AN ESSAY ON INFORMETRICS: A STUDY ON GROWTH AND DEVELOPMENT

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Examines the scope of ‘informetrics’ in relation to metric studies of information and publications such as bibliometrics, scientometrics and librametrics. Suggests a comprehensive definition of informetrics to cover all aspects of study given in definitions of other writers, particularly Morales. Gives a brief account of the growth of literature in informetrics. Surveys measurement techniques in a number of areas such as growth of literature, efficiency scale for a) document supply, b) translations, c) bibliographies, d) SDI services, e) information products and services. Mentions the usefulness of information in decision making.

Man invented methods of measurement perhaps at the very dawn of civilisation to meet his day-to-day needs. In the beginning, measurement was related mainly to length, breadth, weight, and volume. With the progress of civilisation, man understood the concept of time, and invented devices to measure it. As science progressed, need arose to measure innumerable physical phenomena like heat, light, electricity, and so on. Devices were invented and standards of measurement were determined for all.

For a long time measurement was the field of study mainly of physical scientists and mathematicians. Gradually, it started spreading to other areas. Slowly various measurement methods sprawled to social sciences as well, and subjects like econometrics and sociometrics developed.

The studies on ‘informetrics’ started way back in 1896, when F Campbell advanced the idea for the first time of the scattering of information[1]. However, he did not coin any term for such studies. Cole and Eaeles in their publication on the history of comparative anatomy analysed the literature on the subject applying statistical methods and called it ‘statistical analysis’ [2]. Hulme used the term ‘statistical bibliography’ in 1923 for such studies [3]. Ranganathan used the term ‘librarymetric studies’ [4]; he implied the measurement of various library activities and services using mathematical and statistical techniques.

Pritchard coined the term ‘bibliometrics’ to denote a new discipline where quantitative methods were employed to probe scientific communication processes by measuring and analysing various aspects of written documents [5]. The term ‘bibliometrics’ has found wide acceptance. Diverse interpretation of the term have been put forward by some authors [6]. Schimidmeir defined it as the application of mathematical methods to bibliographical, information and library activities [7]. Kerius [8], Lawani [9], Hjerpe [10] also tried to show relationship of bibliometrics with library and information science and in certain cases with science of science. We shall also discuss about the definition and scope of bibliometrics later in the article.

In 1979 Nacke for the first time, defined informetrics as ‘the application of mathematical methods to the investigation of information science objects, with the aim of describing and analysing their properties and laws in order to optimise these objects in decision making [11]. This definition is inadequate, as the definition considers only the investigation of ‘information science objects’ and not information science activities and information itself. According to the definition, informetrics aims to describe and analyse properties and laws of information science objects.

It needs to be pointed out here that informetrics not only describes and analyses the properties and laws of information science objects, but also establishes laws employing
mathematical and statistical methods relating to the growth, propagation, use and decay of information. Morales defines informetrics as the metric discipline concerned with the study of mathematical and statistical methods and models and their application to the quantitative analysis of the structure and properties of scientific information and the patterns and laws of scientific communication processes including identification of the laws proper [12].

According to Morales, informetrics is concerned with the study of mathematical and statistical methods and models and hence is an integral part of mathematics. However, we feel that informetrics should be concerned mainly with the application of mathematical and statistical methods and models to measure the diverse aspects of any subject/discipline. Indeed in the application of these methods and models to various subjects, a knowledge of the subject is a prerequisite or required at an equal measure with the methods of application. Specific courses on mathematical methods and models would be forming part of a course of study on informetrics when informetrics is fully developed as an independent discipline.

The next point in Morales' definition is the analysis of the structure and properties of scientific information using mathematical and statistical methods and models. Now, the question arises should we only analyse the structure and properties of information without any objective? If not, then what is the objective? The objective is missing in the definition. Moreover, Morales considers only scientific information* in his definition. Some laws like the law of scattering of publications and law of obsolescence of publication are based on scientific publications. If these laws are extended to non-scientific publications (e.g. humanities publications) they may fail. But, laws relating to the propagation of information may be equally applicable to non-scientific publications as they are applicable to scientific publications. The way the efficiency of scientific information systems, services and products can be studied, the same methods can be employed for non-scientific information systems, services and products. It is not necessary that all laws pertaining to a field of knowledge should be equally applicable to all its branches. Some laws will be applicable to all its branches and some will have restricted applications. We can take the examples from biology. Here some laws are equally applicable to both plant and animal sciences, and some are applicable only to plant sciences or animal sciences. For, the growth of animal body takes place according to a fixed pattern which is not the case with plant bodies. Animals always inhale oxygen and exhale carbon-di-oxide, but the plants do the same at night, reverse during the day. Nevertheless, both plants and animals are covered by biology. Hence informetrics also should cover scientific as well as non-scientific information.

From the foregoing discussion, it is clear that both the definitions suffer from certain limitations. We are trying to put forward another definition covering all aspects of informetrics. We, however, do not claim that our definition is absolutely free from limitations. We have only tried to remove obvious limitations and to make the definition comprehensive. We intend to define informetrics as that branch of knowledge which employs mathematical and statistical techniques to measure publications and concepts, their growth, propagation, use and decay of information; establish laws governing these factors, and study the efficiency of information systems, services and products, as well as explore the intra - and interrelationship of disciplines. The main objective in metric studies of information (concepts and documents) are to provide processed data leading to reliable indicators for a) research and development in all disciplines, b) policy making and planning, and c) management of institutions, projects, programmes and activities.

Now, let us examine this definition keeping in view the eleven aspects of informetrics enumerated by Morales. The eleven aspects enumerated by Morales are:-

i) quantitative growth of literature  
ii) information obsolescence and scattering  
iii) efficiency of information products and services in science, technology and production  
iv) efficiency of information systems and information establishments in general

*Scientific information here is construed as information relating to science in the conventional meaning of science, as is understood in most western countries.
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the role of different kinds of documents as means of scientific communication
the role of information channel in scientific communication
information relevance and pertinence
ranking of periodicals and serials by various parameters
overlapping of subject contents between periodicals and serials
citation habits of scientists and the growing role of citation analysis
intradisciplinary and interdisciplinary relation as determined on the basis of bibliographical reference."

The growth aspect of literature has been taken well care of in our definition. The second aspect relates to information obsolescence and scattering. This aspect has been covered by the term propagation and decay. These terms are obviously more comprehensive than obsolescence and scattering.

The third and fourth aspects cover the efficiency of information systems, services and products. These also have figured in our definition.

The fifth and sixth aspects relate to the role of documents as well as information channels in scientific communication. Documents and other information channels are, in fact, the means of propagation of information. Hence, they are well-covered in the definition.

The seventh aspect deals with the relevance and pertinence of information. The relevance and pertinence of information are invariably linked with the use of information. This aspect has also been included in the definition.

Ranking of periodicals and serials and overlapping of subject contents in periodicals and serials (aspects viii & ix) are again the phenomena of propagation.

Citation habits of scientists is the manifestation of the use of information. It may be argued that all the articles cited by a scientist in an article might not have been used by him. In many cases this may be true. To what extent this is true, informetrics attempts to find out that. Even though, some articles etc. referred by a scientist have not been used by him, he refers to these documents with the intention that others may use them. So, citation habit reflects two things:

i) documents used by the citer and
ii) documents may be used by others

Citation analysis (aspect x) is a method employed in informetrics for determining the propagation, use, decay etc. of information. Determination of intra- and interdisciplinary relations has also been covered in our definition.

Morales[12] considers informetrics as a scientific information activity. Some laws like the law of scattering of publications and laws of obsolescence of publications are based on scientific publications. If these laws are extended to non-scientific publications (e.g. humanities publications) they may fail. But, it has already been mentioned that laws relating to the propagation of information may be equally applicable to non-scientific publications as they are applicable to scientific publications.

RELATIONSHIP WITH OTHER SUBJECTS

Informetrics and Bibliometrics

Informetrics and bibliometrics seem to be very close to one another. Etymologically bibliometrics is composed of two distinct parts, i.e. biblio and metrics. The prefix biblio is a loan word from Greek and means book, and the suffix metrics, coined from the Greek word 'metrikos' means the science of meter i.e. measurement. Combining the two, we find that bibliometrics connotes the science of measurement pertaining to books. In our context, we can replace the word 'book' with 'document' and bibliometrics turns out to be the science of measurement relating to documents, especially the number of documents; whereas informetrics becomes a subset of informetrics. Informetrics comprises informetric studies pertaining to all disciplines.

Informetrics & Librametrics

Library science is a well-recognized discipline and the metric studies pertaining to library science can be termed as librametrics. Various library activities are measurable. For example, the average number of books, that a person can classify, catalogue, accession, or even shelve within a given span of time (e.g. an hour, a day
etc) can be determined. Similarly, the average time required for charging or discharging a book, writing a call number on the book, putting various labels and stamps on a book, all can be determined employing mathematical and statistical techniques. The number of books issued or the number of queries answered per day can also be measured. Here the term book can be used, because till now, books remain the most predominant factor in libraries. In the case of metric studies, what is true of books is also true for other documents in a library. The library activities discussed above and certain other activities are measurable. All such library activities as are measurable are encompassed by librametrics. The study of the number of books issued, or the number of queries answered within a given length of time is covered by librametrics as part of informetrics.

Informetrics & Scientometrics

Etymology scientometrics means the study relating to the measurement of science. Science can be measured from a number of points of view like the production of graduates, postgraduates or Ph.d.s of science; the establishment of research institutions, the institutions of study and teaching of science; the deployment of scientific manpower, brain drain; expenditure of R&D; founding of the media of scientific communication, e.g. primary and secondary scientific periodicals; scientific literature; and scientific information systems, services and products. The metric studies of all these aspects fall within the ambit of scientometrics. The area of scientometrics which deal with scientific information is also covered by informetrics. It is to be noted that a very large share of the literature of informetrics pertain to scientometrics.

Growth of Informetrics

From the foregoing discussion, we find that bibliometrics is an integral part of informetrics, part of librametrics and scientometrics are also covered by informetrics. In fact, metric study of information pertaining to any field of knowledge fall within the purview of informetrics.

The growth on informetrics can be measured from the Bibliography of Bibliometrics and Citation Indexing Analysis published by the Royal Institute of Technology. Library (Report TRITA-LIB 2013) [13] and a supplement to this bibliography appeared in Scientometrics [14] and also a bibliography on the subject compiled by R Pal and others, INSDOC covering the period 1980-84 [15]. The graphical representation of the literature indicates a steady growth and peak in 1977 and thereafter a slight fall and again a steady rise. According to Morales [12] the slight fall during 1977-1980 is due to the fact that the coverage during the period is not comprehensive. It should also be pointed out that the works of Eugene Garfield published in his Essays of an Information Scientist were not included in the two bibliographies covering the period 1917 to 1980 [13,14].

Measurement Techniques

Growth of Literature

Usually two methods are being followed in the measurement of the growth of literature. If the subject is broad, usually the number of entries per year appearing in the secondary services on the subject is determined, and on that basis the growth is measured. For instance, to measure the growth of chemical literature, the number of entries in the Chemical Abstracts is counted for a specific period, the difference of entries for the two successive years which is always positive shows the growth. Chemical Abstracts being a comprehensive service on the field, there is little chance of any big error in the computation of the growth. However, it must be pointed out that even the coverage of Chemical Abstracts is not cent per cent. A study of the coverage of Indian chemical literature in the Chemical Abstracts indicated that, the coverage on chemistry was about 90% and of chemical technology was about 60% only. When the coverage of Chemical Abstracts is nearing 6 lakhs items a year, even if several hundred or thousand items are missed, it does not affect the computation of overall growth rate very much; of course, it affects the total number. Most of the abstracting services in the world are not so comprehensive as the Chemical Abstracts. For example, Physics Abstracts, Mathematical Reviews, Excerpta Medica, Index Medicus are not at all comprehensive. The coverage of Indian literature in these services vary between 10% to 60% [16-18]. The coverage from other developing countries may be still low. Measuring the growth basing any one of
these services in the respective fields may not give a comprehensive and true picture.

Nowadays, many countries are bringing out their national abstracting or indexing services, India being one of them. The computation of the growth of national literature basing on these services, may at times lead to grave errors. Studies[19,20] have indicated that a great deal of Indian scientific contributions are being published abroad. As such, they are not getting reflected in the Indian Science Abstracts. What one finds in Indian Science Abstracts is not the true reflection of India’s scientific contribution.

While measuring the growth of literature on a broad subject, it is always risky to depend on a single international secondary service. Covering, of more services may yield better results, but there is huge amount of overlapping among the various services on the same subject which needs to be taken care of; otherwise, the figures will get terribly inflated.

When the growth is measured on a narrow subject, usually several sources are consulted to prepare a bibliography. As such, duplicate entries are eliminated. This method is more or less a foolproof method.

Measurement of the growth of literature on a subject is different from the measurement of the growth of knowledge on the basis of literary output.

When a person or a group is engaged in conducting research on a topic, they send a write-up in the form of short communication before the research is complete with a view to informing others about the research work undertaken. As the research work progresses, a paper may be presented in conferences to have a discussion on the topic to get a direct feedback from the fellow scientists. Finally, when the research work is complete, a full-length paper is published which we may call the ‘basic paper’. After the publication of the basic paper, this may also appear in cover-to-cover translated periodicals. If we consider the contribution to knowledge, the basic paper alone serves the purpose. Some learned comments may also add to knowledge. Even though several papers on the topic have appeared, as far as the growth of literature is concerned, all the papers are to be taken into account. But for the growth of knowledge, the full-length paper alone should be taken into account. Knowledge factor remaining constant, the literary output grows for several reasons, besides those discussed above.

i) Some technical reports also appear in the form of conference papers or research papers.

ii) Papers presented in a conference sometimes also appear in the form of articles in periodicals.

iii) Some authors get the same article published in different journals with minor change and no change.

(iv) An invention patented in various countries of the world result in number of patent specifications.

v) When a conference proceedings is abstracted or indexed; an entry is given for the conference proceedings itself apart from the entries given for all the papers presented in the conference. As a result, the literary output gets an increase by one because of the entry for the conference document.

For measuring the growth of knowledge, previews or short communications, comments (not contributing to knowledge), translations, conference paper/s, technical reports, resulting from the same basic paper should be excluded.

Efficiency of Information Systems, Services and Products

The efficiency of information systems can be measured by taking into account the efficiency of its information services and products.

Information services comprise supply of documents i.e. books, photocopies, microfilms, microfiche, etc.; translations; bibliographies; answers to queries; etc.

Efficiency of Document Supply

The efficiency relating to the supply of documents can be measured in terms of time and the number of documents supplied. The efficiency can be calculated on monthly basis. (Fig.1).

Efficiency of Translation Supply

The efficiency of translation service can be measured by taking into account the number
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Fig. 1: Efficiency Scale for Document Supply

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Percentage of requested documents supplied within a month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>Above 90%</td>
</tr>
<tr>
<td>Very good</td>
<td>Between 75% to 90%</td>
</tr>
<tr>
<td>Good</td>
<td>Between 60% to 75%</td>
</tr>
<tr>
<td>Fair</td>
<td>Between 50% to 60%</td>
</tr>
<tr>
<td>Inefficient</td>
<td>Below 50%</td>
</tr>
</tbody>
</table>

Now we can measure the overall efficiency taking into account the quality percentage. We shall discuss about the measurement of quality later in this article.

Second Case - Document available, but translator not available with the agency.

In many cases, agencies get translation done through panel translators. Sending the document to the panel translator, getting the translation back from him, and editing takes time. The entire process may take 15 to 20 days. Taking into account this factor we can have a scale for measuring efficiency (Fig. 3).

Fig. 3: Efficiency Scale for Translation -2

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Time taken for supply of translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>Upto 4 weeks</td>
</tr>
<tr>
<td>40%</td>
<td>between 4-5 weeks</td>
</tr>
<tr>
<td>20%</td>
<td>Above 5 weeks</td>
</tr>
</tbody>
</table>

Third case: Document not available, but the translator available with the agency.

In our country, almost centpercent demand for translation is from foreign languages, and the availability of the foreign language documents is very low. As such, most of the foreign language documents are to be procured from abroad, which takes time varying from less than one month to more than one year. Basing the experience of INSDOC, we can take the average procurement time of foreign language documents as 10 weeks. For this scale, we are to add the procurement time alongwith the translation time. (Fig.4).

Fourth Case - Document not available, translator not available with the agency.

We can derive this scale simply by merging Efficiency Scale - 2 with Efficiency Scale - 3. (Fig.5).
For measuring the overall efficiency of a piece of translation we are to take the help of the specific Efficiency Scale applicable to the situation and the Quality Scale.

Suppose, an order was placed for the translation of a 10 page German language document into English. The document had to be procured from abroad and the agency was having the translator. The translation was supplied in 10 weeks and the quality of translation was found to be satisfactory. In this specific case, Efficiency Scale No.3 is applicable. From the scale, we get the percentage of efficiency as 60%, and from the Quality Scale, we get the percentage of efficiency as 30%. So, the overall efficiency adds up to 90%.

For measuring the overall efficiency, efficiency has to be measured piece by piece, and then an average has to be calculated. The average value has to be compared with the Efficiency Scale for Document Supply. Suppose the average works out to be 63%, comparing this percentage with the scale we find that the efficiency is good.

Allowances have to made for difficult languages like Chinese and Japanese, or less known languages like Romanian or Hungarian. For reverse translation also e.g. from English to German, or any other foreign language similar allowances will have to be made.

The scales have been made taking a 10 page document as standard. The time taken for translation is directly proportional to the length of the document, to be precise, the number of words in a document. If one week is optimum for the translation of a 10 page document, then 2 weeks time will be optimum for the translation of 20 page document and so on. This factor needs to be kept in mind, while measuring the translation service.

Efficiency of Bibliographies compiled on request

The efficiency of bibliographies compiled on request may be measured in terms of exhaustivity, time taken for the supply, as well as the relevance of the documents included in the bibliography. The measurement of these parameters poses a number of problems. The exhaustivity of a bibliography can be determined only when an exhaustive bibliography on the topic is compiled for the purpose of comparison which is highly time-consuming. The exhausti-
vity is not measurable when the bibliography is selective. The time taken for the compilation of bibliographies varies widely depending on many factors. If the bibliographer finds a good review article of the topic, the compilation of a bibliography takes little time. On the other hand the compilation of a bibliography will be highly time-consuming on a topic, say on a rare insect, whose literature is scarce and widely sparsed. The relevance of the articles, can be decided only by an expert, or the user who asked for the bibliography.

In the circumstances, it is better to elict the user's opinion on all the three parameters to measure the efficiency (Fig.7).

We can grade Highly satisfactory - 80%, Satisfactory - 60%, Tolerable - 40%, and unsatisfactory - 20% for calculating the efficiency.

Efficiency of the Answers to Queries

For measuring this, we have only two parameters to take care of. They are (i) Time required for answering the query and (ii) the relevance of the answer to the query, and the same efficiency scale as given in the Bibliography service can be used here omitting the Exhaustivity parameter.

Efficiency of SDI Services

For SDI services also, the three factors responsible for the determination of efficiency are exhaustivity, timeliness and relevance. Efficiency scales for measuring the service have already been evolved, and it is measured on the basis of the data obtained through feedback cards.

Efficiency of Information Products

By information products we mean here current awareness services, indexing services, express information services, abstracting services etc. For measuring the efficiency of all these services, we are to consider the coverage, timeliness, ease of handling, and index in some cases.

a) Current Awareness Service

For current awareness service, the criteria for the measurement of efficiency should be primarily the timeliness. Relevancy, despite being an important factor, cannot be stressed to much because current awareness services in many cases are directed for world users, who scan through the pages of the service to find if anything of his interest has been published. We cannot also lay too much stress on exhaustivity, since exhaustivity adds not only to the cost, but also to the delay. So a current awareness service has to maintain a balance between timeliness and exhaustivity. Now, the question arises, how to measure the timeliness? After the publication of a periodical/serial, it takes from less than a week's time to several months to reach the agency bringing out the service. However agencies can reduce this time by getting the photocopies of the title pages of the documents by airmail. So for agencies, the measurement of time should be counted from the date of issue of the document by the publisher, and for local current awareness services, from the date of receipt of the publication in the library. If we take 7 days as the transit time by airmail and 15 days time for processing, printing, despatching then three weeks time become optimum for current awareness services being brought out by agencies. For the libraries bringing out current awareness services, we are not taking into account the transit time, because here the measurement of time is from the date of receipt of periodical issue in the library. Here also

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**Fig. 7: Efficiency Scale for Bibliographic Service**

<table>
<thead>
<tr>
<th>Exhaustivity</th>
<th>Timeliness</th>
<th>Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tolerable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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Fig. 8: Efficiency Scale for Current Awareness Services

<table>
<thead>
<tr>
<th>National/International CAS Time lag</th>
<th>Efficiency</th>
<th>Local CAS Time Lag</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 weeks</td>
<td>80%</td>
<td>Less than 2 weeks</td>
<td>80%</td>
</tr>
<tr>
<td>Between 3 &amp; 4 weeks</td>
<td>70%</td>
<td>Between 2 &amp; 3 weeks</td>
<td>70%</td>
</tr>
<tr>
<td>Between 4 &amp; 5 weeks</td>
<td>60%</td>
<td>Between 3 &amp; 4 weeks</td>
<td>60%</td>
</tr>
<tr>
<td>Between 5 &amp; 6 weeks</td>
<td>50%</td>
<td>Between 4 &amp; 5 weeks</td>
<td>50%</td>
</tr>
<tr>
<td>Above 6 weeks</td>
<td>Inefficient</td>
<td>Above 5 weeks</td>
<td>inefficient</td>
</tr>
</tbody>
</table>

for processing, printing, etc. we can take 15 days time as optimum and have scales for measuring the efficiency of CAS. Of course, some percentage, say 20% should be allotted for such parameters as coverage, arrangement and index (Fig. 8).

b) Indexing Services

For reducing the publication delay, the CAS in many cases reproduce the title page itself, and the same is arranged alphabetically by the title of the periodical. As a result, processing time is reduced to the minimum. These services do not lay much importance on exhaustivity. Timeliness is the main criterion for such services. For indexing services, exhaustivity being one of the main criteria, cannot compete with the timeliness of CAS. Moreover, indexing services, in many cases, being voluminous publications, have to arrange entries in a systematic way for easy searching of required information. In addition, indexes are also provided for multiple approach. All these require time. So, a time lag of two months seems to be optimum for such services. We can have a scale for measuring the timeliness of an indexing service (Fig. 9).

For measuring the exhaustivity, first of all an exhaustive list of core and allied periodicals on the subject needs to be proposed. The list of periodicals covered by the service can be compared with the exhaustive list prepared for the purpose. We can allot 60% for core periodicals, 30% for allied, and 10% for alien periodicals. Let us demonstrate the measurement with the aid of an example. Suppose a service covers 40 core periodicals out of 50, 210 allied periodicals out of 300 and some alien periodicals.

\[
\text{Efficiency of core periodicals} = \frac{40 \times 100}{50} = 80\% \\
80\% \text{ out of } 60\% \text{ allotted for core periodicals} \\
\text{Efficiency for allied periodicals} = \frac{60 \times 80}{100} = 48\% \\
70\% \text{ out of } 30\% \text{ allotted for allied periodicals} \\
\text{Efficiency for alien periodicals} = \frac{30 \times 70}{100} = 21\% \\
\]

For allotting percentage for alien periodicals, discretion will have to be used, as it is difficult to compile a list of alien periodicals which may go into thousands, and no service...
can afford to cover all, as it would not be cost-effective. Suppose, in this case 4% is given for the alien periodicals then the total efficiency for exhaustivity adds up to 48% + 21% + 4% = 73%.

The ease of searching is dependent on the arrangement of entries in the text portion, as well as the number and type of indexes provided. For measuring the efficiency, marks will have to be allotted for

<table>
<thead>
<tr>
<th>Arrangement</th>
<th>Classified</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alphabetically subject-wise</td>
</tr>
<tr>
<td></td>
<td>Non-alphabetical subject grouping</td>
</tr>
<tr>
<td></td>
<td>any other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indexes</th>
<th>Subject - exhaustive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>key word</td>
</tr>
<tr>
<td></td>
<td>any other</td>
</tr>
</tbody>
</table>

Author
Sponsor/Affiliation
Others
See and See also References

It is difficult to provide a general formula here. Because an indexing service arranged alphabetically subjectwise reduces to a great extent the need for a subject index. Again, providing of various types of indexes depends mainly on the subject of the service. For example, a geographical index for a geological service is of great value, whereas for biological service, a taxonomic index will be considered highly important.

For determining the efficiency, a questionnaire may be designed allotting marks on items listed above according to the situation, and survey can be undertaken taking users as the sample.

Taking the average of the percentages for timeliness, exhaustivity and ease of searching the efficiency of a service can be determined.

c) Abstracting Services

For bringing out an abstracting service, apart from all the jobs done for bringing out an indexing services, the abstracting of all the items are to be done. Moreover, abstracting services are to provide multiple approaches depending on the subject by way of indexes. Number of indexes as well as depth of indexing is usually more in the case of abstracting services compared to indexing services. Preparation of abstracts and various types of indexes and their subsequent printing obviously involve more man hours and time. Most of the international abstracting services have computerised the production of indexes to a great extent and thereby reduced the time of index preparation a great deal. Taking all these factors into account, we can add two months in each case to the Efficiency Scale of Indexing Services—Time to derive the efficiency scale of abstracting services for time (Fig.10).

\[
\text{Fig. 10: Efficiency Scale of Abstracting Service - Time}
\]

<table>
<thead>
<tr>
<th>Time Lag</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 4 months</td>
<td>100%</td>
</tr>
<tr>
<td>Between 4 and 5 months</td>
<td>80%</td>
</tr>
<tr>
<td>Between 5 &amp; 6 months</td>
<td>70%</td>
</tr>
<tr>
<td>Between 6 &amp; 7 months</td>
<td>60%</td>
</tr>
<tr>
<td>Between 7 &amp; 8 months</td>
<td>50%</td>
</tr>
<tr>
<td>Above 8 months</td>
<td>Inefficient</td>
</tr>
</tbody>
</table>

For measuring the exhaustivity and ease of search, the same procedure can be followed as described under indexing services.

d) Express Information Service

This service has originated from the USSR, where it is called Ekspress Informatsia. This service is usually devoted to a very narrow but highly important field of knowledge. All foreign language recent contributions are chosen on the subject, and a digest of the articles (about 1/3rd of the original size) is prepared in Russian. Introduction and other not very important matter are excluded and important formulas, illustrations, etc. are retained. This is done to obviate the need for going through the original. Each issue contains about eight to ten articles, and published four times a month. The time lag between the receipt of periodicals in the
library and the issuance of the express information service is about one month.

Like current awareness service in this case also timeliness is more important compared to exhaustivity and quality. As foreign languages are involved here, this factor has to be taken into account while fixing the scale. As the number of articles covered in an issue are only about eight to ten, we can allot about two weeks time for translation to the scale fixed for national/international current awareness service. The quality of the digests can be measured in the same way as in the case of translation.

METRIC STUDIES OF OTHER FACTORS

There are well-known methods for the study of information about obsolescence, scattering, relevance and pertinence. Hence they are not being described here. For the ranking of periodicals also, there are well established methods. However the way, any Indian authors are ranking periodicals, there is much as one for improvement. This very aspect has been dealt with in another paper [21].

INFORMETRICS & DECISION MAKING

The development of a country is closely interlinked with its scientific and technological development. The analysis of the scientific and technical information output of a country can identify areas which are weak and need boosting up.

The information agencies or libraries bringing out various information products and rendering various information services can measure the efficiency of the products as well as services to find out how much efficient or deficient a particular service or product is, and measures can be undertaken to remove the deficiency.

Every year there is a considerable hike in the subscription rate of periodicals which is proportionately far more than the increase in the library budget for periodicals. Moreover, there is always demand for new periodicals. In the circumstances, every year need arises to drop certain title to balance the number of titles with the budget. The decision to drop certain titles is taken rather arbitrarily. If a rank list of periodicals is prepared at regular intervals through the study, citation study, etc.; the decision making regarding the dropping of certain periodicals becomes logical as well as easy.

Given above are only some examples where informetrics can be used effectively for decision making. Informetrics is a developing subject and it is hoped it will have much wider application in future.

REFERENCES


