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A rapid analysis of Avian Influenza patents in the Esp@cenet® database – R&D strategies and country comparisons

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Abstract

Avian Influenza is a very hot field. In this rapid analysis we show how patents can be used to rapidly determine the trends of R&D in this field as well as some differences between different groups of countries, academic institutions and companies.

Keywords: Avian Influenza; Avian flu; Bird flu; Patent analysis; APA; Automatic analysis; Strategy; China; USA

1. Introduction

Many companies are developing R&D today in the field of Avian Influenza because of its impact on birds, poultry and eventually humans. This prompted us to make a rapid analysis from the European Patent Office Database to pinpoint how patents can be used to determine the various strategies developed today, not only by firms, but also by countries.

This example, as a real case study, has been used during the course of Competitive Intelligence[1] which has been given in Shanghai in February and March 2006.

The goal of the present paper is to show to students (Masters Degree) that strategic information is not only in classical scholarly papers, but very often patents.

2. Material and method

We used the Esp@cenet® Database to retrieve patents dealing with the Avian Influenza, or avian flu or bird flu or H5N1 as shown in the search strategy below. This database is free and is the best compromise between quality and cost. It covers 72 countries and in September 2005 it contained 59 millions patents (http://www.kfh.ch/uploads/kdbs/doku/Patentinformationen-f-0306.pdf).

The software used to download and to analyse the result was Matheo-Patent [1]. The search was conducted on March 16th 2006. The number of patents retrieved was 48, the bibliographic data were downloaded and analyses were performed to show the various trends and applicants in this field.

3. The result of the search

(extract from the automatic report of Matheo-Patent)
From data of March 14th 2006

Avian Influenza [48 Families – 48 Patents][EPO]: (avian AND influenza) OR H5N1(TI) OR H5N1(AB) OR (bird? AND flu(TI) OR (bird? AND flu(AB)) OR (avian AND flu(TI)) OR (avian AND flu(AB))

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[1] Master in Competitive Intelligence and Industrial Vision. Cooperation between the Brilliance Group Co Ltd from Shanghai (China) and the University of the Méditerranée (University Aix-Marseille II, France).

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64 Applicants; 103 Inventors; 14 IPC4; 95 IPC; 26 ECLA;
PD Year: 2005 [25] 2003 [7] 2004 [6] 2002 [4] 1999 [3] 2001 [2] 1998 [1]
App.: shenzhen taitai genetic engine (cn) [3] medimmune vaccines inc (us) [3] fouchier ronaldus adrianus mar (nl) [2] tang roderick (us) [2] cattoli giovanni (it) [2] gao ping (cn) [2] fernandez siurob isidro (mx) [2] osterhaus albertus dominicus m (nl) [2] univ michigan (us) [2] haller aurelia (us) [2] vironovative bv (nl) [2] marangon stefano (it) [2] capua ilaria (it) [2] xu jiang (cn) [2] subbarao kanta (us) [1]
Inv.: haller aurelia (us) [5] tang roderick (us) [5] qin zhifeng (cn) [4] fouchier ronaldus adrianus mar (nl) [4] osterhaus albertus dominicus m (nl) [4] zhong anqing (cn) [4] jin xianzhong (cn) [3]
IPC4: a61k [30] c12n [22] c12q [16]
IPC7: a61k39 [22] c12n15 [18] c12q1 [15]
IPC: g01n33/569 [10] c12q1/68 [10] a61k39/145 [9] a61k39/12 [9] c12n7/00 [9] c07k14/005 [9] c07k14/11 [6]

The search for the terms "aviary AND flu" gave no result.

4. Analysis of the applicants

The analysis of the applicants gives the following results:

(A) Histogram of the main applicants: (the list of applicants has been given above in the result from the Matheo-Patent automatic report (Fig. 1).

(B) Groups of applicants per countries of origin: One goal of this paper being to give the trend in research and innovation in the field of Avian Influenza, we regrouped the applicants by countries of origin to see the possible differences in R&D between various countries. The histogram of the groups of countries is presented below (Fig. 2).

(C) Relationships between applicants: To determine the R&D trends in the various countries (from the groups of patents) we must know if links between the different groups exist. These links will be due to some co-applications with applicants of different countries. To get this result we made the network of Groups and Applicants. To build this network is easy; we have first grouped the patents by countries, but, applicants of different countries may collaborate and then they will appear simultaneously in different groups. For instance patent A (Applicants from USA and Netherlands), patent B (Applicants from USA

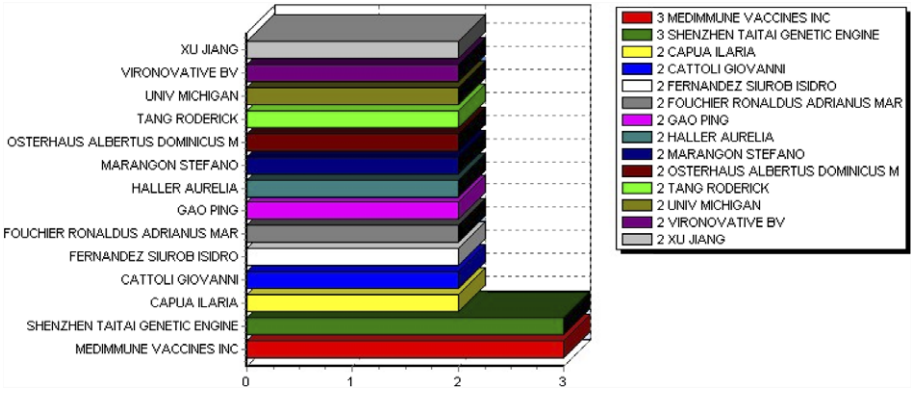


Fig. 1. List of the main applicants (frequency ⩾ 2).

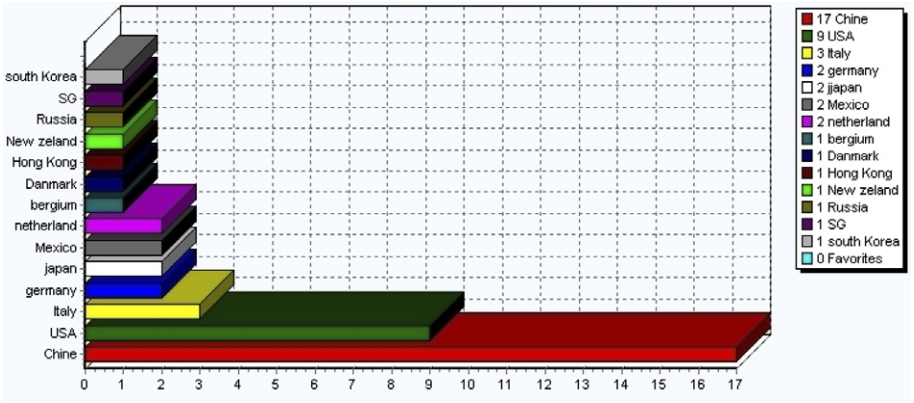


Fig. 2. Histogram of the groups of applicants per countries.

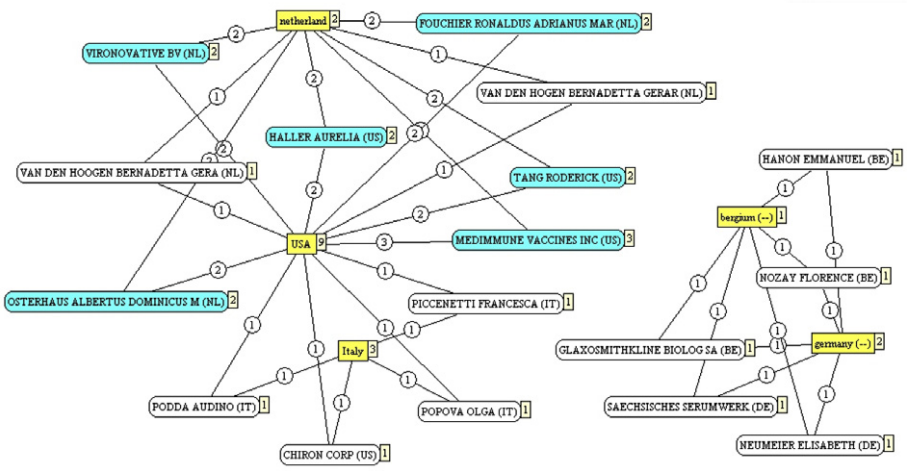


Fig. 3. Links between the different groups.

and Italy), etc. This means that patents A and B are part of a network where USA is linked to Italy and Netherlands. To do it on the whole groups of patent, and to get the network presented below, we built up automatically the networks between applicants and groups.

The network is presented in Fig. 3.

It is possible also to see the applicants that are standing alone. This is sometimes important when lists of applicants are analysed to see their competences (using IPC) or cooperation between them.

5. Main IPC involved in the selected patents

The IPC (International patent Classification) will give the information on the area of research and application. As quoted by Ernst [3] "The ability of patent information to measure R&D activities is attributed to some unique characteristics of patents [4,5]. First, patents are available even for companies that are not required to publish R&D figures and they can be allocated to subfields of interests, i.e., to companies, business units, products, technological fields or inventors. The advance of patent databases has greatly enhanced the possibilities for systematic data retrieval on a large scale. Second, patents are an objective measure of R&D activities, since a patent will be examined and eventually granted by the patent office. Furthermore, a large amount of technological information is contained in patents which are uniformly classified according to the International Patent Classification scheme This eases the analysis of specific technological aspects and allows the coverage of international technological developments, which gains importance in the light of increasing global competition. In addition, a patent presents a patentee's non-negligible expectation as to the ultimate utility and marketability of the invention. We may use the IPC limited at the first 4 digits to have a broad view of the differences between R&D, or we may used the classification with 8 digits to be more precise [6]. We will not use the EC (European Classification), which is globally more precise because we have an important group of patents from China, and these patents do not have the EC.

The histogram of the main IPC (4 digits) is presented below Fig. 4.

The meaning of the various IPC may be obtained either by searching the Internet [7] or by using the list of IPC (4 digits) provided by Matheo-Patent.

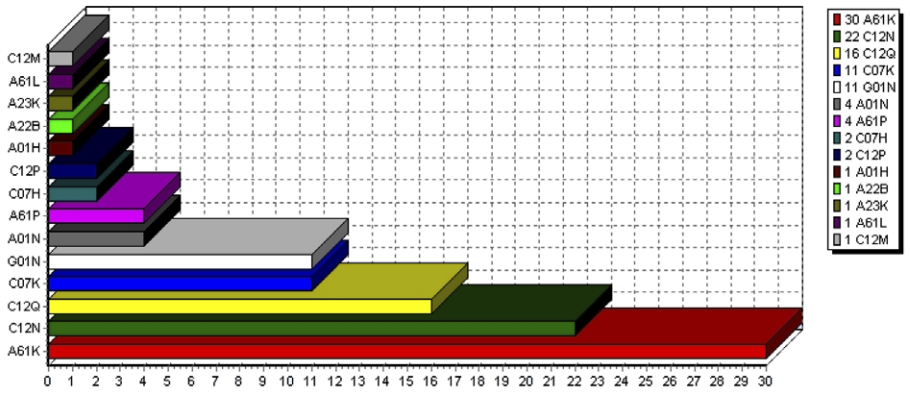


Fig. 4. Histogram of the IPC (4 digits).

For instance:

C12Q: Measuring or testing processes involving enzymes or micro-organisms (immunoassay G01N 33/53); compositions or test papers therefor; processes of preparing such compositions; condition-responsive control in microbiological or enzymological processes.

6. Strategies by countries and innovative potential

To indicate the area of R&D in various countries, and to see if some areas may indicate different research paths, we made the following assumptions:

- If an IPC stands alone and is not shared by other groups or other applicants, this is a potentially innovative area. This is because this area of development has not yet been shared by other Applicants in a common area (here the Avian Influenza). Of course if the frequency of the link between the applicants and the IPC is high, the "innovation" label of this development will be less obvious.
- If an IPC is shared by various groups (then by various applicants), this area is not a potential innovation. This is because if the same IPC is shared by several applicants at the same time, the innovative potential of the development will be lower than in the former case.

Generally speaking this method is often used to see a new area of research coming up in a field of science and development. In this situation, the innovation frequency threshold must be low, and another criteria which will reinforce the potential of innovation will be to appear in a few institutions only, preferably a unique one.

To get the results, we may proceed by building up the network of Groups and IPC or by building a matrix between groups and IPC. This is what is called APA (automatic patent analysis) [8] which refers to bibliometrics for the whole correlation process.

We choose both ways: to get a broad view of the areas of R&D which are specific to a group of countries we draw up the network between groups and IPC (4 digits) and to be more precise and get a better representation, we built the matrix between groups and IPC (8 digits).

(A) A broad view of the areas of R&D: From this network we can see than only two countries, China and Italy, which show some areas of R&D which are unique and not shared with other groups. This underlines, for these two countries a possible potential for innovation (Fig. 5).

To verify this hypothesis, we may look to the title of the various patents with IPC A22B (Italy) and A61L, A23K, A01H, C12M (China) (Table 1).

These titles and abstracts show that the R&D seems very different in the Italian patent from the Chinese patents. We downloaded the text of the patents, but although for the Italian one the text was in English, for the Chinese patents the text is in Chinese for most of them. We could made the translation of the Chinese patents, but the objective of this paper being to show that we can rapidly made an analysis of the differences in application from countries to countries, we think that to use the titles and abstracts is sufficient for most people.

(B) Analyzing the differences in depth: The matrix shows the same results as the network but is easier to produce because the later is complicated and must be arranged manually by means of drag and drop [9]. This result allows

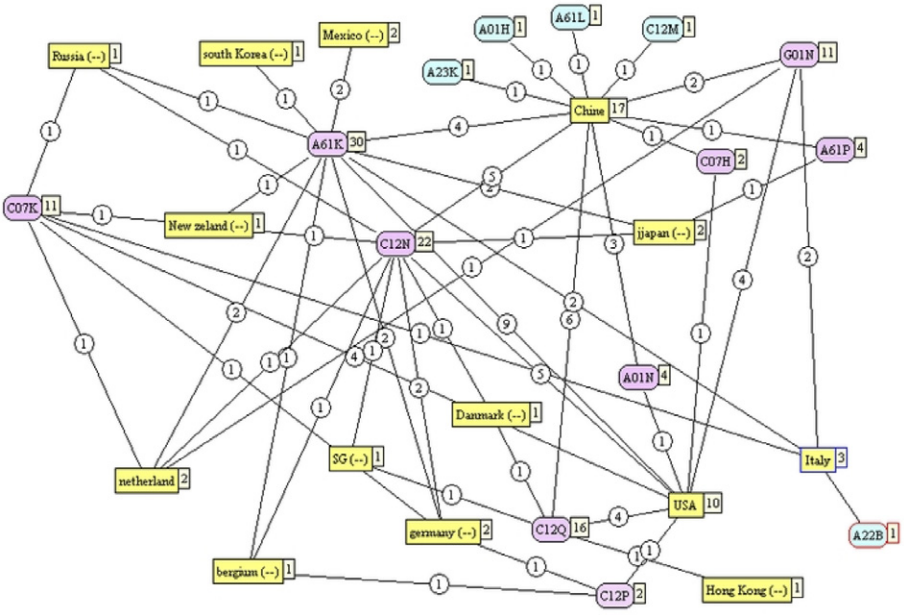


Fig. 5. Networks between IPC (4 digits) and country groups.

Table 1
Title and abstracts of the patents with IPC not linked

A22B – Italy *WO2005095974*	Differentiation assay for AIV infected birds A method for diagnosing Avian Influenza virus infection in a bird, the method comprising the following steps of providing an antibody sample from a bird to be tested and determining whether the sample comprises antibodies to non-structural protein 1 (NS1) of an Avian Influenza virus, the presence of anti-NS I antibodies being indicative of infection of the bird with Avian Influenza virus. Preferably, the method comprises contacting the sample with a non-structural protein 1 (NS 1) of an Avian Influenza virus, or a fragment or variant thereof (or fusion of the same), and determining whether antibodies in the sample to be tested bind thereto, for example using an indirect ELISA or immunofluorescence assay. The invention further provides a kit for performing the methods of the invention. A method for preventing AIV spread by destroying birds that were found to be infected using the diagnosis of the invention is claimed
A61L – China *CN1653909*	Chinese medicinal incense for disinfecting and sterilizing air to prevent livestock bird flu from cross contaminating to human being The present invention relates to air sterilizing technology, and is especially one kind of Chinese herbal medicine incense to kill bacteria in the air and prevent the cross infection of bird influenza. The incense is produced with isatis leaf, honeysuckle, skullcap root, dandelion, white peony root and other 19 kinds of Chinese medicinal materials, and through drying in the sun, crushing into 180–200 mesh, mixing, adding combustion assistant and root powder and extrusion. The present invention has simple production process, convenient use and no toxic side effect on human body and animal
A23K – China *CN1663424*	Feedstuff addictive and its preparing technology and application in process for manufacturing birds flu-preventing feedstuff The invention discloses a feed addictive with its preparing technology and application in producing feedstuff on anti-birdí s flu. By means of inoculating medicinal fungus into all character base material comprised of drug character base material and nutritional base material, adjusting fermentation conditions, it will gain the feed addictive collecting drug character fungus after fermentation spanning some time. This feed addictive can enhance animalsí immunity and used to produce feedstuff on anti-birdí s flu. The equipment has simple technique, low coat and be green and environmental protection
A01H – China *CN1333370*	Crops capable of resisting virus diseases of poultry and production method thereof The present invention discloses a crop capable of resisting one kind, two kinds of three kinds of fowl viruses of Avian Influenza, Newcastle disease and infective cloacal bursa disease and its production method. It is characterized by that the active antigen protein in the crop is obtained by virus RNA inverse transcription, and can encode complete DNA sequence of correspondent HA, F and VP2 protein, and is summation of three-dimensional structure formed in root, stem, leaf and seed of the crop. Said invented production method includes the following processes: insertion of HA, F and VP2 hologene into plasmid vector, expression of recombinant plasmid transferred into plant, pairwise hybridization of plants which respectively possess the action of resisting the above-mentioned three viruses or simultaneous hybridization of three plants, planting the different transgenic seeds into soil to obtain crops which can be used as raw material of feed and feeding fowl with feed containing recombinant active protein
C12M – China *CN1442485*	Method and device for identifying pathogenic influence of concurrent bacteria infection against poultry influenza virus infection A method for determining the pathogenic affection of concurrent bacterial infection to Avian Influenza virus includes such steps as inoculating the bacterium able to secrete subtilisinoid and/or the bacterium able to secrete tryptase and the low-pathogenicity Avian Influenza virus in culture medium of CEF in a particular mode, culturing, and observing if CPE presents. Its cell culture equipment is composed of cell culture bottle and bacteria culture chamber. Its advantages are simple method, short time, high correctness and low cost

a rapid comparison of the R&D trends in various countries. It can be also considered as a rapid benchmarking between various countries, showing to experts some areas that must be analyzed to detect possible innovations. A brief analysis of the matrix emphasizes the innovative potential of USA and Asia (Figs. 6 and 7).

7. Strategies by companies

We analysed the results above by building a matrix between applicants and IPC at 4 or 8 digits.

Other correlations can also be made, with dates, priority dates, inventors, etc. Because these treatments have been described in detail in former work, we will not present them here [2].

We may notice also, that the Chinese applicants are mostly Universities and Research Centres. From there, using the World Wide Web and making a simple search with Google or Google scholar [10] and the Universities or Institute names, it is possible to access to the scientific publications and other important details to understand part of the strategy difference.

8. Clusters of inventors

It is sometimes useful to detect the groups of inventors that are related together because they appear simultaneously (but not all in the same time) in various patents. To reach this objective we built the network between the inventor fields and we obtained the above results (Fig. 8).

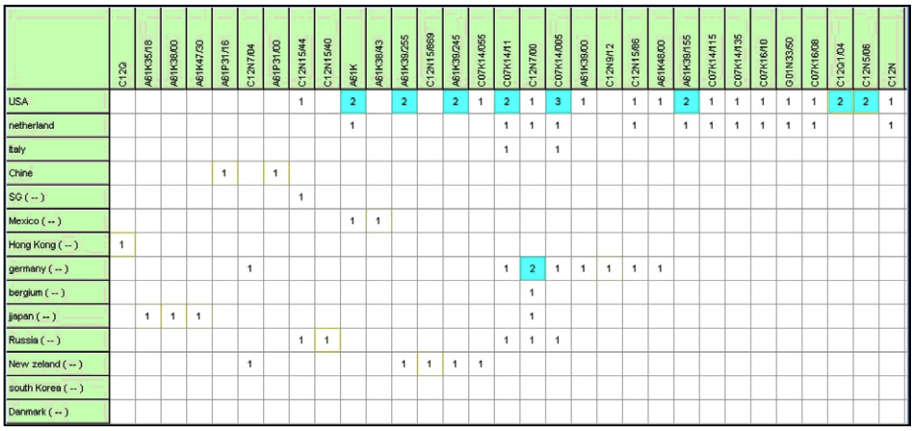


Fig. 6. Matrix between IPC (8 digits) and Country groups, first part.

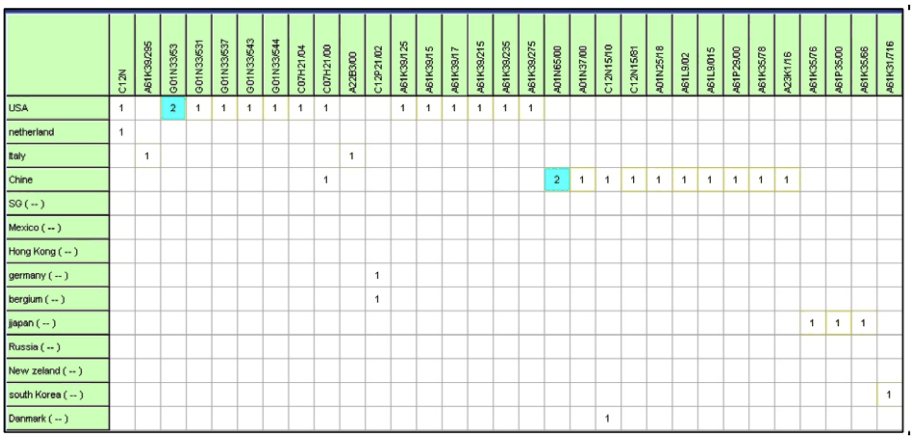
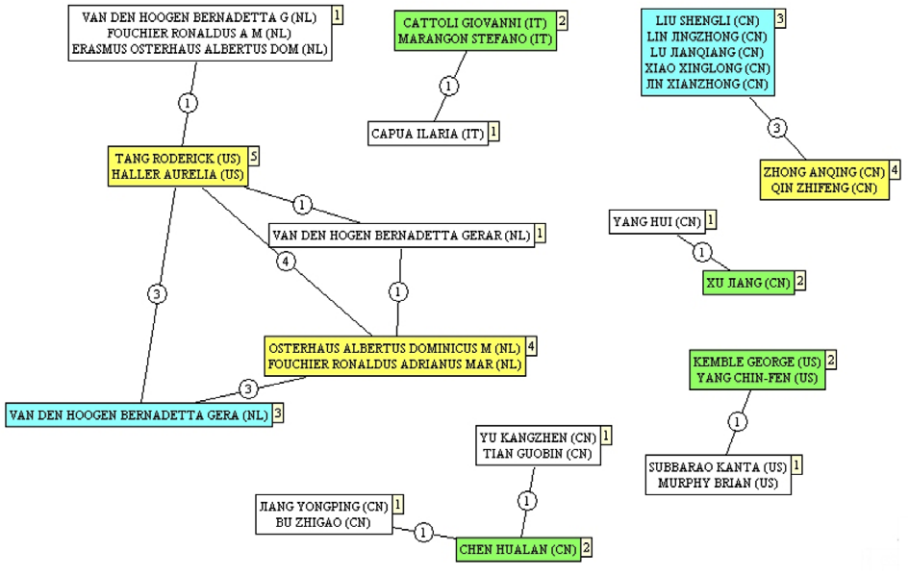


Fig. 7. Matrix between IPC (8 digits) and Country groups, second parts.



9. Conclusion

In this brief search and analysis, we show that APA (Automatic Patent Analysis), is a powerful tool to obtain an overview of a subject. It can also be used to follow or benchmark the R&D of various applicants and countries. The extension to country groups is very interesting because it pinpoints differences in R&D which may reflect a different social approach to the problem.

In the present case, it is obvious that the small number of patents selected (more will be coming in the following years) makes the task easier. But, by ''playing'' with the low and high frequency of links or items such as IPC, applicants and dates, working on a larger number of patents is quite possible.

It is obvious that the number of patents retrieved is small, but this is always the case when you are at the beginning of a research field. Of course a lot of patents exist if you search only with the term ''influenza''. But the present work is linked to innovation, and innovation is always linked to weak signals. Waiting to analyse a larger number of patents in the field of ''Avian Influenza'', will lead a company or a laboratory to miss some weak signals which may be useful in research application or to make useful contacts with companies or inventors.

We use often this rapid but powerful method in competitive intelligence to provide to the experts the necessary overview of the information which will enable them to perform SWOT or other strategic analysis. This is also, because of the very low cost of the search one of the best way to test all ideas of researchers or company executives.

In the field of education the combination of APA and hot topics such as the ''Avian Influenza'' in the present case, shows very clearly the unique information potential of patents on the one hand, and also introduce some patent knowledge in the educational field.

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[10] From the WWW on: http://scholar.google.com (accessed 29.01.2006) for accessing the academic papers or citations.

Henri Jean-Marie Dou, obtained a Ph.D. in Organic Chemistry as well as a title of Petroleo-Chemical Engineer at the University of Marseille. For 20 years he was Director of Research at the CNRS in Chemistry. In the year 1980, he left the CNRS to join the University of Aix-Marseille III as Professor in Information Science. He specializes in Technology Watch, Competitive Intelligence, Information Analysis and Regional Development. During the last 10 years, most of this work has been oriented to international cooperation (Europe, Brazil, Indonesia, China, and Malaysia).

Ying Bai obtained her graduation in China and in Japan. She came to Marseille to work for a PhD under the direction of Prof. Henri Dou. She obtained her PhD in May 2006. She specialized in Competitive Intelligence and Soft Technology applied to sustainable development. She has now returned to China where she will work as a consultant.