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Competitive Dynamics, IP Litigation and Acquisitions

The Struggle for Positional Advantage in the Emerging Mobile Internet

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Abstract

This article investigates how current global intellectual property (IP) litigation provides insight into the competitive landscape of mobile internet, the strategic thinking processes of firms, and the old mobile telecommunications incumbents and new entrants from internet that are vying for space in the new world of mobile internet. To understand the contemporary industry of smart devices, we used the latest IP litigation data from the U.S. to illustrate how the world of essential patents (i.e., the old incumbents in mobile telecommunications) and the world of platform patents (i.e., the new entrants into mobile internet) have become two complementary areas of technology. This analysis addresses the necessity for understanding the firms involved in IP litigation cases for smart devices in particular and the corresponding patents these firms use in current global IP litigation. This article provides evidence that elucidates the current turmoil in mobile telecommunications; identifies the valuable patents, corresponding patent categories and technology areas; and discusses and analyzes the competitive landscape of mobile internet through the eyes of IP litigation and IP acquisitions. Furthermore, we provide additional evidence that the patent acquisitions by Apple, Google, and Microsoft changed the nature of their ownership of different technologies and important patents in the world of essential patents.

Keywords: Apple, Google, Microsoft, Nokia, ICT, Intellectual Property (IP), IP Litigation, IP Acquisitions

JEL: K4, K41, L25, L8, L86

Tiivistelmä

Tässä artikkelissa tarkastellaan langattoman internetin kilpailutilannetta maailmanlaajuisten patenttioikeudenkäyntien kautta. Erityisesti keskitytään yritysten strategiseen päätöksentekoon sekä matkaviestintäalan vakiintuneiden toimijoiden ja uusien tulokkaiden lähtöasetelmiin. Matkaviestintäalan nykytilaa voidaan analysoida tarkastelemalla aineistoja liittyen viimeaikaisiin patenttioikeudenkäynteihin Yhdysvalloista. Täten voidaan havainnollistaa olemassa olevien standardien taustalla olevien patenttien omistajien (vakiintuneet matkaviestintäalan toimijat) ja uusien teknologia-alustojen patenttien omistajien (uudet tulokkaat) strategista toimintaa näillä kahdella toisiaan täydentävällä langattoman internetin teknologia-alalla. Tulokset osoittavat, että toimialalla tapahtuvia teknologiamuutoksia tulee tarkastella vastaavien samalla toimialalla käytyjen oikeustapauksien kautta. Lisäksi selvennetään nykyistä matkaviestintäalan kehitystä tunnistamalla keskeisiä teknologioita analysoitaessa yrityksen kilpailutilannetta patenttioikeudenkäyntien ja yritysostojen avulla. Tulokset tuovat lisänäyttöä siitä, että patentteihin liittyvillä yritysostoilla Apple, Google ja Microsoft ovat hankkineet erilaisten teknologioiden keskeisiä patentteja.

Asiasanat: Apple, Google, Microsoft, Nokia ICT, immateriaalioikeudet, patenttioikeudenkäynnit, patenttiostot

JEL: K4, K41, L25, L8, L86

1 Introduction

During periods of Schumpeterian industrial upheaval, old competencies can be destroyed and new competencies created. As Anderson and Tushman (1990) observed, during these periods incumbents can be swept away, even as new entrants can capture new markets. During these periods, intellectual property is often used by the incumbents in an attempt to ward of the intruders, even as formerly valuable intellectual property (IP) can shift in value. Strategic maneuvering regarding enforcement of intellectual property rights during such periods can provide insights into the role of IP in periods of Schumpeterian change. The setting for our study is the current struggle over the mobile Internet as seen through IP filings, litigation, and the role of acquisitions.

The current frequency of global court cases reflects to firms' strategies for appropriating future economic growth on when a new window of competition opens (Lanjouw and Schankerman, 2001). However, the frequency of IP litigation has remained stable over the last few decades (Hall and Ziedonis, 2007). IP litigation typically appears in situations where 1) incumbents are blocking new entrants to protect their competitive position and 2) incumbents are vying for space in a new world. However, the new entrants can advance technology if they can defeat such incumbents and other new entrants or to agree to license with the incumbents (Shapiro, 1985). Rumelt (1984, 1987) and Liebeskind (1996) confirm this observation because most firms' primary purpose is to create, exploit and defend sources of their competitive advantage and respective economic rents. Hence, a new open window for competition typically reflects events that create disequilibrium and further accelerates division of new economic rents between incumbents and new entrants, and IP litigation typically increases, which generates new competition and conflict (Lanjouw and Schankerman, 2001).

IP litigation should not arise if all new entrants obtain ex ante licenses from the incumbents (Bessen and Meurer, 2006). However, this is not always possible. In the end, most firms agree and license (see Bekkers et al. 2002). This observation is also confirmed by historical data on IP litigation for mobile telecommunications[1]. If there are licenses, why is there litigation? Hence, Teece (1986) argues that licensing intellectual property is recommended if a firm's intellectual property is strongly protected, and intellectual property that is considered a includes a single patent from a patent family that lacks complementary patents or any other complementary assets required. For mobile telecommunications, the purpose of developing standards and standardization is to create compatibility, interchangeability, common development and testing measures to lower the cost of development and testing as well as enlarge the market size (Leiponen, 2006). Furthermore, a single firm's IP requires complementary technologies and corresponding IP to create a complete standard.

Traditionally, the mobile telecommunications industry has been an industry where standard setting and ownership of the essential IPR, such as GSM (global system for mobile communications), 3G (third generation mobile telecommunications), LTE (long term evolution), and other similar standards that play a significant role in defining market structure and the positions of industry firms (Leiponen, 2006; Bekkers and Martinelli, 2012). Furthermore, standard setting and essential IPR ownership have been a primary method for aligning and coordinating different industry actors as well as incumbents and new entrants, which facilitates

[1] Broadcom versus Qualcomm in 2005–2009, Qualcomm versus Nokia 2007–2009 and Nokia versus Apple 2009–2011.

efficient delivery of technologies and respective services to customers in mobile telecommunications (Tilson and Lyytinen, 2006; Bekkers and Martinelli, 2010). Typically, these standard setting procedures have also dominated and affected the rate of incremental technology development for an entire industry.

In mobile telecommunications, as part of standard creation the essential IPR has been used more for strategic maneuvering by the mobile telecommunication incumbents. Furthermore, essential IPR has been used to block competition. However, an increasing number of patents for 3G and LTE are claimed as essential patents with different standards. By claiming an increasing number of essential patents, the new entrants are devaluing the current essential patent mechanism to minimize their entry barriers (i.e., gross licensing fees) for entry into the current mobile telecommunications industry. The latest developments in essential patents mechanisms indicate that certain firms try capturing power over an entire industry by sharing essential technologies and respective IP without licensing fees for different players in an industry.

To appreciate the significance of the contest, consider the scene, setting, and antagonists. In the last seven years, the Apple iPhone has become an iconic product and as a result Apple is one of the most profitable firms in the world. Simultaneously, its Silicon Valley neighbor and giant of the Internet world, Google has become Apple's most significant competitor due to its introduction of the Android operating system, which rapidly advanced to become the smartphone platform with the largest installed base. Microsoft, the world's largest and most profitable software company has felt compelled to enter the mobile phone operating system competition, because of its importance for dominance in the entire computing industry. Finally, the old mobile phone incumbents are faced with the possibility that the new entrants will entirely displace them. The financial stakes are enormous as incumbents and new entrants design strategies to navigate the transition from mobile telephony to the mobile Internet (Kenney and Pon, 2011).

2 Intellectual property and competition in the mobile internet

Technological knowledge and the corresponding IP are weapons in corporate competition and provide a source of advantage for any firm (e.g., Abernathy and Clark, 1985; Shapiro, 2001; Reitzig 2004; Teece, 2006).

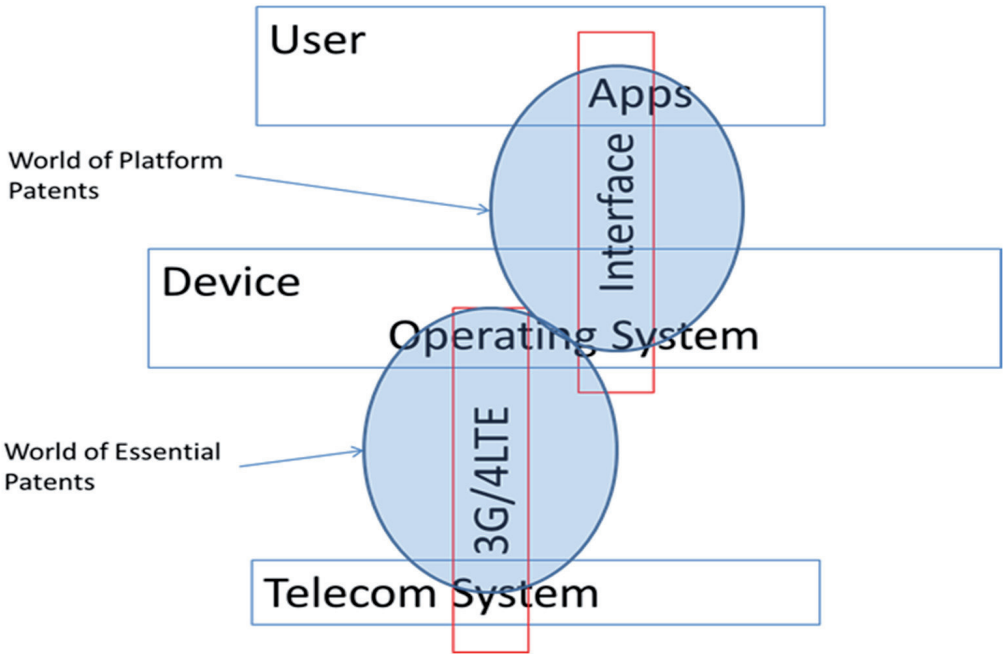
This paper examines the role IP plays in such industrial transitions. This is particularly interesting because the two most successful new entrants, Apple and Google, have not traditionally been significant patentees especially in the mobile Internet space as they come from the relatively less IP- and standards-oriented world of personal computing and consumer electronics and, in the case of Google, the Internet. Only one new entrant to mobile telecommunications, Microsoft, has been oriented towards patents, but is the beneficiary of the de facto standard-setting that occurred in the personal computing industry (see Zysman on Wintelism; Cusumano on Microsoft Secrets). In contrast, the mobile telephony incumbents were creatures of international standard-setting bodies where governments and/or their telephony gathered together decided on a new transmission standard (2G, 3G, GSM) and determined which patents were critical. These then would be licensed to all parties and competition would begin on this mutually available platform. The emergence of the mobile Internet is changing the grounds of

competition and IP has become a weapon in this competition. These two clashing IP regimes can be thought of as 1) the world of essential patents (i.e., the old incumbents in mobile telecommunications) and 2) the world of platform patents (i.e., the new entrants into mobile telecommunications; see Leiponen and Drejer, 2007; Cusumano, 2010). This is illustrated in Figure 1, as the world of essential patents meets the world of platform patents for mobile internet.

This ongoing turmoil in the transforming landscape of mobile telecommunications and the corresponding activity in global intellectual property (IP) litigation can provide insight into the competitive landscape of mobile internet (see similar work on different industries by Graham and Somaya, 2004; Lemley and Shapiro, 2005; Hall and Ziedonis, 2007 on IP litigation). Traditionally, in telecommunications firms cross-licensed their IP as an industry standard in mobile telecommunications and related industries. In mobile telecommunications, cross-licensing between firms is based on fair, reasonable, and non-discriminatory (FRAND) terms and conditions. Furthermore, cross-licensing agreements with FRAND terms provided firms with protection against inadvertent infringement and the right to use the licensee's patents, as noted by Grindley and Teece, 1997. However, as the new entrants Apple, Google, and Microsoft come from the world of the Internet and the corresponding technology platforms, their IP was not mandatorily cross-licensed as was the case for the mobile telecommunications incumbents.

The current IP litigation is so widespread because of the speed with which Apple and Google have gained market share and profitability. This has led the incumbents and firms that are threatened by the mobile internet, such as Microsoft, to use their IP to protect or, in certain cases, salvage their eroding positions.

Figure 1 The world of essential patents versus the world of platform patents



The unique position of Google explained earlier as a "mere" provider of Android to others has protected it from IP litigation. To attack Google both Apple and Microsoft, have launched IP litigation against key members of its platform ecosystem, which includes original equipment manufacturers (e.g., HTC, Motorola Mobility, and Samsung) and application developers[2]. These attacks are global, including the U.S. and the rest of the world except for China; specifically, Apple has attacked the largest producer of Android OS devices, Samsung, in many different nations. This information is the basis for two interesting observations: 1) Apple and Microsoft have attacked Google's alliance network using operating systems software-related patents, which are not considered essential patents for mobile telecommunications, and 2) the IP litigation does not attack the developer and distributor of the operating system software but does attack the final product developer and distributor.

These two observations were confirmed by analyzing IP litigation data and the corresponding patents, as well as international patent categories (IPCs) and technology areas. From the IP litigation data, we identified 234 patents and 48 IPCs in 14 different technology areas, including both service and technology platforms, as well as subplatforms that are critical to current mobile Internet competition, such as sensors, materials and mechanics, navigation, optics, digital data, signaling, security, speech recognition, memory, electronics, radio, transmission, telephony, and picture communication. These patents and corresponding key IPCs identified from the IP litigation aided us in identifying all of the patent application data from the USPTO for these IPCs. We used the European Patent Office (EPO) worldwide patent statistical database (PATSTAT) as of September, 2011 (EPOb 2011). By comparing these two samples of data, we found that the IP litigation data, corresponding patents and IPCs correlated at 76% with the patent application data from the USPTO. The patent application profile created from the patent application data then served as a tool for analyzing the complementarities of the Apple, Google, and Microsoft patent acquisitions. Two interesting observations have resulted from our complementarity analyses: 1) Apple, Google and Microsoft have acquired complementary patents for their patent portfolios (Apple from Nortel, Microsoft from AOL and Nortel, and Google from Motorola) and 2) the acquired patents are under the same IPCs as the incumbents' essential patents in mobile telecommunications, but they are not necessarily essential patents.

This article investigates how current global intellectual property IP litigation can provide insight into the competitive landscape of mobile internet, the strategic processes of the firms, and how old mobile telecommunications incumbents are vying for space in the new world of mobile internet. Our observations will contribute to discerning the role of IP litigation in platform establishment and the IPR strategies and corresponding complementary technology platforms that sponsors adopt to protect their alliance networks. Furthermore, IP litigation data and our analyses aid us in illustrating how the world of essential patents (i.e., the old incumbents of mobile telecommunications) and the world of platform patents (i.e., the new entrants of mobile internet) have become two complementary areas of technology to understand the contemporary industry of mobile Internet devices.

The mobile telecommunications industry is in upheaval as the mobile Internet becomes the dominant application and phones become portable smart devices (Kenney and Pon, 2011).

[2] http://www.macstories.net/news/lodsys-sues-rovio-over-angry-birds-for-ios-and-android-more-developers/ (information retrieved 9.5.2012)

Along with the mobile Internet, new direct competition has emerged from Apple, as well as indirect competition from Google and Microsoft with the mobile telecommunication incumbents. The strategies of these firms (Apple, Google, and Microsoft) for entry into the mobile internet industry have been different; whereas Apple distributes smart devices with its own operating system software, Google and Microsoft distribute operating system software. Google distributes its operating system software free of charge, while earning from the advertising. Only when the alliance network members for Google began using the Android OS in their smart devices did Apple and Microsoft begin attacking the network with IP litigation.

3 Data and methods

To improve our understanding of mobile telecommunications industry upheaval caused by current industry convergence and new industry alliances in the creation of new ecosystems, we considered the latest patent disputes between the two intellectual regimes: 1) the essential patents regime (i.e., mobile telecommunication incumbents) and 2) the IT patents regime (i.e., mobile telecommunication new entrants). To begin, we consider who the mobile telephony incumbents are. We consider Ericsson, Motorola, Nokia, Qualcomm, and Sony the mobile te-

Table 1 **A list of participants in the smartphone patent wars (incumbents versus new entrants)**

	Incumbents	*New Entrants (Asia)*	*New Entrants (IT)*	*New Entrants (Other)*
Ericsson	x			
Motorola	x			
Nokia	x			
Qualcomm	x			
Sony	x			
HTC		x		
Huawei		x		
LG		x		
Samsung		x		
ZTE		x		
Apple			x	
Google			x	
Microsoft			x	
RIM			x	
Amazon.com				x
Barnes & Nobles				x
Bedrock				x
Facebook				x
Foxconn				x
Inventec				x
Kodak				x
Oracle				x
Xerox				x
Yahoo				x

Financial Times 17.10.2011 (information retrieved 14.5.2012); Facebook, Yahoo, Xerox added by the authors.

lephony incumbents, and we categorized the new entrants into following three subgroups due to the different characteristics of each group of new entrants: 1) the new entrants from Asia (i.e., HTC, Huawei, LG, Samsung, and ZTE); 2) the IT new entrants (i.e., Apple, Google, Microsoft, and RIM); and 3) the other new entrants (i.e., Amazon.com, Barnes & Nobles, Bedrock, Facebook, Foxconn, Inventec, Kodak, Oracle, Xerox, and Yahoo)[3] Furthermore, there are several other incumbents and new entrants in the mobile telecommunications industry; however, these incumbents and new entrants do not currently participate in the smartphone patent war.

We illustrate how the value of IP related to current mobile telecommunication standards is no longer inherent while the value of intellectual property related to technology platforms is increasingly based on a unique dataset that we constructed for this article. To provide evidence for and illustrate the contemporary status of IP litigation, we first acquired and linked IP litigation data from all of the US federal district courts and US International Trade Commission (ITC) to the key patents in IP litigation between different incumbents and new entrants. For each patent, we identified several international patent categories (IPCs). We then linked these key patent data (see Appendices 1, 2, 3, 4, and 5 for the list of key patents) and identified the key international patent categories (IPCs). The key IPC categories and corresponding descriptions for our analyses are explained in Appendix 6. Each IPC was further grouped into 14 different technology categories The technology categorization helps us to analyse the differences in patent portfolios of different firms. Second, we analyzed the patent application and patent data for the firms using the IPCs and data from the European Patent Office (EPO) worldwide patent statistical database (PATSTAT) as of September, 2011 (EPOb 2011). The patent application and issued patent data were analyzed for the period from 2000 until 2011. Moreover, the applications issued patents and respective patent groups were then analyzed and categorized into the 14 technology categories explained earlier. The purpose for using non-random sampling was explicitly determine exactly whom to include in our sample using our judgment. This approach enabled us to study the primary stakeholders in the following two IP regimes and their respective behavioral patterns: 1) the essential patents regime (i.e., the mobile telecommunication incumbents) and 2) the IT patent regime (i.e., the mobile telecommunication new entrants). Using this division, we estimated the current share of the essential patents regime compared with the share of the IT patents regime in contemporary industry convergence. Based on this estimate, we then formed a new industry profile for the key technology categories. This profile was then used with the IP litigation data to analyze firms' patent strategies and corresponding IP acquisitions to identify strategic behavioral patterns in the alliance networks context. Furthermore, IP litigation data were correlated with the patent application data and analyzed. These patent application data acquired from European Patent Office (EPO) worldwide patent statistical database (PATSTAT) as of September, 2011 (EPOb 2011) were then used to analyze the latest patent acquisitions for Apple, Google, and Microsoft. For each firm participating in the patent data acquisitions (Byers: Apple, Google, and Microsoft; and sellers AOL, Motorola Mobility, and Nortel), we ran separate patent application profiles. Furthermore, we ran these profiles prior to the patent acquisition and after the transactions were completed to understand the complementarity of each patent acquisition to the buyers. For each patent acquisition, we calculated the correlations using our industry profiles for patent applications. Moreover, each patent acquisition case elucidated the complementarities that it brought to Apple, Google, and Microsoft.

[3] List of mobile telephony incumbents in GSM: Motorola, Nokia, Alcatel, Philips, Telia, Bull, AT&T, Schlumberger, Bosch, British Telecom, NTT, Rockwell, Ericsson, NEC and others (see Bekkers et al., 2002). List of mobile telephony incumbents in 3G: Nokia, Ericsson, Qualcomm, InterDigital, Samsung, Motorola, Philips, Siemens, Asustek, Alcatel, Mitsubishi, Nortel and others (see Bekkers & West, 2009).

4 IP litigation for the mobile telecommunication industry in the U.S.

To enhance our understanding of the mobile telecommunications industry upheaval, we analyzed in detail four key IP litigation cases and which patents were used as part of the litigation: 1) Nokia versus Apple (settled, Appendix 1); 2) Microsoft versus Motorola Mobility (ongoing; Appendix 2); 3) Apple versus HTC (ongoing; Appendix 3); and 4) Apple versus Samsung (ongoing; Appendix 4). Furthermore, the patents and corresponding patent categories from other IP litigation cases were considered. The details from each IP litigation case are in Appendices 1, 2, 3, 4, and 5. Moreover, it is important to recognize the various perspectives in our analyses, including the 1) essential patents regime (i.e., the mobile telecommunication incumbents' perspective) and 2) IT patents regime (i.e., the mobile telecommunications new entrants' perspective).

4.1 Nokia versus Apple

The Nokia versus Apple (see Appendix 1 for details) case provides an interesting approach for our analyses because in the Apple vs. Nokia counterclaim Apple argued that Nokia violated European Telecommunications Standards Institute (ETSI) licensing terms and conditions. In their response, Apple also stated that Nokia did not offer FRAND (fair, reasonable, and non-discriminatory) licensing terms and conditions because in return for Apple's right to use Nokia's intellectual property Nokia wanted a license to use Apple's intellectual property in Nokia's products. Apple would not agree because Apple would have to surrender one of its keys to business success and thereby become vulnerable to "knock-off" interfaces from Nokia. Apple might lose a competitive advantage over a potential competitor in the American market (Nokia has less than 1% of the U.S. market share). Nokia may have refrained from introducing touch-and-feel-based smart phones in the U.S. market due to the Apple patents, most of which are only applicable in the U.S. outside the U.S., Apple has been unable to enforce its U.S. patents because Europe does not permit software-based patenting[4]. Nokia has now merged forces with Microsoft to enable to sell and distribute touch-and feel-based smart phones. Moreover, these patent disputes aided us in identifying not only the key patent groups and patents Apple is using as a basis for their defense but also the basis for Apple's disputes with the Android operating system. Notably, several other disputes are also on-going. Based on the latest information, Nokia and Apple have settled their patent disputes and agreed to a partial exchange of intellectual property rights. This settlement serves both Apple and Nokia. For Apple, this settlement is the final entry ticket to mobile telecommunications, but for Nokia this settlement is a defensive win and new opportunity to earn on their essential patent portfolio[5]. Although Nokia will receive licensing payments from Apple for years, Nokia did not access 100% of Apple's patent portfolio, which would have been important. Yikes.

4.2 Android Litigation

Another IP litigation case explains in detail the strategies that Apple and Microsoft use for attacking the most powerful of the aggressors, Google's Android OS. The IP litigation strategy has been to launch IP litigation against key members of its alliance networks, both original

[4] http://www.siliconrepublic.com/comms/item/14892-apple-moves-to-block-nokia (information retrieved 22.5.2012)

[5] http://press.nokia.com/2011/06/14/nokia-enters-into-patent-license-agreement-with-apple/ (information retrieved 22.5.2012)

equipment manufacturers (OEM's) and application developers though generally not against Google. However, the Microsoft versus Motorola Mobility case is also on FRAND (in addition to licensing terms and conditions). Microsoft sued Motorola Mobility (see Appendix 2 for details) and Apple sued HTC (see Appendix 3 for details) because Motorola Mobile and HTC both use the Android operating system in their devices. Although we discussed two incumbents and two new entrants suing each other, we found that this was an indirect attack against Google's operating system, Android, and Google. The reasoning for this attack is clear. Motorola Mobility and HTC are considered distributors of the Android operating system, not Google. An additional obvious reason for not directly suing Google is that its licensing terms and conditions do not provide indemnification for its Android operating system licensees; therefore, whomever integrates the Android operating system into their devices is responsible for ensuring that the Android operating system does not infringe on other firms' patents. This is considered a significant threat to not only Google but Google's alliance network. If Google cannot protect its alliance network against such IP litigation and claims, then Google may no longer have a role in mobile internet.

4.3 Apple versus Samsung

The Apple versus Samsung case illustrates an additional approach for our analyses because it is one of the most global IP litigation cases. Samsung began litigation in South Korea, Japan, and Germany. In June 2011, Apple filed a countersuit in South Korea. In the same month, Samsung also filed in other European countries, including United Kingdom and Italy. This dispute has so far spanned over 30 cases in 10 countries. Based on the latest decisions from different disputes Japan, South Korea and USA Apple seem to be winner in USA, but not outside USA[6, 7, 8]. Thus far, this IP litigation between the two rivals has not influenced their daily business relationships. Samsung continues to deliver components for Apple devices. The details related to the U.S. IP litigation are described in Appendix 3. The Apple versus Samsung case is the third case of an indirect attack on Google through the Android operating system alliance. However, this case is also more about design and the corresponding patents than the Android operating system. Hence, the same patents are addressed in this litigation as in Apples' other IP litigation cases. Unlike Apple's other attacks, this attack is global instead limited to the U.S.

5 Valuable patents

Working with the hypothesis of Allison et al. (2003), which states that firms use their most valuable patents in IP litigation, we collected a sample of 234 patents considered in 9 different IP litigation cases between the two worlds of patents: 1) platform patents, and 2) essential patents. This hypothesis is supported by number of scholars (see, e.g., Lanjouw and Schankerman, 2001; Graham et al., 2002). Figure 2 provides a representation of these 234 patents and how they are divided between 14 different areas of technology. The figure also highlights the share in percentages of each area for all litigated patents. The details of international patent

[6] http://www.bloomberg.com/news/2012-08-31/apple-loses-japan-patent-lawsuit-against-samsung-over-devices.html (information retrieved 10.9.2012)

[7] http://www.nytimes.com/2012/08/24/technology/south-korean-court-says-apple-and-samsung-infringed-on-patents.html (information retrieved 10.9.2012)

[8] http://www.bbc.com/news/technology-19377261 (information retrieved 10.9.2012)

categorization (IPC) and technology area mapping are explained in Appendix 6. The analyses show that the two most significant areas of technology involve digital data, that is, software patenting that includes patents from the Internet and from mobile Internet and transmission.

Figure 2 Key technology areas in smart devices

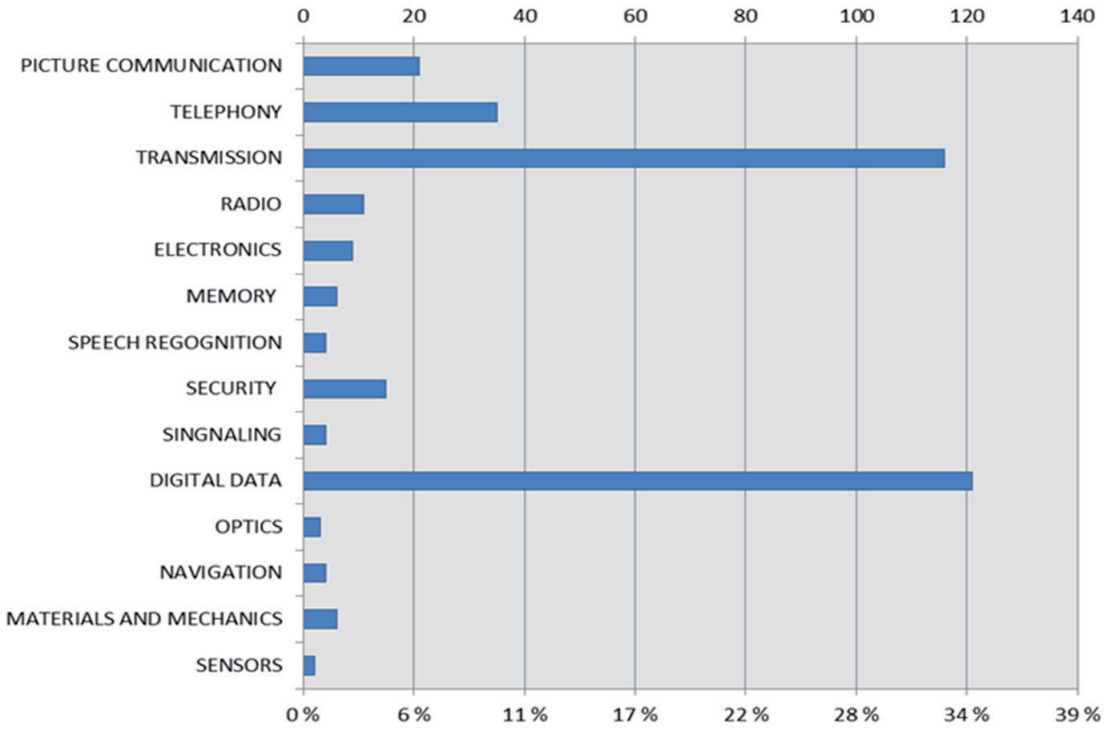
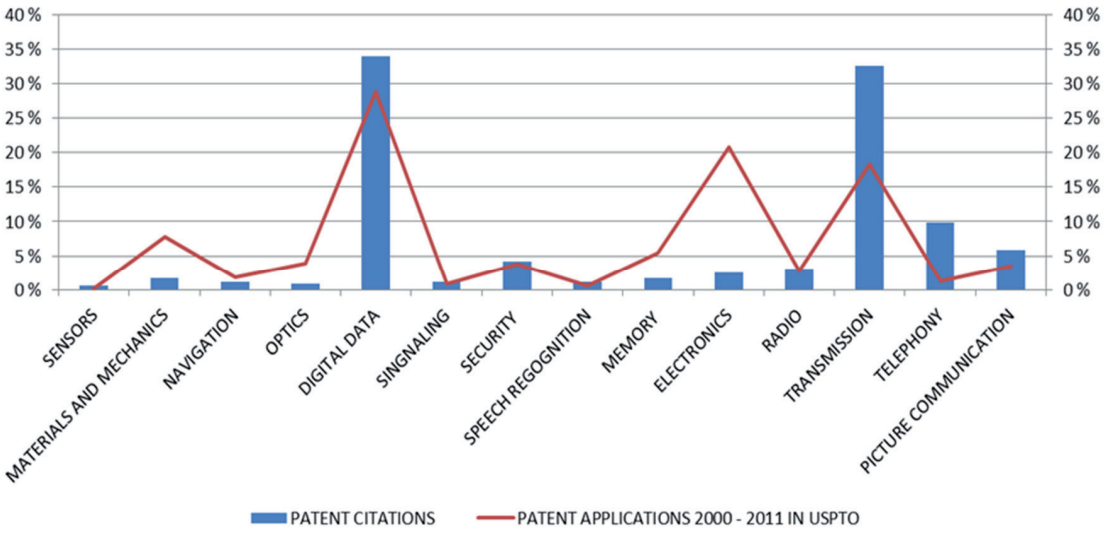


Figure 3 Correlation between technology areas in IP litigation and patent applications in USPTO from 2000 until 2011



These same technology areas are then used to identify all patent applications from the USPTO from 2000 to 2011. We identify 1,522,686 patent applications, for which we create a similar profile of technology areas. We find a 76% correlation between the smart devices profile in IP litigation and the profiles of all patent applications from USPTO from 2000 to 2011. This correlation indicates that the random sample we created for our analyses represents the industry patenting behaviors well. The correlation between the smart devices profile in IP litigation and the profile of all patent applications from USPTO from 2000 to 2011 is shown in Figure 3.

We find that the areas related to technology platforms (sensors, materials and mechanics, navigation, optics, digital data, signaling, speech recognition, memory, electronics, and picture communication) represent 51% of all technology areas, and essential patents (radio, transmission, and telephony) represent 49%. This result shows a trend in which the essential patents related to mobile telecommunications continue to play an important role, but the technology platform-related patents are of increasing significance.

6 Apple, Google, and Microsoft in IP platform establishment

The new entrants Apple, Microsoft and Google are acquiring market share in smart devices. However, all three have different strategies. Whereas Apple distributes smart devices together with its own operating system software, Google and Microsoft distribute operating system software independently. Google distributes its operating system software free of charge while making earnings from advertising. However, all three firms have been active in acquiring patents from outside their core competencies from mobile telecommunications. The key technology profile of smart devices is used as a tool for analyzing the changes in the patent portfolios of Apple, Google, and Microsoft before and after the each firm acquired new patent portfolios from other firms. Three cases are analyzed: 1) Google's acquisition of Motorola Mobility[9]; 2) Apple's acquisition of the Nortel patent portfolio together with EMC, Ericsson, Microsoft, Research in Motion, and Sony[10, 11]; and 3) Microsoft's acquisition of the AOL patent portfolio[12].

Figure 4 shows the position of Google's IP before and after the acquisition of Motorola patents in comparison with the different technology areas identified from the IP litigation data. Based on our analyses, it is evident that Google acquired Motorola patents because the Motorola patent portfolio is complementary to Google's patent portfolio. However, it is important to recognize that most of the Motorola patents are cross-licensed between the mobile telecommunication incumbents, as Motorola is considered one of the early incumbents in mobile telecommunications (see Table 1).

Figure 5 illustrates the position of Microsoft's IP before and after the acquisition of AOL patents in comparison with different technology areas identified from the IP litigation data. The figure suggests that the patents Microsoft acquired are complementary to its current patent portfolio. However, it is important to note that Nortel is not considered one of the incumbents

9 http://investor.google.com/releases/2011/0815.html (information retrieved 17.4.2012)

10 http://news.cnet.com/8301-1001_3-20075977-92/apple-rim-in-group-buying-nortel-patents-for-$4.5b/ (information retrieved 17.4.2012)

11 We assume that all firms have equal rights to the old Nortel patent portfolio through a cross license.

12 http://www.bbc.com/news/technology-17657205 (information retrieved 17.4.2012)

Figure 4 Correlation between technology areas, Google patent applications data and Google & Motorola applications data, USPTO from 2000 until 2011

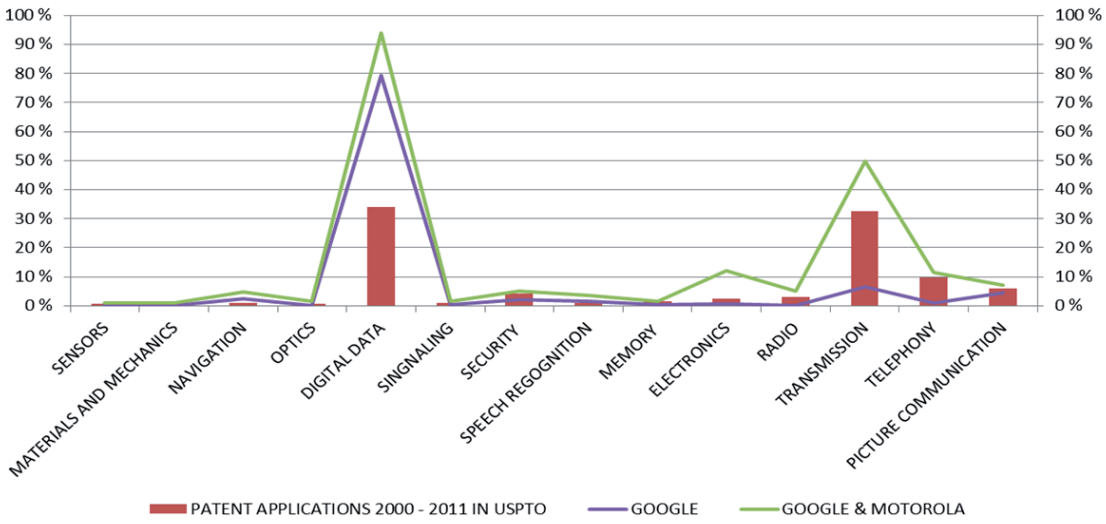
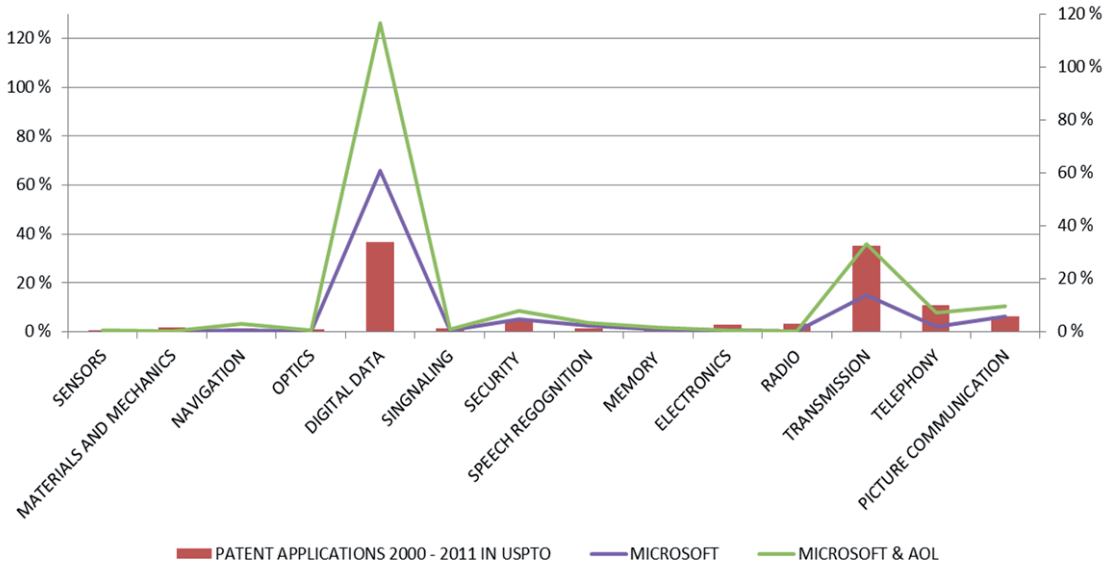


Figure 5 Correlation between technology areas, Microsoft applications and Microsoft & AOL applications in USPTO from 2000 until 2011



in mobile telecommunications; hence, Nortel apparently has significantly important patents due to the respective standards of mobile telecommunications (see Table 1).

Figure 6 shows Microsoft's position before and after the acquisition of Nortel patents in comparison with different technology areas. This IP acquisition seems to have been complementary to Microsoft's current patent portfolio. However, it is important to note that AOL is not considered one of the incumbents in mobile telecommunications; hence, AOL evidently has

Figure 6 Correlation between all patent applications in identified IPCs, Microsoft applications and Microsoft & Nortel application in USPTO from 2000 until 2011

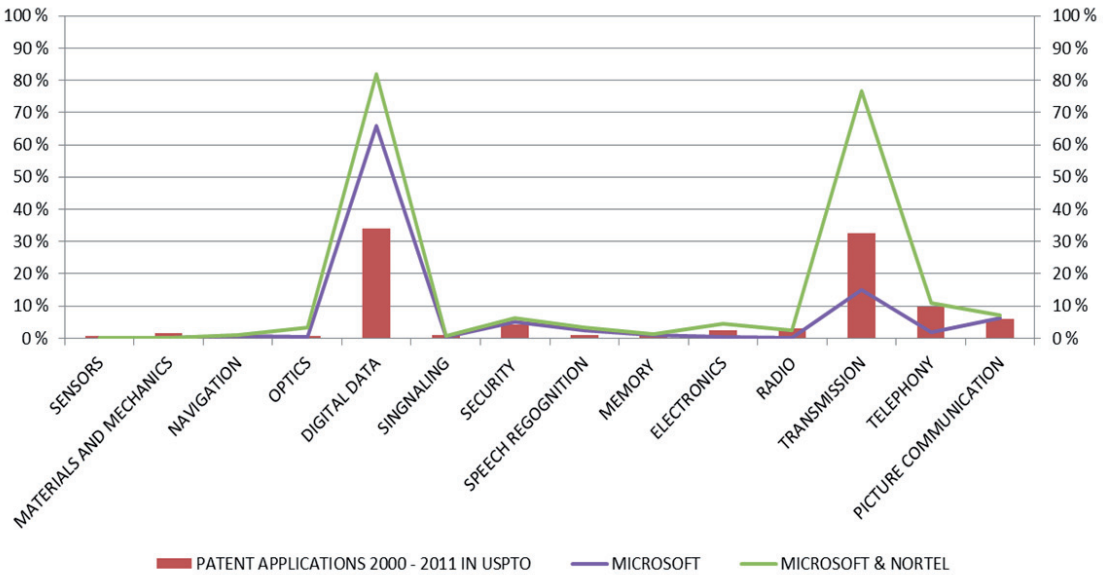
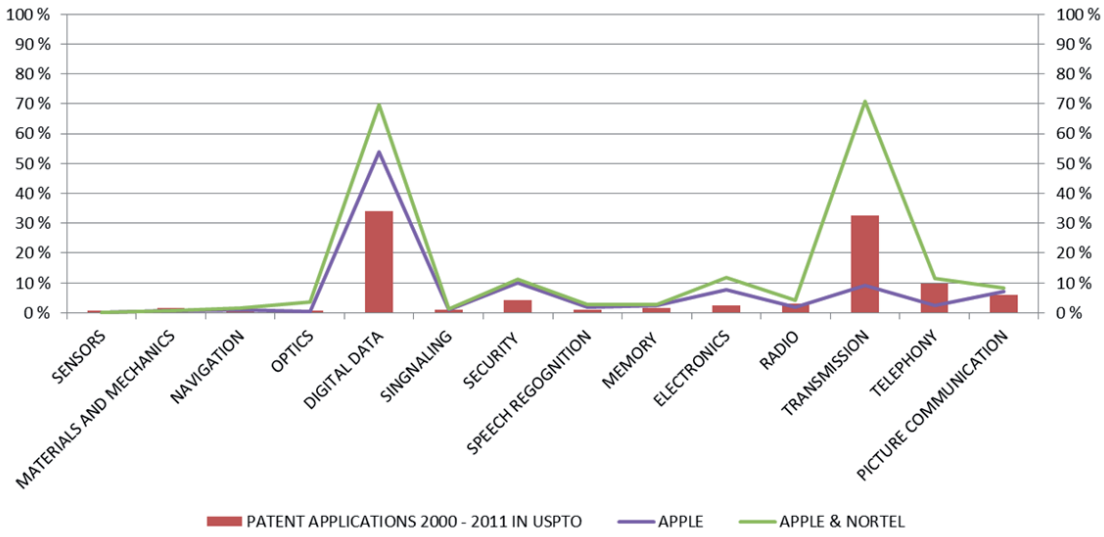


Figure 7 Correlation between all patent applications in identified IPCs, Apple applications and Apple & Nortel application in USPTO from 2000 until 2011



significantly important patents in the area of transmission and telephony due to its background in Internet services[13].

Figure 7 shows Apple's position before and after the acquisition of Nortel patents. It is also evident that this IP acquisition is due to the complementarity it brings to Microsoft's current pat-

[13] http://envisionip.wordpress.com/2012/03/28/289/ (information retrieved 22.5.2012)

ent portfolio. Nortel's patents significantly increases Apple's IP portfolio of mobile telecommunications. However, it is important to note that Nortel is not considered one of the incumbents in mobile telecommunications; hence, Nortel apparently has IP important to Apple in terms of current IP litigation against Google and Google's alliance network[14].

The new entrants Apple, Google, and Microsoft are acquiring IP that is complementary to their existing patent portfolios. All three cases show that the acquired IP represents significant additions to Apple's, Google's and Microsoft's current patent portfolios. The Apple versus HTC IP case demonstrates that Google has already been actively sharing acquired patents from Motorola across its alliance network. However, there is no evidence supporting that Apple and Microsoft have acted the same as Google.

7 Discussion and conclusions

Smart device markets are global, so IP litigation in smart devices has become global. This IP litigation game of operating system software is mainly played out in the US instead of Europe and China. Furthermore, the new entrants to smart devices (Apple, Google, and Microsoft) all come from US soil. The other commonality between Apple, Google, and Microsoft is that they all offer mobile operating system software to current smart devices. Because of the different market positions, the current strategies of Apple, Google and Microsoft for establishing their positions in the current market of smart devices differ from one another.

Apple, Google, and Microsoft all come from the world of platform creation so their patent strategies differ markedly from the old mobile telecommunications world of essential patents. The IP litigation game has been played out several times in the history of mobile telecommunications, but in the area of mobile telecommunications standards, but not in the area of smart device operating system software, where it is currently played out. This situation has arisen because the incumbents to mobile telecommunications using the Android operating system in their smart devices have suffered because Google did not hold ex ante licenses from Apple and Microsoft. We argue that this current IP litigation is only about the world of platform patents (i.e., new entrants into mobile telecommunications) and not about the world of essential patents (i.e., the old incumbents of mobile telecommunications).

The two regimes of IP are: 1) the world of essential patents (i.e., the old incumbents of mobile telecommunications) and 2) the world of platform patents (i.e., new entrants of mobile telecommunications). These two regimes meet in current IP litigation; however, based on our analyses, these two worlds continue to be two separate regimes as it comes to mobile internet. The future technologies e.g. HTML5 will further enhance this separation of two regimes.

The IP litigation data also illustrate that the new entrants Apple and Microsoft are attacking the Google alliance network because Google and the actual smart device distributors of Android operating systems do not hold ex ante licensees from Apple and Microsoft in their technology platform patent portfolio. The new entrants, Apple and Microsoft, seem to be winners in current IP litigation, and their IP is considered to have value in smart devices, while Google, because it does not have IP related to Android operating systems, and its alliance network

[14] http://www2.nortel.com/go/news_detail.jsp?cat_id=-8055&oid=100272100&locale=en-US (information retrieved 22.5.2012)

seem to be losing. The incumbents of mobile telecommunication, such as Nokia and others, continue to play important role regarding the value of their patent portfolios in smart devices, but only in the world of essential patents. Moreover ex ante licensing continues to be the main source for IP litigation.

Two observations can be made from the Apple versus Samsung patent disputes: 1) Apple's patents are only valid and protectable in USA, and therefore Apple will have difficulties leveraging on these decisions outside USA, for example in Europe and Asia; 2) Apple's patent portfolio outside USA is minimal, and therefore Apple will have challenges to protect sales of their products in Europe and Asia. Furthermore, in near future Apple is most likely forced to sign cross-licensing agreements with the old mobile phone incumbents e.g. Motorola Mobility.

A key technology area profile was created to analyze the current IP acquisitions of Apple, Google, and Microsoft and it showed that that the new entrants, Apple, Google, and Microsoft, are acquiring IP from the areas related to essential technology and are strengthening their current patent portfolios. Apple, Google, and Microsoft are able to support themselves and their alliance networks against IP litigation attacks from the mobile telecommunications incumbents, especially in the case of Google and its alliance network using the Android operating system. The IP litigations show that Google has actively offered the acquired patents from Motorola to HTC in HTC counterclaims against Apple. Hence Google is the only one that really needs to acquire IP to be able to support itself, but its alliance network as well.

The current IP litigation game in mobile telecommunications provides an interesting example of how an industry dominated by standards and essential patents in the late 1990s is transforming little by little into an industry increasingly dominated by technology platform patents and other IP. The two regimes of IP are formed inside one industry. These changes in industry structures have been facilitated by forces coming out IP litigation and from the world of technology platforms and respective patents. Furthermore the formation of new strategic alliance networks with a joint strategic interest in IP seems to be increasing.

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Appendix 1
Microsoft versus Motorola Mobility strategic litigation process

PLAINTIFF	DEFENDANT	DATE	DESCRIPTION	PATENTS	NOTES
Microsoft[15]	Motorola Mobility	1st October, 2010	Case no. 2:2010-cv-01577[16]) - United States district court for the district of Washington	5,579,517; 5,758,352; 6,621,746; 6,826,762; 6,909,910; 7,644,376; 5,664,133; 6,578,054; 6,370,566	5,579,517; 6,621,746
Microsoft[17]	Motorola Mobility	1st October, 2010; Supplemented 12th October, 2010[18]	Case No. 337-TA-744) - United States International Trade Commission (ITC)	5,579,517, 5,758,352, 6,621,746, 6,826,762, 6,909,910, 7,644,376, 5,664,133, 6,578,054, 6,370,566.	Same patents as in first patent infringement against Motorola Mobility with the United States district court for the district of Washington Verdict: Violation of patent 6,370,566[19]
Motorola Mobility	Microsoft		Counterclaim to Microsoft's first ITC complaint		See Case no. 3:11-cv-03136
Microsoft[20]	Motorola Mobility	9th November, 2010	Case no. 2:2010cv01823[21] - United States district court for the district of Washington	No patents listed	Microsoft files complaint against Motorola, over RAND licensing obligations
Motorola[22]	Microsoft	10th, November, 2010	First case no. 3:2010-cv-00699[23], later Case no. 2:11-cv-00343; Second case no. 3:2010-cv-00700[24]) - United States District Court for the Western District of Wisconsin	7,301,374; 7,310,375; 7,301,376; 6,980,596; 7,162,094; 5,319,712; 5,357,571; ~~6,686,931~~; 5,311,516; 6,069,896;	In February, 2011 the first Wisconsin infringement case was moved to United States district court for the district of Washington; In April, 2011 the second Wisconsin infringement case was moved to United States district court for the

[15] http://www.microsoft.com/en-us/news/press/2010/oct10/10-01statement.aspx (information retrieved 16.4.2012)
[16] http://dockets.justia.com/docket/washington/wawdce/2:2010cv01577/170688/ (intomation retrieved 16.4.2012)
[17] http://www.microsoft.com/en-us/news/press/2010/oct10/10-01statement.aspx (information retrieved 16.4.2012)
[18] http://www.itcblog.com/20101103/itc-institutes-investigation-337-ta-744-regarding-certain-mobile-devices/ (information retrieved 16.4.2012)
[19] http://www.itcblog.com/20111221/alj-essex-issues-initial-determination-finding-violation-of-section-337-in-certain-mobile-devices-337-ta-744/ (information retrieved 16.4.2012)
[20] http://www.fosspatents.com/2010/11/microsoft-sues-motorola-again-this-time.html (information retrieved 16.4.2012)
[21] http://dockets.justia.com/docket/washington/wawdce/2:2010cv01823/171570/ (information retrieved 16.4.2012)
[22] http://mediacenter.motorola.com/Press-Releases/Motorola-Mobility-Files-Patent-Infringement-Complaints-Against-Microsoft-34d6.aspx (Information retrieved 16.4.2012)
[23] http://dockets.justia.com/docket/wisconsin/wiwdc/3:2010cv00699/29135/ (information retrieved 16.4.2012)
[24] http://dockets.justia.com/docket/wisconsin/wiwdc/3:2010cv00700/29136/ (information retrieved 16.4.2012)

					district of Washington -
Microsoft	Motorola Mobility	25th, January, 2011	Microsoft's answer, defenses, and counterclaims to first patent infringement in United States district court for the district of Wisconsin	6,339,780; 7,411,582	
Microsoft	Motorola Mobility		Microsoft's answer, defenses, and counterclaims to second patent infringement in United States district court for the district of Wisconsin	6,374,276; 7,454,718; 6,822,664; 7,421,666; 6,256,642	
Motorola[25]	Microsoft	10th, November, 2010	Case no. 1:2010-cv-24063 - United States District Court for the Southern District of Florida	5,502,938; 5,764,899; 5,784,001; 6,272,333; 6,408,176; 5,757,544; 6,983,370	In August, 2011 the first Florida infringement case was moved to United States district court for the district of Washington
Microsoft	Motorola Mobility	23rd December, 2010	Microsoft's answer, defenses, and counterclaims to third patent infringement in United States district court for the district of Florida	6,791,536; 6,897,853; 7,024,214; 7,493,130; 7,383,460; 6,897,904; 6,785,901	
Motorola Mobility[26]	Microsoft	22nd November, 2010; Supplemented 14th & 15th, December , 2010	Case no. 337-TA-752) - United States International Trade Commission (ITC)	5,319,712; 5,357,571; 6,069,896; 6,980,596; 7,162,094	
Motorola Mobility[27]	Microsoft	23rd December, 2010	Case no. 3:2010-cv-00826, later 2;2011-cv-00595 in United States District Court	6,992,580; 7,106,358; 6,686,931; **7,088,220; 5,738,931**	In February, 2011 Motorola Mobility amends its third Wisconsin suit, adds two patents

[25] http://mediacenter.motorola.com/Press-Releases/Motorola-Mobility-Files-Patent-Infringement-Complaints-Against-Microsoft-34d6.aspx (information retrieved 16.4.2012)
[26] http://www.itcblog.com/20101221/itc-institutes-investigation-337-ta-752-regarding-certain-gaming-and-entertainment-consoles/ (information retrieved 16.4.2012)
[27] http://dockets.justia.com/docket/wisconsin/wiwdc/3:2010cv00826/29444/ (information retrieved 16.4.2012)

			for the Southern District of Wisconsin		
Microsoft	Motorola Mobility	19th, January, 2011	Microsoft's answer, defenses, and counterclaims in United States district court for the district of Wisconsin	6,374,276; 7,454,718; 6,822,664; 7,421,666; 6,256,642	
Motorola Mobility[28]	Microsoft	24th June, 2011	Case no. 3:2011-cv-03136 - United States district court for the Northern District of California	European patents listed	Motorola brings RAND-related counter-claims against Microsoft at the ITC (No. 337-TA-744) In November, 2011 Motorola's RAND counter-claims are transferred from Northern California to Western Washington

[28] http://dockets.justia.com/docket/california/candce/5:2011cv03136/242297/ (information retrieved 16.4.2012)

Appendix 2
Nokia versus Apple strategic litigation process from 22nd September, 2009 until 16th June, 2011

PLAINTIFF	DEFENDANT	DATE	DESCRIPTION	PATENTS	NOTES
Nokia[29]	Apple	22nd September, 2009	First patent infringement against Apple with the United States district court for the district of Delaware	5,802,465; 5,862,178; 5,946,651; 6,359,904; 6,694,135; 6,775,548; 6,882,727; 7,009,940; 7,092,672; 7,403,621;	The ten patents in suit relate to technologies fundamental to making devices which are compatible with one or more of the GSM, UMTS (3G WCDMA) and wireless LAN standards. The patents cover wireless data, speech coding, security and encryption and are infringed by all Apple iPhone models shipped since the iPhone was introduced in 2007.
Apple[30]	Nokia	11th December, 2009	Apple Inc.'s answer, defenses, and counterclaims to first patent infringement against Apple with the United States district court for the district of Delaware	5,634,074; 6,343,263 B1; 5,915,131; 5,555,369; 6,239,795; 5.315,703; 6,189,034; 7,469,381 B2; RE 39,486 E; 5,455,854; 7,383,453 B2; 5,848,105; 5,379,431	
Nokia[31], [32]	Apple	29th December, 2009	Nokia has filed a 1st complaint (No 337-TA-701) with the United States International Trade Commission (ITC)	6,714,091; 6,834,181; 6,895,256; 6,518,957; 6,073,036; 6,262,735; 6,924,789	The seven patents in this complaint relate to Nokia's pioneering innovations that are now being used by Apple to create key features in its products in the area of user interface, as well as camera, antenna and power management technologies. These patented technologies are important to Nokia's success as they allow better user experience, lower manufacturing costs, smaller size and longer battery life for Nokia products.
Apple[33]	Nokia	15th January, 2010	Apple Inc.'s counterclaim (No 337-TA-704) to 1st Nokia ITC claim	5,379,431; 5,455,599; 5,519,867; 5,915,131; 5,920,726; 5,969,705; 6,343,263; 6,424,354; RE39,486	
Nokia[34]	Apple	7TH May, 2010	Second patent	6,317,083; 6,348,894;	The five patents in question relate to

[29] http://press.nokia.com/2009/10/22/nokia-sues-apple-in-delaware-district-court-for-infringement-of-nokia-gsm-umts-and-wlan-patents/ (information retrieved 2.4.2012)
[30] http://www.apple.com/pr/library/2009/12/11Apple-Countersues-Nokia.html (information retrieved 2.4.2012)
[31] http://press.nokia.com/2009/12/29/nokia-requests-itc-investigation-into-apple-patent-infringement/ (information retrieved 2.4.2012)
[32] http://www.itcblog.com/20091229/nokia-files-new-337-complaint-regarding-certain-electronic-devices-including-mobile-phones-portable-music-players-and-computers/ (information retrieved 2.4.2012)
[33] http://www.usitc.gov/press_room/news_release/2010/er0125hh2.htm (information retrieved 2.4.2012)

			infringement against Apple with the United States district court for the district of Wisconsin	6,373,345; 6,603,431; 7,558,696	technologies for enhanced speech and data transmission, using positioning data in applications and innovations in antenna configurations that improve performance and save space, allowing smaller and more compact devices. These patented innovations are important to Nokia's success as they allow improved product performance and design.
Apple[35]	Nokia	28th June, 2010	Apple Inc.'s answer, defenses, and counterclaims to second patent infringement against Apple with the United States district court for the district of Wisconsin	5,946,647; 5,612,719; 7,710,290; 7,380,116; 7,054,981; 5,379,430; 7,355,905	
Nokia[36], [37] together with Intellisync Corporation	Apple	29th March, 2011	Nokia has filed a 2nd complaint (No 337-TA-771) with the United States International Trade Commission (ITC)	7,209,911; 6,212,529; 6,141,664; 7,558,696; 6,445,932; 5,898,740; 7,319,874	The seven patents in the new complaint relate to Nokia's pioneering innovations that are now being used by Apple to create key features in its products in the areas of multi-tasking operating systems, data synchronization, positioning, call quality and the use of Bluetooth accessories.
Apple[38]	Nokia together with Intellisync Corporation	16th June, 2011	Nokia and Apple filed their joint motion to terminate investigation No 337-TA-771		

[34] http://press.nokia.com/2010/05/07/nokia-sues-apple-in-wisconsin-for-infringement-of-nokia-patents/ (information retrieved 3.4.2012)
[35] http://dockets.justia.com/docket/wisconsin/wiwdc/3:2010cv00249/28263/ (information retrieved 3.4.2012)
[36] http://press.nokia.com/2011/03/29/nokia-files-second-itc-complaint-against-apple/ (information retrieved 3.4.2012)
[37] http://www.itcblog.com/20110330/nokia-files-new-337-complaint-regarding-certain-electronic-devices-including-mobile-phones-mobile-tablets-portable-music-players-and-computers/ (information retrieved 3.4.2012)
[38] http://www.usitc.gov/search-ui/search/C.view=default/results?q=337-TA-771&s=&sa=0&hf=20 (information retrieved 3.4.2012)

Appendix 3
Apple versus Samsung strategic litigation process from 15.4.2011–24.8.2012

PLAINTIFF	DEFENDANT	DATE	DESCRIPTION	PATENTS	NOTES
Apple[39]	Samsung	15.4.2011; amended 16th June, 2011 24.8.2012 infringement decision of six patents: 7,469,381; 7,844,915; 7,864,163; D618,677; D604,305; D593,087[40]	Case No. 4:2011cv01846[41] and 5:2011cv01846 in United District Court of Northern California	7,812,828; ~~7,669,134~~; 6,493,002; **7,469,381**; **7,844,915**; 7,853,891; ~~7,863,533~~; 7,663,607; **7,864,163**; 7,920,129 D627,790; ~~D602,016~~; **D618,677**; D617,334; **D604,305**; **D593,087**; D622,270; D504,889 3,470,983; 3,457,218; 3,475,327 3,886,196; 3,889,642; 3,886,200; 3,889,685; 3,886,197; 2,935,038; 85/041,463 (pending application)	Utility patents, Design patents, Trade dress registrations, and Apple trademarks
Samsung[42], [43]	Apple	27.4.2011	Case No. 5:2011cv02079[44] and 3:2011cv02079[45] in United District Court of Northern California	7,675,941; 7,362,867; 7,447,516; 7,200,792; 7,386,001; 7,050,410; 6,928,604; ~~6,292,179~~; ~~7,009,626~~; 7,069,055; 7,079,871; 7,456,893; 7,577,460; 7,698,711	Converts countersuit to counter claim in 30th June, 2012
Samsung[46], [47]	Apple	28th June, 2011	Samsung has filed a 1st complaint (No 337-TA-794) with the United States International Trade Commission (ITC)	7,706,348; 7,486,644; 6,771,980; ~~6,879,843~~; 7,450,114	

[39] http://www.fosspatents.com/2011/06/apple-amends-complaint-against-samsung.html (information retrieved 17.4.2012)
[40] http://news.cnet.com/8301-13579_3-57500273-37/apple-v-samsung-the-infringing-device-scorecard/ (information retrieved 10.9.2012
[41] http://dockets.justia.com/docket/california/candce/4:2011cv01846/239601/ (information retrieved 17.4.2012)
[42] http://news.softpedia.com/news/Samsung-Sues-Apple-in-the-US-Too-197655.shtml (information retrieved 17.4.2012)
[43] http://www.fosspatents.com/2011/07/samsungs-defense-against-apples.html (information retrieved 17.4.2012)
[44] http://dockets.justia.com/docket/california/candce/5:2011cv02079/240946/ (information retrieved 17.4.2012)
[45] http://dockets.justia.com/docket/california/candce/3:2011cv02079/240172/ (information retrieved 17.4.2012)
[46] http://www.itcblog.com/20110630/samsung-files-new-337-complaint-regarding-certain-electronic-devices-including-wireless-communication-devices-portable-music-and-data-processing-devices-and-tablet-computers/ (information retrieved 17.4.2012)
[47] http://www.fosspatents.com/2012/06/samsung-drops-patent-ahead-of-busy.html (information retrieved 10.9.2012)

Samsung[48]	Apple	28th June, 2011	Case No. 1:2011cv00573 in United District Court of Delaware	7,706,348; 7,486,644; 6,771,980; 6,879,843; 7,450,114	
Apple[49]	Samsung	5th July, 2011 amended 22nd July, 2011	Apple has filed a 1st complaint (No 337-TA-796) with the United States International Trade Commission (ITC)	7,479,949, RE 41,922, 7,863,533, 7,789,697, 7,912,501, D558,757, D618,678	
Apple[50]	Samsung	8.2.2012	Case No. 5:2012cv00630[51] in United District Court of Northern California	5,946,647; 8,086,604; 4,046,721; 8,074,172	

[48] http://dockets.justia.com/docket/delaware/dedce/1:2011cv00573/46608/ (information retrieved 17.4.2012)
[49] http://www.itcblog.com/20110802/itc-institutes-investigation-337-ta-796-regarding-certain-electronic-digital-media-devices/ (information retrieved 17.4.2012)
[50] http://www.fosspatents.com/2012/02/apple-requests-us-preliminary.html (information retrieved 17.4.2012)
[51] http://dockets.justia.com/docket/california/candce/5:2012cv00630/251113/ (information retrieved 17.4.2012)

Appendix 4
Apple versus HTC strategic litigation process

PLAINTIFF	DEFENDANT	DATE	DESCRIPTION	PATENTS	NOTES
Apple[52]	HTC	2nd March, 2010	First patent infringement against HTC with the United States district court for the district of Delaware	7,362,331; 7,479,949; 7,657,849; 7,469,381; 5,920,726; 7,633,076; 5,848,105; 7,383,453; 5,455,599; 6,424,354; 5,481,721; 5,519,867; 6,275,983; 5,566,337; 5,929,852; 5,946,647; 5,969,705; 6,343,263; 5,915,131; RE39,486	
HTC[53], [54]	Apple	18th August, 2010	HTC's answer, defenses, and counterclaims to first patent infringement against Apple with the United States district court for the district of Delaware	7,383,453 ; 7,657,849; 6,282,646 ; 7,380,116	
Apple[55]	HTC	2nd March, 2010; Decision: 19th December, 2011	Apple has filed a 1st complaint (No. 337-TA-710) with the United States International Trade Commission (ITC)	**5,481,721**; 5,519,867; 5,566,337; 5,929,852; **5,946,647**; 5,969,705; **6,275,983**; **6,343,263**; 5,915,131; RE39,486.	Decision: HTC violated **5,946,647** and **6,343,263**; And no violation of **5,481,721** and **6,275,983**
HTC[56]	Apple	12th May, 2010; Decision 17th February, 2012	HTC has filed a 1st complaint (No. 337-TA-721) with the United States International Trade Commission (ITC)	6,999,800; 7,716,505;, 5,541,988; 6,320,957; 6,058,183	Decision: No violation of 6,999,800; 7,716,505;, 5,541,988; 6,320,957; 6,058,183
Apple[57]	HTC	8th July, 2011; Supplemented 3rd August, 2011	Apple has filed a 2nd complaint (No. 337-TA-797) with the United States	7,844,915; 7,469,381; 7,084,859; 7,920,129; 6,956,564	

[52] http://www.apple.com/pr/library/2010/03/02Apple-Sues-HTC-for-Patent-Infringement.html (information retrieved 17.4.2012)
[53] http://www.ashurst.com/publication-item.aspx?id_Content=6089(information retrieved 17.4.2012)
[54] http://www.groklaw.net/article.php?story=20100823205223288 (information retrieved 17.4.2012)
[55] http://www.itcblog.com/20120111/itc-issues-public-version-of-opinion-finding-violation-in-certain-personal-data-and-mobile-communication-devices-337-ta-710/ (information retrieved 17.4.2012)
[56] http://www.itcblog.com/20110204/alj-bullock-issues-claim-construction-order-in-certain-portable-electronic-devices-and-related-software-337-ta-721/ (information retrieved 17.4.2012)
[57] http://www.itcblog.com/20110810/itc-institutes-investigation-337-ta-797-regarding-certain-portable-electronic-devices-and-related-software/ (information retrieved 17.4.2012)

			International Trade Commission (ITC)		
Apple[58]	HTC	11th July, 2011	Second patent infringement against HTC with the United States district court for the district of Delaware	7,844,915; 7,084,859; 7,920,129; 6,956,564	
HTC[59]	Apple	16th August, 2011	HTC has filed a 2nd complaint (No. 337-TA-808) with the United States International Trade Commission (ITC)	7,765,414 ; 7,417,944; 7,672,219; 6,708,214; 6,473,006 ; 7,289,772; 6,868,283 ; 7,020,849;	
HTC[60]	Apple	16th August, 2011	Second patent infringement against HTC with the United States district court for the district of Delaware	7,765,414; 7,672,219; 7,417,944	

[58] http://dockets.justia.com/docket/delaware/dedce/1:2011cv00611/46657/ (information retrieved 17.4.2012)
[59] http://www.itcblog.com/20110929/itc-institutes-investigation-337-ta-808-regarding-certain-electronic-devices-with-communication-capabilities/ (information retrieved 17.4.2012)
[60] http://dockets.justia.com/docket/delaware/dedce/1:2011cv00715/46858/ (information retrieved 17.4.2012)

Appendix 5
Other IP litigation from US

PLAINTIFF	DEFENDANT	DATE	DESCRIPTION	PATENTS	NOTES
Apple	Motorola Mobility			7,812,828; 7,663,603; 5,379,430; 7,497,949; 6,493,002; 5,838,315	
Motorola Mobility	Apple			5,311,516; 5,319,712; 5,490,230; 5,572,193; 6,175,559; 6,359,898; 5,359,317; 5,636,233; 6,246,697; 6,246,862; 6,272,333; 7,751,826; 5,710,987; 5,754,119; 5,958,006; 6,008,737; 6,101,531; 6,377,161; 5,710,987; 5,754,119; 5,958,006; 6,101,531; 6,008,737; 6,377,161	
Microsoft	Barnes & Noble; Foxconn; Inventec			5,778,372; 6,339,780; 5,889,522; 6,891,551; 6,957,233	
Sony	LG				LG infringed on Sony patents related to audio and microphone devices in phones, caller ID technology and transmission power.
Kodak	LG, Samsung			5,016,107; 5,164,831	
Kodak	Apple, HTC			7,210,161; 7,742,084; 7,453,605; 7,936,391	
Kodak	Samsung,			6,292,218; 7210,161; 7,742,084; 7,453,605; 7,936,391	
Kodak	Fujifilm			6,292,218; 5,493,335; 6,573,927; 6,441,854; 5,164,831	
Bedrock	e.g. Google, Yahoo			5,893,120; (5,893,129);	
Yahoo	Facebook			7,454,509; 7,599,935; 5,983,227; 7,747,648; 7,406,501, 6,907,566;	

				7,668,861; 7,269,590; 7,100,111; 7,373,599	
Yahoo	Google,				The case pits Google against Overture Services, an Internet advertising company bought by Yahoo last year. Overture claims it patented an online bidding system for ads seven months before Google introduced a similar system
Xerox	Google, Yahoo			6,778,979; 6,236,994	

Appendix 6
Technology category versus International Patent Categorization (IPC)

TECHNOLOGY	INTERNATIONAL PATENT CATEGORIZATION (IPC)
SENSORS	A61B5 G08G
MATERIALS AND MECHANICS	B82B E04B E05D F21V G01N
NAVIGATION	G01C G01S G01V
OPTICS	G02B G04G G03B
DIGITAL DATA	G06F G06K G06Q G06T G07C G10K
SINGNALING	G08B
SECURITY	G09C G09F G09G H04K
SPEECH REGOGNITION	G10L
MEMORY	G11B G11C
ELECTRONICS	H01F H01H H01L H01R H05K H01S
RADIO	H01Q H03B H03C H03D H03K H03L
TRANSMISSION	H03M H04B H04H H04J H04L H04Q H04W
TELEPHONY	H04M
PICTURE COMMUNICATION	H04N

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