CHAPTER – 3
RESEARCH METHODOLOGY

Research methodology is a way to systematically solve the research problem. It may be understood as science of studying how research is done scientifically. It consists various steps that are generally adopted by a researcher in studying the research problem along with the logic behind them. It is necessary for a researcher to know not only the research methods/techniques but also the methodology. Research methodology has many dimensions and research methods do constitute a part of the research methodology.

It refers to different kinds of methods used by researchers while performing their research. Different kinds of methods are used by researchers to solve or to study their particular research problem. The researchers also need to understand the various techniques, and they need to know the criteria by which they can decide that certain techniques and procedure that will be applicable to certain problems and others will not. It is necessary for the researchers to design research methodology for his/her research problem. Research methodology considers the logic behind the methods, used by the researchers during their research, so that research results are capable of being evaluated either by the researcher himself or by others (Kothari 2008, 7).

3.1 NATURE OF STUDY

The present study being empirical in nature as it was designed to estimate the extent of use of various documentary sources of information in the process of identification, selection, designing, execution and presentation of doctoral research studies during a specified period in the discipline of Management. Primarily the study was intended to measure citation pattern by analyzing its characteristics like bibliographic form, subject-wise distribution, country-wise
distribution and year-wise distribution, authorship pattern, etc. The Bradford’s Law of Scattering has been applied to show how the literature on a particular subject/ discipline was scattered or distributed in the journals.

3.2 SCOPE OF THE STUDY

The Universities of Haryana, Punjab, Chandigarh & Himachal Pradesh which were offering research work in the field of Management was primarily to cater to the requirements of postgraduate students, researchers and teachers. The present study was intended to estimate the use of various documentary sources of information by research scholars of Management, which is based on the quantitative and qualitative analysis of the bibliographical references.

3.3 IDENTIFICATION OF POPULATION AND SAMPLE

The present study was conducted on the Doctoral Dissertations submitted in the Department of Management to the Universities of (a) Haryana (Kurukshetra University, Kurukshetra; Maharshi Dayanand University, Rohtak and Guru Jambheshwar University of Science & Technology, Hisar); (b) Punjab (Punjabi University, Patiala and Guru Nanak Dev University, Amritsar); (c) Chandigarh (Panjab University, Chandigarh) and (d) Himachal Pradesh (Himachal Pradesh University, Shimla) during 2000-2009. A total of 210 doctoral dissertations were submitted in different universities during the period under investigation. All these doctoral dissertations/theses were included under the scope of present study. Data was collected on the basis of Simple Random Sampling, in which each member of the population has an equal chance of being selected.

3.4 METHODOLOGY

The data was analyzed by applying appropriate technique and bibliometric law. The simple counting citation technique and Bradford’s Law of Scattering has been applied to determine the core journals in the field of Management. In
addition, the chi-square test of goodness-of-fit was applied for further confirmation of the Bradford’s Law. A programme was written in C language to calculate annual aging factor ‘a’ and the value of other obsolescence factors is calculated after putting the value of annual aging factor ‘a’ in various obsolescence factors.

3.5 LIMITATIONS OF THE STUDY

The present study was limited to study the citation pattern of research scholars of Management in the Universities of Haryana, Punjab, Chandigarh & Himachal Pradesh during 2000-2009. Only those doctoral dissertations have been included which were available either in the Department or in the University Library. For further analysis of data the study was limited to the periodical/journal literature only.

3.6 FACTORS COVERED FOR BIBLIOMETRIC STUDY

Bibliometric studies analyze the characteristics features of the literature. It is a useful tool for evaluating the use of library collection. It reveals the behavioral themes of the information consumption and or product. Different factors covered under bibliometric study are as follows:

3.6.1 BIBLIOGRAPHICAL FORMS

Bibliographic form of documents refer to documents such as books, journals, reports, magazines, conference proceedings and reference sources containing specific information. As the citations for journals and books constituted more than 75% of the total citations in all cases, in the present study, only these two forms were taken for further bibliometric analysis such as authorship pattern, ranking of authors, chronological distribution, obsolescence of documents, ranking of journals and geographical distribution.
FIGURE 3.6.1: BIBLIOGRAPHICAL FORMS OF DOCUMENTS
3.6.2 AUTHORSHIP PATTERN

The characteristics of any subject literature include not only the basic publishing pattern but those of the authors themselves. Authors are important in a system which is concerned with the generation of information, its communication and consumption. Authors not only contribute to the production of new scientific knowledge, they also influence many other aspects related to and concerned with the information production, dissemination and use. Any kind of investigation aimed at studying the community of authors and their behaviour is likely to yield useful data as it is helpful in improving the overall functioning of the information system.

For studying the authorship pattern, the citations are arranged as single, double, triple, multi-authored and other categories separately for journals and books. Citations under each category are counted and their percentage is calculated for showing the trends of research as solo or team research in a particular field.
FIGURE 3.6.2.1: AUTHORSHIP PATTERN OF BOOKS
FIGURE 3.6.2.2: AUTHORSHIP PATTERN OF JOURNALS
3.6.3 COUNTRY-WISE DISTRIBUTION

Research and development activity play a vital role in the economy of a country. In order to know the contribution made by a country in a specific field, country-wise distribution of contributions/citations is analyzed.

FIGURE 3.6.3: COUNTRY-WISE DISTRIBUTION OF JOURNALS
3.6.4 CHRONOLOGICAL/ YEAR-WISE ANALYSIS

Scholars use documents published in different periods. Different periods come under chronological distribution. The period under investigation is ten years ranging from 2000-2009. The time period ranging from the earliest published document to the latest published one is divided into different years and citations are arranged into groups in these years. The number of citations grouped under each year is counted and noted in a tabular form. The year in which these numbers are the largest indicated that maximum publication or progress has taken place in that particular subject during that year.

**FIGURE 3.6.4.1: CHRONOLOGICAL/ YEAR-WISE DISTRIBUTION OF BOOKS**
FIGURE 3.6.4.2: CHRONOLOGICAL/YEAR-WISE DISTRIBUTION OF JOURNALS
3.6.5 RANKING OF JOURNALS

In order to determine the ranking list of journals the citations were grouped according to the titles of journals. The ranking was done to their ascending order of occurrence. The journals having less than 5 citations each were grouped at the end as ‘others’. The diagram represented a ranked list of the cited journals with the number of citations received, percentage of citations, cumulative citations and cumulative percentage.

![Diagram showing the ranking list of journals with their respective titles and citation information.](image)

**FIGURE 3.6.5: RANKING LIST OF JOURNALS**
3.6.6 OBSOLESCENCE/ HALF-LIFE OF DOCUMENTS

Line and Sandison say obsolescence is the “decline over time in validity or utility of information”. They said if something is less and less used it is said to “obsolesce” and when its use ceases, it is “obsolete”. It indicates the decline of use of literature with age (1974, 290). Some scientists have used the term “half-life” of the literature to indicate the same concept. The half-life is the period of time during which one-half of the currently cited literature was published. The ‘half-life’ of citation decay is the same as the half-life for literature growth. Brookes has evolved the concept of “utility in relation to journal aging” for taking a decision as regard to discard the back volumes of individual journals on the basis of half-life calculations. The age of the document an important criteria for obsolescence study is related to the date of publications or origin to that of its actual use (Brookes 1973, 31). For instance, of the two studies, if one has the half-life of 15 years and another of 10, the researchers in the later study use more current documents than the first one.

FIGURE 3.6.6: OBSOLESCENCE/ HALF-LIFE OF DOCUMENTS- BOOKS
The obsolescence graph shows the median citation age of books citations as 18 years.

3.7 DATA COLLECTION TECHNIQUES & INSTRUMENTS

BIBLIOMETRIC TECHNIQUES

With the bibliometric analysis there are some specific techniques suitable to achieve different purposes. “These techniques are:

a) Counting

1. Geographical distribution (Countries).
2. Time Period (Eras).
3. Discipline (Subjects).
4. Types of publications (Dissertations, Patents, Reports, etc.).
5. Individual author(s)/ an organization.

Here counting refers to count of publications/ specific contribution.

b) Rank and Size frequency distribution

Bradford’s Law and Zipf’s Law are used for rank frequency analysis of data while Lotka’s Law is used for frequency analysis of data.

c) Citation Analysis

Here we are concerned with literature usage count (i.e. literature used by the researchers) of frequency cited by the researchers in their papers and citations” (Krishan Kumar 1992; quoted in Balesh, 1997).

Citation analysis is an important technique to identify literature use pattern. Further, citation analysis is done in different ways i.e. 1) citation count, 2) bibliographical coupling and 3) co-citation analysis.

The basic purpose of the present study was to find out the various characteristics of the literature used by the research scholars in the discipline of
Management in the Universities of Haryana, Punjab, Chandigarh & Himachal Pradesh, simple citation counting method was considered to be the most appropriate technique for the fulfillment of the purpose of study. Citation counting is descriptive technique which involves counting of citations on the basis of their characteristics like subject, authorship pattern, chronological distributions and geographical distribution etc.

In this study, the pattern of references defines the significance of literature that is cited by citation analysis. Citation approach, as the methodology chosen for this project, is based on the bibliographical referencing cited at the end of the doctoral dissertations. The citation data were studied to find out the core journals and to rank them. The bibliographic references cited at the end of the doctoral dissertations were taken as the source data for the present study. For data collection and to determine the information use pattern of scholars in the field of Management, an instrument was designed to fulfil the specific objectives of the present study which consist of 5”x3” size slips. The information which was necessary for the study was to be written down on those slips from the citations of the doctoral dissertations. A specimen of the slip is given below in figure 3.7.1:

```
X 652.2P5; 1
Sharma, Tajinder
J: Journal of Business Study
Kuruksastra
14
```

**FIGURE 3.7.1: SPECIMEN OF DATA COLLECTION SLIP**

Description of the information written on the slip is as following:

**X652.2** - Represents the title of the thesis i.e. Performance Analysis of Mutual Funds

**P5** - Represents the year of submission of thesis
; 1 - Represents the number of thesis in that year

Sharma, Tajinder - Represents the author by surname, forename more than two authors are separated by semicolon (;)

J: Journal of Business - Represents the bibliographic form and title of the journal citation, B: represents Book; J: represents Journals; R: represents Reference tools etc.

Kurukshetra - Contains the geographical location of the Publication

14 - Represents the citation age

- In above specimen, citation age is calculated as difference of year in which thesis had been submitted (2005) and year of publication of that journal (1991).

To find out the place of cited periodicals, Ulrich International Periodicals Directory 38th edition was used. For subjects and geographical location of journals the Google search engine was also used. Information about cited books was recorded on separate slips and each successive citation received by book was marked on it as per the following figure 3.7.2:

**FIGURE 3.7.2: SPECIMEN OF BOOKS CITATION RECORDING SLIP**

From this slip it came to know that Books of Marketing Management was cited 132 times.
To note down the age of cited books and journals slips are prepared and arranged chronologically. Slips contains the number of citations for the period range 0-10, 11-20, 21-30, 31-40, 41-50, and above 51. Specimen of one of these slips is given in figure 3.7.3:

![Specimen of citation period recording slip](image)

**FIGURE 3.7.3: SPECIMEN OF CITATIONS PERIOD RECORDING SLIP**

### 3.8 DATA ANALYSIS TECHNIQUES & INSTRUMENTS

After collection of data one stage of the present study was over and then entered the next stage of data analysis. Data itself conveys no meaning unless it is analyzed, tabulated and interpreted and results drawn from it. Data was analyzed in accordance with the requirements of objectives of the study.

The basic purpose of statistical analysis is to summarize observation of data that they provide answers to the hypotheses or research question. Hence, the related data was grouped at one place, counted and analyzed to come at certain conclusions.

Firstly, tally method was adopted for analyzing the data. Separate slips were made for analyzing, and information contained in earlier slips was noted down on these slips according to the requirement e.g. the collaborative authorship slips was prepared as shown in figure 3.8.1:
<table>
<thead>
<tr>
<th>Single - 524 entries</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint - 359 entries</td>
<td></td>
</tr>
</tbody>
</table>

BOOKS and JOURNALS

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Similarly, slip of chronological distribution of cited books and journals were also prepared. A specimen is shown in figure 3.8.2:

As the data was manageable so the work of data analysis was done manually, arranged, recorded, tabulated and presented with interpretation.

<table>
<thead>
<tr>
<th>Books</th>
<th>Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1919 and before</td>
<td>29 entries</td>
</tr>
<tr>
<td>1920-29</td>
<td>26 entries</td>
</tr>
<tr>
<td>1930-39</td>
<td>48 entries</td>
</tr>
<tr>
<td>1940-49</td>
<td>85 entries</td>
</tr>
<tr>
<td>1950-59</td>
<td>199 entries</td>
</tr>
</tbody>
</table>
The manually analyzed data was entered in worksheets, and tables appended using MS-Excel. The Bradford’s Law has been applied to determine the core Journals in the field of Management under study.

### 3.9 BIBLIOMETRICS LAWS

“The three basic laws in the field of bibliometrics (Lotka’s Law on productivity of authors, Bradford’s Law of scattering and Zipf’s Laws on word occurrence) are related to the authors of papers, the articles in the journals and word counts in the text of papers respectively. They have certain things in common. They all represent hyperbolic distribution. They are positively skewed, long-tailed and reverse J-shaped” (Sahoo 2002, 63).

#### 3.9.1 BRADFORD’S LAW OF SCATTERING

In 1934 S. C. Bradford, a British librarian, described the ‘Law of Scattering’ to determine the number of core journals in any given field. According to Bradford, journals in a single field can be divided into three parts, each
contacting the same number of articles.

Bradford described the ‘Law of Scattering’ in his own words as: “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 other groups or zones containing the same number of articles as the nucleus, when the number of articles in the nucleus and the succeeding zones will be as 1: n: \( n^2 \).....” In other words, if the top \( n \) periodicals contribute 33.33 per cent of the articles in a given subject, the next \( n^2 \) periodicals contribute only 33.33 per cent of the literature and the rest of the literature is scattered in \( n^3 \) least productive journals (Bradford 1934; quoted in Sahoo 2002, 66).

Thus it can be concluded that only a small number of journals will be needed to supply the nucleus of the papers on a given topic, assuming that the topic is of a narrow scientific subject.

### 3.10 CHI-SQUARE TEST

The Chi-square test used to determine the goodness of fit between theoretical and experimental values. In this test, observed values are compared with theoretical or expected values. Observed values are those that the researcher obtains empirically through direct observation; theoretical or expected values are developed on the basis of some hypothesis.

In order to apply Bradford’s Law to the data, a null hypothesis is taken, ‘Data does not fit with Bradford’s Law of Distribution’. Data used for this study was taken from the corresponding tables of ranking of Journals. To test the applicability and validity of Bradford’s Law, formula devised by Leimkuhler was used. The formula he provided was the first general expression of article scatter. Leimkuhler’s model is known as “Bradford distribution”. It was used to predict the references yield of abstracting services in terms of papers and their
resources in terms of papers and their sources in the field of thermo-physical property data. The mathematical expression of Leimkuhler’s formula was:

\[ F(x) = \frac{\log_e(1 + \beta x)}{\log_e(1 + \beta)} \]

Where, \( x \) = the fraction of the document collection.

\( F(x) \) = the proportion of total productivity contained in the fraction ‘x’.

\( \beta \) = a constant related to the document collection.

Leimkuhler’s analysis of Bradford’s Law offered a formula which could be used to express the distribution of papers relevant to a topic cover the range of journals known to be productive for the topic.

In addition, the chi-square test of goodness of fit was applied for further confirmation of the Bradford’s Law (Mahapatra 2009, 132-133).

### 3.11 REFERENCE STYLE

Giving references in the research work is an important part of any kind of study, but all these references should be properly acknowledged. For giving references in the present study “The Chicago Manual of Style” 16th edition has been used.
REFERENCES


