# Patent Analysis on Mobile Operating System

**XuYang[1] XiaohaiDu[1] YangPeng[2]**

[1]Affiliation (*S*chool of Economics and Management Beijing University of Posts and Telecommunications)
[2]Affiliation (Beijing Unionread Information Technology Co., Ltd.)

**Abstract**

In recent years, with the contribution of Apple Inc., Google and Microsoft, mobile operating systems have made mobile phones much more useful and interesting than ever. Main mobile manufacturers tend to share the technology on mobile operating system to gain competition power, so are the telecom operators. As patents can perfectly show the R&D ability and intellectual property of one company [Ⅰ], by using patent-map method, we can get intuitive patent distribution situation [Ⅱ], and provide useful R&D information for Chinese telecom operators. In this article, we can conclude that although Chinese telecom operators possess fewer patents than others, they still have their chances.

**Keywords:** Mobile operating system; Patent-map analysis; Mobile phone manufacturers

## 1. Introduction

Since Apple Inc. announced its first Smartphone, Apple and its followers have greatly changed IT industry, people now prefer to smart phones with touch screen, virtual keyboard, gesture recognition function, lots of apps, and of course, a powerful mobile operating system. There are few mainstream mobile operating systems, such as iOS, Android OS, Windows Phone 7, and BlackBerry OS etc. Mobile OS developers can produce mobile phones by themselves, or just authorize the manufacturers and charge a compensation for each mobile they produce and sell. However, as global mobile phone market tends to saturation, competition between main mobile OS is getting more intense. Patent litigation is one of available powerful and useful ways for mobile OS developers to crush their opponents. For Chinese mobile phone manufacturers, if they want to improve product quality by researching and developing the relative technology, or to deal with the potential risk of patent litigation, it's necessary to analyze the relevant patents.

## 2. Approach and Data Collecting

According to a research implemented by WIPO (World Intellectual Property Organization), about 90% of the inventions and creations in the world are disclosed firstly in patent documentation; while European Patent Office thinks it may be 80%. What's more, Derwent (a famous patent publication organization) put forward that about 70%~90% of techniques that disclosed in patents can't be found in other technical literatures [Ⅲ]. Thus, it's necessary to analyze the patents to get useful information of particular applicant or particular technique. Among all patent analysis methods, Patent-Map analysis is a widely used one in developed countries, such as Japan [Ⅳ]. It's a statistical studying method and can show us overall in-

 

formation mainly in perspectives of time, area, individual applicant and technique category [Ⅴ].

The data collecting and processing tool used in this research is PIAS (Patent Information Analyze Software), which is developed by a subordinate enterprise of Intellectual Property Publishing House of SIPO (State Intellectual Property Office).SIPO cooperates with most influential patent office among the world, including EPO(European Patent Office), WIPO, USPTO(United States Patent and Trademark Office), etc. They share patent databases with each other.

In order to retrieve patents on mobile OS, we conclude several key words from relevant literatures, including "phone", "mobile", "portable", "handheld", "terminal", "software", "application", etc. and Chinese translations of said keywords.

To ensure the accuracy of search process, we carried out secondary search and further data processing. As a result, we got 1565 patents, while the patent-map analysis as follow.

## 3. Analysis

### 3.1 Overall annual patent application trends

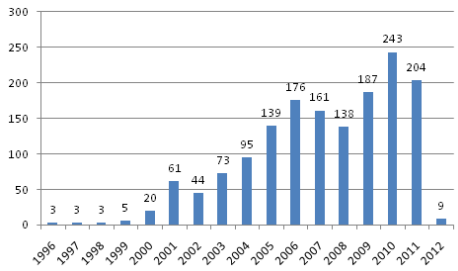


Fig. 1: Overall annual patent application trends

In patent analysis method, the overall patent application trend can show the concerned technique was popular or not in different times.

Figure 1 shows that the research on mobile OS began in 1996, but it was in 2000 the relevant study became popular. From then on, the patent application number kept increasing for 10 years; in 2010, there were 243 disclosed patent applications. After that, the application number declined slightly. So far in 2012, there are 9 applications have been disclosed already. The tendency shows that this technology could not been fully researched, Chinese mobile manufacturers still have the chance to strengthen their patent reservation.

### 3.2 The composition of major patent applicants

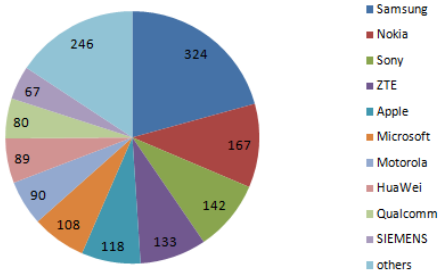


Fig. 2: Composition of major competitors

Figure 2 shows the top-10 applicants who have most disclosed patent applications and the patent number each applicant owes.

As we can see, Samsung has much more patents than the rest applicants. As a manufacturer, enough patents can be beneficial when negotiate or compete with the system developers. Some market research reports have shown that Samsung and Apple share over 90% of the profits in mobile industry, considering the endless patent litigation between them, we could say it's the patents grant Samsung the power of making money. The rest applicants are all powerful companies such as Nokia, Sony, Apple, etc. While each one's patent application number differs not too many. Additionally, two Chi-

nese manufacturers enter the rank, proving that Chinese applicants are already taking action in improving mobile OS technology and to prepare for the potential patent litigation risks.

### 3.3 Distribution of patents from the regional perspective

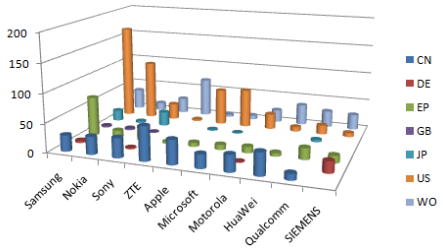


Fig. 3: The distribution of each applicant's patents in different regions

According to the comparison of patents every patent office received from different applicants, we could know the competition situation of patents in different markets.

Figure 3 shows that USPTO has received most patent applications, mainly due to Samsung, Nokia, Apple and Microsoft. Moreover, Samsung has more patent than other applicants. In China, ZTE and HuaWei have most patents than other applicants, Apple ranks 3rd. In WO, ZTE remains first place in patent numbers. While the rest applicants only applied few patents, indicating that they don't rely much on this part of market. In European district, Samsung owes most patents, only a few patents have been applied by other applicants.

Above analysis suggests that applicants such as Samsung are enthusiastically expanding their intellectual property rights to overseas markets to protect their marketing activities. In addition, China and United States are the most attractive markets; it means Chinese mobile manufacturers will have to face fierce competition.

### 3.4 Overall IPC analysis

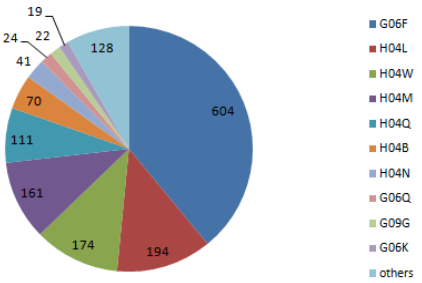


Fig.4: Overall IPC analysis

IPC (International Patent Classification) is a universal method of classifying and managing different patent categories. The IPC analysis can help us to know the key categories of patent applicants individually or as a whole.

In above figure, it is obviously that the category "G06F" (Electric Digital Data processing) ranks first place, the number of patents that belong to this category reaches to 604, far more than other categories'. The following categories are "H04L" (Transmission of Digital Information), "H04W" (Wireless Communication Networks), "H04M" (Telephone Communication) and "H04Q" (Selecting), each of these four categories has more than 100 patents. Exclude said categories, other categories has relatively few patents respectively.

Hence, Chinese mobile manufacturers should pay more attention to above categories when determine R&D strategy.

#### *A. Comprehensive analysis of applicants*

The R&D indicators can show us the statistics of every applicant's R&D resources and capabilities [Ⅵ]. There are 6 indicators as above table shows. Here we only present the statistics of top-10 applicants.

Table.1: KEY R&D INDICATORS OF APPLICANTS

| Applicant | Patent Office | Patent | Percentage | Year | Inventor | Patent |
|---|---|---|---|---|---|---|
| Samsung | CN[28],DE[4],EP[68],GB[3],JP[19],US[166],WO[36] | 324 | 20.72% | 12 | 479 | 3 |
| Nokia | CN[31],EP[13],GB[3],JP[3],US[103],WO[14] | 167 | 10.68% | 14 | 359 | 7 |
| Sony | CN[34],DE[2],EP[25],GB[1],JP[25],US[28],WO[27] | 142 | 9.08% | 14 | 203 | 5 |
| ZTE | CN[59],EP[3],US[3],WO[68] | 133 | 8.50% | 7 | 214 | 2 |
| Apple | CN[42],EP[7],JP[2],US[63],WO[4] | 118 | 7.54% | 11 | 219 | 4 |
| Microsoft | CN[24],EP[9],JP[1],US[67],WO[7] | 108 | 6.91% | 15 | 302 | 5 |
| Motorola | CN[29],DE[1],EP[11],US[27],WO[22] | 90 | 5.75% | 11 | 152 | 3 |
| HuaWei | CN[39],EP[6],US[8],WO[36] | 89 | 5.69% | 10 | 142 | 3 |
| Qualcomm | CN[11],EP[20],JP[4],US[16],WO[29] | 80 | 5.12% | 11 | 86 | 5 |
| Siemens | DE[22],EP[13],US[7],WO[25] | 67 | 4.28% | 13 | 132 | 8 |

"Patent office" can show the patents number every applicant holds in different patent offices, the more patents one applicant has in particular patent office; the more this applicant relies on the relative market. Also, one applicant may apply patents in many areas if this applicant wants to occupy these regions' markets.

"Years" is an indicator of how long one applicant has been carrying on researching these techniques. Longer research history shows one applicant pays more attention to the technology and starts R&D activities earlier; therefore it's more likely this applicant holds core patents.

"Inventor" is a direct indicator of how many resources one applicant has been putting into the R&D activities.

Comparing "Patent" with "Inventor", we can get the efficiency of R&D activities of each applicant; usually the efficiency is calculated via dividing patent numbers by inventor numbers.

"Patent life" is used to value how fast one applicant updates its technology. Generally speaking, the shorter patent life, the better R&D ability one applicant has.

If we take a brief comprehensive consideration of R&D ability and the history, we can find that although most top-10 applicants are foreign companies, but the Chinese applicants, also mobile phone manufacturers still show their strength. Furthermore, applicants such as Samsung, Sony, Motorola, etc. may all be potential partners or opponents of Chinese mobile manufacturers, because they hold many relevant patents, probably core patents in China.

## 4. Conclusion

First, the technology related to mobile operating system could not have been fully studied, that leaves a lot of space for Chinese manufacturers to carry out the re-

lated technology and supply essential patents.

Next, unlike the DVD case in 1990s, Chinese companies have already realized the importance of intellectual property rights and have been putting a lot resource into R&D activities and applying patents to protect intellectual property rights. In this case, Chinese manufacturers such as HuaWei and ZTE are outstanding other Chinese applicants. However, even Chinese applicants can increase their patent reservation in a relatively short time by applying patents which are not too important, it is still very hard to make breakthroughs in core techniques. However, foreign applicants, especially system developers and manufacturers started earlier in this area, they possess more core patents in home market and overseas, and have more bargaining power because of the non-substitutable patents.

However, Chinese mobile phone manufacturers still have their opportunity, because the mobile operating system they use most in manufacturing is Android OS, sometimes including Windows Phone 7 OS. These two mobile operating systems are developed by Google and Microsoft respectively.

As Google intend to defeat Apple, it charges no fee for using Android OS; Android OS is been used widely and becomes the mainstream now [Ⅶ]. Given this, Chinese mobile manufacturers have some policies, for instance, applying patents of moderate improvements or innovations, it can help effectively increase patent storage and bargaining power; balancing the use of Android OS and Windows Phone 7 OS; or trying to cross license with other manufacturers which have overcoming the patent litigation with system developers, etc.

## 5. Acknowledgment

This research is sponsored by the major project of Research of Mobile Internet Architecture, Next Generation Broadband Wireless Mobile Communications Network (2011).

## 6. References

[1] Wu Xinyin, Liu Ping, “The Initial Probing into Patent Map”, R&D Management, Vol.15, 2003

[2] Zhang Xian, Gao Lidan, Tang Chuan, Xiao Guohua, “Research and Application of the Patent Map”, Journal of Information, Vol.26, 2007

[3] Chang Fenfen, Huang Cuixia, “Analysis of LTE Patents Disclosed in ETSI”, Modern Science & Technology of Telecommunications, Vol.8, 2011

[4] Yang Bijia, Zhang Xu, “The Application of Patent`s Network Analysis in Technology Roadmap”, New Technology of Library and Information Service, Vol.5, 2008

[5] Yang Li, ”Patent Analysis Method and Limiting Factors in the Light of Patent Map”, Library, Vol.4, 2011

[6] Liu Ping, Wu Xinyin, Qi Changwen, “Application of Patent Map in R&D Management of Enterprise”, R&D Management, Vol.17, 2005

[7] Yao Yiwen, Liu Liguo, “Study of Android’s Architecture and Its Application Development”, Computer System and Applications, Vol.17, 2008