Research Design
CHAPTER IV

RESEARCH DESIGN

4.1 Objectives of the Study

The objectives of the present study are:

✓ To find out year-wise distribution of articles.
✓ To discover the authorship pattern of the contribution.
✓ To find out subject coverage of articles.
✓ To discover the Degree of collaboration
✓ Single vs. multiple authored papers
✓ To draw an average length of articles and average number of citations per article in the journal
✓ To Examine the geographical distribution of published articles
✓ To discover the distribution of authors by gender
✓ To find out an acknowledgement & appendix in the articles.

4.2 Methodology

For the purpose of this study, Annals of Library and Information Studies has been selected as the source journal. 397 issues of 15 volumes from 1999 to 2013 have been selected for the study. Information about each contribution such as author, author's affiliation, length of contributions, citations, etc., was scanned, checked and examined carefully. Short communications are also included for research. Published papers for the research have been downloaded from the www.niscair.res.in websites and were entered
into a MS-Excel and converted to SPSS Degree of collaboration was calculated, Chi-square test was used to identify the statistical significant difference between variables and Lotka's Inverse Square Law was used to identify author's productivity.

4.3 Scope and Limitations

The present study is limited to 6649 citations appended to the journal of ALIS from January 1999 to December 2013 limited to 15 volumes and 397 articles.

4.4 Hypothesis

The following hypotheses are formulated on the basis of content and coverage of framed objectives and employed appropriate statistical tools to tests them:

1. There is a significant level of deviation in paper publication on various subject in LIS

2. ALIS Authors have a tendency to cite latest literature relevant to their field

3. There has been an increasing trend in collaborative authors after 2010

4. These research studies will be supportive for library professionals in subject of collection development.

4.5 Data Collection

The articles published in the journal of ALIS by the NISCAIR are taken as a source for the present study. The Papers published from 1999 to 2013 by the LIS are accounted as 397 articles. The references 6649 details of publications were entered in the references. Finally the articles were arranged in different ways with a view to identify the scientists of LIS.
4.6. Statistical Tools and Techniques Used

Entered records were finally imported into MS-Excel and converted to SPSS for statistical analysis. Laws, principles of Bradford, Lotka’s and Zipf’s law have been applied for inferences. In addition, General statistical principles and Formulae governing Regression Analysis and Trend Analysis have been applied wherever required.

4.6.1. Relative Growth Rate

The researcher has applied the relative growth rate and doubling time model by Mahapatra to examine the growth rate of papers published and weightage has been given to the scientists of engineering science.

The relative growth rate is increased in the number of publications or pages per unit of time. A specified period of interval can be calculated from the following equations.

\[ R (1-2) = \frac{W_2 - W_1}{T_2 - T_1} \]

Where \( R_{(1-2)} \) is mean relative growth rate over the specified period of interval.

\( W_1 = \text{Log}W_1: \) (Natural log of initial number of Publications/pages)

\( W_2 = \text{Log}W_2: \) (Natural log of final number of Publications/pages)

\( T_2 - T_1 = \) the unit difference between the initial time and final time.

The relative growth rate for both publications and pages can be calculated separately. Therefore,

\( R (a) = \) Relative growth rate per unit of publications, per unit of time (Year);

\( R (b) = \) Relative growth rate per unit of pages, per unit of time (year).
4.6.2. Doubling Time

From the calculation, it is found that there is a direct equivalence existing between the relative growth rate and doubling time. If the number of publication/pages of a subject doubles during a given period, then the difference between the logarithm of the numbers at the beginning and at the end of the period must be number 2. If one uses a natural logarithm, this difference has a value of 0.693. The corresponding doubling time for publications and pages can be calculated by using the following formula.

\[
\text{Doubling Time (Dt)} = \frac{0.693}{R}
\]

Therefore,

Doubling time for Publications  \( \text{Dt (a)} = \frac{0.693}{R (a)} \)

Doubling time for Pages  \( \text{Dt (b)} = \frac{0.693}{R (b)} \)

4.6.3. Lotka’s Law

The Lotka’s law of author productivity is tested with the application of scientific productivity Chi-square model and it is applied in relation to number of authors contributing to the number of publications.

Potter (1981)\(^2\) identified the Lotka’s fraction \(1/n^2-4.65\) on the basis of Euler-maclaurim formula of summation. This model is applied in the present study.

The sum was used as a device for \(1/(na-4.65)\) to determine the proportion of the total number of authors expected to produce ‘n’ papers. The following formula was used to find the proportions.

\[
s = \sum_{n}^{1} \times 4.65 \ n = 1
\]
For the present study ‘S’ is the sum of Lotka’s modified rations for the value n= 4.65. The formula is \( a_n = \frac{1}{n} \times 4.65 \times \frac{T}{S} \) (n=1,2,3,…,65) where T is total number of authors in the sample and ‘an’ is the total number of expected authors producing ‘n’ papers.

The Lotka’s law was tested with the application of scientific productivity Chi-square model in relation to a number of authors who contributed ‘n’ number of publications. It can be expressed by the equation.

\[
a_n = \frac{a_1}{n^2} \quad \text{n=1,2,3…….}
\]

In other words, for every 100 authors making one contribution each, there would be 25 authors contributing two articles each \((100/2^2 = 25)\) about 11 contributing articles each \((100/3^3 = 11.1)\) and so on.

Where ‘an’ is the number of authors contributing ‘n’ papers and 1is the number of authors contributing each one paper.

The Chi-square can be computed as \((F-P)^2 / P\)

F= Observed number of authors with ‘n’ publications

P= Expected number of authors

**4.6.4. Degree of Collaboration**

To examine the extent of research collaboration of scientists of engineering science, Subramaniam’s formulas are adopted for present study.

\[
C = \frac{N_m}{(N_m + N_s)}
\]

C= Degree of collaboration of scientists
\[ N_m = \text{Number of multiple authored Papers} \]

\[ N_s = \text{Number of single authored papers} \]

**4.6.5. Other Tools**

The researcher has applied mean, standard deviation, Co-efficient of variation ‘t’ test percentage and average apart from the above statistical tools. Graphic and Diagrammatic representations are presented wherever necessary. The following concepts are operationally defined for the purpose of the present study.

**4.6.6. Relative Growth Rate**

It explains the increase in the number of publications/pages of Annals of Library and Information studies Technology per unit of Time.

**4.6.7. Doubling Time for Publications**

It means two fold multiplication of number of publications/pages of Annals of Library and Information Studies.

**4.6.8. Authorship pattern**

It denotes the percentage concentration of single authored papers in relation to multi-authored papers on Annals of Library and Information Studies during the study period of analysis.

**4.6.9. Author Productivity**

It examines the prevailing trend in carrying out the research process for paper publication in Annals of Library and Information Studies of the extent to which paper publication is concentrated by a single author.
4.6.10. Degree of Collaboration

It explains the prevalence of proportion of single authored papers and multi authored papers in paper publications.

4.6.11. Half Life Period of Journal Citations

To find out the half-life of journal citations, the graph is plotted taking the period of years at X- axis and cumulative number of citations at Y – axis. A line parallel to X- axis is drawn from point A to meet the curve at B. Point A represents the half – life of the citation. Then a perpendicular BC is drawn from point B on X- axis at C. ‘C’ represents the half- life period for journals citations which is X years

\[ 1 - 2R = \frac{\log e W2 - \log e W1}{T2 - T1} \]

Where,

1 - 2R  – Mean relative growth rate over the specific period of interval

\( \log e W1 \)  – log of initial number of articles

\( \log e W2 \)  – log of final number of articles after a specific period of interval

T2-T1  – Unit difference between the initial time and the final time

aa-l  – average no. of articles The year is taken here as the unit of time.

The RGR for articles is hereby calculated.

Therefore,

1 - 2R (aa-l year-1) can represent the mean RGR per unit of articles per unit of year over a specific period of interval.
REFERENCES


3. Narendra kumar, Applicability to Lotka's Law to research productivity of council of Scientifiic and Industrial Research (CSIR), India. Annals of Library and Information Studies, 57(1) 2010 pp7-11


