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# Elements of good practice for providers of publicly funded patent information services for SMEs – Selected and amended results of a benchmarking exercise

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ABSTRACT

This paper describes key issues relating to the performance and challenges of publicly funded patent information services in the EU-27. The results are to a large extent rooted in a wider benchmarking analysis carried out on behalf of the European Commission as part of its 'PRO INNO Europe activities' the aim of which was to identify and benchmark all available IP-related support services in Europe and a number of overseas countries. For this paper, the relevant findings of the benchmarking study have been amended with an additional literature review and with an outline of the tool of semantic patent analysis. It is found that the competence of the operating staff, easy identification/visibility and timely delivery are among the most significant quality aspects from the point of view of the SMEs, while the geographical proximity of the SMEs to the service premises is a factor of less importance. Information needs of SMEs extend well beyond technical information on patents, and include interpretative help for search results but also IP management questions for decisions on why to use particular IP protection instruments in specific circumstances. The method of semantic patent analysis is described as one possible future option to extend the service activities of relevant information centres. However, provisions must be made in the governance of the (new and/or extended) services, and the reasoning for the need of the offerings should point to clear cases of market failure in order to avoid conflict with the private service sector.



## 1. Introduction

The traditional function of patent information centres – providing easy physical access to patent specifications for interested parties at close geographical proximity, thus facilitating the use of the system of Intellectual Property Rights (IPR) – has been increasingly contested in the past two decades (often denoted as a "pro-patent era"): while, on one hand, the steady increase in demand for patents has also positively impacted the use of patent information, the advent of IT-based information retrieval technologies together with the utilisation of the internet have put a question mark on the necessity of a larger number of physical reading room facilities at the regional level. Many patent information centres (which are arguably among the oldest innovation-supporting institutions in Europe, some dating back to the 19th century) have responded to this development by attempting to re-invent themselves as "fully-fledged" service providers [1,2]. In many such instances, small and medium-sized companies (SMEs) constitute one of the main target groups of the new offerings (cf. [3,4]).

The following paper discusses the patent information needs of SMEs, and what roles patent information centres could play against this background. It is based primarily on a subset of the results of a benchmarking study, carried out on behalf the European Commission, DG Enterprise and Industry, as part of their PRO INNO Europe initiative in 2006/2007. Additional literature review has been performed, and a conference presentation (at the PATINFO 2008, Ilmenau, Germany) has been also used to develop this paper. In the analysis, special attention is given to the market failure argument for implementing publicly funded measures, as this has considerable implications for setting up service offerings for SMEs. Furthermore, examples of three patent information services are used to look at elements of good practice when designing and operating SME-focussed measures. An emphasis lies also on the description of new types of services which can augment existing service portfolios. In this context, the tool of semantic patent analysis is exemplarily presented in more detail.

This paper is organized as follows: following a description of the study design (Section 2), the paper sets out and describes the rationales for offering publicly funded patent information services to SMEs (Section 3). In Section 4 selected results of the benchmarking exercise are presented. Most notably, the issues of user up-take, quality factors for such services, and issues focussing on the institutional set-up and governance are discussed to build an argument on

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the information needs of SMEs. Section 5 is devoted to the presentation of the method of semantic patent analysis in order to illustrate one tool which could be in future used to satisfy the information demand stemming from the SMEs. Section 6 goes back to the market failure argument and discusses possibilities to draw dividing lines between private and public offerings; conclusions follow in Section 7.

## 2. Study design of the EC benchmarking survey

The following section describes the aim and scope of the study and entails an overview of the methodological approach.

### 2.1. Aim and scope of the study

In January 2006, the European Commission, DG Enterprise and Industry, awarded a contract to a consortium consisting of the Austrian Institute for SME Research, Technopolis Consulting Group and 32 other research institutions to conduct a study entitled "Benchmarking National and Regional Support Services for SMEs in the Field of Industrial and Intellectual Property" [5]. The aim of the study was, firstly, to map all existing support services intended to help SMEs deal with IPR issues in the countries of the EU-27, Norway, Turkey, Liechtenstein, Iceland, furthermore the United States, Canada, Australia, and Japan. In a second step a selection of these services was to be benchmarked in order to assess the services' performance. In a third step case studies had to be developed for services which were performing particularly well and could serve as blueprints for policy makers who wish to establish similar services in different countries.

It is important to underline that the benchmarking study [5] looked at IPR support services in general, of which patent information services – services that extend support in dealing with patent information – form only a subset. Other instruments being examined include, for example, support programmes that extend financial support for patent applications or information and awareness raising campaigns in the field of IPR. This approach puts some limitations on the amount of information collected for patent information offerings. Individual patent information services were only scrutinised if they were of high significance for the SME-focussed IPR support system in the respective countries. They also had to fulfil the various selection criteria for the different research phases on the quest to find "good practice" services (see also next Section 2.2). Furthermore, the study team had to make sure that all different forms of IPR support services would be sufficiently covered, which also limited the number of analysed patent information offerings. Finally, only patent information services in Europe have been specifically looked at.

### 2.2. Methodological approach of the benchmarking study

The study design chosen reflected these three-fold objectives by applying also a three-stage approach:

(i) The identification process identified relevant IPR services for SMEs and compiled those, together with some key characteristics such as contact details, service or target group descriptions, into an ACCESS database. With the aid of mostly standardised identification forms applied in interviews with service providers and used in desk research, 279 such data records were created for corresponding services. Eligible services were offerings which had SMEs as a target group (either explicitly, as stated by service documents, or implicitly, as evidenced by a significant share of SME users), they had to be publicly funded through national or regional authorities and they had to address IPR issues – in the first phase the term IPR applied was applied rather loosely to also capture services which did not (only) address patents but also less formal means to protect/appropriate intellectual property (e.g., trade marks, copyrights or designs, but also informal instruments such as trade secrets).

(ii) Out of the 279 services, 72 – the most promising ones which could possibly become "good practices" – were subjected to a benchmarking exercise. The benchmarking exercise utilised a semi-standardised questionnaire which enquired into benchmarking indicators relating to the design of the service (e.g., the type of preparatory activities undertaken or the existence of predecessor services), its implementation (e.g., resources used, organisational set-up) and service performance (as evidenced through the use and value of different performance indicators (e.g., user take-up) or evaluation results). The guideline was applied in an interview with the respective service provider – thus, the results of the benchmarking phase were foremost self-assessments of the service providers.

(iii) The 15 best performing services (those that had interesting "elements of good practice") entered the case study analysis[1]: For each of these services, an SME user survey with an aimed for 50 successful user responses was conducted using a standardised questionnaire. The questionnaire was identical for all services under scrutiny in order to allow for cross-country and cross-service comparisons. The survey was carried out by means of telephone interviews in the time frame of December, 2006 to April, 2007. The underlying paper is based on the results for three patent information services which succeeded in passing all three research phases (see also Section 3). Although not representative for each and every patent information service set-up in Europe (see Section 2.1), the results received from these three case studies indicate that the findings may still be applicable for a large number of other patent information service offerings and centres in Europe.

## 3. The SME market failure argument and how public service providers address this issue

Today, the prevailing view is that policy intervention in the form of a support service in a market economy is only to be effected when there are instances of market failure (cf. [6]). This argument carries two aspects: For once, it focuses on the party which needs support – it has to be at a systematic disadvantage due to the way the markets operate. And secondly, that there is no private support market which could adequately help the party deal with the disadvantages. This thinking has important implications for any public support initiative, not only publicly funded patent information services. Offering a service or extending a service portfolio under such a regime is thus not (only) governed by commercial/business decisions (see also [7]) for a business-oriented approach) but has to be justified in terms of a clearly identified and addressed market failure, too. Moreover, if a public policy intervention is so successful that it alleviates the market failure completely, or if a functioning private market develops, service activities are to be stopped.

In the context of establishing support programmes and services in general for SMEs, the argument given for a market failure is that small firms are, due to resource constraints, at a disadvantage

[1] The study team changed the notion to "services displaying elements of good practices" because the evidence compiled did not allow for a substantial release on good or even best practices – many services had good working parts, most of the time generic in nature to be applied also to other service designs, but seldomly the whole set.

when compared to larger firms. The operation of publicly funded patent information services for SMEs follows this intervention logic. In a study by Hall et al. [8] it was asserted that various factors hinder the utilisation of patent information by SMEs: lack of knowledge on how to access the system and how to perform scans in databases, the complicated language of patent filings (especially with respect to the legal terms used), the lack of available time to obtain this respective know-how, costs involved (e.g., for training the staff) and, last but not least, the expectable overload of information. An EPO analysis of 1995 links the under-usage of patent specifications as sources for information primarily to the resources available to firms, with small firms facing the largest barrier to using patent information [9]. Both the analysis of the EPO and Hall et al. can be said, due to their age, to not fully account for the advances made in information technology and the use of web-based tools. While specific factors for the non-usage of patent specifications have not been specifically enquired into, some anecdotal evidence in the interviews with SMEs in the benchmarking study nonetheless support the view that despite the technological advances the complexity of patent information and the lack of resources today still remain considerable barriers for a wider utilisation of patent specifications by SMEs. All these factors can be thus argued to be instances of market failure, and could prompt for state intervention if suitable private services are not available.

The ways publicly funded patent information services address SMEs with new offerings are manifold: Andrick [10] describes how the German patent information centre MIPO GmbH, Halle tries to help SMEs in using patent information databases and caters also for information requests that extend beyond the scope of patent information (e.g. questions about companies, literature and invitations to tender). Sternitzke [11] expands, among others, on the way the German PATON patent information centre, Ilmenau can handle IP support programmes (in that particular case, the German SIGNO programme which extends financial support to first-time SME patentees). From these sources, and also from the observations from the benchmarking study, it becomes clear that many public patent information service providers frequently try to enrich their portfolio of activities for SMEs through the provision of value-added search services, seminars and lecturing activities or by organising events with local patent attorneys (free initial consulting).

The three patent information services (PIC Stuttgart, serv.ip, IOI) analysed in the benchmarking study as case studies have the following service packages available for SMEs:

- The patent information centre (PIC) Stuttgart in Germany offers, apart from its base service of allowing customers (comprising to a large part SMEs) to search in IPR/patent databases, seminars and trainings targeted at SMEs, various documents and FAQ files on its website to increase the awareness of SMEs on IPR issues. Furthermore, it also organises days where patent attorneys provide free initial consulting to firms. An SME-specific activity is the creation and usage of a "working group patents" which consists of SMEs and advises the PIC on how to better tailor the service offering to smaller firms. PIC Stuttgart has, if compared to other patent information centres a rather large complement of staff (7.5 full time equivalents in 2005) and is operated by the regional government of Baden-Württemberg ("Regierungspräsidium Stuttgart").
- serv.ip is a subsidiary of the Austrian patent office in Vienna and specialises in providing patent (and trademark) database search services, seminars for SMEs and awareness raising campaigns on IP issues. This organisational set-up allows for flat hierarchy structures and avoids bureaucratic procedures that otherwise need to be adhered to if the organisation acted as a public authority. The fact that serv.ip specialises in providing patent search services is also giving the staff the necessary competence to give good advice concerning the patenting procedure in general. A specialty is given in the fact that serv.ip offers searches as standardised product packages such as the product "express searches". Express searches yield, for a fixed price, results of state-of-the-art scans within 4 weeks (Homepage serv.ip February 10, 2009; see also [12]). serv.ip employs a staff of around 40 persons in 2005. Both serv.ip and PIC Stuttgart are members of the PATLIB network, which comprises over 300 patent information centres in Europe.
- IOI is different to the services described before in that it was not an organisation, but a dedicated support programme enacted specifically for SMEs. The programme was a joint undertaking between the Dutch patent office and the innovation development agency Syntens. Under this programme, five employees of the patent office, specialists in patent information, were assigned to work at the different premises of the Syntens agency in the Netherlands. For once, the patent office employees were to increase awareness on the side of the development agency on the use of patent information. If Syntens staff were to identify SMEs in their day-to-day work which would have a need for patent scans, they would, secondly, refer them to the five specialists. These would then have patent scans conducted for the firms. The highly successful initiative ran from 2001 to 2006 (in 2004, major parts were shut down – see also Section 6), and some elements of the programme continue to be operated as part of regular cooperation activities between the two organisations.

## 4. Selected issues for patent information service providers

The following section focuses the discussion on the SME user out-reach and up-take of the patent information services, key quality factors identified by SMEs for such offerings, as well as issues arising from the interaction with the private market and the institutional set-up.

### 4.1. User out-reach

One important success factor for any support service is to be able to reach a substantial amount of the target group and have a sufficiently large user base. Interestingly, when preparing the case studies for the benchmarking study, it was hard for the study team to identify IP support services (including patent information services) which could provide contact databases listing about 50 SME users. The finding can be interpreted in two ways: (i) the services have, on average, a rather low SME user base and/or (ii) data on SME clients is hardly collected. Even if only the latter point holds true (and there might be good reasons to limit the efforts of cataloguing SMEs (e.g., allow for little administrative burdens)), this would nonetheless mean that service providers have only limited knowledge of the wishes and needs of the SMEs they are trying to serve.

For PIC Stuttgart, serv.ip and IOI, a total of 95 (mostly SME) users were questioned on the experiences with the provided offerings. Interesting to note is the composition of the SME user group. While with the IOI programme – which specifically addresses small firms – the user group is comprised mainly of microenterprises (two thirds of the questioned users have less than nine employees), the PIC Stuttgart user sample, as an example of a patent library, shows a rather large share of companies (35%) with more than 250 employees (which would, according to the strict definition of the European Commission, even not be considered SMEs any more). Further to that, upon reviewing the contact databases of both PIC Stuttgart and serv.ip it became evident that SMEs may form only a part of the serviced user groups, the other

groups being mainly patent attorneys and larger companies (multinationals). This might in itself not be a bad thing (it may lead to the question whether certain patent information centres really need to focus on small enterprises; in this context it is interesting to note that many patent attorneys work on behalf of SMEs (see also Section 4.2 for a larger discussion of implications)), but was surprising to the study team given that many patent information centres were specifically stating to strongly target SMEs.

### 4.2. Key quality factors

SME users of the patent information services were asked whether they deem certain generic quality factors of high, medium or low relevance for the kind of service they used. By using this approach, it was possible to determine quality factor profiles for different types of services and compare them to each other. Fig. 1 shows the combined results for the three patent information services under scrutiny:

(i) The most important quality key factors for a patent information service are, in order of descending relevance, the *ease of identification* of the service, the *competence of the service-operating staff*, *timely delivery* and the *provision of information on different IP strategies*. At the other end of the scale, *spatial distance* (i.e., geographical proximity) is only important for a relatively low share of users. This basic distribution of the relevance of quality factors is, with only few deviations, observable also at individual service level. For PIC Stuttgart users, as with many other IPR-related services examined in the benchmarking study, competence of staff is by far the most important quality factor.

(ii) The reaction to the factor of ease of identification refers to the visibility of the service: Not knowing an offering and/or its benefits may constitute a major barrier for SMEs to use any type of support service. In this context, it is noteworthy that a large share of patent information services are operated by patent information centers linked to university libraries (in Germany, 57% of the patent information services are part of a university library) [13] or through national patent offices. This institutional set-up is, concerning visibility, significant insofar as university libraries and/or patent offices are not among those organisations SMEs usually refer to when they look for support for their innovation activities. Such support is usually provided by, for example, chambers of commerce or technology development agencies. As a result, SMEs are also much closer to these general innovation-supporting institutions which possess extensive data records on their clients. Statements given in expert interviews indicate that patent offices and PATLIBS – the predominant suppliers of patent information services – seem to have, on average, rather weak cooperation links with the general innovation-supporting world which further aggravates the situation (cf. [5,14]). Against this backdrop, most patent information services run the danger that they simply vanish behind the cast of actors servicing the needs of SMEs in the area of R&D and innovation and are hardly visibly to

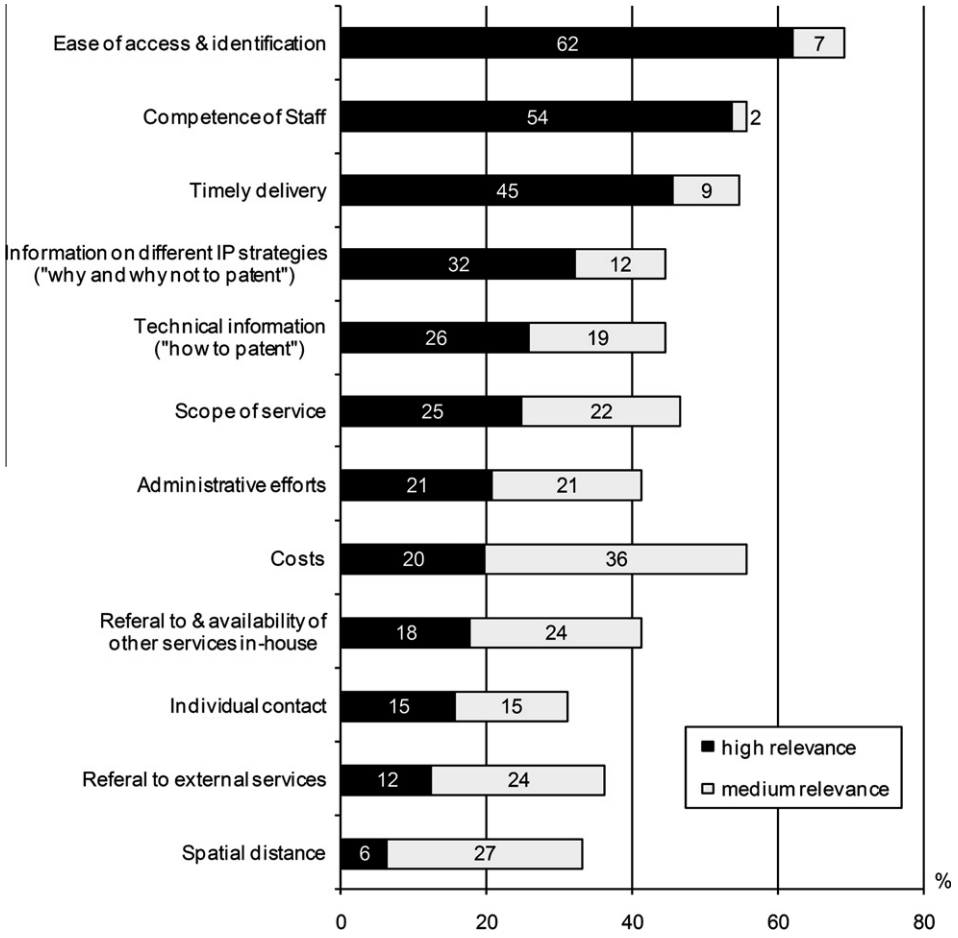


**Fig. 1.** Relevance of key quality factors for patent information services such as PIC Stuttgart, serv.ip and IOI SME users in%, aggregate results, *n* (number of answering SME users) = 95 (Source: [5]).

SMEs. In Switzerland, for example, the OECD institutional chart on the Swiss innovation system does not even mention the Swiss equivalent to a national patent office, the Swiss Federal Institute of Intellectual Property (cf. [15]). Many SMEs overcome this visibility barrier by referring to patent attorneys – the most important type of service providers for SMEs in IPR matters (cf. Fig. 2 and [13]) – who then perform searches on behalf of their clients, frequently also with the help of public patent information services. While this solution seems to be sensible at first sight, Hall et al. note in their analysis that the high fees of patent attorneys may be yet another barrier to SMEs trying to access patent databases in an efficient manner. They argue that many firms *"...do not seem to have learnt the knack of using a patent agent effectively"* [8]. Taken together, this indicates that there may be a need for many patent information service providers to examine their marketing and user out-reach activities. Given limited resources, it might prove beneficial if the marketing strategy targets to a high degree cooperation endeavours with chambers of commerce/technology development agencies and have these institutions refer clients to the specialized offerings of the patent information service providers. This is also one of the reasons why IOI was chosen as a case study in the benchmarking exercise, in order to illustrate how such a cooperation activity could look like.

(iii) The reaction to the factor *competence of staff* is in line with the general finding that staff qualification is a key issue when setting up IPR support services (cf. [16,17] who examined quality factors in German technology transfer agencies ("Patentverwertungsagenturen")). Due to the cross-disciplinary nature of the subject, such staff should ideally possess technical know-how (in the field the SME is active in), legal know-how (patent and other types of IP law) and business know-how (on different types of IP and patent strategies, in view of the industry characteristics the SME is operating in). For patent information services it might be assumed that service-operating personnel are expected to be fully familiar with the search tools employed and to be able to provide, at least to a certain degree, help in interpreting the findings in a business-specific context. Against this background, it seems noteworthy that SMEs deem the factor of *"why and why not to patent (information on different IP strategies)"* as one of the four most important quality factors for patent information services and specifically rate this factor higher than the aspect *"provision of technical information"*. If one also takes into consideration that using a patent information service affects not only the way the supported SMEs deal with patents, but also other types of IPR and IP-related activities (see Fig. 3., where, for example, 16% of the SME users of the three services scrutinised utilised trade secrets more due to using the offerings) there is a clear demand visible on the side of many SMEs for enhanced/"value-added" search (and IP) services.

(iv) By contrast, the reaction to *spatial distance* (*geographical proximity*) can be taken as an indication that it is likely unnecessary to establish patent database search services in every locality, at least when it comes to more experienced and regular SME users of patent information (who make up many of the questioned users). Such users seem to be willing to travel even large distances, if they find the expertise needed. For inexperienced/new users it can be, according to several interviewed experts, nonetheless important to have personal points of contact in the vicinity.

(v) The factor quality of the delivered information (a factor of high relevance as seen by all of the interviewed experts) has been assessed in the benchmarking as part of a question on satisfaction with service delivery. All three services performed well in this regard, with average grades (arithmetic means) given by SMEs of 1.4 (PIC Stuttgart), 1.6 (IOI) and 1.9 (serv.ip) (on a scale from 1 = "very satisfied" to 4 = "not at all satisfied").

## 5. Implications arising from the demand for extended (search) services at the technical level

The demand for higher-level search services and expertise on the side of the service-operating staff has a number of implications for patent information service providers. Questions on the general availability of such specialists, training needs of patent information service staff, remuneration schemes (bearing in mind the frequently limited payroll regimes in the public sector) or the necessary size of the services (in terms of the amount of employees needed to serve the various information needs) are just some of the cases in point. On the technical level, the main challenge for

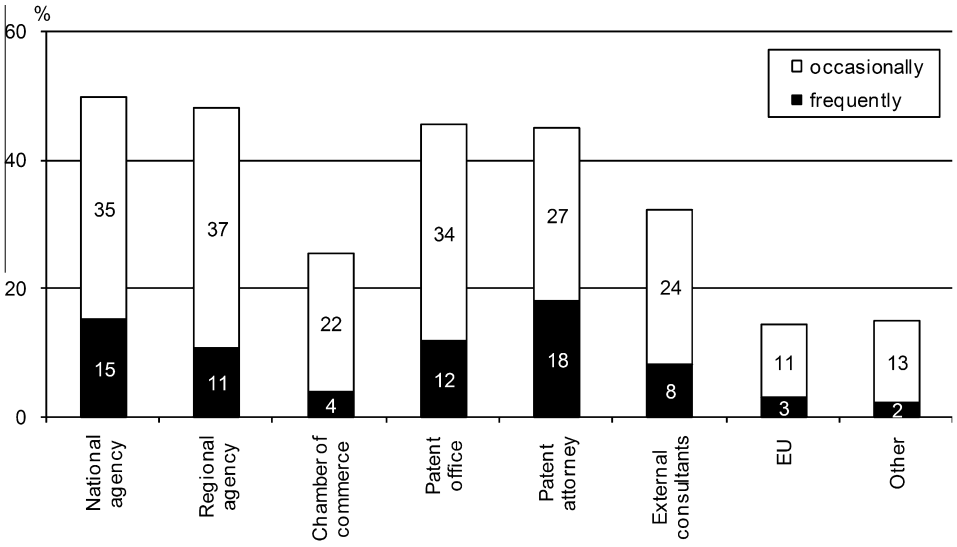


**Fig. 2.** Usage frequency for different types of service providers for innovation matters, SMEs in%, aggregate computation for all 15 case studies of the benchmarking study, *n* (number of answering SME users) = 630 (Source: [5]).

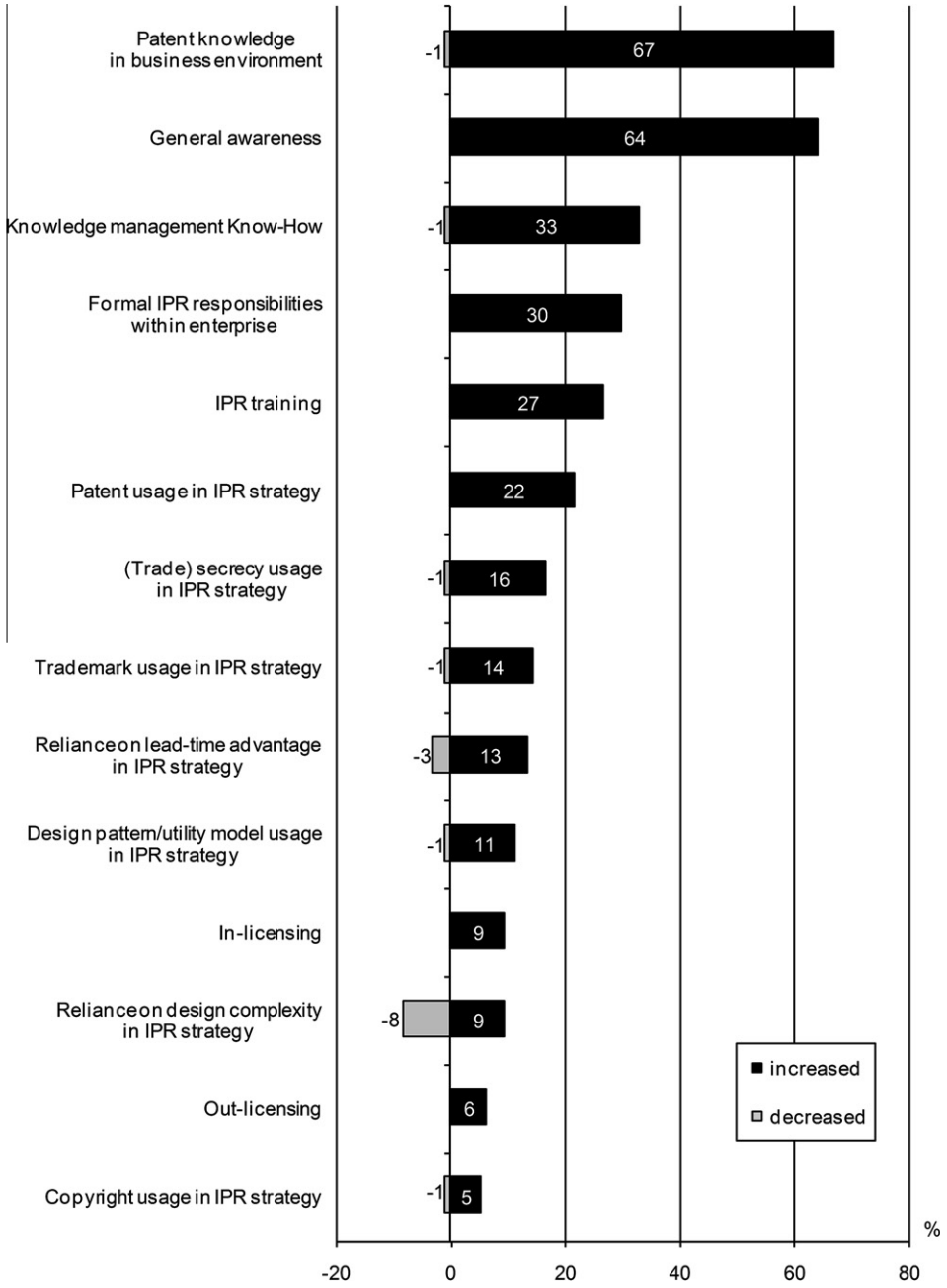


**Fig. 3.** Changes in behavior regarding IP-related activities and aspects, induced by using patent information services such as PIC Stuttgart, serv.ip and IOI SME users in %, aggregate results, $n = 95$ (Source: [5]).

harvesting the benefits of patent data to the full extent seems to be to find a means to deal with the large amount of data available and at the same time avoid a situation of information overflow, thus providing a qualitative extra on "raw" search results. In this section we discuss some of the methods that can be employed in the future by patent information services in order to meet this challenge. In particular, the method of "semantic patent analysis" is described in order to illustrate possible future development paths for patent information services and to hint at possible training needs, at least when it comes to employing new types of software search tools.

### 5.1. Ways to analyse patent information

The fact that all larger patent offices of the world allow their patent databases to be searched for free by using the World Wide Web has, over the last years, significantly changed the way that patent searches and subsequent analyses are being conducted [18]. A world-wide patent scan usually results in a large amount of documents being output, whereby the majority of the displayed search results are of no significance to the researcher conducting the investigation. The reviewing process of the search results is prone to errors: Important documents could be overlooked which would in turn increase the likelihood of either being involved in litigation procedures or in pursuing redundant R&D efforts for already existing solutions to technological problems.

The increased computation power of modern computers offers, however, nowadays the possibility to systematically analyse large data sets and turn tacit into explicit knowledge. It is expected that the usage of advanced algorithms which draw on up-to-date hardware resources will greatly change the way patent information is

being handled [19]. For analysing patent information there are already a lot of different software tools available (cf. [20–22]). These tools implement mainly two "advanced" methods in order to extract relevant content from large-scale data records and present it as easy to read information: data-mining and text-mining techniques. Another means to reduce the amount of information overflow and thus to reduce uncertainties lies in applying the instrument of semantic patent analysis. This method combines in a nifty way semantic text analysis with mathematical/statistical techniques and generates as a result so-called patent maps.

### 5.2. Analysis of patent information using data- and text-mining techniques

*Data-mining techniques* aim at identifying patterns and ordered structures within a document. The theoretical background is rooted, among others, in bibliographical methods. The focus of data-mining techniques lies on the identification of paired key terms in structured documents such as scientific publications. Bibliometric tools thus help disclose similarity relations between documents and deliver the foundation for visualizing these relations by means of special maps [23–25].

*Text-mining* is another instrument to harvest the content of a document. The method is, in terms of the rationale for utilising the tool and the goals pursued, similar to data-mining, with the main difference being primarily the type of data the method is being applied on. Whereas data mining demands the presence of structured documents, text-mining is supposed to work with unstructured files. Contrary to data-mining tools, text-mining applications are required to recognize semantic structures in the text and, in a next step, be able to relate these structures to each other. This requirement necessitates, on one hand, the usage of artificial intelligence and on the other hand demands that provisions be in place which account for the characteristics of the underlying document language. Text-mining tools are considerably less commonly used than data-mining applications. This is understandable given the fact that, due to the need to capture complex linguistic patterns, drafting a working design and successfully implementing the software is far more difficult.

*Patent specifications* are semi-structured documents. They contain on one hand "fixed" data/variable fields (such as the IPC classification, the name of the inventor and the filing entity) and, on the other hand, also unstructured information (e.g., the claims and the description). It is therefore evident that – in the course of extending patent-related information services – especially combined text- and data-mining techniques are in use (and also further under development). The extent to which these two instruments inter-relate with each other (in order to extract the knowledge embodied in the patent documents) varies considerably with the type of computer application that is being utilised.

### 5.3. Semantic patent analysis as a new approach to analyse patent information

Semantic patent analysis is a method which combines natural language processing with similarity measurements of the semantic structures (cf. [26–30]). In particular, the method usually consists of several consecutive steps. In the following, we discuss a particular 4-step approach involving SAO structures:

(i) It can start off with the process of extracting the key statements from patent documents, the so-called SAO-structures (Subject-Action-Object). This is performed with the help of the software Knowledigst™ 2.5 (cf. [31]) which uses a semantic processor (Natural Language Processor (NLP)) [32] for this purpose. The extracted SAO-structures yield for each patent its semantic profile and contain the technological key findings of the analysed patent text. One should note, however, that SAO structures represent only one of several classes of semantic algorithms.

(ii) Following this first step, a linguistic analysis is executed on the SAO-structures with domain-specific speech filters for standardization and minimization of the highly differentiated idiom of specific technological fields. The SAO-structures are in this step modified to take synonyms (synonymising filter) and concept hierarchies (generalizing filter) into account.

(iii) In the next step, several comparative algorithms are used on the semantic profiles to gather similarity measures which are then input into a matrix (cf. [33]).

(iv) The resulting similarity matrix is then visualized by means of multivariate statistical methods (e.g., multidimensional scaling) as patent maps. Multidimensional scaling is an instrument which scrutinises positions and similarities in a perceptional space (cf. [34,35]). The scaling leads to a particular type of semantic map where patents are displayed as data points and where the relative position/proximity of these points with respect to each other indicate similarities between patents: Similar patents are found close to each other on the map, non-interfering documents are farther apart.

Semantic patent analysis may be used successfully in IP management in a variety of ways, not the least for strategic planning. An example of a patent map is given in Fig. 4. In this example, the four-step process was used to analyze the patent environment of an invention (represented through its patent) which was of particular importance for the inventing company. This patent map suggests that two patents of a competitor are relatively close to the key patent of the company. With respect to these two patents care has to be taken, and it could be contemplated to sue the competitor for reason of patent infringement.

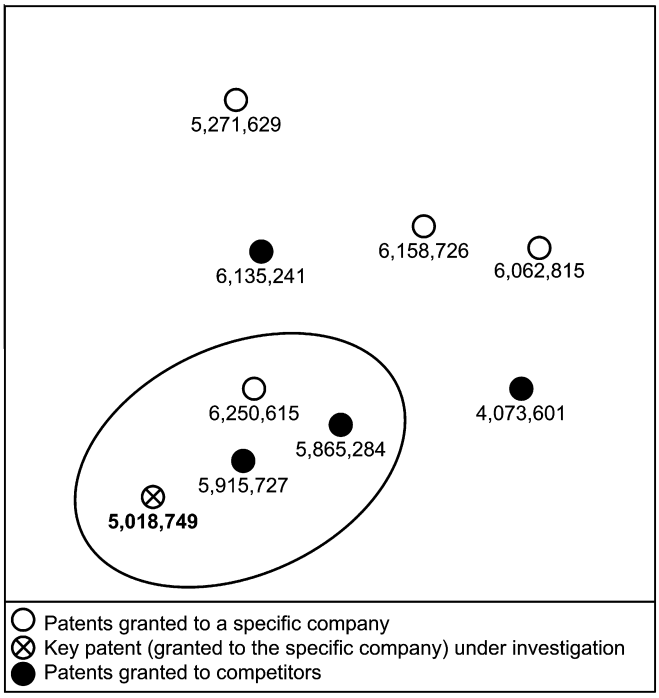


**Fig. 4.** Semantic patent map for a key patent in the field of seal technology.

All in all, semantic patent analysis may prove to be a valuable tool for exploring the contents of patent documents through means of computer applications. Eventually, the method should allow for efficiency increases and lower costs when conducting patent searches due to better navigation through large amounts of information – an issue of particular interest for SMEs. It supports the IP management in pursuing its varied tasks, such as identifying new business opportunities, assessing the state of the art in certain technology fields, providing further intelligence for M&A decisions, the drafting of cooperation agreements or setting up patent pools.

## 6. Keeping in mind the market failure argument – private vs. public support services

In the preceding sections we examined key quality factors for patent information services, underlined as a consequence the necessity for the service providers to expand their activities with 'value-added' services and illustrated one particular method (semantic patent analysis) which may be utilised in the future when such value-added offerings are implemented. An additional point to consider when publicly funded service providers expand their activities is the issue of drawing clear demarcation lines between public and private service offerings. These lead right back to the market failure argument described in Section 3 and are needed to minimize friction between private and public service providers. The following examples show that potential of conflict is not a mere theoretical issue for patent information providers:

(i) In 2004, a complaint by a private party (a software company specialized in patent information services) led to the discontinuation of a major part of the IOI programme, in order to avoid court procedures on the basis of unfair competition.
(ii) Across Europe, private information services providers teamed up in the PATCOM association in order to demand clear-cut dividing lines between publicly funded and private service providers [36].
(iii) In the USA, the "United States Coalition for Patent and Trade Mark Information Dissemination" takes a role similar to that of PATCOM [37].

Thus, it is necessary to underline for public service providers to argue their case in a clear and robust way along the lines of market failures, and to provide for data and governance structures ensuring non-interference with a functioning private market.

Possibilities to tackle this challenge could comprise a number of measures: (i) The set-up of sound goal system targeting an accepted market failure, (ii) the establishment of an evaluation system where the services are (iii) being constantly monitored based on a set of pre-defined and agreed upon indicators that measure the success of the (new/enhanced) services and periodically examined in greater detail by external (evaluation) professionals. Furthermore, (iv) the establishment of governance structures which involve representatives of the private sector may prove valuable; these bodies can decide on measures, for example, on how to make sure that only the intended target group is making use of the service (cf. [16]), or help in the design of the measure and monitor its progress. Against this backdrop, it is interesting to note that only few patent information centers have their offerings evaluated on a regular basis.

The Swiss service "Accompanied Patent Search" can be in several ways regarded as an example of good practice in this context [16]: The service operators have advisory bodies in place (composed of SMEs, renowned patent attorneys) which meet regularly to discuss the evolution of the service and the interrelation with the private market. Only this specific offering of accompanied patent scans is offered at subsidized rates and targets especially "first time" SME users of patent information. Other search services are offered at (higher) market prices which leave room for private providers, and there are clear division lines between these "commercial" offerings and the SME supporting activities in the accountancy system. Against this backdrop, the service provider succeeded in establishing a support programme which the private providers see as a valuable addition to the market rather than a threat (for example, patent attorneys can use this service to outsource a number of patent database scans they would otherwise have to perform for new and inexperienced customers). The private sector is able to provide in-depth research and detailed qualified legal advice (the latter cannot be provided by the publicly funded information service providers), and a situation of symbiotic co-existence between private and public service providers is ensured.

## 7. Conclusions

The paper has discussed key quality factors for publicly funded patent information services. It provided evidence from surveys that the aspect of 'raw' information provision at regional/local level – which has been at the heart of many such services for the past decades – has lost importance, while there is an increasing demand for 'value-added' offerings, which extends beyond pure patent information and stems from SMEs as a (new) customer group. This need covers informational aspects on general IP management issues (not necessarily related to patents) as well as further interpretative help in analyzing patent databases. The adoption and qualified usage of new analytical methods such as semantic patent analysis may help such services to meet the demand. Key challenges ahead comprise, among others, the necessary competence of the service-operating staff, and an improved visibility of the services with the SME target group, better collaboration with other players in innovation support as well as that a balance be established and maintained to complementary private sector offerings in this field.

## References

[1] Krestel H, Götz B. From information supplier to system provider: the diversification of patent information services at patent information centres. World Patent Information 2002;24:143–5.
[2] Newton D. A survey of users of the new British Patent Library Information Centre. World Patent Information 2000;22:317–23.
[3] Byrne B. The Scottish project. World Patent Information 2001;23:247–51.
[4] Slater P, Twyman P, Blackman M. The smart way for patent information to help small firms. World Patent Information 2000;22:337–41.
[5] Radauer A, Streicher J, Ohler F. Benchmarking National and Regional Support Services for SMEs in the Field of Intellectual and Industrial Property. PRO INNO Europe Paper No. 4. Luxembourg: European Commission 2007.
[6] Fritsch M. The market-market failure, and the evaluation of technology promoting programmes. In: Bech G, Kuhlmann S, editors. Evaluation of technology policy programmes in Germany, 2003. p. 311–29.
[7] Wurzer A, Hundertmark S. Route to profitable European PATLIB centres with a process oriented business model in intellectual property services. World Patent Information 2005;27:302–8.
[8] Hall M, Oppenheim C, Sheen M. Barriers to the use of patent information in SMEs. In: Blackburn Robert A, editor. Intellectual property and innovation management in small firms. London, New York: Routledge; 2003. p. 144–60.
[9] European Patent Office. Utilisation of Patent Protection in Europe. World Patent Information 1995; 17: 100–5.
[10] Andrick J. Providing modern information services for small and medium-sized enterprises. World Patent Information 1998;20:107–10.
[11] Sternitzke C, Bartkowski A, Schramm R. Regional PATLIB centres as integrated one-stop service providers for intellectual property services. World Patent Information 2007;29:241–5.
[12] Weidinger I. Dissemination of information activities of the Austrian Patent Office (APO). World Patent Information 2005;27:145–51.
[13] Blind K, Koehler F, Cuntz, A, Radauer A. On the increasing significance of intellectual and the deteriorating role of physical assets in German SMEs. Berlin: Federal Ministry of Economics and Technology (BMWi); 2009.
[14] Radauer A, Walter L. Patente im Rahmen eines breiteren IP Management-Kontexts – Informations- und Servicebedürfnisse von KMU als Kunden von öffentlichen Patentinformationszentren ("Patents in the course of a broader IP

management context"). PATINFO 2008 Patentmanagemnt: Methoden, Werkzeuge und Ausbildung. In: Proceedings des 30. Kolloquiums der TU Ilmenau über Patentinformation, Ilmenau: 12. bis 13. Juni 2008, R. Schramm, S. Milde (Hrsg.) Ilmenau: TU Ilmenau; 2008. p. 71–9.
[15] OECD. OECD Reviews of Innovation Policy Switzerland. Paris: 2006.
[16] Radauer A, Streicher H. SME-IP 1st Report – Support Services in the Field of Intellectual Property Rights (IPR) for SMEs in Switzerland – A review. Berne: Swiss Federal Institute of Intellectual Property (IPI); 2008.
[17] Walter L, Brusch M, Hartung K. Präferenzen bezüglich Dienstleistungen von Patentverwertungsagenturen - Eine explorative Untersuchung (''Preferences with respect to services of technology transfer agencies – an explorative analysis"). Gewerblicher Rechtsschutz und Urheberrecht, Frankfurt a. M.: Beck 2007; 5: 395–400.
[18] Clarke NS. Marketing patent information services on the internet: fighting fire with fire. World Patent Information 2001;23(3):287–93.
[19] Akers L. The future of patent information – a user with a view. World Patent Information 2003;25(4):303–12.
[20] Trippe AJ. Patinformatics. Tasks to tools. World Patent Information 2003;25(3):211–21.
[21] Tseng YH, Lin CJ, Lin YI. Text mining techniques for patent analysis. Information Processing and Management 2007;43(5):1216–47.
[22] Yang YY, Akers L, Klose T, Yabg CB. Text mining and visualization tools – impressions of emerging capabilities. World Patent Information 2008;30:280–93.
[23] Peters HPF, van Raan AFJ. Co-word-based science maps of chemical engineering. Part I: representations by direct multidimensional scaling. Research Policy 1993;22(1):23–45.
[24] Peters HPF, van Raan AFJ. Co-word-based science maps of chemical engineering. Part II: representations by combined clustering and multidimensional scaling. Research Policy 1993;22(1):47–71.
[25] Engelsman EC, van Raan AFJ. A patent-based cartography of technology. Research Policy 1994;23(1):1–26.
[26] Bergmann I, Moehrle MG, Walter L, Butzke D, Erdmann VA, Fuerste JP. The use of semantic maps for recognition of patent infringements. A case study in biotechnology. Zeitschrift für Betriebswirtschaft 2007;4:69–86 [special issue].
[27] Bergmann I, Butzke D, Walter L, Fuerste JP, Moehrle MG, Erdmann VA. Evaluating the risk of patent infringement by means of semantic patent analysis: the case of DNA-chips. R&D Management 2008;38(5):550–62.
[28] Moehrle MG, Geritz A. Developing acquisition strategies based on patent maps. In: Sherif MH, Khalil TM, editors. Management of technology: new directions in technology management. Oxford, Amsterdam: Elsevier; 2007. p. 19–29.
[29] Moehrle MG, Walter L, Geritz A, Mueller S. Patent based inventor profiles as basis for human resources decisions in R&D. R&D Management 2005;35(5):511–23.
[30] Walter L, Geritz, A, Moehrle MG. Semantische Patentanalyse mit dem Knowledgist und PIA. Grundlagen – Beispiele – Kritik. In: Schramm R, Schwanbeck H, Hrsg., PATINFO 2003, Ilmenau: Gewerbliche Schutzrechte für den Aufschwung in Europa; 2003. p. 235–48.
[31] Invention Machine. Accelerate your speed to knowledge. White Paper. Boston: Invention Machine Corporation; 2000.
[32] Tsourikov VM, Batchilo LS, Sovpel IV. US-Patent 6,167,370 (Dec. 26, 2000). Invention Machine Corporation. Priority: US09/321,804 May 27, 1999. Document semantic analysis/selection with knowledge creativity capability utilising subject-action-object (SAO) structures; 2000.
[33] Sternitzke C, Bergmann I. Similarity measures for document mapping: a comparative study on the level of an individual scientist. Scientometrics 2009;78(1):113–30.
[34] Backhaus K, Plinke W, Erichson B, Weiber R. Multivariate Analysetechniken. Eine anwendungsorientierte Einführung, 10. Aufl., Springer; 2003.
[35] Borg I, Groenen PJF. Modern multidimensional scaling. Theory and application. New York: Springer; 1997.
[36] Laagemat G, Frackenpohl WG. Patentinformationen im Umfeld der Patentämter, gewerblichen Anbieter und der Industrie (''Patent information in the environment of patent offices, industry and private service providers"). Presentation at the PATINFO 2005 Conference in Ilmenau/Germany, June 3; 2005.
[37] Ebersole J. Patent information dissemination by patent offices: striking the balance. World Patent Information 2003;26:5–10.

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