Patent Mapping

Case Study

Patent information Specialist: Åsa Fohlin

Our ref: 178116
Date of search:
Your ref: Case Study
Patent Mapping
Patent mapping is a graphical model of patent visualization. It is a way to process and analyze a large amount of documents in an easily understandable manner. A Patent mapping report contains a visual representation of the patents retrieved from a search, along with graphs and charts showing key patent assignees, patenting trends over time, collaborations, the technology development and how competition develops over time.

This case study is an example of how a report can look like and what kind of information you can expect. This case study contains two examples, a market analysis and a company analysis.
The Search
The search has focused on the following:

For a Patent mapping a broad search within the relevant technical field is needed in order to retrieve a relevant amount of documents forming the statistical basic data. The technical field is identified as: “Ball-point pen with a lamp arranged on it”. The purpose of the mapping is to map the main participants as well as their action.

A tailored search in Orbit Business IP was done in October 2013 and found 1763 patent families on the technical area and 5561 patent families on Pilot. Patent documents were searched without any limitations regarding countries or regions. No time limits were explicitly set, i.e. patents dating back as far as the databases used cover their publication were considered for the search and patent analysis. Different search concepts such as patent classification codes, keyword concepts in the title or index words in the abstract of the patent documents, as well as combinations thereof, were used to create a basic set of patent documents.

In the diagrams, year 2013 is always included in the analysis. However, due to the publication of patent documents 18 months from filing, collections for the last years are not complete. Two analyses were done, one on the technical area and one on a company.

The following databases have been used:
EPODOC
The analysis tool Orbit IP by Questel.
Figure 1: The historical application profile by earliest priority year.

Figure 1 shows the amount of priority documents in the technical area over time. What you can see is that filing starts mainly in 1999 and has increased since then. From 2007 to 2011 the number of priority applications has nearly doubled from 125 to 233. It should be noted that the patent dataset may be incomplete the two last years, due to publication timescales of eighteen months.

Figure 2: Top applicant
The diagram illustrates the total patent filings of the top ten companies in the technical area. The three leading companies are Pilot (34) followed by Pentel (219) and Mitsubishi Pencil (14). However, with a total number of 1763 patent families, it is not appropriate to select an outstanding leader in a top position. The quite small number of patent families for each of the top-10 companies indicates a large total number of assignees.

**Figure 3: Patent Mapping of the technical area of Ball-point pen.**

The picture maps patents within the technical area of Ball-point pens, every dot is one patent. The dots have a relation to each other and the more intense the concentration of patents the higher the topography as shown by contour lines. Where there are areas with lots of related patents you see mountains or even glaciers and in the sea there are very few related patents. The patents are grouped together according to the occurrence of keywords of documents in English with help of an algorithm. The words appear then on the map.

Figure 3 shows the Ball-point pen landscape and several key areas within this technology. You can see that the most related patents are in the area of “Inks” and “Flash lamps”. It is possible to focus on one of the technical areas. This study will focus on the technical area of Ball-point pens with some kind of lighting.
Figure 4a: Distribution of keywords for Ball-point pen with light.

Another way to cluster patents together with help of English keywords in the full-text document.
You can see that most of the documents are about Illumination (purple area), followed by Power sources (Orange area) and Battery anodes (Green area to the left). In every area you can find several subareas. If you look closer into those subareas and also plot the three companies with most patents (Mitsubishi, Pilot and Pental) you see within which technical area they are working.

Figure 4b: Distribution of keywords for Ball-point pen with light. ⓒ Questel
Figure 4b shows a deeper penetration of the keywords within the clusters and in what technical fields the patent-intensive companies are working.

Yellow – Mitsubishi Pencil
Red – Pilot
Green – Pental

Comparing the two last pictures (Figure 4b and 4a), it is seen that Mitsubishi Pencil works within the technical area of Inks and Pilot works more within the technical area of Pens.

These two companies are the most frequent companies when it comes to patents in this technical field. As you can see, they are not represented in so many subareas so there are lots of companies with few patents working in the other subareas.

Figure 5: The distribution of the Kind Codes

Kind codes:
A, A1, A2 – Patent application
B, B1, B2 – Granted Patent
U, U1, U2, Y – Utility models

About two thirds of all the documents are utility models. As we will see later most of the documents are from the Asian countries, where utility models are a quiet common form of protection, so it is not surprising to see many Utility models. About a quarter of documents are patent applications and a tenth are granted patents.
Figure 6: The distribution of the legal status.

This picture reveals that 54% of the total number of patent families are not valid, they have lapsed, expired or been revoked. About 31% of the patents are granted and about 13% are still pending. Only 55 patent families were in force during the whole patent life of 20 years before they expired.

Figure 7a: Filings per assignee and earliest priority year.

In the diagram you can see that Pilot files priority applications every year and has a top in 2003 with 7 priority documents in this technical area. Pentel has increased their
research and applied more in 2010-2011. BIC has not filed anything since 2006 and Cheng Lu has not filed anything since 2007.

What has happened to them? Cheng Lu is a paper company and they seem to have focused more on paper products. Bic, Zebra pen and Spark Gold potentially have left this technical area, ball-point pens with light.

It should be noted that the patent dataset may be incomplete the two last years, due to publication timescales of eighteen months.

![Figure 7b: Filings per assignee and publications years.](image)

In this diagram you see when the companies have published their patents, it is not focused on just one invention as in the diagram before.

Pilot publish applications every year and in 2004 had a peak with 8 publications. Spark Gold, Zebra Pen and Cheng Lu have not published anything since 2008-2009. Why? Have they focused their research on something else? Cheng Lu focus on paper products but Spark Gold and Zebra Pen seem to have left ballpoint pens with light.

Outwith the three largest companies, when it comes to patent filing you can see that the French company Bic publish patents every year. The more publications a company has the larger patent portfolio the company has.

You can note a year displacement from the last picture, since you have one year from filing of the priority document to file applications in other countries.

In the next pictures you will find out where the companies have their research and where they have their market.
Figure 8: Heat diagram of the search result by earliest priority year per priority country

Country codes:

AU = Australia  GB = Great Britain  TW = Taiwan
CN = China  JP = Japan  US = United States
DE = Germany  KR = South Korea  WO = World Intellectual Property Organization
EP = European Patent Office

The heat diagram shows filed priority documents per top ten countries over time. The result confirms the earlier picture that indicates that most development taking place in Asian countries.

Most of the priority documents have been filed in China, Japan and Taiwan followed by the United States. China is in leading position when it comes to research in this technical area, has an outstanding number of priority applications and is increasing every year, in contrast to the other countries where the priority application shows a decreasing trend since year 2003.

Pentel, an American company, is listed number two when it comes to filed priority documents in this technical area, see figure 2.

It should be noted that the patent dataset may be incomplete the two last years, due to publication timescales of eighteen months.
Figure 9: Top 10 protected markets


The map of the world shows the ten most protected markets in the world, based on the total patenting activity in terms of “publication country” in relation to the technology. The major part of the applications are filed in China (dark blue). We saw in figure 5 that two thirds of the documents were utility models and most of them are maybe filed in China. Since 2010 the number of Utility models is higher than the number of Patent applications, according to the European Patent Office (EPO).
Figure 10. Heat diagram over the search result by publication countries per publication years.

Country codes:
- AT = Austria
- AU = Australia
- BR = Brazil
- CA = Canada
- CN = China
- DE = Germany
- EP = European Patent Office
- ES = Spain
- FR = France
- GB = Great Britain
- HK = Hong Kong
- IN = India
- JP = Japan
- KR = South Korea
- MX = Mexico
- RU = Russia
- TW = Taiwan
- US = United States
- WO = World Intellectual Property Organization
- ZA = South Africa

On the previous page you saw a map of the world showing the market for the technical area. The diagram in Figure 10 illustrates it more with numbers of published patent application over time and in which country the application is filed. This way you see where the market for this technical area are and how it has changed over time.

We saw on the world map that some of the top ten countries were China, Japan, Taiwan, South Korea and the United States. What is seen here is that China are outstanding and have the most applications, and that they start to run away from other countries from 2002 onwards. Japan, Taiwan, South Korea and United States had a peak in 2005 and has since then decreased and they have about a tenth of the number of documents each compared to China. Except for the Top ten countries there are also markets for ballpoint pens with light in example Brazil, Mexico and India

Figure 11: The average age of family patents by assignee.

This picture show the average age of the patent family for the five most active companies in the technical area. You can see that Mitsubishi Pencil and Cheng Lu have technology that is oldest of these five assignees, 7 years, but they do not have so many patent families compare to Pilot. Beifa’s technology is new, it is as an average 3 years and they only have a few patents.
Figure 12: The distribution of the search result by IPC codes and by assignee.

The technique is divided into the IPC codes in the International Patent Classification System (IPC). One application can hold several IPC codes.

In this example the subgroup B43K – “Implements for writing and drawing” has most applications but in the diagram above the subgroup is divided to several subclasses that are beneath B43K in the hierarchical class system.

The largest number of application (1464) is found in the subclass with IPC code B43K-029/10 - “Combination of writing implements with illuminating devices”.

B43K-29/00 - “Combination of writing implements with other articles” holds 1009 applications.

The Pentel Company are involved in the first three IPC classes. B43K-029/10 (3), B43K-029/00 (3) and B43K-007/00 (6). B43K-007/00 – “Ball-point pens”.

Mitsubishi Pencil is only involved in B43K-007/00 (11) of these top 10 IPC classes.

Pilot’s patents are classified in B43K-029/10 (8); B43K-029/00 (15) B43K-007/00 (21); B43K003/00 (1); B43K023/00 (3) and B43K 023/08 (3)

We can even see here as we saw in Figure 2, that there are many more companies involved in this technical area, since the companies Pilot and Mitsubishi Pencil only have a small part of the classes B43K-029/10 and B43K-029/00. We can look closer into the IPC class B43K-029/10 - “Combination of writing implements with illuminating devices”; to see who else is working in this area.
Figure 13: Assignees for the IPC B43K-029/10 over time and the status on the patents.

We look closer into the largest IPC B43K-029/10 taken from Figure 12.
B43K-029/10 - “Combination of writing implements with illuminating devices”
We can see who else, besides Pilot and Mitsubishi, are working in this technical area and whether they have worked there for long-time.

Pilot, Shandong University and Zhejiang University have all 10 patents but Pilot have applied over time while Shandong only applied 2010-2011 and Zhejiang from 2009 till now. Universities usually work together with a company, but who?

Most of the documents that are alive are young but Yokohama plastic has one from 1996, 17 years. An important patent? They have not filed anything since year 2000, have they merged with another company?
Pilot, Pentel and Beifa have all their priority patents alive since 2002-2003, 11-12 years. They seem to find this technology important.

International Writing Institute has no patents alive in this IPC, the same for Shanghai Huangpu Xinling, Shanghai Business & Information and Duijang Qianli Station.
If we look closer into one of the top company working with ball-point pen, Pentel (Pilot will we dig deeper into later), we can see in which technical area are they working. The technical areas are specified from the International Patent Classification codes (IPC).

The picture shows that the biggest technical area Pentel is working within is C09D-011 – “Inks” Followed by G06F003 – “Arrangements for transferring data to be processed into a form handled by the computer”, both on the lower part of the circle. On the upper parts of the circle is three subclasses belonging to the subgroup B43K – “Implements for writing and drawing”; B43K-007 – “Ball point pens”; B43K-008 – “Pens with writing-points other than nibs or balls” and B43K001 – “Nibs”.

Figure 14: Technical area for Pentel
Pilot

It was seen in figure 2 that Pilot was the leading company in the technical area of Ball-point pens with light. We want to find out how they are filing, where their market are, which technical area they are working within and more. The total number of patent families is 5644.

![Figure 15: Priority publication for Pilot over time](image)

The diagram goes back to 1960 and what is seen is that Pilot file priority applications every year and that the amount is increasing over time. The filing of applications has gone up and down, in 1994 they had 262 application and then they dropped down to 156 in 1997. From 1997 has it been a weak increasing for 13 years and in 2010 it was up to nearly the same as in 1994, 252 priority applications.

It should be noted that the patent dataset may be incomplete, due to publication timescales of eighteen months.
Figure 16: Top 10 publication countries for Pilot.


The map of the world shows the ten most protected markets for Pilot, based on the total patenting activity in terms of “publication country”. This picture show an overview of the market for Pilot. The market is largest in Japan (dark blue). Pilot are a Japanese company. The second largest market is China (middle blue) followed by USA, Canada, South Korea, Taiwan, Great Britain, France and Germany.
Figure 17: Heat map for Pilot and the publication countries over time.

Country codes:

AT = Austria  
AU = Australia  
BR = Brazil  
CA = Canada  
CH = Switzerland  
CN = China  
DE = Germany  
AU = Australia  
BR = Brazil  
CA = Canada  
CH = Switzerland  
CN = China  
DE = Germany  
EP = European Patent Office  
ES = Spain  
FR = France  
GB = Great Britain  
HK = Hong Kong  
IT = Italy  
JP = Japan  
kr = South Korea  
RU = Russia  
SG = Singapore  
TW = Taiwan  
US = United States  
WO = World Intellectual Property Organization

The number of publications per year in Japan is much larger than in the rest of the countries and is increasing over time. Pilot is a Japanese company. Publications in China have increased a lot over the two last years, bearing in mind that these figures may not be complete. Publications from USA, Canada and European Patent Office (EP) have decreased since 2002.

It is interesting to see that Switzerland is in this diagram but without any publication. If I look further back in time it shows that Pilot have publications in Switzerland but only a few each year and it stops in 1992.


It should be noted that the patent dataset may be incomplete, due to publication timescales of eighteen months.
Figure 18: Patent classifications for Pilot over time.

This diagram shows in which technical areas, defined as the International Patent class codes (IPC), Pilot are working. Pilot has most patent application in IPC C09D-011 "Inks" followed by B43K-007 "Ball-point-pens".

It is interesting to see that research on "Nibs", "Erasers" and on "Combination of writing implements with other articles" has increased the last years and the number are incomplete so there may be more patents to come.

B43K-0021 - "Propelling pencils" B43K-023 - "Holders or connectors for writing implements" and B43K-003 - "Nib holders" have decreased since 2009

It should be noted that the patent dataset may be incomplete, due to publication timescales of eighteen months.
If we focus on the largest IPC class for Pilot, C09D-011, “Inks”, we see other actors who are working in this technical area. Here you see companies working with film and camera like Fujifilm, Canon, Ricoh and Konica but also chemical companies like BASF, Toyo ink and Dainippon ink.

Figure 19: Top 10 Assignees for IPC C09D-011

If we focus on the largest IPC class for Pilot, C09D-011, “Inks”, we see other actors who are working in this technical area. Here you see companies working with film and camera like Fujifilm, Canon, Ricoh and Konica but also chemical companies like BASF, Toyo ink and Dainippon ink.
Figure 20: Top 10 Priority countries for Pilot

The map covers national priority applications. Priority applications filed at the European Patent Office (EP) and to World Intellectual Property Organization (WO) are not included.

Looking at the priority document indicates where the development has been performed. This world map shows an overview of the countries where Pilot has done their research. The development is focused to Japan (dark blue) followed in light blue with China, The United States, Great Britain, France, Canada, Russia and Italy.

Figure 21: Collaborators to Pilot.

This figure gives a clear picture of which companies Pilot is working with. The information is taken from the patent assignement field on a patent application and you can from there find out who Pilot is working together with.
**Summary**

This landscape report was done on the technical area of Ball-point pen with some kind of light on it. The total number of patent families were 1763. The study show that the filing started in year 1999 and has increased over time. There are three large actors in this technology: Pilot, Mitsubishi Pencil and Pentel, but they were not overwhelming in terms of number of applications, so it is easy to understand that there are lots of small actors with just a few applications.

Mitsubishi Pencil and Pilot are Japanese companies and when it comes to filing it showed that two thirds of the documents were Utility models and only ten percent were granted patents. We could also see that most of the patents were young and very few of the patents were kept as long as 20 years.

PRV InterPat aims to carry out all requests accurately and thoroughly, but due to the extensive amount of information involved we cannot guarantee that the results are always exhaustive.

PRV InterPat is bound to observe professional secrecy with regard to every search request, as well as the search result. This directive is supported by chapter 31, §12 of the Swedish Secrecy Act (2009:400). Documentation is delivered exclusively to the client, and may not be cited as a hindrance to novelty in a subsequent application.

Please note that PRV retains all material sent in, including models.