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PROPERTIES OF SCIENTIFIC PERIODICALS UNDER BIBLIOMETRIC ASSESSMENT

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Abstract :

The methods of bibliometric research of scientific periodicals are studied much better than the properties of periodicals though the latter are the subject of the assessment. Since the properties in most cases are not being evaluated directly, the problem is to identify the intermediate that is DIRECTLY evaluated by a concrete method and to determine, which specific property of a scientific periodical is reflected by this intermediate most ADEQUATELY. Such an attempt is undertaken in the present work for practically all the methods that are used in corresponding studies of periodicals. By means of philosophical speculations the author finds out the "method - property" conformities.

scientific periodicals, bibliometric assessment, value, productivity, impact, citation analysis, publication count, document handling data, document use, questionnaire survey, peer assessment

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Since Gross and Gross [1] produced in 1927 the list of scientific periodicals, ranked according to the level of their citedness in a specialized chemical journal, and in 1934 Bradford developed the list of periodicals ranked according to the level of their papers being reflected in a bibliography index on geophysics [2], hundreds and hundreds of papers devoted to the quantitative assessment of the ability of periodicals to correspond to the professional information needs of specialists in a concrete scientific discipline appeared.

However, not all the authors pay sufficient attention to the nature of the specific properties of periodicals under study that are quantitatively assessed in the process of periodicals selecting and ranking. Some of them do not realize that a method used in a study reflects a CERTAIN CONCRETE property of a periodical which is more specific than a general ability to correspond to the professional information needs of the specialists, the others seem to be of the opinion that such properties are somewhat conditional, totally derivative from the method of bibliometric evaluation, and hardly existing by themselves as an objective reality.

Non-understanding that the SPECIFIC properties that determine the ability of periodicals to correspond to the professional information needs of specialists in a concrete domain actually exist as an objective reality and that a methods used in a study MUST correspond to a specific property under assessment generated the illusion that a nomination of such properties may be absolutely arbitrary. As a result, in the papers devoted to the periodicals bibliometric assessment, the following nominations of the properties are to be found: "productivity", "profitability", "significance", "information significance", "scientific significance", "importance", "descriptiveness", "quality", "usefulness", "utility", "worth", "value", "information value", "readability", "information potential" and so on; the meaning of the number of the listed terms being the same, while some others are not defined at all(*). Besides, I noticed e.g. 4 (!) meanings of the term "productivity" (despite the fact that the initial Bradford's meaning of this term is quite concrete), 2 meanings of the "term" "significance", 2 meanings for "information value", 4 meanings of "descriptiveness" etc.

It is understandable that for the correct nomination we are to realize the nature of the property to be nominated. But since the properties under study are not directly measurable, but connected with the corresponding indices in a probability (stochastic) manner [3, p. 16-17], while the methods themselves are cognized much better than the properties that they reflect as operating with directly observed indicators, the cognition of the properties to be assessed may be achieved only if we start with the cognition of the methods.

The following general methods of the assessment of the ability of periodicals to correspond to the professional information needs of a domain representatives are noticed in my collection:

1) PUBLICATIONS count by a de visu analysis of periodicals (including such extravagant approaches like the count of translated articles, count of political articles in technical periodicals etc.); count of publications, reflected in bibliographical indexes, in abstractive journals, in data bases, in card files, in documentary flows forwarded to a potential user by the system of selective dissemination of information, in other secondary information sources.

2) Count of various indicators of CITATION ANALYSIS: e.g. the total level of a periodical CITEDNESS in certain SPECIALIZED periodicals, the structure of references in CITING periodicals TO certain SPECIALIZED periodicals, the quantity or portion of citations only to recent papers of a certain periodical; calculations of fractions (number of citations divided by the number of papers published in a cited or citing journal, like impact factor, "discipline impact factor" [4] etc.).

3) Count of various kinds of readers requests to scientific periodicals and copies and reprints of the selected articles published in periodicals: "spontaneous" requests; requests inspired by reading the abstracts, forwarded earlier to a reader by a system of selective dissemination of information or requests due to some other bibliographic information service; requests in a local library or through interlibrary loan etc.; count of time spent by the readers to reading the periodicals in a reading-room; count of the number of the received photocopied articles from various periodicals; count of times a certain periodical was taken from a library; count of refusals to the readers requests to certain periodicals or selected papers published in them... In short, this group includes the quantitative assessment of indicators of all kinds of READERS ACTIVITY DIRECTED TO ORIENTATION IN PERIODICAL MATERIALS, THEIR SEARCH, FINDING AND FURTHER (POTENTIAL) READING.

4) Quantitative processing of the data of questionnaire surveys, interviews, peer assessing and other possible METHODS OF EVALUATION OF SCIENTISTS ATTITUDE to periodicals.

PUBLICATIONS COUNT AND PRODUCTIVITY OF PERIODICALS

The specific methods of the first group (or the first GENERAL method) must not presume any problems about the corresponding reflected property: the content of the method is the count of directly the number of publications and, in the context of what Bradford has written ("... the law of distribution of papers on a given subject in scientific periodicals may ... be stated: if scientific journals are arranged in order of decreasing PRODUCTIVITY of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject and several groups or zones containing the same NUMBER of articles as the nucleus ... etc." (Capitalized by me -- V.L.) [2, p. 85]) it is absolutely clear that the corresponding property is PRODUCTIVITY. The meaning of this term, though, not defined by Bradford, is also understandable. There is a fairly good definition of productivity as "a relative characteristics of a periodical, determined by the number of articles published in this periodical that relate to a given (selected) theme or a branch of knowledge" [5, p. 350]; however, I think there might be still more exact definition of this property e.g. "PRODUCTIVITY is the property of scientific periodicals to contain the articles relevant to a concrete subject, characterized by the quantity of such articles". It is important to note that this property is not artificial, not a derivative from a method applied, but exists by itself as an object of reality.

The productivity case is the simplest one. It is because this property can be DIRECTLY MEASURED by the number of relevant articles when we fulfill a de visu count of relevant publications; also, when the abstracts or bibliographic descriptions are counted, an intermedium is both obvious and minor. At the same time, such substances like "significance", "quality", "value" etc. might be only INDIRECTLY quantitatively ASSESSED by the direct measurement of some indicator of a process that may denote to such properties.

CITEDNESS, USE AND VALUE OF PERIODICALS

The content of the second methodic group is the count of citation analysis indicators. This group is divided, in fact, in two different groups, too, and in this chapter we shall consider what CITEDNESS level of documents really reflect. The standpoint of the recent paper by Salmi [6] (who produced one more attempt to demonstrate that calculation of citedness level is not so much a good method for evaluation the "value", "quality" or "impact" of cited documents), is that "the figures resulting from citation analysis are ... statistical figures of scientific activity" [6, p. 17]. It may be agreed, but the question arises: "what kind of activity?" The next question is if this activity really denotes (not denotes?) to something like "value", "impact", "importance", "quality", "significance" or whatsoever that could not be measured directly?

And, finally, what is the right name or names for such a property (properties?) that are reflected by citedness levels?

In general -- let me be allowed to consider only the general trends, but not the plentiful exceptions, -- citedness level

DOCUMENTARY CONFIRMS THE ACTUAL USE OF CITED SCIENTIFIC DOCUMENTS THAT HAS ALREADY TAKEN PLACE during the fulfillment of a relevant creative work by the authors of citing papers: in general, first, a document is read; then -- if it was not thrown away as evidently useless -- it is being considered; then -- if it is considered to be helpful, -- it is USED (for comparison, including disproving; assimilation of the methods described etc... etc.); then it is CITED (if the scientific ethics of the author, editorial policy of the publishers etc... are OK).

It does sound absolutely obvious and I am sorry for reminding of some trivial things. But I am COMPELLED to speculate in such a manner, reconstructing a lot of notions just ab ovo because of the terminological chaos that does exist AS A RESULT OF CONCEPTUAL MISUNDERSTANDINGS. Speculative way is the only way to confirm the correspondence between a method and a matching property: all the attempts to do it "empirically" are based on the immanently presenting wrong assumption that some of bibliometric methods may be used as "control" or "standard" ones. But such "standard" methods do not exist: if they were, all the plentiful and repeated speculations would be of no sense at all since the validity of a method, say, for the value evaluation would be once and forever determined from the results of the empirical comparative studies of the simultaneous application, say, of citedness level estimation as an indirect aid of the value assessment and of a standard method of direct measurement of it. Now we can reformulate the second question as "DOES THE ACTUAL USE OF CITED DOCUMENTS REALLY REFLECT THE "VALUE", "IMPACT" OR "QUALITY" OF RESEARCH?"

In philosophy the notion of "VALUE" is treated as the criterion of preference in the situation of alternative choice [7, p. 111] (a concrete reference IS CHOSEN to be cited), while as for scientific literature, the notion of value is treated also as its ability to facilitate reaching the

target of the researchers activity [7, p. 111] (i.e. to accomplish a study described in a citing paper).

Moreover, in the information science there is a notion of the value of information which is defined as the "property of information, determined by its fitness for practical USE in various spheres of human activity for the achievement of a certain aim" [5, p. 464]. The value of information is directly connected with its USE, and we have all the right to expand this conclusion to a single document or to a scientific periodical as an organized collection of the documents: "outside a scientific document the human society does not possess the scientific information, too, since it is namely a document that is a material form of its fixing" [8, p. 102]. Then, it is hardly possible at all to obtain any true characteristics of the value of some object without the experience of its USE because the value of an object is determined "not only by its internal structure per se, but also by the fact that an object is involved in the sphere of social human genesis" [9]. It is too well known how the most outstanding scientists failed in expert evaluation of the value of various scientific works BEFORE the latter started to be actually used [8, p. 167]. So, it might be clear, that being a method of evaluation of the actual use of the documents, the count of citedness is a method of an indirect evaluation of the VALUE of cited documents (or, to be a pedant, their SCIENTIFIC value because the value may be aesthetical, historical etc. [10, p. 51]) and, correspondingly, of the value of periodicals, where the cited articles were published.

Besides value, there are two other characteristics of scientific documents, mentioned by Salmi, that are hypothetically reflected by estimation of citedness level, viz. "quality" and "impact" of cited documents [6, p. 17]. To decide whether it is so we must search for the exact meaning of these words and to compare it with the meaning of "value".

Table 1 demonstrates, that first [11], if "quality" is cognized rather abstractly and strongly depending on a cognizing subject (like e.g. an expert), the "value" assessment does not depend on abstract speculations of a cognizing subject, but on relations to his concrete needs or aims. From this viewpoint, citations bear relation with aims and needs of a CITING AUTHORS, but not with his abstractive speculations. As for citations COUNT itself, it is an "automatic" process, on which the will of a counting person has no influence. So, it is confirmed, that citedness level reflects VALUE, while the PEER

No of pair of the definitions	"Value"	"Quality"
1	"...is the result of assessment, i.e. the determining the relation of the known object to the striving, need or aim of a human being..." [11, p. 265]	"...is a category that demonstrates the characteristics of the object which is attributed to it only as an object of cognition, therefore the characteristic that exists only relatively, depending on a cognizing subject" (knowledgeable human being [11, p. 127]
2	"...is attributed or relative worth, merit or usefulness" [12, p. 990]	"...is character of nature as ... distinguishing a thing" [12, p. 740]
3	"...is... that quality of thing, according to which it is thought of as being more or less desirable, useful, estimable, important etc..." [13, p. 2018]	"...is ... the degree of excellence which a thing possesses" [13, p. 1474]
4	"...[is being cognized through]the satisfaction of the desires of human beings that is conditional, in general, on the possession and use of material objects... [or] ... immaterial sources of satisfaction" [14]	"...Where, for example, two two kinds of cloth are said to differ "in quality", it would usually be meant not merely that they differ but that one kind is better (by appropriate standards) than the others..." [15]

Table 1. Some definitions of the meanings of the words "value" and "quality" relevant to the present subject.

ASSESSING (that was treated in [16; 17] as a "control" method in comparative studies of citedness level estimation and peer assessing) reflects the QUALITY: being totally dependent on a cognizing subject and irrespective of his concrete needs or aims of them, the peer assessment is IMMANENTLY the assessment rather of the quality, no matter if the peers were asked to assess quality, value, productivity or whatsoever.

So, from the very first pair of the definitions it might be concluded that 1) "value" and "quality" are NOT synonyms and 2) the peer assessing is neither a standard nor, possibly, a relevant method for the assessment of the documents value. The second and third pairs of the definitions [12; 13] demonstrate that "quality" does not bear relation with merit or usefulness, not, therefore, being involved in satisfaction of concrete needs. All the conclusions are supported by the last pair of the definitions which finally demonstrates again that the value assessment is associated with the possession and USE of an object [14], while "quality" is being cognized irrespective of the mentioned processes and with the aid of some IDEAL standard [15].

So, the citedness figures do not reflect quality. Let's pass from the "quality" to an "impact". On the level of the "common sense" it looks obviously that citedness reflect impact of cited papers. However, we must have a distinct and recognized definition of the term "impact" for real understanding of the matter.

It seems unbelievable, but, despite the enormously frequent use of the term "impact", an appropriate definition is hardly to be found. Even in the paper by Kara-Murza [18] which aim was to disprove the opinion that the analysis of the citedness level may be a good method for the quantitative assessment of the impact, the term "impact" is not defined. Also, the special dictionaries do not contain the definition of this word.

The definitions from the ordinary dictionaries give an commonsense idea of what "impact" is: "influence or effect" [12, p. 451] and "a forcible momentary touch, contact or impression" [13, p. 910]. Of course, we can say that citedness reflects an influence or a strong impression of cited documents on citing authors, but such an influence (or "impact") of a valuable paper is JUST A CONSEQUENCE of a paper's value. And this consequence is NOT so much obvious or compulsory: if a certain researcher frequently cites a certain paper, it is not known for sure if he is strongly influenced by it or he is not thinking a lot about it at all, but it IS known, that he USES it repeatedly. The opposite situation is even more obvious: one might be strongly impressed by some paper, but, if he or she is not working now in the same direction, so he or she would not use it actively, would not cite it... and the "impact" of the document would NOT be reflected. We may conclude, therefore, that impact (influence, impression) COULD be reflected, of course, by citedness, but IN MUCH MORE STOCHASTIC MANNER THAN VALUE IS REFLECTED. And when the term "impact" is applied to indicate a major property of a document reflected by the level of its citedness, so in this case this term is just a redundant one.

We can compare also, of course, the notion of the use with all various possible definitions of "profitability", "significance", "importance" and other words mentioned in the beginning of the paper, but it seems already clear that the MATCHING property from the viewpoint of philosophy [7; 9; 11], political economy [14], information science [5] and a common sense [12; 13] is VALUE. However, I think that the term "usefulness" ought to be commented as having the same root with the word "use".

The meaning, anyhow, is quite different. The vocabulary definition of the word "usefulness" is "the quality of state of being useful" [13, p. 2012], while "useful" is defined as "that CAN be used in ADVANTAGE; serviceable; helpful; beneficial; advantageous; often having practical utility" [13, p. 2012] (Capitalized by me -- V.L.).

The definitions of "benefit" [13, p. 172] and "utility" [13, p. 2013] do not add anything to the conclusion that, despite the common root, the term "usefulness" is less appropriate than "value".

As I mentioned before, peer assessing is NOT a control method for determining validity of citedness analysis. That is why the presence of correlation between citedness figures and the results of peer assessing found by some researchers for certain research fields cannot mean that one and the same property was under study; it may mean only that "value" and "quality", though being different properties, have a lot in common. What about several attempts to find a positive correlations between the level of citedness of an individual author and the probability of awarding a Nobel prize to him or her?

According to the Founder's will, the Nobel prizes ought to be awarded "to those who, DURING THE PRECEDING YEAR, shall have conferred the greatest BENEFIT on mankind" (cited according to [19], capitalized by me -- V.L.). The "benefit" is an "advantage; profit; anything contributing to an improvement in condition" [13, p. 172], it is neither "value" nor "being used". "Contributing" reminds us of an "impact", but we have already agreed that "impact" is just a nonobligatory consequence of the "value". At the same time the citation levels of the so-called "Nobel class authors" were normally estimated NOT for the preceding year, but for the whole carrier of an evaluated author.

There are some other properties of the documents which meaning is rather close to the one of "value" ("pertinence", "topicality" etc.). Though the mentioned words seemed to be never associated with properties of scientific PERIODICALS under bibliometric assessment (they are referred to single documents only) the same analysis as in case with "quality" and "impact" was fulfilled by me, but the conclusion concerning the matching property remained the same.

Though it is understandable what the (scientific) value of (scientific) periodical is, the utmost frequent misuse of the term "quality" in corresponding studies of scientific periodicals (instead of "value") and the ongoing discussions on the essence of a property of reflected by citedness figures make me think that we need to have a recognized definition of the value of a scientific periodical. As for me, I can propose the following draft:

"(Scientific) VALUE of a (scientific) periodical is a property of a periodical to be fit for a use in a (professional scientific) activity of representatives of a certain domain for the achievement of their (professional) aims".

The value of a periodical depends on the "total" value of the published separate papers much more than on a periodical productivity (i.e. on the number of relevant articles): if some journal A published during a certain period, say, 100 relevant papers, each of them being cited once in the following period of time by a domain representatives, and the journal B published during the same year 50 relevant papers each of them being cited 5 times by the same domain during the same period, we should undoubtedly consider the second journal to be more valuable as being more actively used: $(50 \times 5) > (100 \times 1)$.

Anyhow, it is understandable that the productivity, though being an absolutely independent property, may influence on a periodical value (say, a journal with 100 papers each cited once by a corresponding domain during a while is less valuable than another one with 200 papers each cited also once).

READERS ADDRESSING TO THE DOCUMENTS, USE AND VALUE OF PERIODICALS

The third group of specific methods (or the third general method) of the quantitative assessment of the ability of periodicals to correspond to professional information needs of the domain representatives is the quantitative studies of all kinds of readers activity directed to orientation in periodicals publications, their search, finding and further (potential) reading. Which property is reflected by this methodic group?

There are persons who believe that the magnitudes of interlibrary loan borrowings [20], borrowings in a local special library [21; 22] and analogous indicators directly reflects the USE of periodicals. To decide if it is so, we are to compare the nature and essential possibilities of the application of the citedness level estimation and of the studies of the readers activity of the mentioned kind. (The speculative way of comparison is the only way to discover a true answer again as it will be demonstrated below.)

When I told about the "actual use" before, I meant such things as comparison, assimilation of ideas or methods, discussions (including disproving!) etc. IN A CONCRETE CREATIVE WORK of the user; so, I meant the use in the context of very concrete and very important needs and aims of a researcher, such a "use" that in philosophy is the most obvious means of cognition the VALUE. From this standpoint reading just "to know about" and not followed by the involvement of the read materials in the creative work (followed by citations!) is NOT AN ACTUAL USE, IT IS ONLY A PREREQUISITE FOR IT. So we may say that the level of readers activity of the mentioned kind with its unknown and documentary non-confirmed motivation is an indicator of just a POTENTIAL (or intentional) use, which might be used

correspondingly for the assessing of POTENTIAL value of the handled documents. Of course, some of the read materials ARE actually used IN THE FOLLOWING, but by the examination of such the readers activity one cannot forecast if a document will be used in this manner, as well as -- in most cases -- if it will be really read at at. Some authors still search scrupulously for the exception cases when citedness level studies do not reflect the actual use or when the actually used articles are not cited because they believe that the examination of the borrowings of the documents is more helpful in such cases. This misunderstanding might be caused by the existence of the library term "use of the library stocks", the latter being evaluated by the level of DOCUMENTS OUTPUT from the library. But, first, the meaning of this term includes all possible aims of documents readings (such as curiosity satisfaction, compiling bibliographic descriptions by librarians etc.) [23, p. 59], and, second, there are numerous studies that are called "studies of the use of the documents" based on OTHER indicators of readers activity -- of the similar nature, but not "covered" by the definition of the term "use of the library stocks". So, the absence of correlation between readers requests and citations figures discovered by some authors including Scales [20] is determined by the differences in the essences, reflected by the two methods, the differences, which also reveal themselves "qualitatively" through the fact that a document to be potentially used might be requested once and then cited as many times as in many papers being created it was actually used, i.e. once, a few times, a lot of times, never.

The basic differences in general possibilities of the application of the examination of all kinds of readers activity directed to orientation in periodicals publications, their search, finding and further (potential) reading and the analysis of citedness figures for the assessment of the use of the documents, featuring the borderlines of reasonable applications of the two approaches in library studies are summarized in Table 2 that includes also the main conclusions of my Russian-spoken paper [24]. Featuring the borderlines of reasonable applications of these two approaches in bibliometric studies of periodicals, this table gives a final answer to the question concerning the validity of citedness count approach for determining the use of the documents and leads to the following conclusion: since the citation analysis reflects "only" the actual use of the documents and, in general, reflects the use more precisely, the application of this method enables a much better indirect assessment of the value of scientific documents than the examination of readers addressing to them.

Basic Differences in...	Readers Activity data...	Citation frequency data...
(1) ...the scope of reflection of the use:	(1)...might evidence either that the documents were actually used in a particular work, or were just read without specific consideration in its content or just supposed to be read etc...	(1)...are supposed to reflect the real use of the documents in a particular work, viz. in the creation of a citing paper
(2) ...the precision of the assessment of the use	(2.1.)...confirm the hypothetical use; the actual use is not being confirmed, the precision is not sufficiently accurate; (2.2.)...may reflect a momentary action followed by repeated, single or zero actual use, which is not reflected by these data; so, the precision is poor again;	(2.1.)...enable more precise evaluation since the real use that has already taken place is reflected; (2.2.)...reflect repeated use confirmed by repeated citations, enabling more precise assessment
(3) ...the rapidness of the assessment of the use	(3)...reflect the use very rapidly since the readers activity coincide in time with the potential use and precede the actual use (if any)	(3)...follow the actual use, reflecting it, therefore, much less rapidly
(4) ...the possible applicability in library stocks development strategy	(4.1.)...reflect all kinds of documents use which are sufficient data for this purpose; (4.2.)...reflect the use of only the documents, that are physically available	(4.1.)...reflect only the actual use of documents in a concrete work which the THE MOST IMPORTANT BUT NOT TOTALLY COMPLETE data for this purpose; (4.2.)...reflect the use of the documents IRRESPECTIVE of the physical availability of them
(5) ...the possible applicability for the evaluation of scientific research	(5)...as reflecting all kinds of documents use without pointing out the use for the creation of the new documents, these data are good for the assessment of the "information environment", but not the scientific research itself	(5)...as reflecting the actual use in a concrete work, these data may be used directly for the evaluation of scientific research in terms of "information consumption", "information links" or "cognitive basis"

Table 2. Basic differences in general possibilities of the use of the data on the mentioned readers activity and on citedness frequency for the assessment of the use of the documents.

It might be noticeable that the results of application of some of the specific methods of examination of indicators of all kinds of readers activity directed to orientation in periodical materials, their search, finding and further (potential) reading may be influenced by the productivity of periodicals: a photocopy, for example, is requested normally only once to be used either once, or a few times, a lot of times, or zero times, while the indicator which a bibliometrician operates with in this case does not in the least reflect the mentioned differences in the scope of the use (while the citation count DOES reflect it). We can see that the magnitudes of the "corresponding" indicator of the repeated or zero actual use would be absolutely the same; at the same time these magnitude would reflect to some extent PRODUCTIVITY of a periodical from the viewpoint of its ability to be POTENTIAL used. We see that in such a case two concrete properties are reflected in some "mixed" manner, and this phenomenon gives more status to the idea about the necessity in a term designating a "synthetic" characteristics of a periodical to correspond to the information needs of a domain, to the idea of coining a generalized recognized term -- the idea caused by the terminological chaos in nominations of this property, analogous to the one in nominations of specific properties. (This problem is being discussed at the end of the paper.)

However, now it seems clear that we need to have a short generalized term depicting all kinds of readers activity directed to orientation in periodical materials, their search, finding and further (potential) reading: there are various kinds of the mentioned activity that deals in general with the same process -- the potential use of documents or the intention of researchers to use them. On the other hand, though a lot of generalized terms, designating this activity, were arbitrary used in the special literature from my collection, the paradox was that all these terms were THE MISUSE OF STANDARDIZED TERMS THAT HAD QUIET DIFFERENT MEANINGS. The misused terms are plotted in Table 3 that demonstrates both the insufficiency of their being used as generic terms with the necessary meaning and the intuitive inclination of bibliometricians to the use of a STANDARDIZED term that will "cover" all kinds of the mentioned readers activity. In order to overcome these discrepancies, I have written in 1985 the paper entitled "Readers handling scientific periodicals as an indicator of periodicals thematic orientation", but it occurred to be impossible to publish it: the referees felt that I my intention was to criticize the terminological vocabularies (though it was not like that at all) and, being hurt, would not let this paper to be published. So it was published, after overcoming a lot of obstacles, only in 1989 in a book of collected articles addressed only to medical information officers [24].

In this paper the term "READERS HANDLING SCIENTIFIC PERIODICALS" was proposed for designation of all kinds of readers activity directed to orientation in periodical materials, their search, finding and further (potential) reading, of the acquaintance with and looking though a periodical. I think, we may discuss the term itself, but it does seem obvious that it is necessary to coin some short term with this meaning.

Table 3. The terms used in some of bibliometric literature for designating all kinds of readers activity directed to orientation in periodical materials, their search, finding and further (potential) reading: their vocabulary definitions and comments on insufficiency of their being used in the mentioned generic sense.

A misused term	Its recognized meaning and the reference	Comments
"Information request"	The text written in a natural language expressing a certain information need [5, p. 165]	Obviously non-relevant meaning: it may bear no relation to the readers activity under analysis
"Readers demand"	The need of [all kinds of the] readers in [all kinds of] the literature addressed to a library. It may be divided in a certain one (concrete or thematic) and to an uncertain one [23, p. 168]	Too general in terms of literature kinds, too specific in terms of addressing to exactly a library. The output of documents is not implied. Uncertain demands are not characteristic for the scientists activity under analysis
"Use of a library stocks"	The consumption of the documents presented in a library stocks for ideological, scientific, information-and-bibliography as well as for general educative work. The major indicators are books output and books turnover [23, p. 59-60]	The consumer may be a librarian, a politician etc. The aim of "consumption" is not specified as research work. Too specific indicators. In general, the definition is not correct as telling nothing of what the nature of such "use" is: "consumption" and "use" is just the same. The older definition (see column 2) is of more logics.
"Books output"	"Presenting to the readers of a library and to librarians the printed documents for..." [and so on ad literum as in the previous one] [25, p. 58]	The same comments except the last remark
"Books output"	The number of the documents delivered to the readers in accordance with their requests [23, p. 68]	Too narrow meaning.

STRUCTURE OF REFERENCES AS A POSSIBLE AID OF THE ASSESSING THE POTENTIAL VALUE OF CITING PERIODICALS

If citedness denotes the actual use which is more adequate indicator of value, the readers addressing to periodicals denotes a POTENTIAL use, being therefore an indicator of potential value, or, if avoiding the term "potential", being the less precise indicator of value.

However, besides evaluation of periodicals according to their CITEDNESS figures, there are studies of the assessment of periodicals in accordance with the structure of references in them, i.e. the of the assessment of CITING (not cited) periodicals. (SCI Journal Citation Reports for example has a special section devoted to these figures). The structure of references IN periodicals may also tell something about the (citing) periodicals properties, but there is rather a limited number of papers devoted to this problem (e.g. [2832]) which are fulfilled on the basis of a very common sense.

Reconstructing the problem of a property, reflected in such studies, ab ovo I am to tell that the POTENTIAL VALUE of a scientific document that is just being created (so, not yet being used neither being addressed to, but having already references to the documents used while it is being created) is predetermined by the conditions of the creation [7, p. 113], while, possibly, the most important ones are the information conditions. They are called "cognitive basis" [28, p. 16] of a research, which is reflected in the structure of the references in a CITING paper describing its results [28, p. 16]. Thus, if we "decipher" this structure, we can assess the POTENTIAL VALUE OF CITING PAPERS (that might enable one to have a most rapid, almost immediate assessment).

However, such assessment is too much rough, because: 1) the stochastic nature of such assessment is far more stronger than in case with cited papers; 2) therefore, such an approach is absolutely useless when applied to a single paper or to small amounts of them and might be good only for the sufficient collections of papers (so, not so bad as applied to exactly periodicals?); 3) in contrast with the assessment of cited papers, where a more number of citations normally stands for their better value, in this case it is required to find out various indicators of STRUCTURE of references, to determine their meaning and to estimate the "standard" magnitudes for comparison.

The problem of "deciphering" the references structure in CITING periodicals for the assessment of their potential value is still a great challenge [29; 30]. And the problem of the "standard magnitudes" is only meeting some very first approaches that just seem reasonable [31]. However, we can try to designate a PROPERTY of a CITING periodical, reflected by CITING REFERENCES STRUCTURE as POTENTIAL VALUE -- "much more potential" that the one reflected by readers addressing to periodicals, because the notion of the value is not yet in the content of any -- even potential -- USE of periodicals, but only determined by the inner structure of the articles, which is determined by the documents used by their creators. (This factor IS important, but it is not the only one.)

SCIENTISTS ATTITUDE TO PERIODICALS EXAMINATION: QUALITY IS EVALUATED, ALL THE REST IS TEA-LEAVES READ

The forth group of methods is quantitative processing of the data of questionnaire surveys, interviews, peer assessing and other possible methods of evaluation of scientists ATTITUDE to periodicals. In contract with the methods of previous groups which reflect either directly a concrete property itself (productivity) or an intermediate of a property as a process existing in objective reality (use as an intermediate of value), the methods of this group reflect only OPINIONS that seems to be less reliable intermediate than a piece of objective reality. Of course, it is much possible to put questions to the peers, responders etc. about value, "impact" and even productivity, but what is the reason?.. The value is more "directly" assessed through the use data than through the opinions data, the latter rather being immanently closer to the

notion of the "quality" (see Table 1), while the productivity is being measured either directly (de visu count) or almost directly. It is a tempting idea to assess the IMPACT by these methods, but the idea does not seem not to be developed enough as yet to explore it fruitfully. Of course, the notion of the impact as of influence or a strong impression seems to be fairly identifiable though opinions -- in contract with value, but, again, it is still the point of further consideration.

Also, there are, of course, some properties of scientific periodicals that do exist as an objective reality and that we cannot quantitatively evaluate in a way other than studying opinions. For example, we are able to say that scientific periodicals have such property as "attractiveness" -- by analogy with "attractiveness" of a piece of art [32, p. 38--39], which is determined by such factors like format of a periodical, cover design and other external factors affecting on subjective liking. However, such properties are hardly the ones of any importance in the content of the assessment of the ability of periodicals to correspond to the information needs of a domain.

Sometimes the USE is also evaluated through the methods of the forth group [33]. It is well-known, however, that some experts tend to exaggerate the scope of their use of such periodicals that were their favorite ones in the days of the beginning of their scientific carrier, that they pretend to demonstrate more number of periodicals that they really regularly use [36, p. 294] etc. (But how could they remember? Their memory relates to READING rather than to the actual use.) Such details, to tell the truth, are anyhow of no importance: citation analysis also has some recognized "demerits", but citation analysis is an aid of evaluation the use itself, while in the case under consideration only opinions about the use are under study. Again, as it was demonstrated above (Table 1), the analyzed approach is IMMANENTLY matching for QUALITY evaluation.

THE NEED IN A RECOGNIZED TERM TO DENOTE THE GENERAL ABILITY OF PERIODICALS TO CORRESPOND TO THE INFORMATION NEEDS OF A DOMAIN

It seems almost undoubtedly that some specific properties of scientific periodicals (other than productivity and value) that also determine the ability of the latter to correspond to information needs of a concrete domain representatives exist; the problem is that our methodic arsenal does not make us possible to evaluate them. On the other hand, some of the specific methods bring a mixed notions of productivity and value of periodicals (like some varieties of readers addressing to periodicals examination). So, the generalized term for designation of the the ability of periodicals to correspond to information needs of a concrete domain representatives should be coined to avoid misunderstandings in complicated situation and to be used in generic sense. In fact, a lot of terms were arbitrary used for such purpose, but this use was not regulated at all as in case with specific properties nominations. In 1981 I at first used the conditional term "thematic orientation of a scientific periodical" [34] in the mentioned generic sense, in 1983 I published a special paper called "Quantitative assessment of thematic orientation of scientific periodicals" which aim was to ground the necessity in a special term with the above meaning, and to coin this term [35]. However, I have not succeeded and just a couple of authors followed me in the terminology. Possibly this term did not sound good; however, my objective now is again to demonstrate the necessity in such a term for the further stimulation of the quantitative assessment of the properties of scientific periodicals. *

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Endnote:

(*) References are omitted in order not to overload the referencelist. The examples are taken from the articles, devoted to the results of periodicals quantitative evaluation, that I collected in 1978-86.

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SCIENCE and TECHNOLOGY INSIGHTS in SMEs

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Abstract: Access to and applications of new technological information from worldwide sources is fast becoming critical for SMEs. Nevertheless, SMEs have distinctive challenges to overcome in order to generate business and S&T insights that would result in tangible actions. Assistance to SMEs by governments appears to be very much in fashion but their understanding of the specificities of SMEs and their capacity to act, both from a technological and market points of view are usually limited. In this paper, I shall examine the issue of S&T insights for technology based SMEs in order to stimulate further discussion and empirical research.

SCIENCE and TECHNOLOGY INSIGHTS in SMEs

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INTRODUCTION

Greater availability of statistical information, has allowed academic researchers to investigate business strategies in a dynamic environment. In periods of information scarcity, generals who had good maps and scouts had a distinct advantage over their adversaries. However, strategies were static and the ability to anticipate the countermoves of adversaries and reaction of the population was limited. Aristotle Onassis suggested that one needs to know something that one's competitor does not know. In today's knowledge society and information overload, it is almost impossible to follow this advice. What is now required is a slow and methodical gathering, screening, organizing and analysis of information for the generation of insights. Insights, sometimes called Intelligence, is generated from information from competitors, customers and suppliers and is aimed at strategy formulation by the Executive team with its clear trade-offs and choices.

INTERNATIONAL MARKETPLACE OF SMEs

Since the end of the Second World War, world trade has expanded, and by the early 90s was comparable to its level at the beginning of the first world war (1). The impact of this globalization brought about in part by the reduction in tariffs will not only be felt acutely by Multi National Corporations (MNCs) but also by Small and Medium sized Enterprises (SMEs) (2). As the merger of MNCs (3) continues unabated we can expect that supplier SMEs will see MNCs either set up their own suppliers, establish alliances, acquire SMEs or simply demand that SMEs assume responsibility for technical development and increase productivity. The reductions in custom tariffs and the easier movement of capital, will force SMEs to internationalize their strategies. Although there are many examples of SMEs which have a lucrative export business, until recently, most have been excluded from foreign markets because they lacked the required expertise and/or human and financial resources. Nevertheless, when exports reach a certain level, SMEs usually encounter non-tariff barriers enacted at the instigation of local firms (4). As every threat is also an opportunity, SMEs will also face more competition in their own unprotected home markets.

There is presently a World-wide ideological and political consensus on the benefits of free trade. However, that consensus may, or may not, continue over the coming decades. The increasingly protectionist industrialized countries are seeking to raise labour standards, eradicate sweatshops and stop child labour in developing countries even though low wages in developing countries arises from their low productivity (1). Indication of a backlash is already noticeable in Latin American Countries (5) and one could legitimately question whether the population of developing countries will accept ever increasing liberalization of world trade.

But, professor Kobrin (6) at the Wharton school believes that the scale of modern technology makes the trend irreversible. Furthermore, specialization results in interdependence as organizations specialize in developing core competencies and deepening their strategic positions rather than broadening it. Thus for the foreseeable future, the road-map of the business world appears to be moving away from independence to interdependence and it is those who will be learn the skills required to manage this interdependence (7) who will prosper. It follows that the complexity of decision-making in SMEs should and will reflect the complexity of the competitive environment (8).

TECHNOLOGY BASED SMEs

The received common sense is that SMEs have the ability to respond with speed and flexibility while larger companies are much slower. This common sense neglects to address the fact that SMEs do not, in general, have massive resources at their disposal and that they may not recover from a wrong strategic thrust. The US National Bureau of Economic Research (9-a) has demonstrated that small firms are less likely to use advanced technologies such as computer controlled tools and account for a disproportionate share of job losses and job gains. More recently, Baldwin (9-b) found that SMEs have not only been paying increasingly lower wages but are also less productive. This would indicate that decision making in SMEs is not, in general, as good as the received common sense would suggest. This may entice researchers to seriously look at the specificities of SMEs and governments at better targeting their SMEs assistance programs.

It is unfortunate that SMEs have been lumped into one amorphous category and although the use of technology would be a determining factor of competitiveness for most SMEs, a distinction should be made between agricultural SMEs, service SMEs and manufacturing SMEs. SMEs (except for agricultural SMEs) are either suppliers of products to MNCs, incubators for new products and processes that would be bought by MNCs, or producers of customized products and services (10). Companies with no sales (start-ups) have a different set of requirements for insights. This distinction is important because globalization has proceeded at different rates not only for companies who are in different industrial classifications but also for those within each classification. I will confine (11) myself to manufacturing SMEs (Technology Based SMEs) who utilize technology as a source of proprietary product or process innovations. In this case, the purpose of Science and Technology insights (STi) is the identification of threats and opportunities.

Technology based entrepreneurs, like any entrepreneur, attempt to sell, in a given market, a superior product or service. Products must be priced correctly, with commensurate specifications to compete in the market place, and be effectively marketed to potential customers. The Executive Team in SMEs is required to anticipate market needs over the planning horizon and the potential technological developments that will displace their products, present and future. Thus, technology based SMEs require insights for the preparation of business plans, the raising of capital and the pricing, marketing and distribution of products, etc. The process of integrating managerial, financial and marketing with technological skills is no mean feat, as traditionally these have been two solitudes. In general, successful technology based SMEs are those where the executive team has learned how to bridge these solitudes and is demonstrated by the emergence of new behaviour (12).

S & T INSIGHTS

Technology is now recognized as one of the basic determinants of competitiveness. Scientific and Technical insights (STi) is therefore crucial for all SMEs which rely on technology for their survival and must include the ability to monitor technological developments of competitors, clients and customers World-wide. STi has been defined as S&T information on external opportunities, threats and developments who affect the company's future position in the international marketplace (13). Another definition is knowledge and foreknowledge of the environment as a prelude to management action (14). Thus, STi is both a defensive and offensive tool since it not only reduces the risk of investment decisions but is also a source of opportunities. STi focuses specifically on insightful technical information in the context of the international marketplace. This information is often obtained through various networking activities (15). Also, the executive team must be fully cognizant of both technology push and technology pull forces World-wide. Indeed, the recognition of technical opportunities, coupled with the identification of market needs, are recognized as the two most important ingredients for successful innovations. Most SMEs realize the need for early recognition of technological opportunities, but have usually neglected to conduct thorough S&T monitoring or scouting. This neglect can only be explained by beliefs of the Executive team either that one has no ability to control the outside environment, or one knows it all.

STi strength comes from the slow accumulation and analysis of S&T information, its analysis in the context of the international marketplace and its use for strategy formulation. If one follows Mintzberg's (16) analogy, STi is the result of steady and continuous analysis of S&T information (left brain), with synthesis or insights (right brain). The 4th century Greek philosopher, Aristotle postulated that wisdom was not achievable by logic alone, but was by disciplined intuition. Thus, one should not develop a STi program based exclusively on analysis since the exclusion of synthesis would considerably diminish the usefulness of STi in business decisions.

BACKGROUND ON S&T INSIGHTS AND SMEs

There is a paucity of papers and case studies on the phenomenon of S&T Insights (STi) in SMEs. This may be because most politicians and researchers, consciously or not, look at SMEs as having an overriding objective of expansion into large firms. Yet only a minority of SMEs will ever expand into larger firms and it is unwise to base programs and policies on such premises. The general assumption is that a SME would require the same quality of STi as its larger counterparts, but somehow more targeted and cheaper to generate.

The challenge for the executive team is to allocate its investments in the right direction to move from the present design to future designs at the lowest development cost per unit of customer satisfaction. To do this, the team needs to understand the requirements of its customers, employees and shareholders, in that order. This hierarchy is based on a study that indicates customer demands far outstrip other factors as the main engine of innovation.

Yet there appears to be a paradox between the increasing unpredictability of the business world and our "faith" in technological foresight and forecasting. Drucker (17) suggested that "it is not so very difficult to predict the future, it is only pointless". The competitive advantage of being able to know today where are the future technologies, based on what has been discovered today.

Although there are multiple intelligence models (18) and nodes in SMEs, The steps in the STi cycle (loosely based on Kroll (20) and Mintzberg (16) taxonomy) are as follows:

- . Technological needs as defined by overall company strategy
- . Collecting data from publicly available sources
- . Organizing and processing information
- . Analysis of information and generation of S&T insights
- . Synthesis of STi with various business insights
- . Strategy formulation by Executive team
- . Technological needs as defined by overall company strategy

Technological needs must be clearly defined in order to generate useful STi. The issue is that the analyst can drown in too much data thus, the search must be focussed on the technological requirements which are deduced from the firm strategy. If one believes Porter, strategy formulation should be to deepen the strategic competitive position rather than broadening it (19).

- **Gathering the data**

In collecting one must ask oneself how much structure to establish? The amount of staff networking to encourage as the involvement of staff has other benefits besides sharing the workload. If information is widely dispersed, one would have to enlist other sources of information and gatekeepers such as local libraries, industrial associations, universities and colleges or government resources and specialized (21) information retrieval firms (Is closer contacts with fewer universities better?). Soliciting the views of customers, non-customers and suppliers would increase their satisfaction with the firm. Also the use of stock analysts is often neglected.

Other considerations in designing a gathering system are:

Maturity of the technology (In rapidly evolving industries, STi should be generated from an international viewpoint. Coe and Helpman have demonstrated that foreign R&D stock is at least as important as the national stock in countries with small economies;

Capital intensity (Larger investments would require extensive STi, as once an investment is made, it is usually difficult to undo);

Who and where are the other players (competitors, suppliers, clients; the size and background of present and future players often indicate their decision making processes);

What are their technological plans (If they are allocating funds to R&D then one can expect changes);

Where is the marketplace (If the marketplace is small and local and the technology mature then one would not expect competitors unless...);

Stability and predictability of the marketplace (competitors, clients, suppliers);

How are the competitors responding to globalization? (Are they going in or out of certain markets, are MNCs bankrolling competitors?);
Quality of investors (angels, venture funds, bankers, shareholders);

- **Organizing and processing the data**

Once the data gathered, then organizing and processing of the data can be done. Examples of processing data would be various citation, patent and content analysis. This should be done with the involvement of senior staff in the company who have extensive experience in the marketplace.

- **Analysis of information and generation of S&T insights**

The analysis of information and generation of insights on both the technology and competitors is weak even among MNCs (22). The generation of STi in a MNC is usually centralized and assigned to a dedicated group close to the executive team. The result would be an objective assessment of current technologies compared with present competition and an assessment of new competitors based on emerging technologies or change in strategy. In the case of an SME insights could be generated by divisions heads, with the occasional involvement of outsiders with specific skills or expertise. Recently several service companies provide customized analysis of published information. These companies have assembled substantial knowledge and expertise in specific technical sectors and have substantial archiving capabilities. Their publications are sold to whomever pays the subscription price. Most companies will perform analysis on a custom basis, but obviously it is rather expensive and out of reach of most technology based SMEs (\$100K). Nevertheless in fast moving sectors it would be a false economy not to undertake thorough scouting of S&T information.

- **Synthesis of STi with other insights**

STi must be combined with other business insights in order to make decisions and take actions. STi is only one piece of the puzzle in strategy formulation and one generally technical insights on its own does not lead to corporate decisions. Therefore, the convergence of both streams must be completed at this stage. This is not easy even in large companies (22).

- **Strategy formulation by Executive team**

The style of decision making of the Executive team is an important factor in designing any program. Insights must be presented in a form that allow the owner and his team to develop and formulate their strategies (16). An astute Executive team would also want to monitor the effect of its technological strategy by further collection of data and analysis.

GOVERNMENT RESEARCH AGENCIES and UNIVERSITIES

There is a perception that government and university researchers have vast deciphering powers that can nurture technology based SMEs. Also, most Technology based companies depend on such international governmental activities as standards and regulations. It is therefore not a surprise that SMEs have requested that governments share with them their insights on

international markets and technologies. These STi activities are often viewed as a natural extension of technology transfer from government laboratories. These demands neglect to take into account that public research institutions, including universities, have as prime motivator the stability of their research programs and a certain aversion to risk(23).

Albagli et al. (15) developed the concept of exploiting the participation of National Research Council of Canada researchers in collaborations and networking activities to generate STi. A trial copy of an STi bulletin was prepared and selectively disseminated to technology based SMEs in the high technology sector. The evaluation of the trial demonstrated that the concept was unique and the information provided useful and needed. As specific SMEs needs were unknown, the government researchers had to have the skills to analyze information (left brain) and synthesize insights into the international marketplace (right brain). It was abundantly clear that the training of researchers was crucial, but government researchers have rarely the skills to perform both functions and they seldom can differentiate between what are an exciting technical discovery and a commercial opportunity. It is now the opinion of this author that government research organizations can provide on a continuous basis screened technical information, which remains a very useful contribution to SMEs.

Conclusion

I have defined the need for S&T insights by technology based SMEs and scoped various factors affecting the generation of STi. It is evident that further empirical research on this topic is required. Specially, the service sector has been neglected and is worthy of more thorough investigation as by all accounts, greater productivity increases would occur in this sector.

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La Bibliométrie, un indicateur de tendance
Les codes CIB pour détecter les marchés potentiels
Exemple: les cartes à puce sans contact

The Bibliometrics, a trend indicator
IPC code to detect the potential markets
Example : the contactless smart cards

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Mots-clés Veille technologique, Bibliométrie, Analyse statistique, Brevets, Cartes à puce, Information, indicateur, Classification internationale des brevets

Résumé

L'accroissement des volumes d'informations renforce le besoin d'indicateurs bibliométriques aussi bien sur le plan de la recherche qu'au niveau industriel. Le développement de la Veille Technologique, en partie basée sur cette recherche d'indicateurs, permet de donner à la bibliométrie une dimension industrielle.

Leader mondial dans le domaine de la carte à puce, Gemplus n'en demeure pas moins à l'écoute du moindre changement, de la moindre évolution aussi bien en terme de technologie que sur le marché, de manière à anticiper, surprendre la concurrence et renforcer sa position de leader.

Cette étude montre comment à partir de références issues des bases de données brevets, interrogées grâce à des mots-clés du langage naturel, une étude bibliométrique sur les codes de classification permet de détecter les segments de marché intéressants dans le domaine de la carte à puce sans contact.

Keywords Competitive intelligence, Bibliometrics, Statistical analysis, Patents, Smart card, Information, International patent classification

Abstract

The increase of the volume of information strengthens the need of bibliometrics trends in the Research field and at industrial level. The development of competitive intelligence, for the most part based on the trend search, gives an industrial dimension to the bibliometrics.

World's leading producer of smart card, Gemplus is always listening to the evolution on the market and the technologies, in such away to anticipate, surprise the concurrence and reinforce its leadership.

This study shows, how from patent database references, questioned with keywords of the natural language, a bibliometrics treatment on the international patent code permits to detect the interisting markets in the contactless smart card domain.

La nécessité d'obtenir de plus en plus rapidement des informations stratégiques à partir de volumes d'informations qui croissent exponentiellement, ne peut s'envisager sans une aide informatisée. Cette aide, sur le plan de l'exploitation par des méthodes bibliométriques, intervient à tous les niveaux, depuis la préparation des données jusqu'à leur analyse.

I DEFINITION

Pour avoir une approche pragmatique, nous définirons la bibliométrie comme l'application de méthodes statistiques ou mathématiques sur des ensembles de références bibliographiques.

La bibliométrie est donc un outil de mesure auquel on fait appel pour aider à la comparaison et à la compréhension d'un ensemble d'éléments bibliographiques.

La bibliométrie est aux publications ce que la démographie est aux populations.

II LA BIBLIOMETRIE : UN INDICATEUR DE TENDANCES

La bibliométrie permet d'exploiter des signaux bibliographiques comme la démographie permet d'étudier les populations : il est inutile de lire toutes les publications pour les sérier pas plus qu'il est utile de connaître tous les individus pour les dénombrer.

L'accroissement des volumes d'informations ne permet plus une lecture linéaire de toutes les publications et renforce donc le besoin d'indicateurs bibliométriques aussi bien sur le plan de la recherche qu'au niveau industriel. Le développement de la Veille Technologique, essentiellement basée sur cette recherche d'indicateurs, permet de donner à la bibliométrie une dimension industrielle. A partir de ces indicateurs, l'expert saura quels documents sont les plus importants dans le cadre de ses préoccupations.

III L'ANALYSE STATISTIQUE OU COMMENT EXPRIMER RAPIDEMENT ET SIMPLEMENT L'INFORMATION CONTENUE DANS UN VOLUME IMPORTANT DE DONNEES ?

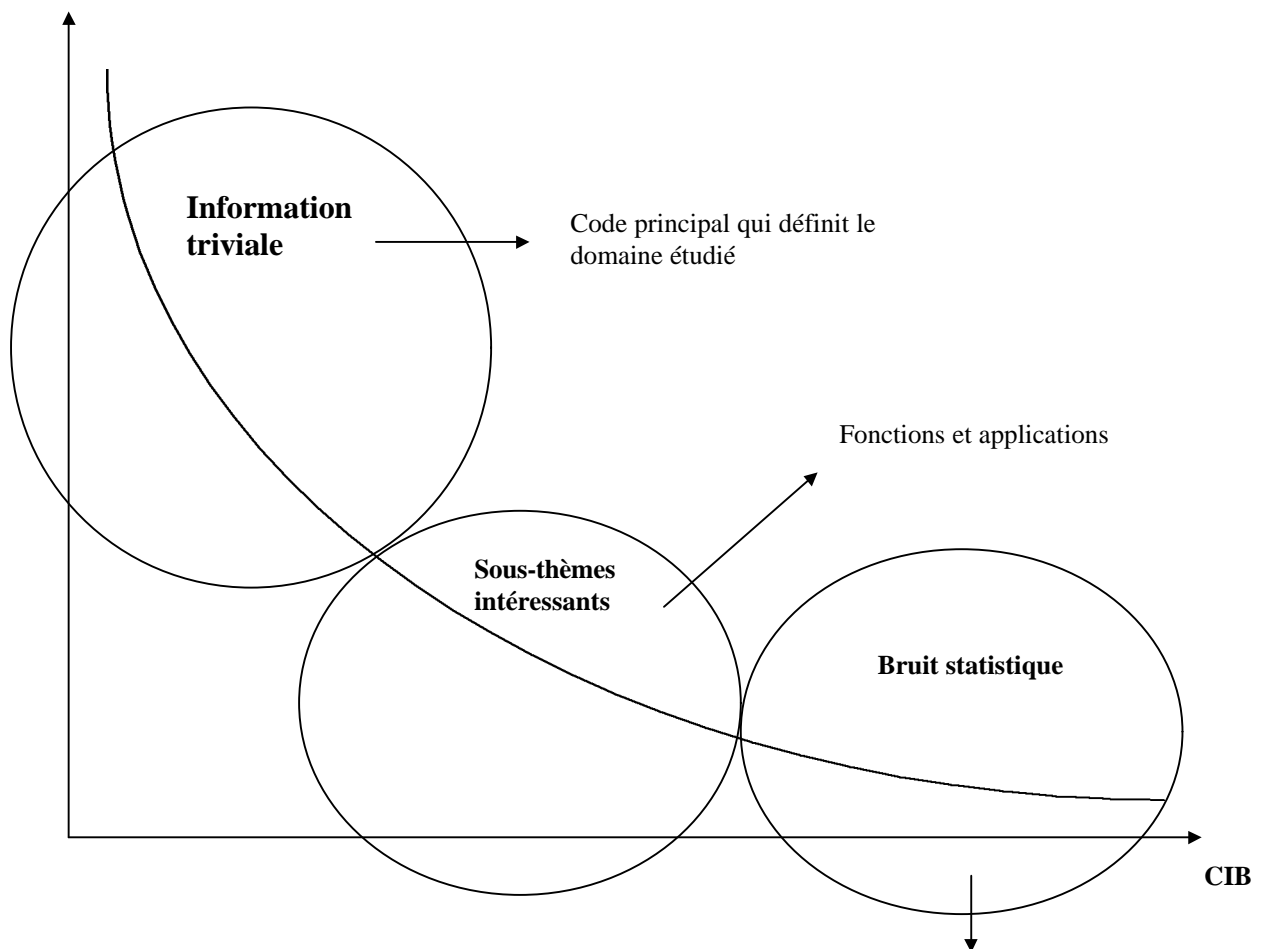
Si nous prenons le cas des brevets, l'analyse statistique va nous permettre de :

- surveiller un concurrent
- analyser l'évolution dans le temps d'une technologie
- connaître rapidement les nouvelles technologies
- évaluer la situation du marché international
- améliorer la recherche par mots-clés et codes de classification

Il faut consentir à une perte d'information pour obtenir un gain de signification.

Les brevets dans les bases de données sont référencés à l'aide de différents champs. Il est donc possible, avec les outils adéquats, de réaliser des analyses statistiques sur chacun de ces champs, et d'obtenir rapidement des informations concernant l'évolution de chacun des points spécifiés ci-dessus.

Si nous prenons le cas de la classification internationale des brevets (CIB), la collecte d'information à l'aide de cette classification n'est pas totalement exhaustive mais dans certains cas permet de réduire considérablement les zones de 'bruit', c'est-à-dire les données inutiles dans le cadre de certaines études que l'on qualifiera de rapide.



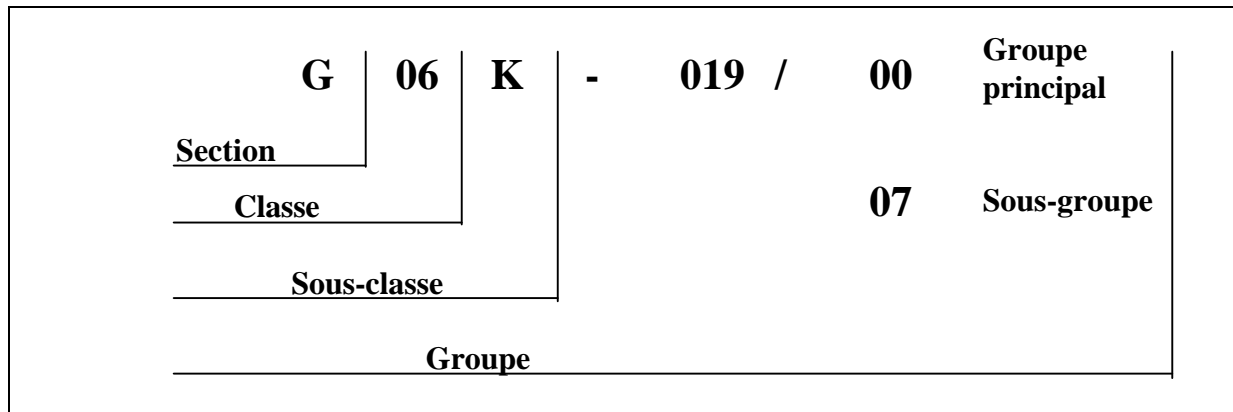
	85	86	87	88	89	90	91	92	93	94	95	96	97
CIB 1													
CIB 2													
CIB 3													
CIB 4													
CIB 5													
CIB 6													

L'étude statistique des codes de classification nous donne trois types d'informations à trois fréquences d'apparition différentes :

- ☉ L'information dite triviale : c'est celle qui définit le domaine étudié
- ☉ Les sous-thèmes intéressants : descriptifs des fonctions ou applications particulières
- ☉ Le bruit statistique : ce sont des informations se situant à des fréquences faibles. La faible fréquence n'étant pas de l'information exploitable, il est nécessaire de la coupler avec d'autres champs, en particulier le champ date de manière à retracer l'évolution dans le temps des technologies, et ainsi déceler les dégénérescences de certains secteurs ou au contraire les innovations potentielles.

La CIB est la seule classification citée dans toutes les bases de données brevets (Derwent, USPatents, EPAT, FPAT, JAPIO,...). Respectée par tous les pays et traduite en cinq langues, **la CIB est un outil de communication international.**

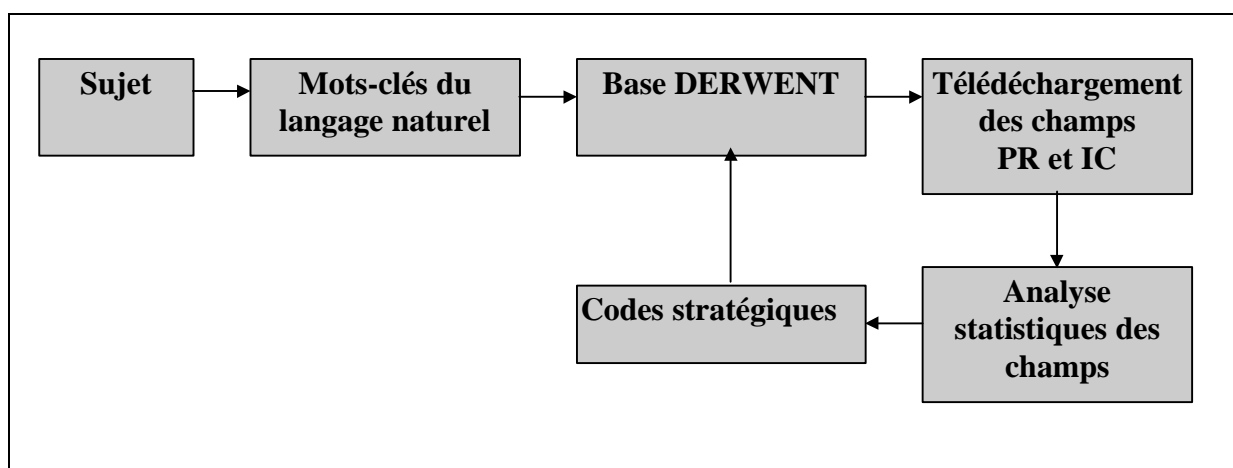
Cette classification recouvre l'ensemble des connaissances que l'on peut considérer comme relevant du domaine des brevets et se divise en sections, chaque section en classes, sous-classes, groupes et sous-groupes.



*Classification internationale des brevets, exemple
[International patent classification, example]*

L'exploitation rationnelle des codes est particulièrement puissante. Elle permet en effet de mettre en évidence les réseaux de connaissances qui concernent un travail, un concept, une production scientifique et de remonter au pays, auteurs, sociétés,...

La figure ci-dessous montre comment à partir du langage naturel, il est possible de suivre l'évolution d'un domaine au cours du temps grâce aux codes CIB.



*Du langage naturel aux codes stratégiques
[From natural language to strategic codes]*

**Evolution du nombre de brevets d'un domaine spécifique
par les codes de classification
Détection des codes stratégiques et des applications nouvelles**

	89	90	91	92	93	94	95	
a63f-007							5	→ Jeu
b29c-045						6	4	→ Moulage par injection
b42d-015	4		6	8	11	35	29	→ Carte avec graphique
e05b-049						5		
g01b-007						3		
g01r-019				3				
g01r-031			3	4		5	3	→ Vérification de propriétés électriques
g01r-033						3		
g01s-013						3		
g05b-019								Équipement pour le traitement et le transfert de données, le transfert d'information entre une mémoire et un microprocesseur
g06f-001		4				5	5	→
g06f-003						4	3	
g06f-013						3		
g06f-015		6	3	3				→
g06f-019						3		Méthode pour la lecture d'un support d'information
g06k-005			3	4				→
g06k-007	5	9	14	9	7	14	16	→
g06k-017	2	5	4	11	6	26	30	→
g06k-019	9	21	26	26	29	74	74	→ Support d'enregistrement avec des puces à circuits intégrés
g07b-011						4	4	
g07b-015	4		3	8	4	12	13	→ Billetterie, barrière, péage
g07c-001					3			→ Horodateur
g07c-009			4	4	5	4	7	→ Tourniquet
g07f-007		4	3	7	3	4	10	
g07f-017					3			→
g08b-013							4	→ Lecteur de carte pour vente
g08c-017			3	3		3		
g11b-005				3				
h01f-038							5	
h01i-021		3	5	7	7	12	7	→
h01i-023				4	4	10		Appareils adaptés à la fabrication des dispositifs à semi-conducteurs
h01q-001						4		
h01q-007			3					
h02j-007							3	
h04b-001			5	8		7	8	→
h04b-005		5	5	3		4	8	
h04b-007			3	8	3	3	4	
h04i-025							3	
h04i-027		3				3	4	
h04m-001			3					
h04q-009			3					
h05k-001						6	5	→
h05k-003						3	4	
						3		Circuits imprimés et appareils pour leur fabrication

Figure I

IV DE L'ANALYSE STATISTIQUE A L'INDICATEUR DE TENDANCES

Prenons le cas des Cartes à puce sans-contact et, suivant le schéma précédent, regardons quels sont les codes de classifications les plus importants, et comment ils évoluent au cours du temps.

Choix du serveur : QUESTEL

Base de données : WPIL

Mots-clés : CARD
CONTACTLESS

Collecte des données : Interrogations et téléchargement des références

Traitement grâce aux logiciels d'analyse statistique : ici DATAVIEW (CRRM)

Les bases de données présentent les documents sous forme de références bibliographiques comprenant des champs, chaque champ correspondant à diverses données du document (auteurs, titre, déposant, codes de classification, résumé, dates, ...).

Dans le cadre de notre études, nous nous attacherons à deux champs en particuliers :

- le champ **IC**, pour les domaines technologiques (codes CIB)

- le champ **PR**, pour les années de dépôt des brevets.

Après mise en forme du fichier dans EXCEL, la figure I présente les résultats du traitement statistique des références obtenues lors de l'interrogation de la base DERWENT.

Lors de la mise en forme des données, les références comprenant des codes à fréquence 1,2 et 3 ont été volontairement supprimées pour rendre plus lisible la présentation. De même, les références antérieures à 1989 ont été éliminées, le domaine de la carte à puce sans-contact étant relativement récent.

INTERPRETATION DES RESULTATS

Premières constatations :

- ☉ Le code G06K-019 est le code dominant
- ☉ Les codes G06K-007, G06K-017 et B42d-015 ont une fréquence importante
- ☉ Certains codes appartenant à la même sous-classe forment des groupes tels que G06F, H01L, ou H04B.
- ☉ D'autres codes évoluent de façon non négligeable au cours du temps tels que les codes des sous-classes G07B et G07C.

Le serveur QUESTEL met à disposition deux bases nommées ECLATX et CIB qui donnent l'intégralité des subdivisions de classement de la classification internationale des brevets, et permet d'obtenir une définition fine des composés intervenant dans les brevets les plus fréquents, la CIB décrivant aussi les fonctions que les applications.

La figure II nous montre une référence de la base CIB qui traduit en langage clair les divers éléments du code dominant G06K-019.

- GR G06K-019/00** Supports d'enregistrement pour utilisation avec des machines et avec au moins une partie prévue pour supporter des marques numériques (supports d'enregistrement adaptés pour commander des machines spécifiques, voir la sous-classe correspondante à la machine, p. ex. B 23 Q, D 03 C, G 10 F, H 04 L; impression de formes B 41; cartes de classement B 42 F 19/00; supports d'enregistrement en général G 11)
- SG . G06K-019/06** caractérisés par le genre de marque numérique, p. ex. forme, nature, code
- SD01 .. G06K-019/063** le support comportant des perforations ou des encoches latérales, p. ex. des fentes allongées[5]
- SD02 .. G06K-019/067** Supports d'enregistrement avec des marques conductrices, des circuits imprimés ou des éléments de circuit à semi-conducteurs, p. ex. cartes d'identité ou cartes de crédit[5]
- ... **G06K-019/07 avec des puces à circuit intégré**[5]
- G06K-019/073 Dispositions particulières pour les circuits, p. ex. pour protéger le code d'identification dans la mémoire (protection contre l'utilisation non autorisée de mémoire de calculateur G 06 F 12/14)[5]
- G06K-019/077 Détails de structure, p. ex. montage de circuits dans le support[5]
- SD03 .. G06K-019/08** utilisant des marquages de différentes sortes sur le même support d'enregistrement, p. ex. un marquage étant lu optiquement et l'autre par des moyens magnétiques
- ... G06K-019/10 au moins une sorte de marquage étant utilisée pour l'authentification, p. ex. de cartes de crédit ou de cartes d'identité (vérification des cartes d'identité ou des cartes de crédit dans des mécanismes actionnés par ces cartes G 07 F 7/12)[5]
- G06K-019/12 le marquage étant lu par des moyens magnétiques[5] G06K-019/14 le marquage étant lu par irradiation[5]
- G06K-019/16 . le marquage étant constitué par un hologramme ou un réseau de diffraction[5]
- G06K-019/18 Détails de structure[5]

Figure II : *Extrait de la base de données Eclat X*
[Extract of Eclat X database]

En procédant de la même façon pour tous les codes et groupe de codes apparaissant sur la figure I, certaines informations intéressantes émergent :

Les recherches sur bases de données brevets concernant la carte à puce pourront s'effectuer grâce au code de classification G06K-019.

Beaucoup de brevets sont déposés dans le domaine des systèmes de transmission à boucles inductives, émetteurs-récepteurs, autrement dit des antennes et des lecteurs associés

Des informations 'Marketing' importantes : les dépôts de brevets concernant les péages, barrières, tourniquets,... sont en constante progression. Ce sont les marchés auxquels sont dédiées les cartes sans-contact : contrôle d'accès et transports.

V CONCLUSION

La bibliométrie, à travers cet exemple, permet de mieux appréhender l'environnement, qu'il soit technologique ou marketing. L'analyse statistique apporte des éléments nouveaux, de nouveaux moyens d'informations, et une manière conviviale de présenter les évolutions.

Mais, la description menée à son terme appelle irrésistiblement l'explication. Elle nécessite un dépassement théorique que seul un initié peut apporter. En bibliométrie, l'innovation est faiblement représentée et se situe à des faibles fréquences. Cela signifie qu'en général, quelle que soit la méthode d'analyse de données employée, les interprétations devront être croisées avec d'autres types d'informations.

La bibliométrie a le mérite de soulever très vite les nouvelles questions et de mettre en évidence des zones d'observations qui devront faire l'objet d'études plus approfondies.

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Information flood management and multimedia integration in information system

La gestion des flux d'information et l'intégration des techniques multimédia dans les systèmes d'information

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Résumé : L'information revêt actuellement une importance capitale dans nos sociétés modernes en constante compétition.

Des nombreux auteurs ont déjà analysé les types d'information manipulés par divers organismes.

Dans un premier temps, il est d'abord essentiel de recenser les différents types d'information que peuvent manipuler des structures telles que les PME/PMI ou les administrations.

La gestion dynamique de l'information à l'intérieur d'une structure est essentielle. Aussi, il est important de savoir comment caractériser ces flux, comment communiquer une information sans la dénaturer, et comment les techniques multimédia peuvent se révéler utiles dans la gestion de ces flux.

Le multimédia s'intègre à tous les niveaux de ce système : sources, consultation, et diffusion.

Mots-clés : information, multimédia, flux, gestion dynamique

Abstract : The opening of markets to the world and the growth of technological applications are among factors militating in favor of dynamic information system management.

Few authors have already analyzed the different types of information used by organisms, but their studies didn't integrate the dynamic dimension of information.

This characteristic induce a new definition of the different types of information and the information has to be now considered as a flood in the system.

The multimedia is integrated in any stages of the information system : sources, queries, diffusion.

Key-words : information, multimedia, flood, dynamic management

La gestion des flux d'information et l'intégration des techniques multimédia dans les systèmes d'information

I. Introduction

L'information revêt actuellement une importance capitale dans nos sociétés modernes en constante compétition. Que ce soient les grandes entreprises multinationales, les PME-PMI ou les collectivités locales, le besoin d'information est permanent. Il est, de plus, l'un des facteurs essentiels dans la détermination de la stratégie d'une entité.

Une entreprise se doit de réaliser un profit minimum afin d'assurer sa prospérité ; Un établissement public possède de plus en plus de données à manipuler avec un potentiel humain en constante mutation.

Ces constatations mettent en évidence un objectif commun entre ces deux types d'organismes totalement différents : Le concept d'efficience relatif à la gestion de l'Information.

Des nombreux auteurs ont déjà analysé les types d'information manipulés par divers organismes, ainsi que les raisons qui les conduisent à s'approprier tel ou tel type de données. Les ouvrages de H. Dou [1] et de F. Jakobiak [2] explicitent bien le concept d'Information Stratégique associé au thème d'Intelligence Economique.

Parallèlement à ces études, J.L. Le Moigne et J.A. Bartoli [3] analysent l'impact des nouveaux systèmes d'information sur les organisations.

Ainsi, quatre composantes indissociables constituent le dénominateur commun de toutes ces études :

- L'intégration de tous les supports d'information dans les systèmes,
- L'"intelligence" de la mise en forme de ces informations, afin d'obtenir une présentation convenant à la majorité des acteurs de la structure,
- La circulation rapide des flux de données au travers de réseaux informatiques,
- La gestion collective indissociée de ces flux.

Les auteurs tiennent à souligner qu'ils n'entreront pas dans le débat concernant l'avenir et les enjeux de l'Information.

Les analyses suivantes seront centrées sur l'étude des besoins et la définition de concepts clés relatifs à la modernisation des systèmes d'information publics ou privés.

II. Les différentes dimensions de l'information

Dans un premier temps, il est d'abord essentiel de recenser les différents types d'information que peuvent manipuler des structures telles que les PME/PMI ou les administrations [4].

Il est d'usage en gestion documentaire, d'établir une classification des informations selon leur forme (texte, son, audio-visuelle...), leur type (scientifique, technique...) et leur classe (information brute, information élaborée) [5]. Cette classification caractérise l'information selon sa nature intrinsèque, sans tenir compte du caractère dynamique de celle-ci (échanges, modifications ...). Cette vision purement statique de l'information concerne d'ailleurs plus la gestion de fonds documentaire qu'une **gestion stratégique de l'information**.

En considérant l'information comme une ressource stratégique de l'entreprise au même titre que les matières premières et l'énergie, W.A. Turner et Y. Le Coadic [6] ont présenté l'évolution nécessaire de cette gestion statique vers une gestion dynamique de l'information.

Ces considérations se révèlent d'autant plus justes que l'information est un produit "périssable". La durée de vie d'une information est d'abord fonction de sa nature. Si elle est économique, par exemple, elle aura tendance à être très courte, et donc la réaction et l'action par rapport à cette information devra être rapide. En ce qui concerne les informations brevets, elles seront moins périssables.

La gestion dynamique des flux d'information doit permettre à terme de faire parvenir la bonne information au bon interlocuteur au bon moment sous la bonne forme.

Considérer l'information seulement d'un point de vue statique revient à négliger complètement la notion de temps et donc de durée de vie dans les systèmes d'information.

C'est pourquoi la gestion de ces flux d'informations à l'intérieur d'une structure est essentielle. Mais il est important de savoir comment caractériser ces flux, comment communiquer une information sans la dénaturer, et comment les techniques multimédia peuvent se révéler utiles dans la gestion de ces flux.

Chaque établissement possède ses propres spécificités en termes d'information. Néanmoins, pour certaines activités telles que la gestion et la production de services, il est possible de trouver des lignes de conduite générales adaptables.

Les entreprises du secteur tertiaire ou les services de gestion de l'information de structures comme les suivants rentrent parfaitement dans le cadre de cette étude :

- Gestion de ressources humaines d'une PME
- Service de documentation et d'information du secteur privé ou public
- Centre d'information et d'orientation dans un établissement scolaire
- Gestion de clients et de fournisseurs

Dans cette optique, se dégagent cinq grands types d'information, classifiés de manière dynamique.

Cette classification dynamique prend en considération les caractéristiques suivantes :

- **leur source**
- **leur destination**

- **leur flux**
- **les modifications qu'elles subissent lors de leur confrontation avec tous les acteurs du système.**

Ces différents flux d'information sont représentés *figure 1*.

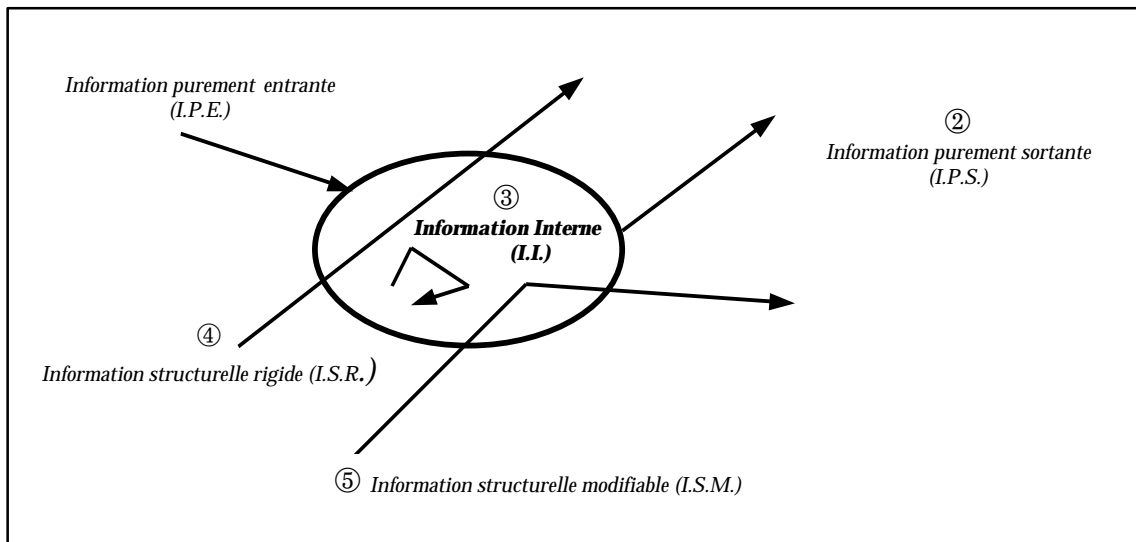


Figure 1 : Caractérisation dynamique de l'information

Cinq types d'information ont été recensés :

① **Information purement entrante (I.P.E.)**

Information absorbée par la structure. Celle-ci s'en rend propriétaire sans en être la source : collecte de prospectus, interrogation de serveurs télématiques, abonnements divers...

② **Information purement sortante (I.P.S.)**

Information générée au sein de la société entièrement dédiée à la communication externe : publicité, rapports externes, image de l'entreprise, appels d'offres....

③ **Information Interne (I.I.)**

Information générée par l'entreprise, destinée à une diffusion interne unique, c'est la seule qui peut véhiculer des données confidentielles. Les tâches de gestion de personnel, la circulation des tarifications de produits et services peuvent également en faire partie, ainsi que les différentes données sur les fournisseurs, les clients ou les employés, les notes de services.

④ **Information structurelle rigide (I.S.R.)**

L'I.S.R. représente l'information qui traverse la structure sans être modifiée. Elle est constituée des données absolues consultables par l'organisme : marchés publics, bulletins officiels, textes et règlements...

⑤ **Information structurelle modifiable (I.S.M.)**

L'information structurelle modifiable est la plus complexe à analyser de par sa nature multi-forme. Elle est constituée par les données absorbées, mises en forme, puis modifiées par la structure. Ainsi, les données relatives à un client, peuvent subir des modifications pour aboutir à l'élaboration de courrier pour ce même client. L'établissement de bulletin de salaire fait

également partie de ce type d'information. D'une manière plus complexe, l'information brevet collectée puis soumise à une opération d'innovation, peut devenir de l'information sortante sous forme de contre brevet.

Selon cette ligne d'idées, il devient possible de parler "d'information personnalisée", notion fondamentale introduite par l'intégration des techniques multimédia aux systèmes d'information conventionnels.

III Intégration de techniques multimédia

III-1 Caractérisation des flux d'information au sein de l'entreprise

Selon les axes exposés précédemment, l'entreprise est maître d'œuvre sur les informations suivantes :

- les Informations Internes (I.I.)
- les Informations Purement Sortantes (I.P.S.).

On peut donc supposer que le système de traitement de l'information utilisé répond bien aux impératifs d'efficacité.

Néanmoins, toujours en observant la figure 1, les Informations Purement Entrantes (I.P.E.), les Informations Structurelles Rigides (I.S.R.) et les Informations Structurelles Modifiables (I.S.M.) revêtent des formes multiples. L'entreprise n'a d'autres choix que de les manipuler telles quelles, ou bien de les modifier pour en arriver à une forme compatible avec le système d'information utilisé.

Les systèmes multimédia répondent à ces contraintes de polymorphie de l'information, tant au niveau de la collecte que du traitement et de la diffusion. L'usage de tels systèmes doit ainsi permettre de conserver l'intégralité de chaque type d'information tout au long du processus de traitement et jusqu'à l'ultime étape de restitution.

Ainsi, un prospectus recueilli sur un stand d'exposition, une photographie mettant en scène des acteurs "inattendus", un entretien radiophonique, peuvent être stockés et manipulés sans les réductions d'information qui sont normalement imposées par les techniques traditionnelles [7].

En effet, la structure conventionnelle d'un système d'information professionnel est très souvent bâtie autour d'une base de données, plus ou moins judicieusement structurée. L'expérience montre que, dans le meilleur des cas, cette base de données s'inscrit dans une architecture réseau de type client-serveur. Ceci permet à plusieurs acteurs d'intervenir sur le fonds informationnel de la structure, entreprise ou collectivité. Ce système centralise l'information et nécessite de la part des acteurs une action volontaire de recherche d'information. Ces systèmes issus des systèmes de gestions documentaires prennent encore peu en compte l'aspect dynamique de l'information.

Dans les systèmes traditionnels de gestion d'information (statiques), l'information qu'elle soit de type image, son ou vidéo est décrite sous la forme de fiches signalétiques plus ou moins élaborées. Or, les contraintes de veille technologique et d'intelligence économique imposent de manipuler d'autres données que ces fiches structurellement rigides. Toute information ne peut se réduire à un signalement sous forme de champs [8]. Selon les techniques traditionnelles, une image contenant l'information utile doit d'abord faire l'objet d'une description selon une grille pré-établie. Si le caractère objectif de cette phase est communément reconnu, l'effet réducteur dû à cette grille est souvent oublié.

En effet, celle-ci contient une suite de directives d'observations et une liste de mots sensés "guider" l'indexeur, mais ce guidage, si pertinent soit-il, est orienté dans le sens des besoins instantanés en information. Le résultat d'une telle opération aboutit forcément à une réduction voire une déformation du contenu de l'image. De plus, en fonction de l'évolution des besoins en information, cette étape n'est pas constante dans le temps.

Le même raisonnement peut être appliqué à d'autres supports tels que le son ou la vidéo.

Un système d'information stratégique doit donc garantir à tout utilisateur final l'accès possible à l'intégralité de l'information, c'est-à-dire, au dossier général d'information.

Dans une logique multimédia, le problème du repérage et de l'"étiquetage" des données se trouve marginalisé, car la description d'un document n'est ici utile que pour le retrouver. N'attendant aucune interprétation du document, ni aucune valorisation de son contenu informationnel, la description d'un document sera normalement la plus neutre et la plus générique possible.

Tous ces éléments soulignent la caractéristique essentielle du système d'information moderne : la souplesse. Il devient ainsi évident que les systèmes d'information classiques atteignent vite leurs limites dans cet environnement concurrentiel.

III-2 Mise en place

La mise en place d'un système d'information moderne nécessite une infrastructure informatique (ordinateur multimédia et lecteur de CD-ROM au minimum).

Les développements suivants sont génériques. Ils doivent donc être adaptés à la structure de l'entreprise ou de la collectivité à laquelle ils se rapportent.

La figure 2 présente l'intégration du multimédia dans un système de gestion dynamique de l'information.

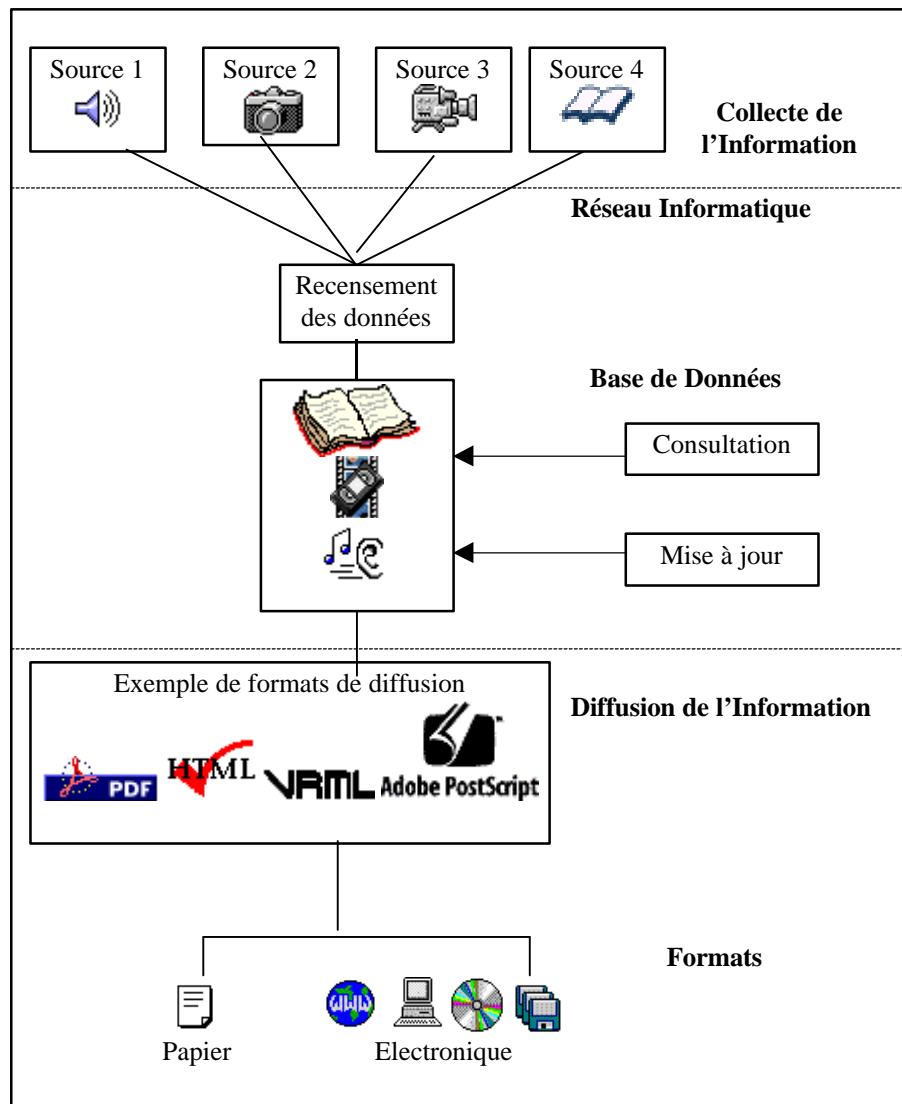


Figure 2 : Exemple de Système d'Information Multimédia

Ce schéma intègre les différents types d'information (son, image, vidéo, écrite) au sein d'un système informatique de diffusion et de consultation. La mise à jour (modification) de l'information au niveau de la base de données doit être réglementée par un système de sécurité.

En ce qui concerne la diffusion et la consultation, elles doivent aussi être sécurisées tant au niveau interne qu'externe. Néanmoins, il ne faut pas négliger la souplesse de ce système et donc permettre une consultation par tous les acteurs susceptibles d'être intégrés dans cette logique [9]. Cette sécurisation dépend bien évidemment du contenu stratégique de l'information.

Le multimédia s'intègre donc à tous les niveaux de ce système : sources, consultation, et diffusion. Il est possible de diffuser l'information sous forme papier ou électronique (CD-ROM, Internet, Intranet, disquette, client-serveur...).

IV Conclusion

Ce genre de système d'information doit impliquer un maximum d'acteurs, afin de collecter le plus d'informations possibles. Les personnes concernées venant de tous horizons (commercial, comptabilité, service clientèle, achat...), les informations collectées sont hétérogènes (fiche client, scanérisation d'une publicité concurrente, film publicitaire...).

Seule une gestion dynamique de ces informations permet d'accroître la valeur ajoutée, en ce qui concerne la stratégie et la prise de décision.

Souplesse et convivialité sont les deux maîtres-mots pour qu'un tel système soit opérationnel (fonctionnement mécanique et acceptation de celui-ci par les acteurs).

V. Bibliographie

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PATENTS INFOMETRY AND FIRM COMPETITIVENESS

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Abstract

This paper present an applied research in which infometric tools were used for patent references process. The firm which asked for the analysis wanted to identify and to quantify all the products with the same functions than the main product of the company. The results were analysed by the firm's experts. The full method using software package developed in the CRRM is explained in this paper.

Keywords

firm competitiveness, patent, international patent classification (IPC), infometry, product approach, function analysis, competitive Technical Intelligence.

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Bibliométrie du brevet et compétitivité des entreprises

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1. Introduction

80% des informations nécessaires aux entreprises sont accessibles de manière ouverte au travers d'une multitude de sources d'informations de natures diverses. Ces informations du domaine public sont accessibles par l'intermédiaire de bases de données électroniques ou papier, presse spécialisée, brevets, livres, observatoires nationaux ou internationaux, les différents réseaux électroniques, congrès, foires, etc.

Cependant la nature et les différents supports que ces informations peuvent adopter sont si nombreux que les volumes engendrés sont difficilement appréhendables. Il est alors nécessaire d'en apporter une vue synthétique aux entreprises. C'est pourquoi nous avons mis en oeuvre une méthode, qui permet de filtrer, analyser et synthétiser l'information, de manière à pouvoir l'intégrer dans les systèmes de décision de l'entreprise.

Notre méthode s'appuie sur la BIBLIOMETRIE, qui peut être définie comme «l'application de méthodes statistiques ou mathématiques sur des ensembles de références bibliographiques». En d'autres termes, «la bibliométrie est un outil de mesure auquel on fait appel pour aider à la comparaison et à la compréhension d'un ensemble d'éléments bibliographiques [1]».

Un des moyens d'accéder à l'information recherchée par une entreprise est d'utiliser l'information contenu dans les brevets. Le document brevet présente l'avantage d'être à la fois une source d'information légale, technique et stratégique. En effet, 80% des informations contenues dans les brevets ne font l'objet d'aucune autre publication [2].

De ce fait, le document brevet a été choisi pour mener une étude initiant une stratégie de veille technologique au sein d'une entreprise [3]. Cette étude peut se présenter en trois étapes distinctes:

- la recherche et la collecte de l'information

² Thèse entre le C.R.R.M. (Marseille) et le CRP Henri Tudor (Luxembourg) avec une bourse du Ministère de l'Education Nationale du Grand-Duché du Luxembourg.

- le traitement, dans le but de synthétiser et de présenter l'information sous une forme facilement interprétable
- la diffusion bien ciblée de cette information traitée au sein du milieu décisionnel de l'entreprise.

La présentation que nous vous proposons s'attache à un traitement de l'information qui repose sur une méthode d'analyse bibliométrique.

2. L'analyse bibliométrique

En bibliométrie, l'unité de travail est la référence avec ses différents champs bibliographiques qui seront comptabilisés très facilement grâce à l'informatique.

Une unité d'information élémentaire est appelée «forme».

Le traitement bibliométrique va permettre de réaliser une évaluation statistique des informations contenues dans un corpus de documents et donc de déterminer par exemple :

- des tendances, à partir de recherches rétrospectives, pour prévoir d'éventuels développements de programmes de recherche ou de divers projets,
- de cartographier un domaine afin de voir l'état d'un sujet et de le situer dans un certain contexte,
- d'élaborer des grilles de lecture de documents primaires,

Certains champs des références bibliographiques des brevets sont codés totalement ou en partie. Ainsi l'OMPI (Organisation Mondiale de la Propriété Intellectuelle) a élaboré un ensemble de codes définis par la Classification Internationale des Brevets (CIB). Une telle structure uniformise les données de manière universelle ce qui les rend plus facilement exploitables avec des outils informatiques.

L'utilité de la CIB dans le contexte de la veille industrielle a largement été étudié par Dos Santos [^{iv}]

Nos analyses bibliométriques traitent un nombre important de références bibliographiques (quelques centaines à quelques milliers), téléchargées à partir de bases de données brevets consultées en ligne.

Nous avons exploité les possibilités qu'offre le logiciel de traitement de l'information développé au CRRM (Centre de Recherches Rétrospectives de Marseille) par l'équipe du Professeur H. Dou : DATAVIEW¹.

Ce logiciel autorise des mesures de l'apparition de formes ou de paires de formes par fréquences ou occurrences (association intra ou inter-champ) aussi bien que de divers facteurs de corrélation qui matérialisent la force de l'association entre différentes unités d'information.

Les résultats engendrés peuvent être rendus plus explicites sous forme infographique, à l'aide de tableurs et sont donc ainsi plus facilement interprétables: listes triées, réseaux de co-apparition, matrices, graphes divers (évaluation de tendances, par exemple «courbes en S»), etc.

Si on examine quelques centaines de brevets relatifs à une technologie, une analyse bibliométrique permettra entre autre de connaître quelles sont les principales sociétés impliquées dans un domaine technique, les principaux sous thèmes de recherches...

On pourra également déterminer les réseaux de collaborations internes aux entreprises concurrentes, ainsi que ceux entretenus par ces dernières avec d'autres entreprises...

3. La pensée technologique

Nous présentons ci-dessous une approche basée sur l'utilisation de la bibliométrie et de la Classification Internationale des Brevets, dont les résultats sont destinés à l'assistance des industriels lors d'une réflexion technologique sur le métier de leur entreprise. Cette analyse peut être réalisée de deux façons :

L'*approche produit*, qui va en permanence chercher à améliorer le produit fabriqué, en tenant compte de toutes les transformations possibles qui pourront lui être apportées. De ce fait, l'entreprise suit l'évolution de la technologie de son métier. Si les habitudes du marché changent ou si la technologie évolue brusquement, ce type d'attitude réactive peut mettre en péril l'entreprise.

L'approche qui repose sur une *analyse par fonction* est, quant à elle, plus globale. On déterminera dans un premier temps quelles fonctions remplit le produit en cause. Puis, on cherchera à évaluer les différentes solutions techniques qui permettent de satisfaire chacune des fonctions. Cette approche permettra de mettre en place, alors qu'il est encore temps, des produits nouveaux, remplissant la même fonction, mais mieux adaptés aux besoins du marché. Ce type d'attitude peut être qualifiée par le néologisme «pro-active».

4. Méthodologie

Afin de répondre à un besoin exprimé par une entreprise luxembourgeoise, nous avons mené une étude pilote utilisant l'analyse par fonction. Les résultats étant satisfaisants, ils ont servis de base pour la mise en place d'une méthodologie.

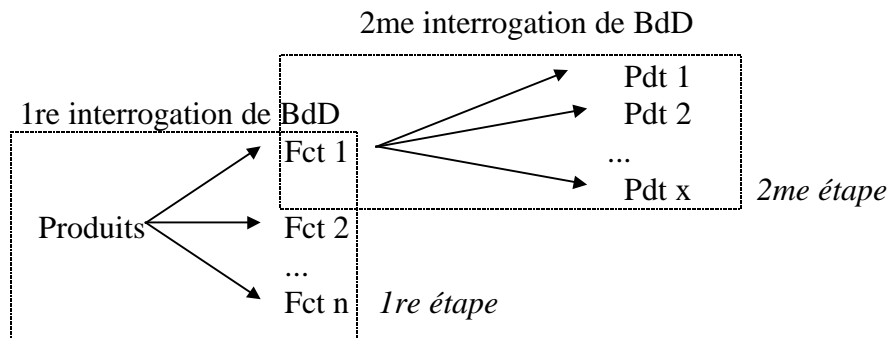
Les objectifs de la méthode sont dans une première étape, de pouvoir :

- identifier toutes les fonctions couvertes par un produit,
- quantifier l'importance relative de chaque fonction par rapport à l'ensemble des fonctions identifiées,

Puis de pouvoir :

- identifier les produits brevetés qui remplissent chacune des fonctions.
- connaître l'importance relative des produits concurrents à l'intérieur de chacune des fonctions.
- déterminer l'évolution de chacune des fonctions au cours du temps, afin de détecter celle(s) qui pourrai(en)t prendre un ascendant sur les autres.

Principe de l'analyse par fonction :
(Function analysis principle)



Une stratégie d’interrogation de base de données est élaborée de façon à retrouver le plus grand nombre de brevets protégeant le produit étudié.

Après téléchargement du corpus bibliographique, puis reformatage des données, on peut alors effectuer le traitement statistique proprement dit avec le logiciel DATAVIEW. Ainsi, la liste de tous les codes de la Classification Internationale des Brevets est extraite (Table 1: Code CIB). On en tire, avec les experts de l’entreprise, les fonctions remplies par le produit (Table 1: Fonctions). Chaque fonction peut être représentée par plusieurs codes CIB.

Code CIB	Texte de la CIB	Fonctions
Code 1	Texte 1	Fonction A
Code 2	Texte 2	
Code 3...	Texte 3	
Code 4	Texte 4	Fonction B
Code 5...	Texte 5	
Code 6	Texte 6	Fonction C
Code 7	Texte 7	
Code 8...	Texte 8	
etc.		

Table 1 : Détermination de la liste des fonctions du produit étudié à partir de l’étude des codes CIB issus de tous les brevets relatifs au dit produit.

(Table 1: From the patents and with the help of the firm experts, we find out the product functions, defined by one or several codes.)

Les codes CIB sont regroupés sous forme de concept (fonctionnalité propre au logiciel) définissant chacun une fonction. Le logiciel Dataview mesure alors la présence (1) ou l’absence (0) d’une fonction pour chaque référence bibliographique (Table 2).

	Fct. 1	Fct. 2	Fct. 3	Fct. 4	Fct. 5	Fct. 6	
Réf. 1	0	1	1	0	1	0	
Réf. 2	0	1	1	1	0	1	
Réf. 3	1	1	0	1	0	1	
Réf. 4	0	0	0	1	0	0	
Réf.	
Réf. n	1	1	0	1	1	1	
	$\Sigma_{F1(1-n)}$	$\Sigma_{F2(1-n)}$	$\Sigma_{F3(1-n)}$	$\Sigma_{F4(1-n)}$	$\Sigma_{F5(1-n)}$	$\Sigma_{F6(1-n)}$	Σ_{F1-F6}

Table 2 : Matrice de présence/absence des fonctions dans chacune des références.

(Table 2: function présence/absence matrix for each reference)

Afin de déterminer l'importance absolue d'une fonction, on effectue la somme par colonne (par fonction).

L'importance relative est calculée en divisant la somme absolue par la somme totale (\sum_{F1-F6}).

La matrice peut alors être exploitée directement par des logiciels tableur de type EXCEL, STATISTICA..., pour fournir une représentation infographique facilement analysable, explicitée au schéma 1.

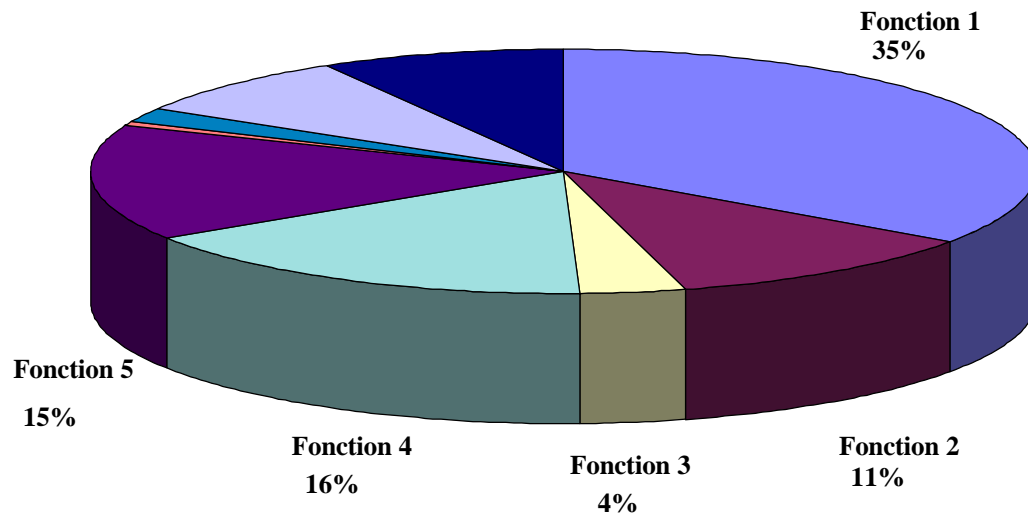


Schéma 1 : Présentation des résultats pour les experts
(Schema 1: Results presentation for decision making)

On peut ensuite, toujours à l'aide du logiciel DATAVIEW, étudier l'évolution des fonctions des différents produits concurrents au cours du temps, pour une fonction donnée (Schéma 2). Cette analyse peut être menée en construisant une autre matrice, celle-ci étant basée sur les fréquences d'apparition des formes et non plus de présence/absence.

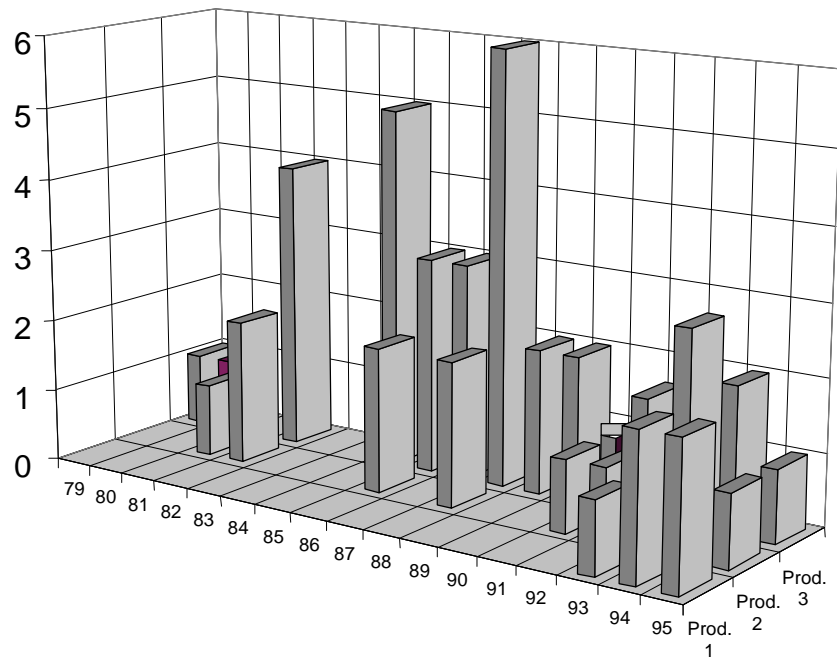


Schéma 2 : Présentation des résultats pour les experts
(Schema 2: Results presentation for decision making)

Conclusion

L'analyse bibliométrique appliquée aux brevets constitue un puissant outil pour fournir des informations susceptibles d'induire une réflexion analytique sur le métier de l'entreprise. La bibliométrie appliquée aux brevets produit des informations à forte valeur ajoutée, portant aussi bien sur les technologies, les concurrents que les marchés. Elle s'insère donc totalement dans le cadre d'une démarche de veille technologique. Une étude telle que celle menée permet notamment d'aider les entreprises à passer d'une attitude réactive aux changements du marché à une attitude pro-active, plus adaptée aux lois de la concurrence actuelle.

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