voice search and Google acquired Motorola Mobility to secure a portfolio of hardware and communications patents to supplement their already substantial software patent portfolios.

Lastly, the trends show that several companies that innovate and provide products overseas eventually enter the U.S. market. Huawei, again, provides an example.⁹¹ Foreign innovation and market share appears to be a driver for US market entry.

C. Litigation and Enforcement of Rights

The data for smartphone patent litigation involving the 37 market leaders shows that the parties asserting patent infringement and the types of lawsuits have noticeably heterogeneous characteristics. This suggests that there has not been a single model of litigation seeking to restrain competition in the smartphone industry.

Market leaders are infrequent plaintiffs and there are no strong concentrations of lawsuits either from small or large companies or from companies asserting small or large numbers of patents.⁹² While non-practicing entities represent a significant percentage of frequent smartphone patent litigants, they too have very varied characteristics.⁹³ For example, several advertise specifically to universities that seek to commercialize on university research, others appear to stockpile patents and seek licensing fees, others are formed by individuals looking to monetize specific innovations, and others are small spinoffs from practicing companies looking to assert patents. And lastly, among the other frequent litigants, small practicing technology companies seeking to protect their innovations are well represented. Collectively, this heterogeneity suggests that many strategies and practices are behind the patent litigation involving market leaders.

One interesting trend, however, relates to patent purchases by market leaders such as Google's acquisition of Motorola patents. Because the market leaders were infrequently plaintiffs (with the exception of Apple), patent portfolio purchases may be a defensive strategy, allowing companies to countersue any practicing entities that assert patents on specified technologies rather than part of an innovation strategy. Such defensive acquisitions of patents can be asserted against larger or small companies attempting to protect their respective innovations. A large company with several thousand patents may be able to overwhelm small company plaintiffs attempting to assert a small number of patents.⁹⁴ This risk is likely to lessen the ability (or willingness) of smaller companies to defend their intellectual property. Similarly, a potential large company defendant may seek to use a patent portfolio to insulate itself from infringement claims by other large companies through use of the portfolio to counterclaim and increase the cost of litigation for the plaintiff. If these practices become wide-spread, then defensive patent acquisition might represent an impediment to an open market because it would raise the cost of market participation.

⁹¹ Interestingly, Huawei and Sony have increased their US patent holdings in advance of major market advances in the United States. See Part IV.B.3(b) Figures 15 and 16. The market share/patent lag effect may still exist internationally, but would require a comparison of international market share to international patent assets.

⁹² See Part IV.B.5.

⁹³ See Part IV.B.5.

⁹⁴ A small company may be unable to support the expense of litigation involving several patents.

Since patents, however, can only be asserted against entities allegedly infringing the patent, a defensive strategy is not viable against non-practicing-entities. This means that patent owners might, in the future, shift their infringement claims to non-practicing assertion entities. If this occurs, then the acquisition of large patent portfolios for defensive purposes will be less successful.

VI. CONCLUSION

The empirical results of this study are necessarily retrospective and bounded by the choices in defining smartphones and market leaders. The picture that emerges from this study is that the market has experienced dramatic growth in patents while maintaining fluidity in participant entry and exit and fluidity in product popularity.

At the same time, important litigation trends indicate that patents are emerging as part of a potentially significant defensive business strategy for large companies while they remain part of a product development strategy for smaller companies. If history is a guide, the future evolution and openness of the smartphone market will depend most on the pace of technological change and business strategy decisions.

[Annex follows]

Appendix I

Survey sent to 37 companies



Study on the Impact of the Acquisition and use of Patents on the Smartphone Industry

Commissioned by the World Intellectual Property Organization

The World Intellectual Property Organization (WIPO) has commissioned the Center for Law and Information Policy (CLIP) at Fordham University (New York, NY) to research and report on the acquisition and use of patents in the smartphone industry. This new study is a follow-up to one of the recommendations made in the REPORT ON AN ANALYSIS OF THE ECONOMIC/LEGAL LITERATURE ON INTELLECTUAL PROPERTY RIGHTS (IP): A BARRIER TO ENTRY? (CDIP/8/INF/6 CORR.) that was prepared by CLIP for WIPO's Thematic Project on Intellectual Property and Competition Policy of the Development Agenda.

The objective of this new research for a STUDY ON THE IMPACT OF THE ACQUISITION AND USE OF PATENTS ON THE SMARTPHONE INDUSTRY, is to obtain and analyze empirical data that can provide insight on the openness of the smartphone market and to report on the impact of the ownership and enforcement of large patent portfolios on the accessibility of the market.

The following survey is intended to elicit information about organizational practices related to smartphone patents. Your organization's participation is both important to and very valuable for a thorough understanding of the role that patents play in the market. We would greatly appreciate any responses to these survey questions and any additional materials that you think we should consider.

Please return completed surveys by August 8, 2012 to:

**Center on Law and Information Policy
ATTN: Daniel Gross
Fordham University School of Law, Room 05A
140 West 62nd Street
New York, NY 10023
USA
Tel: +1-212-930-8879
Fax: +1-212-930-8833
Email: jreidenberg@law.fordham.edu**

Survey on Patent Practices

Please fill in the following:

Name: _____

Title: _____

Please indicate which of the following smartphone related categories your patent activities reflect (select all that apply):

- High level handset technology
- High level software technology
- Component level hardware
- Ornamental design work
- Other _____

Answers for this questionnaire should be based on information related to the above categories. Please indicate whether your responses may be:

- Identified
- Quoted anonymously
- Used only for background and statistical compilations

Patent Generation / Holdings / Management

1. you indicate the quantity of live smartphone patents:

	0 – 5,000	5,000-10,000	10,000 – 15,000	15,000-20,000	Over 20,000
Owned	<input type="checkbox"/>				
Licensed in	<input type="checkbox"/>				
Licensed out	<input type="checkbox"/>				
Acquired in the last year	<input type="checkbox"/>				
Sold in the last year	<input type="checkbox"/>				

2. Can you indicate the percentage of your organizations live smartphone patents (Please indicate relative to your current smartphone portfolio. It is understood that patents sold are no longer part of your holdings):

	None	0-25%	25-50%	50-75%	75-100%
Developed internally	<input type="checkbox"/>				
Acquired from a third party	<input type="checkbox"/>				
Acquired in the last year	<input type="checkbox"/>				
Sold to a third party	<input type="checkbox"/>				

Sold in the last year	<input type="checkbox"/>				
Licensed out	<input type="checkbox"/>				
Licensed in	<input type="checkbox"/>				

3. Does your organization seek to obtain additional income by commercializing its smartphone patents ?

- Yes
 No

4. Can you indicate whether your organization uses or plans on using any of the strategies below to generate income in the smartphone space?

	Currently does	Plans to	Is considering	Has rejected	Has never considered
Licensing to third parties	<input type="checkbox"/>				
Investing in other companies	<input type="checkbox"/>				
Spinning off of a business unit	<input type="checkbox"/>				
An alliance or partnership other than pooling	<input type="checkbox"/>				
A joint venture other than pooling	<input type="checkbox"/>				
Cross licensing	<input type="checkbox"/>				
Selling patents	<input type="checkbox"/>				
Pooling	<input type="checkbox"/>				
Donating patents for tax relief	<input type="checkbox"/>				

5. In generating smartphone patents , can you indicate the degree to which your organization considers the following?

	1 Very little	2	3	4	5 Very much
Cost efficiency	<input type="checkbox"/>				
Expansive legal protection	<input type="checkbox"/>				
Generating a licensing income stream	<input type="checkbox"/>				
Strategic portfolio building to access a new market	<input type="checkbox"/>				
Strategic portfolio building to protect an existing market	<input type="checkbox"/>				
Minimizing tax liability	<input type="checkbox"/>				

6. In managing smartphone patents , can you indicate the degree to which your organization considers the following?

	1 Very little	2	3	4	5 Very much
Inventoring all patents	<input type="checkbox"/>				
The legal entity holding individual patents	<input type="checkbox"/>				
Developing performance metrics	<input type="checkbox"/>				
Evaluating tax strategy	<input type="checkbox"/>				
Identifying licensable assets	<input type="checkbox"/>				
Identifying infringement	<input type="checkbox"/>				
Decisions made at Board level regarding patent status and strategy	<input type="checkbox"/>				

7. Which of the following best describes the decision of smartphone patent placement within legal entities?

- Tax considerations
 Strategic patent considerations
 Other _____

8. Can you describe the considerations the organization evaluates to decide the assignment of smartphone patent ownership within legal entities?

9. Can you indicate to what degree the below statements accurately reflect your organizations smartphone patent strategy?

	1 Inaccurate	2	3	4	5 Accurate
Seeks patent registration in all areas of business	<input type="checkbox"/>				
Seeks patent registration in limited specified areas of business	<input type="checkbox"/>				
Values the quantity of holdings	<input type="checkbox"/>				
Values the quality of holdings	<input type="checkbox"/>				

Patent Acquisitions / Sales

10. Does your organization actively increase its smartphone patent holdings through patent portfolio acquisitions?

- Yes
 No

11. Can you indicate approximately how much capital your organization has devoted to smartphone patent acquisitions (in millions):

	\$0 – 250	\$250 – 500	\$500 – 750	\$750 – 1,000	Over \$1,000
In the last 12 months	<input type="checkbox"/>				
In the last three years	<input type="checkbox"/>				

12. Can you indicate what you expect to happen to the amount of capital devoted to smartphone patent acquisitions over the next 12 months?

- Increase
 Decrease
 Stay the same

13. Can you provide background for how your organization determines what smartphone patents to acquire?

14. Can you provide the three organizations from which you acquired the most smartphone patents over the past three years?

	Sector	Company
1.	<hr/>	<hr/>
2.	<hr/>	<hr/>
3.	<hr/>	<hr/>

15. Is your organization actively selling smartphone patents at the present time?

- Yes
 No

16. Can you indicate approximately how much revenue your organization has generated through smartphone patent sales (in millions):

	\$0 – 250	\$250 – 500	\$500 – 750	\$750 – 1,000	Over \$1,000
In the last 12 months	<input type="checkbox"/>				

In the last three years

17. Can you indicate what you expect to happen to revenue generated through smartphone patent sales in the next 12 months?

- Increase
- Decrease
- Stay the same

18. Can you provide background on how your organization determines which smartphone patents to sell?

19. Can you provide the three organizations you have sold the most smartphone patents to in the past three years?

	Sector	Company
1.	_____	_____
2.	_____	_____
3.	_____	_____

Patent Licensing

20. Does your organization currently license out smartphone patent rights?

- Yes
- No

21. Can you indicate approximately how much revenue licensing out smartphone patents has generated (in millions):

	\$0 – 250	\$250 – 500	\$500 – 750	\$750 – 1,000	Over \$1,000
In the last 12 months	<input type="checkbox"/>				
In the last three years	<input type="checkbox"/>				

22. Can you indicate what you expect to happen to revenue generated from licensing out smartphone patents in the next 12 months?

- Increase
- Decrease
- Stay the same

23. Can you provide background on how your organization determines which smartphone patents to license out?

24. Can you provide the three companies you currently license smartphone patents to that generate the most revenue?

	Sector	Company
1.	_____	_____
2.	_____	_____
3.	_____	_____

25. Does your organization currently license in smartphone patent rights?

- Yes
 No

26. Can you indicate approximately how much expense licensing in smartphone patent rights has generated (in millions):

	\$0 – 250	\$250 – 500	\$500 – 750	\$750 – 1,000	Over \$1,000
In the last 12 months	<input type="checkbox"/>				
In the last three years	<input type="checkbox"/>				

27. Can you indicate what you expect to happen to expenses generated from licensing in smartphone patents in the next 12 months?

- Increase
 Decrease
 Stay the same

28. Can you provide background on how your organization determines which smartphone patents to license in?

29. Can you provide the three organizations you currently license the most smartphone patents from?

	Sector	Company
1.	_____	_____
2.	_____	_____
3.	_____	_____

30. Can you provide information about cost of licensing patents in per smartphone unit sold? For example, what percentage of the sale price of each unit produced is used to pay for smartphone patent licensing?

31. Can you provide information about any smartphone patent pools or smartphone cross licensing agreements your organization is involved in?

Patent Litigation Activity

32. Can you indicate on how many occasions you have sent cease and desist letters related to smartphone technology citing:

	None	1 – 10	10 – 100	100 – 1,000	Over 1,000
Utility patent rights in the last 12 months	<input type="checkbox"/>				
Utility patent rights in the past three years	<input type="checkbox"/>				
Design patent rights in the past 12 months	<input type="checkbox"/>				
Design patent rights in the past three years	<input type="checkbox"/>				

33. Can you indicate on how many occasions you have filed court documents related to smartphone technology asserting:

	None	1 – 10	10 – 100	100 – 1,000	Over 1,000
Utility patent rights in the last 12 months	<input type="checkbox"/>				
Utility patent rights in the past three years	<input type="checkbox"/>				
Design patent rights in the past 12 months	<input type="checkbox"/>				
Design patent rights in the past three years	<input type="checkbox"/>				

34. Can you approximate what percentage of your total asserted smartphone patents reflect:

	None	0-25%	25-50%	50-75%	75-100%
High level handset	<input type="checkbox"/>				

technology					
High level software technology	<input type="checkbox"/>				
Component level hardware	<input type="checkbox"/>				
Ornamental design work	<input type="checkbox"/>				
Other	<input type="checkbox"/>				

35. Can you provide background on how your organization determines which smartphone patents to assert, and whether to assert by cease and desist letter or formal court filing?

36. Can you indicate the three parties that you have most recently asserted smartphone patents against?

	Sector	Company
1.	_____	_____
2.	_____	_____
3.	_____	_____

37. Can you indicate on how many occasions you have been sent cease and desist letters related to smartphone technology citing:

	None	1 – 10	10 – 100	100 – 1,000	Over 1,000
Utility patent rights in the last 12 months	<input type="checkbox"/>				
Utility patent rights in the past three years	<input type="checkbox"/>				
Design patent rights in the past 12 months	<input type="checkbox"/>				
Design patent rights in the past three years	<input type="checkbox"/>				

38. Can you indicate on how many occasions other parties have filed court documents related to smartphone technology against you citing:

	None	1 – 10	10 – 100	100 – 1,000	Over 1,000
Utility patent rights in the last 12 months	<input type="checkbox"/>				
Utility patent rights in the past three years	<input type="checkbox"/>				
Design patent rights in the past 12 months	<input type="checkbox"/>				
Design patent rights in the past three years	<input type="checkbox"/>				

39. Can you indicate what percentage of the total asserted smartphone patents reflect:

	None	0-25%	25-50%	50-75%	75-100%
High level handset technology	<input type="checkbox"/>				
High level software technology	<input type="checkbox"/>				
Component level hardware	<input type="checkbox"/>				
Ornamental design work	<input type="checkbox"/>				
Other	<input type="checkbox"/>				

40. Can you indicate the three parties that have most recently asserted smartphone patents against you?

	Sector	Company
1.	_____	_____
2.	_____	_____
3.	_____	_____

Policies

41. Please attach, if possible, copies of

- (1) any press release related to patent acquisitions or sales;
- (2) any company policy related to smartphone patent acquisitions;
- (3) any company statement related to smartphone patent strategy;
- (4) and company statement related to smartphone patent pooling or cross licensing.

Appendix II

Lists of the top 20 patent grantees from 2007-2011 in each of the fourteen categories:

370	375	379	398	455	320	341
Cisco	Samsung	AT & T I	Fujitsu	Samsung	~Individually Owned Patent	Samsung
Samsung	Broadcom	~Individually Owned Patent	Finisar	Nokia	Sony	Texas Instruments
IBM	Intel	IBM	Samsung	~Individually Owned Patent	Research In Motion	~Individually Owned Patent
Intel	Qualcomm	Avaya Technology	Nortel	Broadcom	Sanyo Electric	Sony
Broadcom	Panasonic	Cisco	~Individually Owned Patent	Qualcomm	Samsung SDI	Broadcom
Nokia	Texas Instruments	Microsoft	Electronics And Telecommunications Research Institute	LG Electronics	LG Chemical	Infineon Technologies
Fujitsu	~Individually Owned Patent	AT & T II	Alcatel	Research In Motion	Milwaukee Electric Tool Corporation	Analog Devices, Inc.
Qualcomm, Inc.	LG Electronics	At&T Corp.	Alcatel-Lucent	NEC	O2 Micro International	Marvell International
LG Electronics	Sony	AT & T	Ciena	Motorola	Toyota	IBM
~Individually Owned Patent	Nokia	Sprint Communications	Lucent Technologies	Ericsson	Black & Decker	Panasonic
Ericsson	Toshiba	Alcatel-Lucent	NEC	Intel	Dell Products	Cirrus Logic
Nortel	Fujitsu	Nortel	Hitachi	Ntt Docomo	Nissan Motor Company	Toshiba
Juniper	Ericsson	Nokia	Alcatel Lucent	Fujitsu	Panasonic	Mediatek

Networks						
Alcatel Lucent	Infineon	Samsung	Intel	Sony	Robert Bosch	Research In Motion
Alcatel-Lucent	Interdigital Technology	Alcatel Lucent	Cisco	Panasonic	GM Global Technology Operations	Freescale Semiconductor
NEC	Marvell International	Verizon	Nippon Telegraph & Telephone	Sony Ericsson Mobile Communications	Samsung	NXP B.V.
Huawei	IBM	Bellsouth IP	Oki Electric Industry	Sprint Spectrum	Denso	Matsushita Electric Industrial
Panasonic Corporation	Electronics And Telecommunications Research Institute	AT & T Knowledge Ventures	AT & T Corp.	Cisco	Panasonic EV Energy	Realtek Semiconductor
Microsoft	Microsoft	Sprint Spectrum	Huawei	Interdigital Technology	Tesla Motors	Fujitsu
Electronics And Telecommunications Research Institute	NEC	AT & T BLS	AT & T II	Alcatel-Lucent	Honda Giken Kogyo Kabushiki Kaisha	Intel

349	361	704	706	707	715	719
LG Display	~Individually Owned Patent	Microsoft	IBM	IBM	Microsoft	Microsoft
Samsung Electronics	Hong Fu Jin Precision Industry (Shenzhen)	IBM	Microsoft	Microsoft	IBM	IBM
Sharp Kabushiki Kaisha (Sharp Corporation)	IBM	Nuance Communications	~Individually Owned Patent	Oracle International	~Individually Owned Patent	SAP

AU Optronics	Hewlett-Packard Development Company	~Individually Owned Patent	Sony	SAP	Apple	Sun Microsystems
Seiko Epson	Fu Zhun Precision Industrial (Shenzhen)	AT & T II	Yahoo	~Individually Owned Patent	SAP	Hewlett-Packard Development Company
Hitachi Displays	Fujitsu	Samsung Electronics	Hewlett-Packard Development Company	Yahoo	Adobe Systems	Intel
LG Philips LCD	Toshiba	Panasonic	SAP	Google	Canon Kabushiki Kaisha	Oracle International
Semiconductor Energy Laboratory	Hon Hai Precision Ind.	Sony	Intel	Hitachi	Sony	~Individually Owned Patent
Sony	Intel	AT & T	Xerox	EMC	Hewlett-Packard Development Company	Oracle America
NEC LCD Technologies	Samsung Electronics	Toshiba	Google	Sony	Oracle International	Canon Kabushiki Kaisha
Hitachi	Inventec	Canon Kabushiki Kaisha	Rockwell Automation Technologies	Hewlett-Packard Development Company	Ricoh Company	Bea Systems
Fujifilm	TDK	Nokia	Siemens Medical Solutions USA	Canon Kabushiki Kaisha	Xerox	EMC
Nitto Denko	Dell Products	Koninklijke Philips Electronics	Siemens	Fujitsu	Fujitsu	Apple
Toshiba Matsushita Display Technology	Hitachi	Fujitsu	Boeing	Netapp	Google	Cisco
Chimei-Innolux	Panasonic	LG Electronics	General Electric	Sun Microsystems	Samsung Electronics	Samsung Electronics

Chunghwa Picture Tubes	Sanyo Electric	Intel	Health Discovery	Symantec Operating	Fuji Xerox	The Math Works
Epson Imaging Devices	General Electric	Broadcom	Oracle International	Apple	Nokia	Nokia
Hannstar Display	Apple	Apple	Samsung Electronics	Teradata US	Yahoo	Research In Motion
Mitsubishi Denki Kabushiki Kaisha	Murata Manufacturing	Motorola	Fair Isaac	AT & T I	AOL	Siebel Systems
Dai Nippon Printing	Eaton	Matsushita Electric Industrial	Toshiba	Network Appliance	Research In Motion	Unisys

Appendix III

Number of categories within the fourteen in which a company was in the top 20 grantees in the period from 2007-2011

Company	Number of Categories
Samsung (combined)	13
AT & T (combined)	11
IBM	10
Sony	10
Fujitsu	9
Intel	9
Alcatel / Lucent (all appearances)	8
Microsoft	8
Panasonic	8
Nokia	7
LG (combined)	6
Toshiba	6
Apple	5
Broadcom	5
Cisco	5
Hewlett-Packard	5
Hitachi	5
Oracle (combined)	5
Research In Motion	5
Canon Kabushiki Kaisha	4

NEC	4
SAP	4
Electronics And Telecommunications Research Institute	3
Google	3
Nortel	3
Qualcomm	3
Sprint	3
Ericsson	3
Yahoo	3
Interdigital Technology	2
Motorola	2
Siemens	2
Texas Instruments	2
Ntt Docomo	1

Appendix IV

Number of Patents granted in fourteen classes from 2007-2011

Company	Number of Patents
IBM	5926
Microsoft	5150
Samsung	5046
LG	3024
AT&T	2764
Nokia	2167
Intel	1955
Sony	1924
Qualcomm	1665
Alcatel-Lucent	1490
Panasonic	1419
Motorola	1212
Oracle	1018
RIM	1014
Siemens	881
Nortel	862
Texas Instrument	848
Sprint	798
Ericsson	672
Apple	645
Huawei	584
Lucent	558
Google	542
Juniper	519
NTT Docomo	463

Sony Ericsson	411
Alcatel	402
Verizon	357
Adobe	275
Nokia Siemens	167
Nextel	136
Palm	85
ZTE	59
HTC	41
LG-Nortel/LG-Ericsson	33

[End of Annex and of document]