

Mapping of Inter-relationship between
Library and Information Science (LIS)
And Non-LIS Literature Publications

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By
ATANU DAS

Supervised by
Prof. (Dr.) Udayan Bhattacharya
Department of Library and Information Science
Jadavpur University

Department of Library and Information Science
Jadavpur University
Kolkata-700032
2016

CERTIFIED THAT THE THESIS ENTITLED

“Mapping of Inter-relationship between Library and Information Science (LIS) And Non-LIS Literature Publications” submitted by me for the award of Degree of Doctor of Philosophy in Arts at Jadavpur University is based upon my work carried out under the Supervision of Dr. Udayan Bhattacharya, Professor, Department of Library and Information Science, Jadavpur University, Kolkata and that neither this thesis nor any part of it has been submitted before for any degree or diploma anywhere / elsewhere.

Countersigned by the

Candidate: (Atanu Das)

Supervisor: (Dr. Udayan Bhattacharya)

Dated:

Dated:

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List of Abbreviations

AHCI	:	Arts & Humanities Citation Index
ALIS	:	Annals of Library and Information Studies
APA	:	American Psychological Association
ARIST	:	Annual Review of Information Science and Technology
COC	:	Citations Outside Category
DDC	:	Dewey Decimal Classification
DESIDOC	:	Defence Scientific Information & Documentation Centre
DJLIT	:	DESIDOC Journal of Library and Information Technology
IASLIC	:	Indian Association of Special Libraries and Information Centres
ICI	:	Indian Citation Index
IF	:	Impact Factor
ILS	:	Information and Library Science
ILSA	:	Indian Library Science Abstract
IS	:	Information Science
ISI	:	Institute for Scientific Information
ISSN	:	International Standard Serial Number
JCR	:	Journal Citation Report
LH	:	Library Herald
LIS	:	Library and Information Science
LISA	:	Library and Information Science Abstract
LS	:	Library Science/Studies
NISCAIR	:	National Science Communication And Information Resources
SCI	:	Science Citation Index
SJIM	:	SRELS Journal of Information Management
SRELS	:	Sarada Ranganathan Endowment for Library Science
SSCI	:	Social Sciences Citation Index
WoS	:	Web of Science

Chapter- I

Introduction

Library and Information Science is a multidisciplinary field of activity. The concept of library and information science (LIS) became predominant in the mid-twentieth century as the renaming of library school into schools of LIS. Library science is an area of study that deals with collection, processing, organization, preservation, and dissemination of different types of information resources in various kinds of libraries and enabling the optimum utilization of information by information seekers (Dutta & Dutta, 2013; Lugya, 2014). Although the concept of library is an old and historical one, the librarianship and then the documentation and information science are new concepts (Vickery, 2008).

Library science is defined by the American Library Association as the professional knowledge and skills by which recorded information is selected, acquired, organized and utilized in meeting the information demands and needs of a community of users (Lugya, 2014). According to Borko (1968), information science (IS) is a “discipline that investigates the properties and

behavior of information, the forces governing the flow of information, and the means of processing information for optimum accessibility and usability. It is concerned with that body of knowledge relating to the origination, collection, organization, storage, retrieval, interpretation, transmission, transformation, and utilization of information. It has both a pure science component, which inquires into the subject without regard to its application, and an applied science component, which develops services and products”.

Both the subjects, library science and information science originally evolved in due course of integration of the contributions from other disciplines including science, social science, humanities, arts, management etc. (Dutta & Dutta, 2013). LIS is a body of specialized knowledge that supports the library and information science profession. Hayes (1985) explained the relationship between library science and information science in three different ways- (i) information science is concerned with the information content of books and documents, while library science is concerned with the books and documents as physical records, (ii) information science is concerned with the practical knowledge of value for the solution of specific problems, while library science is concerned with the full range of knowledge, and (iii) information science is concerned with the application of computers and other automated systems, while library science is concerned with intellectual processes as handled by people. The convergence of librarianship and information science to form LIS is seen as a recent phenomenon, with the term ‘information science’ originally focused on the application of computers to library operations and services. LIS

as a science and multidisciplinary field applies the practice and perspective of information with the aim of answering important questions related to the activities of a target group. LIS is the study and practice of professional methods in the use and exploitation of information, whether from an institutional base or not for the benefit of users. An umbrella term abbreviated as LIS used to cover all the term such as library science, librarianship, information science, information work, documentation etc. It becomes more and more complex due to the application of theories, principles, concepts, ideas etc. imported from other disciplines. Now a day LIS is treated as a separate branch of study.

LIS education in India is currently passing through a turning point and has become a fast developing subject with multidisciplinary approach. Today LIS education not only includes the library specific subject but it also has been extended to subjects like computer application, statistics, information science, management studies and operation research. With the changing scenario modern librarianship has become a profession with a diversity of opportunities and challenges for LIS students and professionals (Senthurvelmurugan, 2011). The growth of research publications increases day by day in the field of library and information science. Most of the people involved in the LIS profession such as teachers, scientists, librarians, scholars, students etc. are having specific educational background other than library and information science knowledge. And for this reason, LIS publications has trend to influence by the other field of knowledge in many cases. The present study will measure the disciplinary

influence by knowledge transfer of non-LIS field of studies on LIS contributions.

1.1 Discipline and Subject

A discipline is any comparatively self-contained and isolated domain of human experience which possesses its own community of experts, with distinctive components such as shared goals, concepts, facts, tacit skills and methodologies (Braun & Schubert, 2003). Simply, a discipline relating to academic field is a branch of knowledge. Disciplines are the intellectual and social structures through which modern knowledge is organized. A discipline is a culture, a set of shared assumptions as to its foundations, scope and methods. One can look at a discipline as a result of a process that starts with a set of facts, which lead to hypotheses and which in turn lead to theories (Bhattacharya, 2010). It incorporates expertise, people, projects, communities, challenges, studies, inquiry, and research areas that are strongly associated with a given academic discipline. For example, the branches of science are commonly known as scientific disciplines, e.g. physics, chemistry, mathematics etc., again botany, zoology, microbiology, biotechnology, pharmacology, environmental science coined as bioscience disciplines. The word originates from the Latin words *discipulus* (pupil) and *disciplina* (teaching). According to Kockelman (as cited in Bhattacharya, 2010), discipline is a branch of learning or a field of study characterized by a body of inter-subjectively acceptable knowledge, pertaining to well defined realm of entities, systematically

established on the basis of generally accepted principles with the help of methodical rules or procedures e.g. mathematics, physics, history. Kinger (as cited in Bhattacharya, 2010) defines discipline as a “recognized branch or segment of knowledge within rational learning with certain generally agreed upon canons and standards.” An academic discipline can be defined that focus on a self-imposed limited field of knowledge. Disciplines differ from one another in at least three primary ways: the area of their investigations, their research methods, and their epistemologies (as cited in Cohen & Lloyd, 2014).

In the Oxford English Dictionary, the word ‘discipline’ in the sense of an area of knowledge is defined as:

- (a) A branch of instruction or learning
- (b) A department of learning or knowledge
- (c) A science or art in its educational aspect

Again a subject is an organized or systematized body of ideas, whose extension and intension are likely to fall coherently within the field of interest and comfortably within the intellectual competence and the field of inevitable specialization of a normal person. (Ranganathan, 1967). Boedons, Morillo and Gomez (2004) explained that disciplines are the intellectual and social structures through which modern knowledge is organized. The term *discipline* signifies the tools, methods, procedures, concepts and theories that account coherently for a set of objects or subjects. Over time they are shaped and reshaped by external contingencies and internal intellectual demands. In this manner a discipline comes to organize and concentrate experience into a

particular “world view”.....There is, in short, a certain particularity about the images of reality in a given discipline (Klein, 1996). However, the established order of knowledge is being influenced nowadays by an important change, boundaries separating disciplines are dissolving, disciplines tend to overlap, and new hybrid field emerge. All these definitions relate to the idea of disciplines as the term is used in studies of the universe of knowledge.

1.2 Inter-, Multi-, and Trans-disciplinary

Interdisciplinary, multidisciplinary, and transdisciplinary are considered as related terms, but the concepts are different based on the level of integration involved in research output (Bordons, Morillo, & Gomez, 2004; Morillo, Bordons, & Gomez, 2001; Rosenfield, 1992). The concepts of interdisciplinarity has been discussed by many researchers and defined as scientific output or activity using knowledge, methods, and tools from two or more disciplines (Klein, 1996; Rosenfield, 1992; Tang, 2004). Braun and Schubert (2003) defined interdisciplinarity “is the bringing together of distinctive components of two or more disciplines in research or education, leading to new knowledge which would not be possible without this integration”. The term ‘interdisciplinary’ defined as projects that involve several unrelated academic disciplines in a way that forces them to cross subject boundaries to create new knowledge and theory and solve a common research goal (Tress, Tress & Fry, 2005; Turvey, 2015). Interdisciplinarity has over years attracted scientist from social and natural sciences to other areas of

research practice. The principle of interdisciplinarity means an integration of theories, concepts, techniques and data from diverse bodies of knowledge. One element of diversity in scholarly communication is the degree to which scholars engage in interdisciplinarity (Sugimoto, 2009). Again, Carlin (2003) explained that interdisciplinary studies involve the use of concepts, methods and theories developed in other disciplines. Interdisciplinarity is continuing to increase across many areas of research (Morillo, Bordons, & Gomez, 2003) and is highly promoted by the funding agencies and academic institutions (Bordons, Zulueta, Romero, & Barrigon, 1999; Porter, Cohen, Roessner, & Perreault, 2007).

Since the 1970s, there has been an exponential growth of publications in almost all the field of studies. By 1990s, a majority of people from various fields and disciplines were immersed with interdisciplinary research. ‘Interdisciplinary research’ means “...a mode of research by teams of individuals that integrates (i) perspectives, concepts, theories, (ii) tools, techniques, and / or (iii) information, data from two or more disciplines or bodies of specialized knowledge... to solve problems whose solutions are beyond the scope of a single discipline” (Porter et al., 2007). An interdisciplinary methodology has been defined as “two or more disciplines which combine their expertise to jointly address an area of common concern” (Davies & Devlin, 2007; Ertas, Maxwell, Tanik, & Rainey, 2003).

Multidisciplinary can be defined as the subject under study is approached from different angles using different disciplinary perspectives, but

integration is not accomplished. ‘Interdisciplinary research’ leads to the creation of a theoretical, conceptual, and methodological identity, so, more coherent and integrated result are obtained. Multiple disciplines were coming together but, each working primarily with their own framings and methods. Morillo, Bordons and Gomez (2001) distinguished the terms interdisciplinarity and multidisciplinary. They considered multidisciplinary as a basic situation in which elements from different disciplines are present, whilst “interdisciplinarity” is a more advanced stage of the relationship between disciplines in which integration between them is attained.

Transdisciplinarity can be defined as the practice of acquiring new knowledge through education, research, design, and production with a broad emphasis on complex problem solving. The field of transdisciplinarity started in the early 1970s (Nicolescu, 2010; Pohl, 2010). The goal of transdisciplinary practice is to improve researchers’ understanding of complex issues by extracting the valuable aspects of typical academic disciplines and create more integrative and universal solution to support the importance issues of the society (Cronin, 2008; Ertas, Frias, Greenhalgh-Spencer, & Baack, 2015). Transdisciplinary research includes cooperation within the scientific community and a debate between research and society at large. Transdisciplinarity promotes theoretical, conceptual, and methodological reorientation with respect to core concepts of the participating disciplines. The transdisciplinary approach teaches researchers to seek collaboration outside the boundary of their professional experience to make new discoveries, explore

different perspectives, express and exchange ideas, and gain new insights (Ertas et al., 2015).

Finally, transdisciplinarity goes one step ahead which refers to a process in which convergence between disciplines is pursued, and it is accompanying by a mutual integration of disciplinary epistemologies (Van den Besselaar & Heimeriks, 2001). Many published works attempted to break down interdisciplinarity into components such as pluridisciplinarity, crossdisciplinarity, and metadisciplinarity. But these subdivisions throw little light on the theory and practice of interdisciplinarity (Bhattacharya, 2010; Braun & Schubert, 2003). Again, Porter et al. (2007) differentiate interdisciplinarity, multidisciplinarity and transdisciplinarity as separate concepts, while other researchers consider interdisciplinarity as the umbrella term under which the rest of the terms fall (Morillo, Bordons, & Gomez, 2003).

This study attempted to identify and correlate the existence of these concepts in LIS discipline with reference to Indian LIS publications. It also measures the transfer of knowledge from various disciplines to LIS scholarly communications. The termed 'disciplinary influence' is used as an umbrella term to cover all types of cross-disciplinary research.

1.3 Disciplinary Influence

The term disciplinary means "of or relating to a specific field of academic study". Disciplinary influences simply define as the influence of one or more disciplines on another discipline. Knowledge transfer from one

discipline to another discipline identifies the disciplinary relationship between the various fields of studies (Das & Bhattacharya, 2016; Porter & Chubin 1985; Urata, 1990). Studying knowledge transfer among disciplines provides researchers with valuable insights into the status of knowledge development by disciplines (Pratt, Hauser, & Sugimoto, 2012). The study of disciplinary influence illustrates how each discipline participates in knowledge exchange (i.e. as importer or exporter of knowledge) and how relationships among disciplines evolved overtime.

The disciplinary influences in publications can be approached from different perspectives such as the collaboration amongst authors from different disciplines, citation of references from different disciplines, and the publishing of works within other disciplines. However, Pierce (1999) argued that boundary-crossing behaviour through publications outside one's own discipline is the true interdisciplinary information transfer than does borrowing through citations because information is presented by members of the discipline in which it originates. In the 80's some pioneering studies were done based on more large scale empirical data. Among others the contribution of one discipline to others by field migration of scientists was analysed (Hargens, 1986; Le Pair, 1980). Porter and Chubin (1985) were among the first to study knowledge transfer across disciplines by use of bibliometric data.

In a comparative study using both methods, Urata (1990) showed that citation analysis and analysis of migration of scholars of social science fields in Japan produced more or less similar results.

1.4 Why Disciplinary Influence

LIS education has incorporated expertise from other disciplines since its founding. At the entry level of LIS education, potential library professionals bring a background in a discipline other than library and information science as a foundation on which the professional study of librarianship could be built (Weech & Pluzhenskaia, 2005). Researchers within a specialty communicate more with one another than with researchers in other communities, and they are expected to refer to one another's significant work more frequently than to the work of outsiders. But the funding agencies for the research are increasingly emphasized the social relevance of research results and continuously new mode of application-oriented research is emerging (Besselaar & Heimeriks, 2001; Pierce, 1999).

The disciplinary influence is important as modern society increasingly demands application-oriented knowledge, and the usability of scientific knowledge generally requires the combination and integration of knowledge from various scientific disciplines. Traditionally the disciplines have been very dominant in the organization of the science system. Successful knowledge transfer provides benefits to organizations and society. Studying knowledge transfer among disciplines provides researchers with valuable insights into the status of knowledge developments by disciplines. Interdisciplinary approach has become an important and challenging technique in the modern curriculum. The interdisciplinary approach synthesizes more than one discipline and creates teams of teachers and students that enrich the overall educational experience.

1.5 Problem Statement

Numerous attempts have been taken to identify the nature and structure of LIS. Studies were also tries to identify the subjects that were influenced the growth and development of library and information science literature publications since 1900s. Knowledge input in LIS is one of the popular studies since its evolution. Most of the studies were made on the basis of analysis of references cited in the articles published in the selected journal(s) from abroad. These studies were done on the basis of representative sample citations of the journal articles or based on citation databases. Influence of various disciplines on LIS scholarly communication as represented by articles publications with reference to India has chosen as the problems of study.

1.6 Objectives of the Study

The basic objectives of this study are as follows:

- ❖ examine the relationship between the LIS and other field of studies as reflected on the articles published in Indian LIS journals
- ❖ measure the type of resources utilized by the contributors in LIS publications
- ❖ identify the major contributory disciplines that transfer knowledge in the LIS publications on the basis of author analysis and citation analysis

1.7 Significance of the Research

The present study measure the influence of various disciplines on library and information science literature publications. The significant of the study is expected to identify the inter-relationship between LIS and non-LIS research publications by way of knowledge imported in LIS research. This study is also significant to identify the collaboration between LIS and non-LIS professionals and contributions from non-LIS professionals for the growth and development of LIS research during the last ten years.

1.8 Research Questions

After the thorough study of the related literatures published, the following research questions have been identified:

1. What is the academic background of the authors contributed in LIS journals in India?
2. Whether LIS professionals work collaboratively with the scholars from other field of studies?
3. Is any Non-LIS scholar do contribution in LIS literature?
4. What is the trend of documents utilization by LIS professionals?
5. Whether LIS publications in India influenced by other disciplines or not?
6. What disciplines input knowledge in Indian LIS literatures?
7. What is the degree of relationship between the LIS and non-LIS disciplines?

8. Is LIS communities biased by disciplinary influences?

1.9 Assumptions

The following assumptions are made in this study:

1. Library and information science is an interdisciplinary field of knowledge. It has strong relationship with many disciplines such as computer science, education, management, psychology etc.
2. The articles published in the *Annals of Library and Information Studies*, *DESIDOC Journal of Library and Information Technology*, *SRELS Journal of Information Management*, *IASLIC Bulletin*, and *Library Herald* are representative of the literature of library and information science.
3. Contribution of multiple authors has equal responsibility in the publications.
4. Documents cited in the articles published in *Annals of Library and Information Studies*, *DESIDOC Journal of Library and Information Technology*, *SRELS Journal of Information Management*, *IASLIC Bulletin* and *Library Herald* are represent the materials that were used and/or consulted by the authors of the articles
5. Databases to be used to identify the subjects of the documents are well classified.
6. Dewey Decimal Classification (DDC) 23rd edition is an adequate classification scheme to classifying the cited documents.

1.10 Limitations

The basic goal of this study is to examine the major contributory disciplines which enrich the LIS discipline. The other aspects of LIS such as theories, laws etc. are beyond the scope of the current study. This study is cover the articles published in *Annals of Library and Information Studies*, *DESIDOC Journal of Library and Information Technology*, *SRELS Journal of Information Management*, *IASLIC Bulletin* and *Library Herald*; other publications such as foot notes, editorials, obituaries, book reviews, and letters to editors were excluded from this study.

1.11 Glossary

- Altmetrics : The study and use of scholarly impact measures based on activity in online tools and environments
- Bibliometrics : The applications of mathematics and statistical methods to books and other media of communication
- Citation : Acknowledgement that one document receives from another
- Citation analysis : An activity involving analysis of the citation or references which forms a part of the primary scientific communication
- Citations Outside Category : The citations outside category approach calculates the percentage of total citations that

are outside the cited journal's subject category

- Crossdisciplinary : Viewing one discipline from the perspective of another
- Cybermetrics : Science of measurement involving cyber objects
- Discipline : Discipline signifies the tools, methods, procedures, concepts and theories that account coherently for a set of objects or subjects
- Information : Information is that, which is transmitted by the act or process of communication
- Information science : Information science is an interdisciplinary science that investigates the properties and behavior of information; the forces that govern the flow and use of information; and the techniques, both manual and mechanical, of processing information for optimal storage, retrieval and dissemination
- Informetrics : The study of the application of mathematical methods to the objects of information science
- Interdisciplinary : Integrating knowledge and methods from different disciplines, using a real synthesis of approaches. Combining or involving two or more academic disciplines to build new knowledge
- Intradisciplinary : Working within a single discipline

- Interspecialty : Research referring to different specialties of the same discipline
- Journal : A periodical, especially one published for a learned society of profession
- Library and information Science : The study and practice of professional methods in the use and exploitation of information, whether from an institutional base or not, for the benefit of users. An umbrella term, abbreviated LIS, and used to cover terms such as library science, librarianship, information science, information work etc.
- Library science : A generic term for the study of libraries and information units, the role they play in society, their various component routines and processes, and their history and future development.
- Librarianship : The profession of the librarians devoted to organization, preservation, and use of graphic records
- LIS community : The group of people involved in the LIS profession such as teachers, scientists, librarians, scholars, students etc.
- Multidisciplinarity : Two or more disciplines sharing research and subject content but not incorporating in any one of the disciplines the methodological or conceptual assumptions of the other disciplines

- Reference : A set of bibliographic elements that refers to a work and is complete enough to provide unique identification of that work for a particular bibliographic function
- Scientometric : The quantitative methods of the research on the development of science as an informational process
- Trans-disciplinary : Creating a unity of intellectual frameworks beyond the disciplinary perspectives
- Webometrics : The study of the quantitative aspects of the construction and use of information resources, structure and technologies on the web

1.12 Chapter Outline

The first chapter is introductory chapter which explained the problem statement, the objectives of the study, research questions, scope and assumptions, limitations of the study, etc. After the introductory chapter, chapter 2 provides the details literature reviews relating to the topic under study. The relevant literature has been collected from the various print journals, online journals published by Sage Publications, Elsevier, Taylor etc., numerous database such as ProQuest database, Web of Science, Scopus database, Library and Information Science Abstract (LISA), etc. Chapter 3 provides the details of methodology used for data collection, data analysis, data presentation and statistical tools and techniques used for data testing in this study and its

implications. Chapter 4 is the main analysis part. It deals with data presentation, analysis and interpretation of data by using various charts and diagrams. Few quantitative techniques also applied to tests the research questions. Chapter 5 is the concluding chapter. Here the summery of the work is drawn. This chapter restates the research questions and justifies its validity. Chapter 5 also outlines the areas for future studies. After the last chapter, a bibliographic list of document consulted arranged as per APA style manual and appendices appeared.

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Chapter- II

Review of Literature

Literature review is an evaluative report of studies forum in the literature related to a selected area of study. The reviews should describe, summarize, evaluate and clarify this literature. It gives a theoretical basis for the research and help to the researchers to determine the nature of their own research (Boot & Beile, 2005). According to Best and Khan (1986) “effective research is based upon past knowledge, review of related literature which helps to eliminate the duplication of what has been done and provide useful hypothesis and helpful suggestions for significant investigation. It is a valuable guide to defining problem, recognizing the significance, suggesting and premising data gather devices, appropriate study of design and source of data. This also helps to sharpen the understanding the existing knowledge in the problem and provides background for research project.

A literature review is the search for information and includes the identification and articulation of relationship between the literature and the selected field of research. A literature review is a text written by someone to

consider the critical points of current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic. Literature reviews are secondary sources and as such, do not report any new or original experimental work. Also, a literature review can be interpreted as a review of an abstract accomplishment.

Literature search plays a very important role in research activities, as it forms the very first step of research pursuit. A thorough review of related literature is very essential for conducting a new research. The main function of review of literature is to determine the work both theoretical and empirical, which has been done before, should assist in sketching of problem of area. It provides a basis for conceptual framework, insights into methods and procedures, suggests operational definitions of major concepts and also provides a basis for interpretations of findings. The study of related literature implies locating, reading, and evaluating reports of research as well as reports of casual observation and opinion that are related to the planned research project (Satija & Singh, 2006). Literature review is “the process of reading, analyzing, evaluating and summarizing scholarly materials about a specific topic (Fink, 2009). The basic objectives of literature review are

- focus on a specific problem, issue or debate
- illustrate how the subject has been studied previously
- include a clearly stated research methodology based on the existing literature
- Helps to refine, refocus or even change the topic

- Outline the gaps in previous research and show where the research fits into the existing body of knowledge
- Ensure that the research hasn't been done before (or that it is not just a replication study)

2.1 Biblio-, Sciento- and Informetrics

Bibliometrics is the study dealing with quantification of written communication which helps in the measurement of the published knowledge. Bibliometrics is an emerging thrust area of research in the field of Library and Information Science (LIS) and has practical application in measuring the coverage and quality of journals. Bibliometrics is an application of statistical and mathematical methods to bibliographical studies. Bibliometrics involves the quantitative analysis of the literature of a subject domain, as represented by bibliographic entries such as keywords, classification codes, authors and citations (Dalai & Ramesh, 1995; Dutta & Sen, 2001; Narang, 2004; Narang & Kumar, 2010; Ramakrishna & Babu, 2007). The main objectives of the bibliometrics study are to find out authorship pattern, author's productivity, prolific authors, core journals in subject area, indexing terms frequency, year-wise distribution of articles, language-wise distribution of articles and country-wise distribution of journals (Singh, 2007).

There has been considerable confusion in the terminology of the closely related metric terms. 'Bibliometrics', 'Scientometrics', 'Informetrics' are unfortunately not very clear and there is choice in the terminology (Hood &

Wilson, 2001; Wormell, 1998). The first recorded study of bibliometric topic was in 1917 by Coles and Eales with the title 'Statistical analysis of literature of history of comparative anatomy' which served as a model for applying the counting technique in the evaluation of international activities (Jena, Swain & Shaoo, 2012; Lawani, 1981). However, Allan Pritchard first introduced the term 'bibliometrics' in 1969 in his paper entitled "Statistical Bibliography or Bibliometrics?" published in the December issue of *Journal of Documentation*. Though the term 'bibliometrics' evolved in the year 1969, it became more popular during 1980s. Pritchard (1969) suggested that the word 'bibliometrics' is the application of mathematical and statistical methods to books and other media of communication. It can define as 'organization, classification pattern of all macro and micro communications along with their authorship by mathematical and statistical calculus (Sengupta, 1990).

Again, Sengupta (1992) claimed that Campbell (1896) produced the first bibliometric study, using statistical methods for studying subject scattering in publications. Cole and Eales (1917) studied the growth of literature in comparative anatomy for the period 1550-1860. Hulme's (1923) work is another early study, using document counts to provide insight into the history of science and technology. Hertzfel (1987) traced the development of bibliometrics from its roots in statistics and bibliography, paying particular attention to the development of the bibliometric laws. Broadus (1987) discussed the early history of bibliometrics upto 1969 when the term 'bibliometrics' coined by Pritchard (1969) and examined the development of the three

bibliometric laws, citation analysis and library use studies.

Scientometrics is the study of measuring and analyzing science research. It is often done using bibliometrics which is a measurement of the impact of publications. In 1969, Vassily V. Nalimov and Z. M. Mulchenko coined the Russian equivalent of the term 'scientometrics' (naukometriya). As the name would imply, this term is mainly used for the study of all aspects of the literature of science and technology (as cited in Hood & Wilson, 2001). The term had gained wide recognition in 1978 by the foundation of the journal *Scientometrics* by Tibor Braun in Hungary. According to its subtitle, *Scientometrics* includes all quantitative aspects of the science of science, communication in science, and science policy (Hood & Wilson, 2001).

Another metric term, 'informetrics', comes from the German term 'informetrix' was first proposed in 1979 by Nacke to cover that part of information science dealing with the measurement of information phenomena and the application of mathematical methods to the discipline's problems, to bibliometrics and parts of information retrieval theory, and perhaps more widely (as cited in Hood & Wilson, 2001).

Brookes (1990) discussed the history and use of the different terminology of the three metrics. Hood & Wilson (2001) discussed the history of the three metric terms and of librmetrics. The fundamental importance to the development of the three metric fields was the discovery of certain regularities, distributions or laws. The earliest of these laws was Lotka's law which provided a relationship between authors and papers (Lotka, 1926).

Bradford's law dealt with the problem of the scatter of papers on a scientific subject through the scientific journals (Bradford, 1934). Zipf's law was concerned with word frequency of occurrences (Rousseau, 2002).

2.2 Bibliometric Studies

Bibliometric study used to identify the pattern of publication and authorship, citation and coverage of journals articles in terms of geographic, subject, organization, bibliometric coupling, self citation pattern, half life of citation, co-word analysis, impact factor, ranking of journals, studying mechanism of development of a subject and other related parameters (Kherde, 2003). It also helps in library resource management and planning strategies for documentation service to the user community of that particular literary discipline (Das & Tripathi, 2007). A handsome number of bibliometric studies were done by several authors in India and abroad.

A bibliometric analysis of all the articles published in *Malaysian Journal of Library & Information Science* (MJLIS) from 1996-2000 was carried out by Tiew, Abdullah, and Kaur (2002). The range of articles published per volume was between 14 and 17; average number of references per article was 22.5; the average length per article was 41.2 pages. The study shows that 69.74% contribution was research oriented and the multi-authored works was predominant over single-authored works. Most of the authors were from Malaysia followed by India. The self-citation rate for authors was 39.5%, whereas rate of journal self-citation was found to be 27.6% and most of the

articles (67.1%) does not contained any formal acknowledgement. In 2012, Rattan and Gupta studied *Malaysian Journal of Library and Information Science*. The authors of this journal contributed 100 articles and have referred 2,894 references. The analysis covered mainly the number of articles, authorship patter, geographical distribution of authors, pattern of references etc. A.N. Zainab was reported as most contributing authors with 13 articles during the study periods. *Scientometrics* was the most cited journals by the contributors of MJLIS.

Kulkarni, Poshett, & Narwade (2009) did the bibliometric analysis of the journal *Indian Journal of Pharmaceutical Education and Research* for a period of eleven years. The study found that journals were predominant cited document followed by books. They also concluded that majority of the contributing scientists preferred to publish research papers in multiple authorship and there was considerable time lag in publication of articles from the date of receipt of the papers.

Zainab, Ani and Anur (2009) in their bibliometric study on *Malaysian Journal of Computer Science* evaluated the article productivity of the journal from 1985 to 2007 using Lotka's Law. They further revealed authorship, co-authorship pattern by degree of authors' collaboration that ranged from 0.25 to 0.95. Narang and Kumar (2010) analyzed 4,798 citations appended to 400 articles published during 2003-2007 in five volume of the *Indian Journal of Pure and Applied Mathematics* and observed the number of contributions and their distribution in different volumes, authorship pattern, foreign and Indian

author contributions, citation analysis and number of pages used in each volumes. They concluded that number of contributions decreased in the successive volumes, the most cited documents were journal articles, the number of foreign contributors were more than Indian contributors, and growth and popularity of the journal was shown a mixed trends i.e. upward and downward progress.

In another investigation of *Journal of Intellectual Property Right*, a total 332 articles carrying 1,541 journal citations during the period of 2002-2010 were analyzed by Swain and Panda (2012). They found less collaborative works among 471 contributors. The average number of citations against all published articles was found to be 0.66 per article. Moreover, it was discovered by them that self-citations among authors were 22.01% of the total citations. The top five cited journals in this study were *Journal of Intellectual Property Rights*, *European Intellectual Property Review*, *Research Policy*, *World Patent Information*, *Trademark Reporter*, and *Current Science*.

Naseer and Mahmood (2009) conducted bibliometric study on *Pakistan Library and Information Science Journal* covering period 1998-2007. A total of 236 contributions from 30 issues were examined for subject covered, geographical distribution of authors, collaboration among authors, gender of authors etc. on an average 7.87 articles per issue and 23.60 articles per year were published under study. Most popular subject category among the authors was “Industry professional Education” with 93 articles. Most of the contributions were from Pakistan. Also, the authors of this journal preferred

individual work as 209 articles out of 236 articles were written by single authors. Patil (2010) examined 249 articles published in *Herald of Library Science* during 1995 to 2005 for authorship pattern, degree of collaboration and geographical distribution of papers. The study found that majority of articles written by single author and degree of collaboration was found 0.30. The geographical distribution reveals that Andhra Pradesh was the highest contributing state in India while Nigeria was the top in case of foreign countries.

Swain (2011) studied articles published in *Library Philosophy and Practice* (LPP) from 2004 to 2009 and found that the degree of collaboration in LPP ranged from 0.222 to 0.52 and the highest numbers of contributors were from Nigeria, followed by USA, India, and Iran. Roy and Basak (2013) examined the articles published in *Journal of Documentation* for authorship pattern, degree of collaboration, geographical distribution of papers and citation analysis. The study revealed that majority of papers was multi-authored. The degree of collaboration was found to be 0.51 and the geographical distribution revealed that the contribution by United Kingdom was the highest. The average citations per paper were 43.

Singh (2013) analyzed the various bibliometric components of the articles published in the *Chinese Librarianship: an International Electronic Journal* between 2009 and 2012. His major focused areas was to find out the quantitative growth of articles and distribution of citations, finding out the range and percentage of citations per articles, finding out the degree of author

collaboration and examination of the geographical contribution of the articles. Singh (2013) concluded that the highest numbers of articles were contributed by single authors and most of the authors belonged to various non-teaching categories. India has contributed more articles than any other countries, followed by Nigeria, Pakistan, USA, etc. and most of the articles between 6 and 10 pages long. Shah (2016) made a bibliometric analysis of 81 articles published in six volumes of *International Journal of Agriculture Sciences (IJAS)* during 2009-2014. All contributions of research papers have been carefully examined to ascertain the year wise distribution of articles, authorship pattern, geographical distribution of contributions, country wise contribution, prolific contributors of articles, average number of references per articles, form of documents referred and age of references, etc. It was found that majority of the articles published in IJAS was collaborative research; the degree of collaboration was 0.8765 which clearly indicates the dominance of collaborative research upon individual contributions. Journals were the primary sources of references used by the contributors. A list of most frequently referred journals was compiled and identified the core journals i.e. '*Transactions of the ASAE*'.

2.3 Collaborative Studies

Collaboration is an intense form of interaction that allows for effective communication as well as the sharing of competence and other resources. Researchers not only communicate research results and information to each

other, they also co-produce and co-report research results (Melin & Persson, 1996). Research collaboration refers to the cooperation process among researchers who work together to achieve the common goal of producing new scientific knowledge (Katz & Martin, 1997). Research collaboration can be in the forms of exchange of ideas, joint experiments, or participating in the same research programme. Many studies using co-authorship as the measurement of research collaboration indicated that there were extensive research collaborations among the authors from different departments, institutions, and disciplines (Adams, Black, Clemmons, & Stephan, 2005; Gazni, Sugimoto, & Didegah, 2012; Narin, Stevens, & Whitelow, 1991). The number of authors contributing to scholarly publication in terms of authorship pattern is an interesting part of any bibliometric study. A count of author(s) contributing to articles offers some indication to the degree of collaboration between authors. Cronin (2008) comments that, authorship an “undisputed coin of the real in academia” and “absolutely to the operation of the academic reward system”. However, the concept of authorship was evolved over the course of the 20th century (Pradhan, Panda & Chandrakar, 2011).

As a part of bibliometric study, various studies in different disciplines based on the authorship pattern and collaborative research found in the literature. Price (1963) was among the first to study the authorship pattern and opined that multi-authored articles are gradually increasing with simultaneous reduction in single-authored papers. Maheswarappa and Mathias (1987) studied the research collaboration in different disciplines of applied sciences in India

and observed an increasing trend towards collaborative research but the actual rates of increase varied from one discipline to another. Begum and Rajendra (1990) in their study observed the dominance of multiple authors over single authors in zoological sciences. Authorship pattern in psychology as observed by Karisiddappa, Maheswarappa and Shirol (1990) was that the proportion of single-authored articles has fallen to 39.43% in 1988 when compared to 84% in the 1920's indicating the trend towards multiple-authorship.

Munshi, Vashisth and Gautam (1993) analyzed and interpreted that the trends of multiple authorship in agricultural sciences and observed the predominance of multiple authors over single authors. Vimala and Reddy (1996) analyzed the doctoral theses in zoology of Venkateswara University, Tirupati and conclude that although multiple-author is dominant, solo research also exists and degree of collaboration in zoology research is 0.75 as a whole. O'Neill (1998) examined the authorship pattern in one theory based journal and another research based; *Educational Theory* (1955-1994) and *Journal of Educational Thought* (1970-1974). He found that majority of authorships were single in both the journals regardless of the date of publication against de Solla Price's prediction that co-authorship would eventually increase and single-author paper will be extinct. Farahat (2002) examined the patterns of authorship in nineteen Egyptian journals of agricultural science and found that multiple-authorship was predominant and co-author papers were accounted as 79% of the sample. Pillai (2007) found that team research is being more preferred and average value of degree of collaboration was 80% on his study of the trends in

authorship pattern and collaborative research in physics and

Zafrunnisha and Reddy (2009) studied the authorship pattern and degree of collaboration in psychology considering 141 Ph.D. theses of universities and found the predominance of the multi-author papers over single authored papers and the degree of collaboration was 0.53. Many researchers argued that co-authorship alone is not sufficient as a measure of research collaboration. Katz and Martin (1997) identified that many cases of collaboration did not result in co-authored publication. In many cases it was found that researchers worked closely together, but published their opinion separately in their own discipline as single-author paper.

Melin and Persson (1996) also said that co-authorship was only a rough indicator of collaboration. Pepe (2011) observed that listed co-authors did not communicate with each other during research collaboration. Communication between researchers stimulates them to think regarding the unsolved problems in their fields and possible research projects, thereby developing new ideas and solution. It also transmits knowledge to efficiently solve the problems of other researchers in their own discipline as well as other disciplines (Fox, 1983; Laudel, 2002).

Collaborations mostly begin informally and arise from information communication between researchers, i.e. through close personal contacts and professional networks (Bozeman & Corley, 2004; Katz & Martin, 1997). Melin (2000) described that collaboration could be measured in various ways such as exchange of phone calls and e-mails, but a more concrete form to measure the

collaboration was through co-authorship information.

However, collaboration between authors has many disadvantages, but Borgman and Furner (2002) concluded that collaboration was one of the communication behaviours exhibited by authors in their various capacities. Although citing literature from different disciplines and the co-authorship of researchers from different disciplines are common ways of interdisciplinary information transfer (Pierce, 1999).

2.4 Citation Analysis

Citation analysis is a bibliometric technique of counting citations that may facilitate the flow of scholarly communication (Tsay, 2015). Researchers may need to measure the importance of their publications by this method of citation analysis (Gupta & Ratan, 2013). The analysis of bibliographic citations is a common research technique used by information workers for a variety of applications. Citation analysis examines the frequency, patterns and graphs of citations in articles and books (Garfield, 1983). Citations can cluster to identify the flow of topics within and among disciplines (Tsay, 2013). Citation analysis can be used to map relationships among documents, journals or other channels of scholarly communication (Borgman, 1999). It is now commonly used to determine what titles to purchase, to discontinue, or to weed. The main idea of citation analysis is that citations reflect the real impact of published scientific results (Smith, 1981). This is a most reliable tool through which the scattering of subjects can easily be determined. The authors referred to the publications of

various subjects, which are relevant to a specific field of study while writing a research article/paper. Citation analysis will reveal the specific subjects that are related to a field of study (Mahapatra, 2009). The process involves the analysis of citations from a source publication such as an index, abstract, or journal to determine the characteristics of the literature being used or produced within a discipline. Citation analysis is predicated on the assumption of the symbolic value of a citation. Scholars conducted research, disseminated that research to their peers, and then are acknowledged for their contributions through citations.

The applications of citation analysis range from practical studies such as determining the appropriate retention period for a library's periodical holdings to more theoretical studies for information flow, communication patterns, and scholarly activity within a discipline (Borgman, 1999; LaBorie & Halperin, 1976). It makes use of bibliographic references which are essential part of the primary scientific communication. It uses citations in scholarly works to establish links. Citation implies a relationship between a part or the whole of the cited document and a part or the whole of the citing document. Citation analysis is an important area of library and information science from which, one can understand which scholars from which disciplines cite which articles, which journals were cited more and which disciplines cite the journals of others disciplines (Desai, 2003). Scales (1976) argued that lists of journals ranked according to number of citations received were frequently used as indicators of usefulness, but little research has been carried out to test the validity of this hypothesis. Scales compared the lists of titles of journals ranked by citation

counting with the lists of the same journals, ranked according to frequency of use using data from a survey at the National Lending Library, and found that the rank order correlation between the two was low. He suggested that ranked lists produced by analyses of citations do not constitute valid guides for journal selection by libraries.

The basic differences between reference and citation is, a reference is the acknowledgement that one document gives to another, a citation is the acknowledgement that one document received from another (Mahapatra, 2009; Smith, 1981). Various kinds of links that can be ascertained by citation analysis are links between author(s), between scholarly works, between journal, between fields or even between countries. One very common use of citation analysis is to determine the impact of single author on a given field by counting the number of times the author has been cited by others. They are also used to map literatures, reveal networks of citers and citees and assess the impacts of organizations, authors, journals articles, but other types of documents such as books/book chapters, conference publications, dissertations etc are increasingly mined as well (Husain & Khanam, 2015). Boyer (1973) identified the earliest uses of citation analysis back to the 1920s, and a review of the literature shows most of the emphasis has been on science and social literatures (as cited in Laborie & Halperin, 1976). Line and Sandison (1974) in their work stated that citation analysis of documents not only shows the relationships among journals, papers and authors, but also investigates the quality and quantity of research work. In this direction, Salton and Bergmark (1979) evaluated the importance

of individual authors, documents, and journals through a clustering study of computer science literature using bibliographic citations as clustering criterion.

Earle and Vickery (1969) compared the form of citations of social science with that of science and technology and observed that in social sciences, books were cited (46%) in a greater number of times than were journals (29%). A number of analyses have been conducted on the use of types of documents cited by Indian social scientist. Rana (1982) analyzed the type of documents cited by Indian anthropologist and determined that 51.68% of the total citations belonged to books and 33.2% were of journals. Focusing on the *Journal Citation Reports* as a suitable data base, an alternative indicator was validated by Porter and Chubin (1985) on a sample of 383 articles drawn from 19 journals. The results support the use of *Citations Outside Category* (COC) as an indicator of cross-disciplinary research activity. An estimated version of this indicator was used to examine three research categories- Demography, Operations Research/ Management Science, and Toxicology- as to the extent of cross-disciplinary citation occurring by the journals in these categories and to them. Results suggested that COC can be a quite informative bibliometric measure. A key substantive finding is that citation across broad field categories such as engineering, life sciences, physical sciences, and social sciences was extremely infrequent. Articles published in Indian Library and Information Science journals between 1975 and 1985 studied by Mahapatra (1994) and shows that articles show an increasing tendency to cite more documents in years later than 1975. A comparative study between the appearance of citing

and non-citing articles revealed that citing articles were always dominant in their number over non-citing articles.

Herring (2002) conducted citation analysis on the research articles published in electronic journals during 1999-2000. This study focused on the extent to which scholars were using those resources and the types and subject areas of those online resources that were referred. The result showed a growing trend of using online resources and a high use of interdisciplinary references. Sharif and Mahmood (2004) selected eight volumes each of *Pakistan Development Review* and *Pakistan Economics and Social Review* to find the citation pattern of articles. Mean score of citations per articles remained insignificantly different in the two journals. More than 50% of the citations of both the journals were single authored and from non-journal sources, mainly books. About 47% of the total citations of the *Pakistan Development Review* were up to five years old as compared to *Pakistan Economic and Social Review* citations, where only 25% fell into this category. The top most cited journals in both the cases were from USA.

Shokeen and Kaushik (2004) studied *Indian Journal of Plant Physiology* and found that journals articles were predominant with 81% of total citations, the ratio of author self citation to total citations is 1:16.65. The ratio of journal self citation to total citation was 1:31.91. The results also highlight that 398 citations were below 10 years old, whereas 358 citations were of 10-20 years old. Biswas, Roy and Sen (2007) conducted a bibliometric study on *Economic Botany* from 1994-2003. They found that book citations were 59% and journals

citations were 41% . They concluded that e-citations were quite negligible. Kumar and Kumar (2008) analyzed 8,093 citations given in the *Journal of Oilseeds Research* (JOR) published during 1993 to 2004. Out of 8,093 citations, 5,642 were given in main articles and 2,551 in short communications of JOR. It also analyzed the type of documents cited and identified the core journals. They covered the analysis of citation pattern along with the calculation of collaboration coefficient. Geographical distribution of cited references has also been analyzed. They concluded that 20 core periodicals cover more than 50 percentage references and also indicates that collaborative research is prevalent in oil seeds research. Sam (2008) analyzed the articles published in the *Ghana Library Journal* over a period of seven year from 2000-2006. The most cited references in the study were journals (44.5%) followed by books (32.5%) and reports (9.4%). Current journal sources were 62.9% and 48.8% of the books appearing in the references sources were published in 1990 and later. Most of the authors were from Ghana and most of the research was conducted on academic libraries.

Zafrunnisha and Reddy (2009) presented the result of the citation analysis study in *Indian Journal of Marketing* (IJM). The major objectives of the study were to find out the authorship pattern, bibliographic form, subject, language, country and rank wise distribution of citations of articles appeared in IJM volume number 36 published in the year 2006, i.e. January to December 2006. A total of 74 articles were published in these issues. Overall 701 citations featuring 752 authors had been found. The results indicate that 40.94

percentage articles published in these issues were single authored. It was also revealed that book source was predominant with 40.51 percentages of total citations.

Gupta, Kshitij, and Singh (2010) analyzed research output of computer science in 11-subfields in India during 1999 to 2008 and found that the average citations per paper were 2.10 during 1999-2006 and the cumulative collaborative publications output accounted for 19.92% in the cumulative output of India in computer science. Citation analysis of all the journal articles published in the *Journal of Library and Information Science* from 2004-2009 was carried out by Simisaye and Osinaike (2010). A total of 998 references were studied by the authors and the result shows that journals were the most cited materials, followed by books. The findings further shows that 62 cited LIS journals produced 172 citations. *African Journal of Library, Archives and information Science* led the top ten most cited LIS journal with 40 citations. The majority of cited documents were published in 1995 and beyond, authorship pattern shows that 79.85% of the documents cited were single author, and only 8.8% of the total citations were internet resources.

Similarly, Maharana, Majhi, and Sethi (2011) conducted a citation analysis of top research papers in chemistry retrieved from *Science Direct Database* and revealed that India secured third position after USA and China. Ramesh and Nagaraju (2000) analyzed the citations provided in articles of *Indian Journal of Information, Library and Society*. It was found in the study that 138 citing articles have cited 901 citations i.e. on an average 7 citations

were cited per article. About 67.5% of the articles had 1-20 citations. More citations were from the books and periodicals than the other type of documents. Das and Sen (2001) analyzed 1,049 citations appended to 34 research articles of *Journal of Biosciences*. They found that out of the total citations, journal articles were highly cited documents with 85.89%. Similar type of study was performed by Koley and Sen (2003) covering 457 citations appended to 26 research articles published in the four issues of the quarterly *Indian Journal of Physiology and Allied Sciences*. Of the citations, 76.81% related to journal articles, 18.59% to monographs, and the rest to conference papers, theses, etc. Jan (2009) studied all the journal articles published in the *Library Trends* from 1994-2007 and found that 593 articles were published in the journal during 14 years. The Journal contained 15662 references for the study period of which 13783 were print-citations and 1879 were electronic-citations. Every issue published approximately 11 articles and each article has an average of 23.2 print-references and 3.1 electronic-references. It was found that 44.51% print books were consulted by the authors and no e-books were used. Authors have consulted 44.04% p-journals as against 11.82% e-journals.

Ahmad and Nazim (2010) investigated the pattern of citing references of research articles published in D-Lib Magazine during 2002 to 2008. A total of 4775 citations were collected from 295 articles published during the study periods. Articles classified as editorial materials, power point slides, book reviews, columns reports and news items were not considered for the analysis. References of each article were collected and Microsoft Office Excel 2007 was

used for data handling. The various analyses focus on year-wise distribution of articles and cited references, types of documents cited, country and language of cited documents, file format and domain of cited references, etc. the study shows the changing trends of research in the field of LIS in the area of digital libraries particularly with the introduction of internet and www. They concluded that researchers in digital libraries have been used digital and web resources to conduct their research works.

Citation analysis of all the journal articles published in the *Journal of Documentation* from 1996-2010 was carried out by Singh, Sharma and Kaur (2011). Total 487 articles were published in the journal during 15 years. The journal contained 15,587 citations during the study periods. Journal articles were highest cited documents and *Journal of Documentation* was on the top with 795 citations whereas *Journal of the American Society for Information Science* was ranked second with 599 citations. The authorship pattern of citations shows that the single author contributions are more in numbers that is 201 (49%) and more than three authored citations are lowest in numbers that is 31 (8%).

Huang and Lin (2011) examined citations of western journals in eight LIS journals and six history journals published in Taiwan. They found that both the western journals' impact factor values and whether they are included in JCR may not necessarily indicate their real use in Taiwan's LIS and history research. Analysis of cited documents appeared in the online journal *Information Research* studied by Gupta and Rattan (2013) during the period 2008-2012. The

average number of citations per articles was 43.21 and the maximum numbers of articles have citations between 26- 50. Citation analysis of IR reveals that the mean score of citations per article was found to be 39.4. About 60% of citations are from journals articles and more than 50% of citations are multi-authors. The most cited journal was *Journal of the American Society for Information Science and Technology*. As for as age of the cited journal is concerned, about 43% of the cited documents are 8 year old and half period life of the journal is about 9 years.

In the next year, Rattan (2014) carried out a citation analysis of all the articles published in the journal Pakistan Journal of Library and Information Science. In this study it was found that contributors cited 848 references to writing 40 articles during the period of seven years i.e. 2006-2012. Growth of citations, average citations per paper, author pattern of citations, etc. has been calculated. Ranked list of cited journal indicated that Information Outlook was the most cited journal. Bradford law of scattering has also been tested to this journal and the Bradford distribution for the sample data was 11:38:123.

2.5 Disciplinary Influence Studies

In the twentieth century, it has seen the emergence of problem-centered and mission-oriented research in which discoveries and developments in one discipline are synthesized into the research of a very different field, often with dramatic and life-altering results. Cross-fertilization across different disciplines is being described as a key element in the advancement of science. Cross-

disciplinary initiatives were promoted through national and international research programmers (Morillo, Bordons, & Gomez, 2001). Interdisciplinarity is being associated with high levels of creativity, progress, and innovation because many of the intellectual discoveries of modern times were obtained by crossing disciplinary boundaries. Collaboration is a common and important feature of interdisciplinary work and has been studied by researchers (Palmer, 1999; Qin, Lancaster, & Allen, 1997; Bordons, Zulueta, Romero, & Barrigon, 1999).

Pierce (1999) identified two other types of interdisciplinary information transfer in addition to collaboration. Pierce defined collaborations as researchers from different disciplines working together on a single publication. Pierce (1999) added borrowing- importing theories or methods from other disciplines into the literature of your own discipline (typically done through the use of citations) and boundary crossing- the publishing of work in a discipline different from the disciplinary affiliation of the author, thereby exporting theories and methodology from one discipline to another. Therefore, disciplinary influences can be manifest in two ways, either (a) through collaboration or communication between scientists working in different fields, or (b) through the work of individual scientists who employ concepts or methods across disciplines. Interdisciplinary links can be identified by juxtaposing a clustering and mapping of documents against journal-based categorization of the same document clusters (Small, 2010). Smith (1991) suggested to reviews and synthesis studies that have attempted to characterize

the interdisciplinary nature of a branch of study such as library and information science.

When information from one discipline does appear in the literature of another discipline, the information transfer is affected in the following three ways:

- Borrowing- Researchers borrow theories or methods from other disciplines, importing them into their own disciplinary literatures
- Collaboration- Researchers published work in their own disciplinary literatures coauthored with members of other disciplines
- Boundary crossing- Researchers published work in other disciplines, exporting theories or methods to other disciplinary communities.

Highly cited papers of all disciplines based on *Thomson Reuters'* *databases* over the 1900-2012 period, Chen, Arsenault, Gingras, and Lariviere (2014) concluded that (i) inter-specialty research has a greater impact on science development than intradisciplinary (or intraspecialty) research for most specialties and disciplines; (ii) interdisciplinary research plays a more important role in natural sciences and engineering than in social sciences and humanities; and (iii) interdisciplinary research is becoming more important in science either at the specialty or discipline level. The interdisciplinary characteristic of LIS is a long debated issue and the discussion has been often embedded in the exploration of the disciplinary nature and intellectual structure of library science or information science itself (Bates, 1999; Saracevic, 1999). Library and information science emerged as information science was incorporated into

the field of library science and library science reacted to the impact of information technology. Therefore, some of the past researches focusing on LIS interdisciplinarity based on selected journals in only library science or information science or both and found that

1. LIS researchers often cited publications across disciplines (Al-Sabbagh, 1987; Bracken & Tucker, 1989; Buttlar, 1999; Chen & Liang, 2004; Cheng, 1995; Chikate & Patil, 2008; Chung, 1995; Gatten, 1991; LaBoire & Halperin, 1976; Pluzhenskaya, 2008; Tsay, 2008; Tsay, 2011),
2. LIS researchers collaborate with researchers from different disciplines (Chen & Liang, 2004; Das & Bhattacharya, 2016; Qiu, 1992)
3. LIS publications cited by researchers from various disciplines (McKechnie, Goodall, Lajoie-Paquette, & Julien, 2005; Meyer & Spencer, 1996; Odell & Gabbard, 2008; Tang, 2004b).

Multiple ways of measuring interdisciplinarity such as *citations outside category* (COC), *Brillouin's Index*, *Pratt Index*, *interdisciplinary borrowing index* etc. have been proposed and used in the literature to quantitatively assess the openness of an academic discipline (Choi, 1988; Hurd, 1992; Morillo, Bordons, & Gomez, 2001; Pierce, 1999; Sugimoto, 2009; Steel & Stier, 2000). The COC approach calculates the percentage of total citations that were outside the cited journal's subject category (Porter & Chubin, 1985). Steele and Stier (2000) argued that the COC approach does not provide a complete and accurate

account citation data. Instead, they suggested that Brillouin's diversity index (Brillouin, 1956) better captures the richness and relative abundance of observations. Pratt index measures the concentration and scattering of documents (Pratt, 1977). However *interdisciplinary borrowing index* quantifies the degree of borrowing as an index of interdisciplinarity. As an indicator of degree of interdisciplinarity, a higher number would represent a higher degree of interdisciplinarity. The *interdisciplinary borrowing index* could be generated for any unit- a single type of source in a reference list, the entire reference list of a single work, all the references from a journal, all the references in a scholar's oeuvre, etc. (Sugimoto, 2009).

Based on *world of science* (WoS) database, Sedighi (2013) investigated the interdisciplinary relations in some high-priority field of science and technology. The study population consists of scientific articles of Iranian researchers in five fields that have been indexed in *WoS* database. These fields were included nanotechnology, biophysics, nuclear physics, sociology and communication. He studied 41080 citations and concluded that there was a positive correlation between co-authorship and interdisciplinary approach in all the studied fields and there is no significant relation between the number of citations and interdisciplinary approach.

2.6 Disciplinary Collaboration between Authors

Communication and collaboration between research scholars are of great importance in the development of subject areas and in the dissemination of

research results (Ding, Foo & Chowdhury, 1999). It is common today for scientists to conduct research in collaboration with their colleagues from different institutions and disciplines (Qin, Lancaster & Allen, 1997). Authorship is an observable phenomenon reflecting the contemporary practices by clearly showing patterns of communication, productivity, collaboration and influences among researchers even though their quantities and qualities are not well understood. Bibliometrics provides a method for examining communication among scholars in a field through their scholarly publications (Subramanyam, 1983). Co-authorship/ collaboration appears as a central consideration in investigations of communication patterns linking scholars in a subject field and along with other social relationships contributes to a “network” facilitating communication among scholars (Melin and Persson, 1996). It is widely assumed that collaboration in research is ‘a good thing’ and that it should be encouraged. Numerous initiatives have been launched with the aim of developing collaboration among individual researchers.

Houser (1988) employed a concept analysis method and used the first 15 volumes of the *Journal of the American Society for Information Science* (JASIS) to explore the nature of information science. It was found that the majority of JASIS authors which could be identified were from library science and a majority of them taught in library science. It was also found that information science is merely library science and there is no inter- or multi-disciplinarily in the field of information science. White and McCain (1998) explored the domain knowledge of the information science field from 1972 to

1995 by author co-citation analysis of highly cited authors. They identified twelve subjects of information science. Their findings demonstrate the development of information science within these various subjects during the study period.

Qin, Lancaster and Allen (1997) collected a sample of 846 scientific research papers from SCI published in 1992 and tested hypotheses on the relation between research collaboration and interdisciplinarity. Collaboration was measured by the number of authors, number of institutional affiliations, number of affiliation disciplines, and type of collaboration. Interdisciplinarity was measured by the number of disciplines represented in the journals cited. The result showed that the levels and types of interdisciplinary collaboration varied in different disciplines, but the general trend was toward high interdisciplinarity, which especially was pronounced in biology and medical sciences. The study also suggested that, regardless of the two extremes, i.e. highly collaborative but slightly interdisciplinary and highly interdisciplinary individuals, collaboration positively correlated with interdisciplinarity.

Ding, Foo & Chowdhury (1999) studied the collaborative pattern of the Information Retrieval (IR) research field by analyzing co-authored articles retrieved from Social Science Citation Index (SSCI) for a period of 11 years from 1987 to 1997. This study reveals a perceptible upward trend of collaborative IR research with the results of these research efforts been reported in all major core IR journals. The inter-disciplinary and intra-disciplinary scholarly communications in collaborative researches were very much in

evidence and cover broad areas like psychology, and computer and medical sciences respectively. In a study on sociology and political science, boundary-crossing authors were found to come preferably from neighboring disciplines and succeed in achieving interdisciplinary information transfer, as measured through their paper's citation rates (Pierce, 1999).

Cumminngs and Kiesler (2005) investigated scientific collaboration across disciplinary and university boundaries to understand the need for coordination in these collaborations and how different levels of coordination predicted success. They conducted a study of 62 scientific collaborations supported by a programme of the United States National Science Foundation in 1998 and 1999. The projects with principal investigators (PIs) in more disciplines reported as many positive outcomes as did projects involving fewer disciplines. They concluded that projects with PIs from more universities were significantly less well coordinated and reported fewer positive outcomes than projects with PIs from fewer universities.

Holland (2008) investigated the nature of collaboration within information science. His main objective of the investigation was to answer two questions, (1) what philosophic distinction can be made between inter- and multi-disciplinary efforts? and (2) Is one or more valuable than the other to information science research? Holland (2008) found that very little research into what it precisely means within information science has been conducted. Co-authors' affiliations were analyzed by Huang and Chang (2011) to investigate the interdisciplinary changes in information sciences during 1978-

2007. The disciplines of co-authors from five information science journals were selected for the study purpose under the heading Information science and Library Science covered by JCR of 2008. Huang and Chang (2011) reported that co-authors of information science articles were from 23 disciplines. The co-authors were primarily from the discipline of LIS, followed by general science, computer science, business/management, and medicine. This indicates that information science researchers often produce scientific papers with researchers from non-LIS disciplines.

Chua and Yang (2008) analyzed the collaboration trends, author-ship and keywords of all research articles published in the JASIST during the two 10-year periods, 1988-1997 and 1998-2007. Raw data retrieved by Chua & Yang from *JCR* (Social Science Edition 2006). The main objective of the study was to analyze the shifts in (i) authors' collaboration trends (ii) top authors, their affiliation as well as the pattern of co-authorship among them, and (iii) top keywords and the sub-disciplines from which they emerge. The finding reveals a distinct tendency towards collaboration among authors, with external collaborations becoming more prevalent. Top authors have grown in diversity from those being affiliated predominantly with library/information related departments to include those from information systems management, information technology, business, and the humanities. Correspondingly, the distribution of keywords' occurrences that leans heavily on core information science has shifted towards other disciplines such as information technology and socio-behavioural science.

2.7 Disciplinary Borrowing Studies

Bibliometric techniques using citation analysis may facilitate the study of scholarly communication flow. Citation analysis has been widely used to investigate the structure and scholarly activities in many social and natural sciences (Garfield, 1979). The unit of analysis citation or reference is any source, such as a journal article, a book, a working paper, or an unpublished dissertation/thesis, listed by authors (Goldman, 1979). Cross-boundary behavior through publication outside one's own discipline represents a much direct form of interdisciplinary information transfer than does borrowing through citation, since information is presented by members of the discipline in which it originates (Pierce, 1999).

2.7.1 Disciplinary Borrowing in IS

Information science (IS) is a field devoted to scientific inquiry and professional practice addressing the problems of effective communication of knowledge and knowledge records among humans in the context of social, institutional and/or individual uses of and needs for information (Saracevic, 1995). During the 20th century there was a strong desire for the provision of information services to become scientific, to move from librarianship, bibliography, and documentation to an information science (Buckland, 2012). Saracevic (1995) identified three general characteristics of information science that are associated with its evolution and existence. Firstly, information science is interdisciplinary in nature. Secondly, information science is inexorably

connected to information technology. Thirdly, information science is with many other fields, an active participant in the evolution of information society.

Harmon (1971) interpreted the emergence and development of information science within its wider disciplinary framework. Information science is approached as one of a modern generation of communication or behavioural disciplines which emerged almost simultaneously around World War II. Consequently an attempt is made to discuss the evolution of relationships between information science and other modern generation disciplines. Harmon (1971) first sketched the internal development of information science and secondly discussed the possible relationships and roles of information science within a potentially emergent supra-system of knowledge.

Small (1981) made a co-citation cluster analysis of a three year (1975–1977) cumulation of the SSCI is described, and clusters of information science documents contained in this data-base are identified using a journal subset concentration measure. The internal structure of the information science clusters is analyzed in terms of co-citations among clusters, and external linkages to fields outside information science are explored. It is shown that clusters identified by the journal concentration method also cohere in a natural way through cluster co-citation. Conclusions are drawn regarding the relationship of information science to the social sciences, and suggestions are made on how these data might be used in planning an agenda for research in the field.

Al-Sabbagh (1987) studied the interdisciplinary nature of information science on the basis of the reference patterns in the *Journal of the American Society for Information Science* (JASIS) from the issue of January, 1970 to the issue of December, 1985, and identified the changes in the sources of the references in the articles of JASIS during the study period. In the study of JASIS, Al-Sabbagh collected 1,202 citations i.e. 10% of the total references at random and examined. Descriptive statistics was used by him to analyzed data and found that thirty two different disciplines are the contributors to information science, contribution of information science to its own literature is the highest, followed by computer science, library science, science-general, psychology, management, chemistry, and mathematics and statistics. It was found in the study that the relationship between information science and library science is weakening, on the other hand, the relationship between information science and computer science become stronger.

Borgman and Rice (1992) tried to find the answer of the question “Are the disciplines of information science and communication converging or more integrated?” Borman and Rice analyses the journal citation data obtained from the *Journal Citation Reports* (JCR) of the *Social Sciences Citation Index* (SSCI) for each of the 11 years from 1977-1987. The data include citations among the 77 journals in the core list entitled “communication” and “information and library science” in the 1985 JCR volume. The resulting dataset was a square matrix (77 x 77) of citing and cited data for each year, consisting of 20 communication and 57 information and library science

journals. At the end they conclude as “..... we found less evidence of cross-citation between communication and information science than we had expected, given the ideas and scholars crossing between them, we are encouraged by the positive direction of the trend”. At the same time, DeHart (1992) analyzed the monographic references cited in the 1987-1990 issues of three information science journals (IPM, JASIS, JOD). He employed Dewey main classes to analyzed disciplinary distribution of 172 cited monographs and found the following results, generalities (000) cited 60 times, natural science and mathematics (500) cited 35 times, social sciences (300) cited 26 times, and philosophy and psychology (100) cited 17 times. The results demonstrated shifts in disciplinary emphasis in the information science field.

Huang and Chang (2011) analyzed the references to investigate the interdisciplinary changes in information sciences during 1978-2007. The disciplines of references from five information science journals were selected for the study purpose under the heading “Information science and Library Science” covered by JCR of 2008. Huang & Chang (2011) reported that the information science researchers have cited the publications from 29 disciplines. Information science researchers most frequently cited publications of library and information science, followed by general science, computer science, engineering, and medicine. This indicates that information science researchers mainly rely on publications in LIS.

Tsay (2011b) explored the journal bibliometric characteristics of the *Journal of Information Science* (JIS) and the subject relationship with other

disciplines by citation analysis. The citation data were drawn from references of each article of JIS during 1998 and 2008. The result of this study revealed that journal articles were the most cited document, followed by books and book chapters, electronic resources, and conference proceedings, respectively. The three main classes of cited journals in JIS papers were “library science”, “social sciences” and “science”. The three subclasses of non-LIS journals that were highly cited in JIS papers were “industries. land use. labour”, “mathematics. computer science”, and “science”. The three highly cited subjects of library and information science journals encompass “searching”, “information work”, and “world wide web”. The highly cited main classes of books in JIS papers were “social sciences”, followed by “library and information science”, “science”, “philosophy. psychology. religion”. The three highly cited subclasses of books in JIS papers were “books (general). writing. paleography. book industries and trade. libraries. bibliography”, “industries. land use. labour”, and “mathematics. computer science”, and the most cited subject of books is “knowledge management”.

2.7.2 Disciplinary Borrowing in LS

There were many studies examined the insights and outskirts of the subject field based on references and citations. For the purpose of exploring the nature of research in library science, Nour (1985) conducted a study based on a total of 343 research articles published in 41 core library journals during 1980 on subject, research methodology, and number of references. The study

revealed that (i) the source articles were mainly from six subjects: administration (21%), library services (20%), materials (16%), automation (14%), technical processes (13%) and history (7%); (ii) the research articles cited by the sample source articles were mainly (80%) in the field of LIS; (iii) the references made by the sample source articles were to journals outside the 41 core journals accounts for only about 38%.

Baradol and Kumbar (1998) reports that the subject librarianship has relation with 29 other subjects after reviewing the articles published from the thirteenth to seventh volumes of Academic Press' *Advances in Librarianship*. They concludes that telecommunications technology, computer technology and information storage technology are highly influenced the articles. The remaining subjects have relations with it by way of providing a theoretical basis to it or by utilizing the services and products of it for their advancement.

Fang and Xiangnv (2010) choose *Journal of the China Society for Scientific and Technical Information* (JOCSSSTI) as the source of data analysis to reveal the changing trends of the application of research methods in information science in China. They analysed the interdisciplinary characteristics of information science and its corresponding research methods and constructed the classification criteria of these methods. The results show that the research methods applied in JOCSSSTI trends more and more scientific, computer and information technology are the most adopted ones followed by informetrics and bibliometrics methods.

2.7.3 Disciplinary Borrowing in LIS

There were many studies examined the insights and insights of the subject field based on references and citations. Using sociology and LIS as researchable field, Carlin (2003b) examines how interdisciplinary presentation appropriate discipline-specific concepts. Information technology (IT) has brought a tremendous change in the nature, boundaries and structure of information. The ongoing movement towards an electronic information society is pushing libraries towards automation and digitization. These developments had also influenced LIS writing and publishing. Study shows that while the application of IT has gained considerable importance in Indian libraries, IT-based papers have surprisingly found less space in Indian LIS periodicals as compared to the LIS literature in general. The findings of the study also indicate that there is an uneven distribution of various topics within the Indian LIS IT-published literature; while some area of IT have received considerable attention others have been barely touched. Topics like IT in general, bibliographic databases, library networking, library automation and electronic resources have been found to predominate in the growth of Indian LIS literature as compared to the coverage of other areas of IT (Singh, 2009).

Tsay (2008) studied the relationship between JASIST and other disciplines by citation analysis. The citation data were collected from the references of each articles of JASIST in 1980, 1985, 1990, 1995, 2000 and 2004. Library science, science and social sciences journals are most cited

periodicals in the study. The three main classes of journals of LIS encompass general bibliography, machine methods of information & retrieval and mechanized bibliographic control and library and information science. The most cited books are from science discipline followed by LIS, social sciences, philosophy, psychology, religion etc.

Using three bibliometric methods direct citation, bibliographic coupling, and co-authorship analysis, Chang & Huang (2011) investigate interdisciplinary changes in LIS from 1978 to 2007. The result reveals that LIS researchers most frequently cited publications in their own discipline. In addition, half of all co-authors of LIS articles are affiliated with LIS-related institutes. The results confirm that the degree of interdisciplinarity within LIS has increased, particularly co-authorship. However, the study found sources of direct citations in LIS articles are widely distributed across 30 disciplines, but co-authors of LIS articles are distributed across only 25 disciplines.

At the same time using *Journal of Documentation* (JOD) as source journal, Tsay and Shu (2011) revealed that journal articles are the most cited document, followed by books and book chapters, electronic resources, and conference proceedings respectively. The three main classes of cited journals in JOD papers were library science, science, and social science. The most cited main class of books in JOD papers was library and information science, followed by social sciences, science. They concluded that library and information science, as represented by JOD, is a developing discipline with an expanding literature relating to multiple subject areas. Tsay (2011) explored

and compared bibliometric characteristics and subject relationship with other disciplines of and among three information science journals, namely JASIST, IPM, and JOD. The citation data were drawn from references of each article of the three journals during 1998 and 2008. Quantitative results on the number of JASIST, IPM and JOD literature references, average number of references cited per paper, documents type of cited literature and the journal self-citation rate were reported. Moreover, the highly cited journals and books, the main classes and subclasses of cited journals and books in papers of the three journals, the highly cited subjects in journals and books of LIS were identified and analyzed. His studies confirmed that JASIST and IPM were very much in common and diffuse to other disciplines more deeply than JOD.

Using direct citation analysis, Chang (2012) explored the interdisciplinary characteristics and changes in LIS across 30-year period (1982 to 2011) by analyzing the disciplinary attributes of book references. The result show that an increasing trend in degree of interdisciplinarity was identified based on book references and journal references. Although both book references and journal references represented across 30 disciplines, the proportion of LIS books is much higher than that of LIS journals. In addition, the main disciplines have a great contribution to book references were different from those to journal references.

Again, Tsay (2013) studied citation data of each article of four leading library and information science journals, *Journal of the American Society for Information Science and Technology* (JASIST), *Information Processing and*

Management (IPM), *Journal of Information Science (JIS)*, and *Journal of Documentation (JOD)* from 1998 to 2008. Tsay (2013) found that library and information science possessed string self knowledge flow as these four source journals are also the four most cited. Finally, He concluded that the knowledge inputs for LIS include mainly LIS itself and social sciences and general science as well. Moreover, there were minor inputs from various subjects. And the result has no significant different in another study by Tasy (2015) considering the same source journals, i.e. JASIST, IPM, JIS, and JOD for the period 1998-2010. He observed that knowledge flow out of the domain of information science mainly includes information science itself, and also science and technology at a lower percentage. Moreover, there are minor outputs for various other subjects. This study also revealed that there was a significant knowledge flow from computer science to information science.

2.7.4 Disciplinary Influence of LIS

Numerous works proved that library science and information science influenced by philosophy, psychology, economics, education, law, sociology, commerce, management, mathematics, medical sciences etc. At the same time, Odell and Gabbard (2008) used JCR (1996-2004) for collection of raw data. They identified the citing journals of the journals listed under the category “Information Science and Library Science” in JCR. The result of the study shows that sixty seven journals listed in JCR subject category information

science and library science received 27% citations from journals listed in other JCR subject category.

Empirical investigations of citations to and from 150 journals published in the field of Information and Library Science (ILS) by Tang (2004a) has enabled cross-mapping of the interdisciplinary evolution of the field. The sample data of the study include citation frequency to the publications in the subject category of “Information & Library Science” in the *Science Citation Index* (SCI), *SSCI* and *Arts & Humanities Citation Index* (AHCI). The data search was limited to the journal articles. The publications were randomly drawn in six years between 1975 and 2000, with 25 articles each from the selected years. The study produced a rich set of results relevant to the evolutionary mapping of the interdisciplinary breadth of the ILS field. Tang (2004a) concluded that “..... ILS has an abundance of intellectual substances that are of interest to multiple extra-disciplines, including computer science, communication, education, and management science”. With the help of same data of citations, ANOVA tests reveal that although raw counts of self-citations and extra-disciplinary citations are not significantly different by year, they are different depending on whether it is from or to ILS. Nearly thirty disciplines hold mutual citations with ILS and computer science, communication, management science, education and psychology are among those highly impact disciplines (Tang, 2004b).

Hessey and Willett (2013) quantified the knowledge export from LIS publications to other disciplines. Web of Science searches were used to identify

citations to 232 high quality LIS publications extracted from submissions to the UK's 2008 Research Assessment Exercise. These publications resulted in 1,061 knowledge exports to 444 unique non-LIS citing journals, for which Ifs were taken from the Journal Citation Reports databases and normalized in order to minimize inter-disciplinary differences in citation behaviour.

2.7.5 Negative Influence on LIS

Influence of non-LIS disciplines by way of knowledge input in LIS not always significant as studied by Cheng (1994). Cheng (1994) analyzed 13,266 cited references drawn from 1,079 articles published in Chinese in the seven libraries and information science periodicals published in Taiwan from 1974 to 1993. The major findings was the average number of cited references per article increased from 8.2 in the first period to 13.6 in the second period, the percentage of articles without any references or notes decreased from 28.90% to 17.04%, the percentage of cited references published in English increased from 50.32% to 56.04%, journal was the primary source of references, the percentage of cited references published in journals increased from 39.32% to 48.84%, the percentage of cited references being not more than five years old decreased from 45.12% to 38.75%, the main subject area of cited references was library and information science, and the percentage of cited references in this area increased from 703.0% to 74.54%. The result of subject area analysis shows that library and information science in Taiwan does not have interdisciplinary characteristics.

2.7.6 Disciplinary Borrowing on Non-LIS

The study of measuring the influence of disciplines on core discipline is not confined to library and information science only. Similar kind of studies were also carried out on other disciplines such as anthropology (Choi, 1988); business disciplines (Pratt, Hauser and Sugimoto (2012); computer science (Shi, Tseng, and Adamic, 2009); consumer research (Leong, 1989); forestry science (Steele & Stier, 2000); humanities and social sciences (Urata, 1990); management and social science (Neeley, 1981); science (Hurd, 1992; Morillo, Bordons, & Gomez, 2003); science and technology (Sedighi, 2013), social sciences (Rigney & Barnes, 1980); tourism (Weiler, Moyle, & McLennan, 2012) etc. Neeley (1981) proposed the method for measuring interdisciplinary relations in scientific literature based on cross citation among core journals empirically selected on the basis of use and importance. The method was used to test hypotheses derived from bibliometric definition of interdisciplinarity among the management and social science literatures. The results reveal that the management literature is dependent on the social sciences, that it is more dependent on them than vice versa, and that it is more dependent on them than they are on each other. Urata (1990) attempt was made to clarify the relationships among disciplines by examining the flow of citation and the migration of scholars in the humanities and social sciences in Japan. The results of both methods were consistent with each other. In humanities and social sciences, distinct hierarchical relations were recognized between disciplines offering much information to other disciplines and disciplines

obtaining much information from other disciplines. Rigney & Barnes (1980) extracted 5% systematic sample of citations from the core journals of five social science disciplines for the forty year period from 1936 to 1975. The journals selected for analysis were *American Sociological Review*, *American Anthropologist*, *American Economic Review*, *American Political Science Review*, and *Psychological Review*. Citations to periodicals literature (total 4,131) were separated from the total sample and classified by subject area using Dewey number obtained from *Ulrich International Periodical Directory*. Result shows that each of the selected social science disciplines has the highest rate of self-citation and lowest rates of interdisciplinary borrowing.

Choi (1988) examine the intra- and interdisciplinary communication patterns about core anthropology periodicals published in the USA. Intradisciplinary citation analysis reveals that sub-disciplines of anthropology are quite heterogeneous and mutually isolated from one another. In the interdisciplinary analysis, Choi (1988) shown that 70% of cited literatures in anthropology were drawn from outside of the main discipline. And they are most influential on anthropology such as history, biomedical sciences and sociology.

Shi, Tseng, and Adamic (2009) examined the impact of cross-community information flows in computer science through their empirical observations of citations of computer science articles, focusing specially on information flow across community boundaries and temporal gaps. Leong (1989) studied the 6,867 references cited by the authors of 168 full-length

articles and 40 notes, comments, or brief research articles published in five volumes of *Journal of Consumer Research*. The result of the study shows that consumer researchers are highly depends on the literature of psychology, marketing and consumer behavior. The disciplines that influence the consumer research publications are economics, mathematics and statistics, sociology, communication and journalism, family and home economics, business in general etc.

Steele and Stier (2000) use citation analysis and ordinary least squares regression to investigate the relationship between an article's citation rate and its degree of interdisciplinary in forestry. They concluded that articles drew information from a diverse set of journals were cited with greater frequency than articles having smaller or more narrowly focused bibliographies.

Hurd (1992) used the techniques of citation analysis to examine information use by scientists in a university chemistry department and measured the interdisciplinarity of their publications. The chemists whose publication was examined were found to make use of many journals that class outside the discipline of chemistry. Hurd (1992) found that over 49% of the journals cited in a sample of their recent publications were classed in other disciplines. Morillo, Bordons, & Gomez (2003) provided a general overview of all scientific disciplines, with special attention to their interrelation. They established a tentative typology of disciplines and research areas according to their degree of interdisciplinarity. Pratt, Hauser and Sugimoto (2012) used bibliometric research methods to examine the transfer of knowledge across

business disciplines over four decades. The goal of the research was to identify publication and citation trends associated with knowledge creation and knowledge transfer within business disciplines. Import-export statistics described the knowledge transfer among business disciplines. Weiler, Moyle, & McLennan, (2012) examined the disciplinary influence and the extent of multidisciplinary doctoral research in tourism in the United States, Canada, Australia and New Zealand. Abstracts were analyzed for 1,888 tourism-focused doctoral theses completed between 1951 and 2010 to determine disciplinary influences, differences between countries, and changes over time. The growth in tourism-focused doctoral research has been exponential. Overall, psychology, environmental studies and anthropology have influenced the greatest number of dissertations. Weiler et al. (2012) noted that of the main disciplines informing doctoral research, economics had the greatest decline as a proportion of all tourism theses. The declining trend was particularly noticeable in the U.S and Australia, where economics had originally been a founding discipline, as compared to Canada and New Zealand where there was no significant change in the number of tourism theses using economics as a discipline.

Sedighi (2013) investigated the interdisciplinary relations in some high-priority fields of science and technology based on ISI data. The study population consists of scientific articles of Iranian researchers in five fields i.e. nanotechnology, biophysics, nuclear physics, sociology and communication that have been indexed in WoS database. She found that there was a positive

correlation between co-authorship and interdisciplinary approach in all the studied fields. But there was no significant relation between the number of citations and interdisciplinary approach. Finally, She concluded that the analysis and mapping of interdisciplinary relations in a scientific field can provide useful information regarding connectivity and interdependence among areas.

2.8 Studies on Source Journals

2.8.1 Studies about ALIS

The *Annals of Library and Information Studies* (ISSN 0972-5423) is a leading quarterly journal in library and information science in India publishing original papers, survey reports, reviews, letters, etc. pertaining to library science, information science and computer applications in these fields. In the year 1954, erstwhile INSDOC launched *Annals of Library Science* as its first publication and Dr. S. R. Ranganathan was its first Editor. The journal's title was expanded to *Annals of Library Science and Documentation* in 1964 and again renamed in 2001 as *Annals of Library and Information Studies*. Into its 59th volume in 2012, *Annals of Library and Information Studies* is the oldest LIS Indian journal.

Several bibliometric studies have been undertaken by various researchers considering ALIS as source journal. Verma, Tamrakar and Sharma (2007) studied *Annals of Library & Information Studies* (ALIS) published during 1999-2005. They studied twenty eight issues of seven volumes from

1999 to 2005 comprises 131 contributions. This study examined the information about year-wise, institutions-wise, state-wise distribution of contributions, authorship pattern, citation analysis, length of the contributions etc. This study shows that most of the articles are contributed by single author, most of the authors are from New Delhi. The highest numbers of contributions are by academic/research institution and the average length of the contributions is 6-10 pages. In this study 1456 citations were analyzed to find out the average number of citations per contribution, types of publications cited and preparation of a ranked list of cited journals in the contributions of this journal. The study reveals that journals are the most cited publication among the library and information scientists and *Annals of Library and Information Studies* is the most cited journal in the contributing articles.

A similar study was made by Jena, Swain, & Sahoo (2012) for the contributions of *ALIS*. They includes nine volumes (vol. 49 to 57) of *ALIS* published during 2002 to 2010 containing 247 articles and found that average citations per article increases year by year. The information about each published articles were collected, organized and analyzed using MS-Excel spreadsheets. The collected information includes number of authors, name of authors, place of authors, number of reference and their form, number of pages etc. The results are summarized according to the objectives of the study. Results shows that the journal citations are predominant followed by books, degree of collaboration is 0.676, top contributing country is India and the state is New Delhi. He also found that authors' citation of documents ranged from

very recent year of publication to as old as documents of 200 years old, and the half life of the cited documents is about 11 years.

Chaurasia (2008) made the bibliometric analysis of the journal “*Annals of Library and Information Studies* (2002-2006)” which shows a trend of growth in contributions and average number of contributions is 21.4 per volume. Majority of the library and information scientists prefer to do collaborative research and contribute their papers jointly. Most of the contributions are on Bibliometrics (36.45%). IT & Digital technologies in Libraries have also got sufficient papers. The institutional and geographical distribution of contributions is calculated. Most of the contributions are with citations. Majority of the library and information scientists have cited journals in large number (50.15%) while books comes on second with 273 (19.96%) citations. ‘Annals of Library & Information Studies’ occupies the 1st rank & ‘Scientometrics’ occupies the 2nd rank in the ranked list of cited journals.

Hussain (2013) carried out a bibliometric analysis of annals of library and information studies for the period from 2006-2010. The study demonstrates and elaborates the various aspects such as year-wise distribution of articles, authorship patters, institution wise distribution of contributions, subject distribution, citation patterns, length of article, rank of cited authors, and geographical distribution of authors. At the same time period Pandita (2013) studied articles published in ALIS during 2002-2012. He was observed that mean value of article is 7.04 per year, average citations per articles was 17.11. Researchers from 16 different countries across the world have contributed

research articles during the study period. He also identified that 65.81% articles published in the journal have been published on co-authorship pattern and all the top nine contributors to the journal were from India.

Mete and Deshmukh (1996) analyzed 1824 citations from 202 articles published in *Annals of Library Science and Documentation* during 1984-1993. They showed that journals were most cited form of documents. They testified Bradford's Law of Scattering with the journal citations data and it was found that 23.13% of total journals could meet 67% of the requirements. The half life of LIS literature was found by them was 8 years for journals and 12 years for books. After fifteen year, one more study on ALIS was done by Deshmukh (2011). Here analysis of 4141 citations appended to articles in volumes 44 to 57 of ALIS. Again it was proved that journal was the most cited documents. The half life of LIS literature was found to be 9 years for journals and 14 years for books respectively. However, in this study it was found that 12.7 citations per article, which showed that the number of citations was increased.

Husain and Khanam (2015) analyzed the citations of the articles published in ALIS published during 2005-2014. Their analysis was included 6188 number of citation and the analysis includes the finding of different types of publications cited and preparation of ranked list of cited journals etc. Husain and Khanam concluded that journals were the most cited publication amongst the library and information scientist and the source journal i.e. *Annals of Library and Information Studies* was itself the most cited journal in the contributions of that journal.

Kundu (1981) carried out a study on self-citations on the journal *Annals of Library Science* during 1954-1975. He found that the percentage of self-citations is only 14.9%. He also noted that the top self-citation author is S. R. Ranganathan with a count of 174 self-citations. Rattan (2013) studies ALIS during 2002-2012 to find the self-citation counts. She found that 53.72% of the articles contain self-citations. Out of total 5261 citations, the 12.08% citations are self-citations. Frequency of self-citation per article ranges from one to forty three. Almost 20% authors have cited themselves. A webometric study was done by Verma (2010) considering the articles published in ALIS during 2000-2005 (except 2003). Total 96 articles were published during the study period in the journals which had a total 959 citations. The study revealed that majority (78%) of the contributions was without web citation during the study periods.

Garg and Bebi (2014) studied the articles published in ALIS during 2010-2013 and the citations obtained by these articles during 2010-2014 (April) using Google. The study develops immediacy index and impact factor of the journal. Immediacy index of ALIS increased from 0.12 to 0.14 during 2010 to 2013 and impact factor increased from 0.66 for 2012 to 1.13 for 2013.

2.8.2 Studies about DJLIT

The *DESIDOC Journal of Library and Information Technology* (DJLIT) (ISSN 0974-0643) is a peer-reviewed, open access, primary research journal in the area of LIS in India, is brought out by Defence Scientific Information and Documentation Centre (DESIDOC), a premier documentation institution in

India. The *Journal* is a bi-monthly publication and endeavors to bring recent developments in library and information technology, as applicable to library and information science, to the notice of librarians, documentation and information professionals, students and other interested in the field. The articles published in the *Journal* are covered in Scopus, LISA, LISTA, EBSCO Abstracts/Full-text, Library Literature and Information Science Index/Full-text, The Informed Librarian Online, DOAJ, OpenJ-Gate, Indian Science Abstracts, Indian Citation Index (ICI), Full text Sources Online, WorldCat, and OCLC. The periodical started in 1980 as *DESIDOC Bulletin* - a four-page newsletter- basically to publish the activities of DESIDOC. In the late 1980s, DESIDOC Bulletin enhanced with new columns like IT Scan, IT Events, Book Reviews, Recommended Websites, and at least one paper usually form DESIDOC. It was printed and distributed at free of charge to the institutions and continued till 1990s is decided to price it to offset the postage expenses when it grown in stature and circulation. In 1992, the *Bulletin* was renamed as *DESIDOC Bulletin of Information Technology* (DBIT). In 2008, DBIT became a primary research journal and was renamed as *DEIDOC Journal of Library and Information Technology* (DJLIT). Since then, only primary research is, after peer-evaluation, is accepted for publication (Desai, 2014). At the same time DJLIT adopted Open Journal System- an online publication management system which reduced the paper publication time period and became open access journal available in web at <http://publications.drdo.gov.in/ojs/index.php/djlit>.

Tigga, Lihitkar and Rajyalakshmi (2005) carried out a content analysis of 33 issues of *DESIDOC Bulletin of Information Technology* (DBIT) published during January 1997 to July 2002. The focused area was editorials trends, research/review papers, information technology events, information technology scan, book review/book shelf, and current literature survey. Tigga et al. (2005) used the quantitative (or descriptive) and inferential methods to evaluating the *Bulletin*. It was observed that out of 33 issues, 13 issues were thematic issues on specialized subject fields, half of the guest editorials were from Delhi and 10 articles out of 96 articles were on IT subject area. They also observed that more than 70% contributions are single authored, 163 different events happened nationally and internationally during the study periods.

Bansal, Kumari, Kumar, and Singh (2005) continued the research work of Tigga et al. (2005) considering DBIT as source journal. They studied the content of DBIT published during 2000-2004 and concluded that 57.8% articles were collaborative works. A bibliometric analysis of DJLIT was done by Kumar and Moorthy (2011) for the year 2001-2010. They studied the year-wise distribution of papers, authorship pattern of the contributions, average number of references per paper, average length of the papers, subject of contributions, and contributory institute. Kumar and Moorthy (2011) observed that the journal has a remarkable change after 2006. The number of papers increased substantially. The average length of the papers was 6-10 pages, which is an ideal length for research articles. Most of the papers are from single authors and journals are the major cited documents. Authors from the universities, and

government research institutes were the major contributors. According to them, DJLIT has emerged as a core journal of LIS and a platform for knowledge sharing, especially among the students of LIS.

At the same time another bibliometric study on DBIT produced by Singh, Jain, and Babbar (2011). Research publications over a ten-year period from 1992-2002 were analyzed by Singh et al. (2011) to assess the trends in the publication patterns in DBIT. The study revealed that 145 articles were published in the 60 issues of the journal. Out of the 145 publications 97 (66.9%) articles published by single author. The study also revealed that 128 (88.28%) articles were contributed from India and rest 17 articles contributed from abroad. The authors also identified that maximum numbers of articles have been contributed on the topic of information technology (22.76%), male authors are major contributors (79.31%), and maximum number of articles were contributed from research organizations (46.22%).

Bansal (2013) investigated thirteen year's data collected from the articles published in DJLIT during the period. The objectives of this study were to assess the growth pattern of the research output, authorship pattern, geographical distribution of output, subject coverage, and citation analysis of the references. It was found that 391 articles were published during the period of study which resulted that maximum number contributions was joint contribution (61.4%), most of the contributions were from India(88%), maximum number of articles (65%) has the 6-10 pages length and majority of the authors preferred journals as the source of information providing the highest

number of citations. Dr B. M. Gupta was the highest contributing author during the period. Thavamani (2013) studied five years articles published in *DESIDOC Journal of Library & Information Science* during 2007-2011. He observed that relative growth rate was high in terms of literature productivity and degree of collaboration also high in terms of authorship pattern.

Desai (2014) analyzed the articles published in DJLIT during 2012 consisting 65 articles. He found that most of articles were single author, the average length of papers was 8 pages, and the contributors were using online resources as source of information. He concluded that there was steady growth of research contribution among the LIS researchers during. More number of LIS professionals was actively involved in the subject areas such as open source software, digital preservations, e-books, patent information, digital library, open access literature, webometrics, cloud computing, ICT, information literacy, information systems, online databases, web 2.0 etc.

A 33 years historical development study of DJLIT was done Kumar, Bansal and Dey Kanungo (2014). They show that how a newsletter became one of India's leading journal in the field of library and information science. Garg and Bebi (2014) studied the articles published in DJLIT during 2010-2013 and the citations obtained by these articles during 2010-2014 (April) using Google. The study develops immediacy index and impact factor of the journal. Immediacy index of DJLIT increased from 0.06 to 0.15 during 2010 to 2013 and impact factor increased from 0.80 for 2012 to 1.04 for 2013. Velmurugan and Radhakrishnan (2015) made an attempt to measure the quantitative

research out of DJLIT journal during the period between 2007 and 2013. It was observed from the analysis that the maximum number of research output were written by multiple authors. The highest author productivity was 130 in the 2012 and the lowest author productivity was 58 in the year 2007. The majority of 181 contributions have been contributed by multi-authored and the remaining 121 contributions by solo authors. It was found by the authors that the degree of collaboration ranges from 0.36 to 0.77 and the average degree of collaboration was 0.59.

2.8.3 Studies about IASLIC Bulletin

The *IASLIC Bulletin* (ISSN 0018-8441) is the official organ of the Indian Association of Special Libraries and Information Centres. This is a quarterly publication since 1956 till date. This bulletin is devoted to the advancement and dissemination of the fundamental and applied knowledge of library and information science in as accessible form to professional colleagues who have a common interest in the field in India and abroad. This bulletin is abstracted and /or indexed in various abstracting and/or indexing periodicals e.g. Library and Information Science Abstract (LISA), INSPEC, Indian Library Science Abstract (ILSA), Guide to Indian Periodical Literature etc.

Halder and Chandra (2009) studied the papers published in IASLIC Bulletin during 2003-2007. They focused on the distribution of contributions, authorship pattern of contributions, distribution of references, analysis of length of literature, distribution of illustrations used, state wise distribution of

contribution and subject trends of the articles, etc. They found that most of the contributions were single author, journal articles play prominent role in references, and average number of reference per articles was 11.6 and 83.16% contributions contained illustrations. They also concluded that most of the contributions from West Bengal (26.78%) and maximum contribution were from digital information systems (16.66%), followed by library and society (11.9%).

Singh and Mishra (2013) analyses 158 contributions published in the journal *IASLIC Bulletin* during 2004-2010. The study was made to calculate year wise distribution, authorship pattern of contributions, institute wise distribution of contributions, state wise distributions, length of articles, and the study of citation. They concluded that most the contributions are single authored, contributors are from Academic Institutions, and West Bengal is the major contributing state. They also found that mean pages of articles were 6 pages while majority of articles have 1 to 10 citations.

Chandra (2014) did bibliometric analysis of *IASLIC Bulletin* for the 1999-2008 consisting volume 44 to 53. Her observation was focused on the year-wise distribution of contribution, average number of contribution per issue, authorship patter of contribution, distribution of references, average references per contribution, average references per volume, average length of the volume and papers, distribution of illustration, state-wise distribution of contribution and subject field of the contribution. Her major finding were average number of contribution per volumes is 22.8, average number of

references per article is 8.21 and journal play the dominant role in reference. She found that most (22.8%) of the contributions are from West Bengal and digital information system play highest number in subject wise contribution. Finally she concluded that IASLIC Bulletin is an expanding literature in LIS for the development of the discipline.

Das and Bhattacharya (2014) studied six years articles published in *IASLIC Bulletin* during 2008 to 2013. The main objective of the study was to indentify the disciplines of the cited journals and cited books that have influence on LIS publications. They found that contributors in *IASLIC Bulletin* during the study periods, journals were the highly cited documents followed by web resources, books, conference publications etc. LIS journals were highly consultant by the contributors. The other top five non-LIS journals contributions were science in general (6.33%), medical sciences (4.82%), computer science (4.22%), education (4.22%), and management (3.16%). More than 50% non-LIS books were contributed in the articles publications as referred by the authors. The study also identified that management was the highest non-LIS discipline of the cited books during the study periods. Other than management there were education, psychology, bibliography, computer science, science in general, sociology, communication, language/literature, history, journalism major disciplines that were contributed in the *IASLIC Bulletin* publications. They calculated the Karl Pearson's correlation coefficient between LIS and Non-LIS journals and books citation was 0.83 which implies that there was a strong relation between LIS and Non-LIS citations.

2.8.4 Studies about LH

The *Library Herald* (ISSN 0024-2292) is a quarterly peer reviewed journal published by Delhi Library Association. It was first published in April 1958. This journal published original contributions in the field of library science and services, review of Indian and foreign publications and includes research reports. Special issues on various aspects of library and information science are also published from time to time. The journal is indexed in Library Literature, Library and Information Science Abstracts, Guide to Indian Periodical Literature, Indian Library Science Abstract and Index India. It is one of the oldest journals in India in the field of Library and Information Science. (Thanuskodi, 2011; Singh & Bebi, 2014) and now a days it is available online.

A five year study from 2003 to 2007 of *library herald* was conducted by Riahinia (2009). She tried to find scientific and intra-discipline communication relations among the papers published LH. Eighty-eight percentages of contributions were from India. The journal had only 16 international contributions during the course of five years. Finally it was concluded that LH is a prestigious journal in the field of LIS India and worth to be subscribed by university libraries. Thanuskodi (2011) studied *library herald* for the period from 2006 to 2010. He cover mainly the number of articles, authorship patter, subject wise distribution of articles, average number of references per articles, forms of documents cited, year wise distribution of cited journals etc. Thanuskodi (2011) concluded that the maximum number of contributions are single authors with 52.17%, library automation is the highly thrust area of LIS

study, most of the contributors are from Indian origin and library herald journal is the highly preferred journal for communication by the library and information science professionals. Singh & Bebi (2014) extended the earlier studies of library herald conducted by Thanuskodi (2011) for the period 2006-2010 and Riahinia (2009) who made the citation study on *Library Herald* from the period 2003-2007.

Singh and Bebi (2014) studied 234 articles published in LH for the period of 10 years (2003-2012). The study examined the various bibliometric parameters such as authorship pattern, genders, geographical distribution, major contributing authors and their affiliation, topical mapping and length of the articles. The authors concluded that almost half of the articles (48.72%) are single authored. Maximum numbers of articles were contributed by the male authors. Almost 81% of the articles were published by Indian researchers. Average page length of the articles was 6-10 pages and references vary from 6-10 references. It was observed by the authors that the majority of the articles are on academic libraries and based topics.

Das and Bhattacharya (2016) studied 220 articles published in library herald during 2005-2014 and measured the knowledge inflow in LIS. The authors studied the academic disciplines of the contributors and identified the subject disciplines of the cited documents. The study revealed that educationists were the most contributing authors from non-LIS fields. Collaboration between educationist and LIS professionals was remarkable and they contributed across disciplinary contributions in Library Herald. It was also found that journal

articles from education, management books, conference proceedings from education discipline, and medical science theses/dissertations were mostly cited. The authors concluded that library professionals tend to cite more publication from outside of their own disciplines and produces collaborative researches in diverse disciplines.

2.8.5 Studies about SJIM

The *SRELS Journal of Information Management* (ISSN 0972-2467) was founded in 1964 by Dr. S. R. Ranganathan was known as '*Library Science with a slant to Documentation*'. The title of the journal was changed to *Library Science with a slant to Documentation and Information Studies* from vol. 25 in 1988 and then to *SRELS Journal of information Management* from vol. 37 in 2000. The journals is peer reviewed and publishes scholarly as well as article of practical use in the field of library and information science and services. The journal published bimonthly and completed 50 years in 2013 (Asundi, 2013).

Verma (2010) identified that web citation in the SJIM articles were increased over the period of her study. The study period was 2000-2005 except 2003. This study also includes journal-wise distribution, author-wise distribution, item-wise distribution, and citation occurrence. Verma (2010) observed that the trend of citation has slowly changed towards the web citation.

Mulla and Dhanamjaya (2014) made a bibliometric analysis of 412 research articles published in 10 volumes of 40issues appeared in the SJIM during the periods of 2000 to 2009. They reviewed the authorship pattern,

degree of collaboration, author productivity etc. The study result shows that 43.695 articles are joint authored contribution. Overall average number of authors per article is 1.66 and average productivity per author is 0.60. This study also reveals that majorities of articles (79.30%) are contributed by Indian authors followed by USA.

2.9 Conclusion

The literature review above reveals that most previous studies were on the bibliometric analysis on single journal or two or three journals. Some studies deal with building domain knowledge structure by co-citation analysis based on authors or journals. However, subject analysis of the references cited had been seldom studied. This chapter focused on library and information science as the subject of analysis. LIS as information science was incorporated into the field of library science and library science reacted to the impact of information technology. Therefore, some of the past research focusing disciplinary influence on LIS by selecting journals in only library science or information science or both as LIS and found that (i) LIS researchers often cite publications across disciplines (Al-Sabbagh, 1987; Bracken & Tucker, 1989; Buttlar, 1999; Chen & Liang, 2004; Cheng, 1995; Chikate & Patil, 2008; Chung, 1995; Gatten, 1991; LaBorire & Halperin, 1976; Pluzhenskaya, 2008; Shi, 2002; Tsay, 2008), (ii) LIS publications are cited by researchers from various disciplines (Goodall, Julien, Lajoie-Paquette, & McKechnie, 2005; Meyer & Spencer, 1996; Odell & Gabbard, 2008; Tang, 2004), and (iii) that

LIS researchers collaborate with researchers from different disciplines (Chen & Liang, 2004; Das & Bhattacharya, 2016; Qui, 1992).

However, most studies have used only direct citation analysis and focused exclusively on the journals cited. It is observed that most of the research works done in abroad considering journal citation database (i.e. WoS, Scopus, etc). But all the research works reveals that there is significant relation between LIS and non-LIS disciplines except few cases (Cheng, 1994). It is also reveals that very little research works done in India to investigate the disciplinary influence of non-LIS subjects on LIS publications. After considering the research gap, this study analyzed a large number of contributors and references consisting journal articles, book/book chapters, conference publications, and theses/ dissertations cited by the contributors in the LIS research and to identify the correlation between LIS and non-LIS disciplines by way of coauthor study and citation analyses.

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Chapter-III

Methodology

This study tries to identify the inter-relationship between LIS and non-LIS literatures by measuring the knowledge inflow in LIS study. Disciplinary influence on LIS literature published in India taken as problem area under study. To fulfill the basic objective of the study i.e. to quantify the disciplinary influence on LIS in India, citation analysis has been chosen as the appropriate technique where cited documents will study for their subjects. Citations are the references given as a foot note or listed at the end of the publications. These are mainly given to credit to the authors whose views or ideas are expressed in the course of narration or to give credit to related works. Main reasons for selecting the citation analysis technique are (a) citations are readily available and (b) citations are unobtrusive, in that they do not require the cooperation of the respondent. Another technique used to achieve the basic objective is author study where the academic background of the contributing authors, collaboration between authors with different academic background, and the contributions made by authors with expert knowledge on non-LIS disciplines is quantified.

3.1 Journal Selection

Periodicals are sensitive indicators of the emerging new ideas in any discipline. A careful evaluation of periodical literature may indicate a complete picture of the discipline (Jan, 2009). Scholarly journals are used by the scientists and professionals to share their ideas, thoughts, inventions, and discoveries (Kumar & Moorthy, 2011) and considered as most preferred medium of latest information. Selection of journals for any kind of research work is a vital task to the researchers and it is necessary that the selected journals should be the good representative of the particular discipline. James Neeley (1981) used two techniques to select core journals to study the interdisciplinarity of management and its relationship with the social science disciplines. He explained his selection methodology by saying:

“The particular journals which comprise the core have been identified in two ways. The first is based on use, typically measured by the relative frequency with which individual journals are cited in their respective literature. ... A second method of identifying core journals uses subjective evaluation by scholars in the field, typically academics or members of the field’s national associations.... the two methods yield similar results.”

Another well known method for selecting journal for its study is consideration of *impact factors* (IFs). The *impact factor* (IF) of an academic journal is a measure reflecting the average number of citations to recent articles published in the journal. Impact factors are calculated yearly for those journals that are indexed in the *Journal Citation Reports* (JCR). It is frequently used as

an alternative for the relative importance of a journal within its field, journals with higher impact factors deemed to be more important than those with lower ones. Impact factor is one of the measures for assessing the scientific contribution of a journal. It is based on the assumption that if the papers published in a particular journal are cited more frequently in the scientific literature that follows, then that journal has had a greater impact on the scientific field that it relates (Aggarwal & Bhatia, 2007). Impact factors of journals are published every year by Thomson Reuters in its *JCR*, a companion volume to *Science Citation Index* (SCI) since 1975 and now *Web of Science* (WoS).

Library and information science education, practices and research in India is carried out over a period of hundred years. A major number of practicing librarians and LIS professionals are publishing their research papers in the Indian LIS journals. The first Indian LIS journal *Library Miscellany* was published by the State Library Department, Baroda in the year 1912, and its publication ceased in 1919. However thereafter a number of LIS journals published by many associations and institutes related to library and information science professions and LIS journals increases day by day in India not only in English, but also in various regional languages (Dutta & Sen, 2014; Garg & Bebi, 2014; Kherde, 2003; Mahesh & Wadhwa, 2012; Shafi, 2014; Singh & Panda, 2002). Publication history of Indian LIS journals reveals that some of them are existence over 50 years. But none of the Indian LIS journals have been indexed by Thomson ISI's citation databases (*WoS*) which results that

none availability of impact factors of any Indian LIS journals. Sharma (1999) identified that lack of timeliness, poor language, lack of planning in starting a journal resulting in the premature death of the journals, and so on are some of the problems afflicting the LIS journals from the region. Again, Chardrakar and Arora (2010) reporting on the Indian research productivity in LIS stated that “most of the Indian authors publish their research articles in the Indian journals, however, most Indian journals in LIS are either not indexed in the SSCI database or has fewer representations at the international level.

Durden and Ellis (1993) developed a methodology, based on citation counts, for classifying journal articles as highly-cited, pre-classic, classic and super-classic. In order to establish the benchmark measures necessary for such classification, a citation analysis was done of all main articles produced in the *American Economic Review* from 1965 through 1985. Using the established benchmarks, 127 articles published during the review period met the minimum criteria for at least highly-cited status. In addition, a subset of 17 articles was designated as either classic or super-classic. An additional 11 articles were on a yearly citation pace to become classics and were classified as pre-classic.

Evidence from other studies is presented to support the methodology developed by Durden and Ellis. Patra and Chand (2006) analyzed the LIS research in the country based on LISA database and identified top 10 Indian journals in which Indian LIS researchers publish their findings. In another study of LIS research in SAARC and ASEAN region they identified the top journals out of a total of 322 journals and found that the top five positions were

occupied by Indian journals (Patra and Chand, 2009). Aggarwal and Bhatia (2007) calculated the impact factors of *Indian Journal of Gastroenterology* for the years 2005 and 2006 based on the citation counts in *WoS*.

Martin-Sempere, Rey-Rocha, & Garzun-Garcia (2002) analyzed Spanish scientific journals on geology none of them covered as a source by the *Science Citation Index* (SCI). They searched the *SCI*, through the *WoS*, for citations received by articles published in these journals in 1995 and 1996. The term-impact of journals has been calculated, within two- and three- year citation windows. The effect of including citations from the domestic journals was considered, and a sample of 189 Spanish geologists was surveyed about the journals they consider of highest quality. A notable correspondence among experts' assessment and citation analysis has been found. Results here reported, together with those obtained in previous studies; provide data for improving knowledge about the quality of Spanish geology journals.

A significant study was made by Mahesh and Wadhwa (2012) for ranking of Indian LIS journals based on *WoS*. The study was done through the use of 'cited reference search' mode of *WoS* and counts the citations received by the Indian journals. Despite the many limitations of the 'cited reference search' and keeping in view that the Indian LIS journals are not covered in *WoS*, the finding shows that *Annals of Library and Information Studies*, *DESIDOC Journal of Library and Information Technology*, *SRELS Journal of Information Management*, *IASLIC Bulletin* and *Library Herald* are most five prominent Indian LIS journals. Sen (2014) in his short communication, showed

that top seven LIS journals published in India are *Annals of Library and Information Studies*, *SRELS Journal of Information Management*, *DESIDOC Journal of Library and Information Technology*, *Information Studies*, *COLLNET Journal of Scientometrics and Information Management*, *IASLIC Bulletin* and *Library Herald*.

Other than citation counts study, a number of different kind of bibliometric and citation studies were carried out by different author(s) on *Annals of Library and Information Studies* (Chaurasia, 2008; Deshmukh, 2011; Garg & Bebi, 2014; Husain & Khanam, 2015; Hussain, 2013; Jena, Swain & Sahoo, 2012; Kherde, 2003; Kundu, 1981; Mete & Deshmukh, 1996; Pandita, 2013; Rattan, 2013; Verma, 2010; Verma, Tamrakar & Sharma 2007), *DESIDOC Journal of Library and Information Technology*, (Bansal, 2013; Bansal, Kumari, Kumar & Singh, 2005; Desai, 2014; Garg & Bebi, 2014; Kherde, 2003; Kumar, Bansal & DeyKanungo, 2014; Kumar & Moorthy, 2011; Singh, Jain & Babbar, 2011; Thavamani, 2013; Tigga, Lihitkar & Rajyalakshmi, 2005; Velmurugan & Radhakrishnan, 2015), *IASLIC Bulletin*, (Chandra, 2014; Das & Bhattacharya, 2014; Halder & Chandra, 2009; Kherde, 2003; Singh & Mishra, 2013; Verma, 2004), *Library Herald* (Das & Bhattacharya, 2016; Kherde, 2003; Nosrat, 2009; Riahinia, 2009; Singh & Bebi, 2014; Thanuskodi, 2011; Verma, 2001) and *SRELS Journal of Information Management* (Mulla & Dhanamjaya, 2014; Verma, 2010).

All the above mentioned discussion implies that the *Annals of Library and Information Studies* (ALIS), *DESIDOC Journal of Library and Information*

Technology (DJLIT), *IASLIC Bulletin*, *Library Herald* (LH) and *SRELS Journal of Information Management* (SJIM) are significant representative of LIS research publications in India. So these five LIS journals published from India can be selected as the source documents for the study.

3.2 Data Collection

This study tries to find the inter-relation between LIS and non-LIS disciplines and identified the influence of non-LIS disciplines on LIS. Data collection was made on the basis of the objective of the study. This study considered the articles published during 2005 to 2014 in the selected LIS journals from India, these were *Annals of Library and Information Studies*, *DESIDOC Journal of Library and Information Technology*, *IASLIC Bulletin*, *Library Herald*, and *SRELS Journal of Information Management*. The data regarding authorship and references were directly collected from the journal articles. Total 1,718 articles published in the selected journals during the study periods i.e. 2005-2014 and the total number of contributors was 3,169. Contributors of the articles published in the selected journals referred 22,442 documents during the study periods. Other than articles, the publications such as footnote, editorials, obituaries, book review, letters to the editors etc. were excluded for this study purpose.

A database was created using Microsoft Office Access 2007 to record and manage the data required for analyses. In the MS Access Database, seven tables were created to record the details of contributing authors, journal

references, cited books including book chapters, cited conference publications, cited dissertations (doctoral and masters), cited web resources and other cited documents.

The first table deals with authors details which includes author(s) name, authors' affiliation including designation, contact details, title of the article written by the author(s). The Second table deals with cited journal references details which includes cited author(s), cited article title, cited journal name and other details related to cited journals. The third table deals with cited books/book chapters. It includes cited book title, author(s) and imprint details. The fourth table deals with data regarding conference publications such as cited author(s), conference articles, conference name and details. The fifth table deals with cited dissertations which includes researcher name, title of the dissertation, awarding university and year of awarded. The sixth and seventh table created to record data regarding web resources and miscellany cited document only for counting purpose. Additional field was created to control the relativity between the source article and its citation data by code name. Codification was made by mentioning the abbreviated journal title, year of publication, volume number and issue number, and article serial number for each entry in the table. It is necessary to highlight few imperfections found during the data collection. All the authors' designation and affiliation was not found from the source articles. Out of 3,169 authors, 83 (2.62%) authors were excluded due to insufficient data regarding their affiliation. Next, authors' names were not always been consistently rendered even though they may belong to same person (for

example, Majumder, K.P. and Krishnapada Majumder) or the authors names were given as an initial followed by the last names and at other times given in full (for example, B. Dutta and Bidyarthi Dutta), in such cases two names were considered as belonging to the same author if the affiliation and contact details matched. Again, few authors found with different affiliation in different time periods in the same source journal or different source journals during the study periods (for example, B. K. Sen, Ex-Scientist, NISCAIR, New Delhi; Chairman, Bibliometrics Experts Committee, DST, GOI; Project Investigator, INSA, New Delhi; Visiting Prof., University of Malaya, Malaysia etc.), were consider as same authors after analysis of their contact details and publications records. All this anomalies were manually resolved before the analysis of data. Some imperfections were also found in case of cited journals where full name of the cited journals or abbreviated name of the journals were used. Again no standard was maintained for abbreviation of journal name.

3.3 Data Analysis

This study analyses the collected data according to the research question. Data analysis includes identification of disciplines of the contributors, joint collaboration of authors between LIS and non-LIS academic background, contributions by non-LIS Authors, and identification of subject disciplines of journals citations, book citations, conference publication citations, and dissertation citations.

The disciplines of the author(s) were determined according to their

designation and institutional affiliation listed in the articles. Some cases author's designation were not provided in the article, only the institutional affiliation was given, in that case Google search engine used to found the authors academic background. In this connection, variety of secondary sources have been checked such as official website of the affiliated institution, prospectus of the affiliated institution, participation list of conferences/courses, Research Gate database, LinkedIn database, curriculum vitas of the individual authors, mandatory disclosure of the affiliated institution etc. to identified the discipline in which a particular author belongs to. The author's disciplines were fitted to the second summary (i.e. hundred classifications) of Dewey Decimal Classification (DDC) scheme that also used for the disciplines of references. Total 83 authors (2.62% of total) were excluded from the authors' discipline identification study because their institutional affiliation data were not provided or incomplete. As a result, 3,086 authors were identified for disciplinary influence study and taken into the consideration.

Research collaborations between authors were identified by counting articles contributed by atleast one author from LIS discipline and other(s) author from non-LIS discipline(s). In few cases it was found that more than one non-LIS authors contributed with LIS scholars. In that case, LIS collaborations were identified after considering the author's responsibility to the articles i.e. order of authorship. For example, in the year 2008, one article contributed in ALIS by three authors from physics, LIS, and engineering respectively where author from physics was the first author and it was considered as collaboration

between LIS and physics discipline. Similarly in the year 2010, one article contributed by the authors from botany, computer science and LIS disciplines, where author from botany was the first author and considered as collaboration between LIS and botany and so on.

The discipline of each reference (journal citations, books/book chapters, conference publications, doctoral and master's dissertations) was determined by retrieving their DDC class number from the selected database(s). The main class of the journal reference was determined as the journal classified itself. The DDC class number of each cited journals were collected from online *Ulrich's Periodical Directory*. The DDC class number of each cited books and conference proceedings were collected from *OCLC Classify*- an experimental classification service database which provides access to more than million classification numbers of books, magazines, movies, and music using the Dewey Decimal Classification system and subject descriptor was verified by the *WorldCat*, the world's largest library catalogue. If the subject discipline of any particular book was not found in the *OCLC Classify* and *WorldCat* database, then online *British Library integrated catalogue, IndCat*- online union catalogue of Indian Universities was searched to find the main class. In few cases, publisher's web database and/or distributors web databases was searched to identify the subject of the cited book. Conference proceedings were classified by searching *WorldCat, British Library Catalogue, IndCat* databases. In case of cited dissertations, they were first separated according to the awarding university. The main classes of the cited dissertations (doctoral)

awarded in India were collected from *Shodhganga* database- a reservoir of Indian theses. *WorldCat* and *British Library Catalogue* databases were searched to identify the subjects of cited dissertations (doctoral) awarded by the foreign universities. In some cases, *E-LIS repository*, web database of the dissertations awarding universities, also searched to identify the main discipline of the cited dissertations. The disciplines of the dissertation (masters) were determined according to the courses for which it was prepared.

All the classified documents according to their types were fitted to the second summary of DDC (i.e. hundred classes) to find the main subject discipline of that document and arranged according to the main classes. Little localization was made for Bengali, Marathi, and Hindi language and literature and they termed as Indic language and Indic literature. After taking all measures if any documents left to classify due to incomplete information, it marked as unidentified and excluded from the disciplinary influence study.

3.4 Data Testing

Various statistical tools and techniques were used to test the data to validate the research questions. These statistical tools include *seasonal trend line* for citation by the method of least squares, *correlation coefficient* calculation including small sample test, calculation of *Interdisciplinary Borrowing Index*, *Chi-square Test* for independence or association between variables, and *Two-way ANOVA Test* to check the variation in means due to variation in the independent variables.

Method of Least squares is a device for finding the equation of specified types of curve, which best fits a given set of observations. The method depends upon the *Principles of Least Squares*, which suggests that for the “best-fitting” curve, the *sum of the squares of differences* between the observed and the corresponding estimated values should be the minimum possible (Das, 2010, Gun, Gupta, & Dasgupta, 2008).

The equation of trend line is

$$y' = a + b t$$

where,

y' is the projected value of the y variable for a selected value of t

a is the y -intercept, an estimated value of y when $t = 0$ or the value of y where the line crosses the y -axis when t is zero

b is the slope of the line, or the average change in y' for each change of one unit in t

t is any value of time that is selected

and the normal equations to find a and b are ,

$$\Sigma y_t = n a + b \Sigma t$$

and $\Sigma t y_t = a \Sigma t + b \Sigma t^2$

The concept of *correlation* is widely used in everyday life. It is the basis for many technical comparisons and for reporting results of much experimental research. In statistics, correlation is a method of studying similarity or agreement between the sets of observations or two types of behavior. The

correlation between two sets of scores of a group of individuals obtained through tests, for instance, is simply the extent to which they are similar or the extent to which they agree. Correlation analysis aims to study the strength and the direction of a linear relationship between two or more variables. The relationship or correlation between two variables is expressed with a numerical measure that is “*coefficient of correlation*”. It indicates the degree or extent of relationship between the variables. The value of *coefficient of correlation* (denoted, r) is such that $-1 \leq r \leq +1$, the sign indicates whether the two sets of data are positively correlated or negatively correlated, i.e., whether the values in the second data become larger or smaller as the values in the first data set become larger. A *correlation coefficient* equal to ± 1.0 is described as perfect relationship, between ± 0.75 to ± 1.0 as very high relationship, between ± 0.50 to ± 0.75 as high relationship, between ± 0.25 to ± 0.50 as low relationship, between 0 to ± 0.25 as very low relationship and 0 as absent relationship (Asthana & Bhushan, 2007).

If $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$ be a given set of n pairs of observations on two variables x and y then the *Correlation Coefficient*, or *Coefficient of Correlation*, between x and y (denoted by the symbol r) is defined as

$$r_{xy} = \frac{\text{cov}(x, y)}{\sigma_x \sigma_y}$$

Where,

$\text{cov}(x, y)$ = *covariance* of x and y observations

σ_x = standard derivation of x observations

σ_y = standard derivation of y observations

This expression is known as Pearson's product-moment formula, and is used to measure linear correlation between the variables x and y . The numerical value of *correlation coefficient* is independent of the change of origins and scales of the variables. The formula for correlation coefficient can re-write as,

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where:

n = number of pairs of observations

x = Deviation of each corresponding observation from its mean/assumed mean in variable X

y = Deviation of each corresponding observation from its mean/assumed mean in variable Y

$\sum xy$ = Sum of the products of both variables deviations

$\sum x^2$ = Sum of deviations squares in variable X

$\sum y^2$ = Sum of deviations squares in variable Y

The word "*correlation*" is used to denote the degree of association between variables. If two variables x and y are so related that variations in magnitude of one variable tend to be accompanied by variations in the magnitude of the other variables, they are said to be correlated. Correlation may be *linear* or *non-linear*. If the amount of change in one variable tends to bear a constant ratio to the amount of change in the other variables, then the correlation is said to be '*linear*' (Das, 2010; Giri & Banerjee, 2010).

Using Pierce' (1999) element of borrowing, *interdisciplinary borrowing index* quantifies the degree of borrowing as an index of interdisciplinarity. As

an indicator of degree of interdisciplinarity, a higher number would represent a higher degree of interdisciplinarity. The *interdisciplinary borrowing index* could be generated for any unit—a single type of source in a reference list, the entire reference list of a single work, all the references from a journal, all the references in a scholar’s output, etc. To assess this index the following formula is used

$$\frac{d}{0.1 + \frac{i}{n}}$$

Where,

d = number of unique disciplines in addition to the core discipline,

i = the number of references classified within the core discipline,

n = the total number of references and 0.1 is constant.

The *Chi-square test*, devised by Karl Pearson, is used to decide whether the observations are in good agreement with a hypothetical distribution, i.e. the sample may be supposed to have arisen from a specified population. *Chi-Square distribution* can be used in both large and small sample tests. It is mainly used to (a) test for goodness of fit, (b) test for independence of attributes, and (c) test for a specified standard deviation (small sample tests). Two attributes are said to be “independent”, if they are unrelated to each other, i.e., the presence or absence of any attributes among the members of the population does in no way influence whether the other attribute will be present. If the attributes are not “independent”, they are said to be “associated”. Suppose that the observations are classified simultaneously according to two attributes,

and the frequencies (f_o) in the difference categories are shown in a two-way table (known as *contingency table*). On the basis of cell frequencies it is required to test whether the two attributes are associated or not under the null hypothesis

H_0 (Attributes are independent)

and the expected frequency (f_e) of any cell is given by

$$f_e = [(\text{Row total}) \times (\text{Column total})] / \text{Total frequency} = \frac{A_i \times B_j}{N}$$

Then we calculate the statistic

$$\chi^2 = \sum \left[\frac{(f_o - f_e)^2}{f_e} \right]$$

Where,
 f_o = Observed frequencies
 f_e = Expected frequencies
 degree of freedom ($d.f.$) = $(n-1) \times (m-1)$

If the calculated value of χ^2 exceeds the tabulated value for the given $d.f.$ and at a specified level, the null hypothesis is rejected, and we conclude that the attributes are not independent, but associated (Das, 2010; Giri & Banerjee, 2010; Khan, 2010).

Analysis of Variance (ANOVA) is one of the most powerful tools of statistical analysis. It is an extension and generalization of student t -test but is relatively more powerful. It also helps in minimizing experimental error because experiments have to be designated more rigorously to fulfill its assumptions. It has been defined as the statistical techniques for the “separation of variation due to a group of causes from the variation due to other groups”. It

analyses different components of total variance of the sample to estimate the relative magnitude of within group variation due to uncontrolled random factors and the between group variance which may have been influenced by the induction of independent variance. The ratio of between groups to within groups (error) mean square is distributed as F after satisfying the basic assumptions for ANOVA. The observations may be classified according to single criterion (one factor) or two criteria (two factors). The classification according to one factor is called one-way classification and classification according to two factors is called two-way classification. In two factor analysis of variance, it is possible to design the test so that an analysis of variance can be used to test for the effect of two independent factors on the response variable of interior simultaneously i.e. we can test two sets of hypothesis with the same data at the same time (Asthana & Bhushan, 2007; Das, 2010; Khan, 2010).

ANOVA Table for Two-Way Classification:

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F
Between columns	$c-1$	SSC	$MSC = \frac{SSC}{c-1}$	MSC/MSE
Between Rows	$r-1$	SSR	$MSR = \frac{SSR}{r-1}$	MSR/MSE
Residual or Error	$(c-1)(r-1)$	SSE	$MSE = \frac{SSE}{(c-1)(r-1)}$	

Where,

SSC = sum of squares between columns

SSR = sum of squares between rows

SSE = sum of squares due to errors

SST = total sum of squares = SSC + SSR + SSE

r = number of rows and c = number of columns

The measuring rod for testing significance is two-way classification of ANOVA is 'residuals'. 'Residuals' represent the magnitude of variation due to forces called 'chance' (Das, 2010; Gun, Gupta, & Dasgupta, 2008; Khan, 2010).

The *level of significance* (α) is that probability (denoted by, p) of chance occurrence of observed results up to and below which the probability of the null hypothesis being correct is considered too low and the results of the experiment are considered significant ($p \leq \alpha$). The selection of level of significance and the direction of extremes (*one-tail* or *two-tail*) depend on the choice of the researcher. Generally level of significance is taken to be 5% i.e. $\alpha = 0.05$ in case of social science research (Asthana & Bhushan, 2007; Malec, 2012).

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Chapter- IV

Data Presentation and Analysis

The literature review reveals that numerous studies were done on bibliometric analysis or citation analysis. However, subject analysis or disciplines identification of the cited documents and the academic background of the contributors had been seldom studied. And the same studies are rare in Indian LIS literatures. The objective of the present study is to analyze the disciplines contributed in LIS literature publications through author study and study of the cited documents. The present studies will helpful to understand the relationship between LIS and other field of studies by subject disciplines in India. This study will identify the quantity of items cited and analyze the subject matter of cited documents. This study will also measure the volume of authors contributing their knowledge in LIS field by scholarly communications.

Data were collected and examined to achieve the following goals:

1. to identify the quantity of major contributing disciplines used for the development of LIS publications in India,
2. to identify the resources utilization in LIS publication and

3. to examine the relationship between the LIS and other field of study.

The data were analyzed to find the interrelation between LIS and non-LIS field of studies by identifying the disciplinary influences on library and information science (LIS) literature, as represented in *ALIS*, *DJLIT*, *IASLIC Bulletin*, *LH* and *SJIM* and to determine the percentage of contribution of each discipline. Various statistical tools and techniques were used to identify the contribution of the different disciplines in LIS literatures.

4.1 Distribution of Published Articles

Research articles published in five Indian LIS journals i.e. *ALIS*, *DJLIT*, *IASLIC Bulletin*, *LH*, and *SJIM* were collected and analyzed for the last ten years i.e. 2005-2014. Total 1,718 research articles were published by 3,169 authors in the selected journals during study periods.

4.1.1 Distribution of Articles in ALIS

Total 321 articles were published in 40 issues of ALIS during the year 2005-2014. Table-4.1 describes the data regarding number of articles published issue wise in the source journal ALIS during the study period.

Table-4.1: Distribution of Articles Published in ALIS

Year	Vol.	Issues				Total
		I	II	III	IV	
2005	52	05	06	06	06	23
2006	53	06	06	07	07	26
2007	54	06	09	05	07	27

2008	55	09	10	09	07	35
2009	56	07	08	08	10	33
2010	57	09	09	15	10	43
2011	58	10	10	09	06	35
2012	59	06	06	08	07	27
2013	60	09	09	09	10	37
2014	61	09	08	11	07	35
Total						321

It has been seen that the publications of articles gradually increases in ALIS. Table-4.1 reveals that maximum number of articles (i.e. 43) was published in the year 2010 and minimum number of articles (i.e. 23) was published in the year 2005. The average number of articles published per year was 32 and 8.025 per issue.

4.1.2 Distribution of Articles in DJLIT

Total 438 numbers of articles published in DJLIT during 2005-2014 in its 59 issues. Table-4.2 represents the data regarding distribution of articles published in DJLIT during the year 2005-2014.

Table-4.2: Distribution of Articles Published in DJLIT

Year	Vol.	Issues						Total
		I	II	III	IV	V	VI	
2005	25	03	03	02	03	02	-	13
2006	26	03	05	02	02	04	02	18
2007	27	07	04	04	07	05	07	34
2008	28	09	09	07	09	08	06	48
2009	29	11	10	09	06	09	04	49
2010	30	07	08	07	08	11	06	47
2011	31	08	08	07	13	09	10	55
2012	32	11	10	12	12	11	10	66

2013	33	12	08	09	11	09	11	60
2014	34	09	11	10	10	10	10	60
Total								450

The average number of articles published was 45 per year. Publications growth of articles increases year by year. Maximum number of articles (i.e. 66) was published in the year 2012 and minimum number of articles (i.e. 13) was published in the year 2005.

4.1.3 Distribution of Articles in IASLIC Bulletin

IASLIC Bulletin published 227 articles during the study periods in its 40 issues. Table-4.3 shows the issue wise distribution of articles. The average number of articles published per year was approximately 22. The maximum number of articles i.e. 28 was published in the year 2010 and minimum number articles i.e. 18 was published in the year 2013.

Table-4.3: Distribution of Articles Published in IASLIC Bulletin

Year	Vol.	Issues				Total
		I	II	III	IV	
2005	50	02	09	04	07	22
2006	51	03	07	05	06	21
2007	52	04	05	08	04	21
2008	53	03	07	05	06	21
2009	54	07	05	05	06	23
2010	55	07	08	07	06	28
2011	56	05	06	07	05	23
2012	57	05	07	05	06	23
2013	58	05	05	04	04	18
2014	59	06	06	05	06	23
Total						223

4.1.4 Distribution of Articles in LH

Library Herald published several memorial volumes in the name of eminent LIS personals during the study periods. In 2009, fourth issue was memorial volume in the name of Professor PN Kaula and does not published any research articles, all were reminiscence. Again in the year 2012, third issue was in the name of Professor S Das Gupta and did not produce any research articles. In the 2005, issue number 3 & 4 was a combined issue which includes twenty-two years database of cumulative index and contained minimum number of articles (i.e. 14).

Table- 4.4: Distribution of Articles published in LH

Year	Vol.	Issues				Total
		I	II	III	IV	
2005	43	08	06	00	00	14
2006	44	07	08	06	07	28
2007	45	08	09	05	05	27
2008	46	05	07	04	05	21
2009	47	06	06	06	00	18
2010	48	07	07	05	08	27
2011	49	07	07	04	06	24
2012	50	07	05	00	03	15
2013	51	06	06	04	06	22
2014	52	06	07	04	07	24
Total						220

Table- 4.4 shows that 220 research articles produced in LH during 2005 – 2014. Year 2005 published minimum number of articles (i.e. 14) by LH and in the year 2007 and 2010 maximum number of articles (i.e. 27) was published in LH. The average number of articles published per year was 22.

4.1.5 Distribution of Articles in SJIM

Total 504 articles published in the SJIM during the study period i.e. 2005-2014. Table- 4.5 shows the issue-wise distribution of articles published in SJIM. Average number of articles publication was 50 per year. The publishing house of SJIM changed its periodicity from quarterly publication to bi-monthly publication in the year 2010. As a result, the number of contributions increased from the year 2010. Though the journal produced maximum number of articles (i.e. 68) in the year 2013, it suddenly decreased to 46 in the year 2014. The minimum contributions were 35 published in the year 2006.

Table- 4.5: Distribution of Articles Published in SJIM

Year	Vol.	Issues						Total
		I	II	III	IV	V	VI	
2005	42	07	09	09	12	-	-	37
2006	43	09	09	09	08	-	-	35
2007	44	08	07	09	12	-	-	36
2008	45	14	11	14	10	-	-	49
2009	46	11	09	12	12	-	-	44
2010	47	11	11	12	08	11	09	62
2011	48	12	11	10	10	09	10	62
2012	49	10	10	11	12	12	10	65
2013	50	10	10	09	08	15	16	68
2014	51	07	07	08	07	07	10	46
Total								504

4.2 Authorship and Academic Disciplines

The number of authors involved in scholarly publications termed as authorship. Study of authorship pattern of the contributions indicates the degree of collaboration. This study tries to identify the academic disciplines of the

each contributing authors and their contribution to publications of research articles in Indian LIS journals.

4.2.1 Authorship Study for ALIS

ALIS published 321 articles during the year 2005-2014. Table-4.6 describes that 144 out of 321 articles were double-authored works. It is also revealed that 66.35% articles were collaborative works where more than one author involved. Total 621 numbers of authors were contributed 321 articles in ALIS during the study periods. Contribution per author was 1.94. In the year 2010, maximum number of authors (i.e. 79) contributed maximum number of articles (i.e. 43) and in the year 2005, minimum number of authors (i.e. 46) contributed minimum number of articles (i.e. 23).

Table-4.6: Authorship Pattern in ALIS

Author-ship	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Single	09	06	11	12	05	17	13	11	12	12	108
Double	08	14	10	15	19	18	14	10	18	18	144
Triple	05	05	06	07	09	06	07	06	05	03	59
Four	-	-	-	01	-	02	-	-	-	02	05
Five	-	01	-	-	-	-	-	-	01	-	02
Six	01	-	-	-	-	-	01	-	01	-	03
Total	23	26	27	35	33	43	35	27	37	35	321
Total Authors	46	54	49	67	70	79	68	49	74	65	621

Total 621 authors published 321 research articles in ALIS during the year 2005-2014. Out of the 621 authors, academic background of 12 authors could not identify because of no affiliation or insufficient data about the

authors. Table-4.7 shows the academic background of the contributing authors. Most of the contributing authors (i.e. 548) were from library and information science discipline. Other than LIS background, 18 others disciplines of the authors were identified. Most of the non-LIS authors were from computer science (2.09%), followed by mathematics (1.13%), physics (0.97%), engineering (0.81%), and medical science (0.65%).

Table-4.7: Academic Background of Authors in ALIS

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	-	-	-	-	03	-	-	-	03
Biology	-	-	-	-	-	-	-	-	-	01	01
Botany	-	-	-	-	-	01	01	01	-	-	03
Chemical engineering	-	01	-	-	01	-	-	-	-	01	03
Chemistry	01	01	-	-	-	02	-	-	-	-	04
Computer science	03	-	-	01	-	03	01	02	-	03	13
Education	-	-	-	-	-	01	-	-	-	-	01
Engineering	-	-	-	01	01	01	01	-	01	-	05
News media & publishing	-	-	-	-	-	-	01	-	-	-	01
Law	01	-	-	-	-	-	-	-	-	-	01
LIS	38	46	46	62	65	64	57	42	71	57	548
Management	-	-	-	-	01	01	-	01	-	-	03
Mathematics	01	01	01	-	-	02	01	-	-	-	06
Medical science	-	02	-	-	01	-	01	-	-	-	04
Physics	01	-	-	03	01	-	-	-	-	01	06
Science	-	-	-	-	-	-	-	01	-	-	01
Social sciences	-	02	-	-	-	01	-	-	-	-	03
Sociology	-	-	-	-	-	01	01	-	-	-	02
Technology	-	-	-	-	-	-	-	-	01	-	01
Unidentified	01	01	02	-	-	02	01	02	01	02	12
Total	46	54	49	67	70	79	68	49	74	65	621

Table- 4.7 shows that maximum numbers of non-LIS authors (i.e. 13) were contributed in the year 2010 and the same was lowest (i.e. 1) in the year 2007. Authors from computer science discipline contributed 6 out of 10 years of study and engineering and mathematics authors contributed in 5 out of 10 years under study.

4.2.2 Authorship Study for DJLIT

Authorship pattern of the articles published in DJLIT is presented in the Table-4.8. The study reveals that 450 articles published in DJLIT during the year 2005-2014 by 870 authors. In the year 2012, maximum numbers of articles (i.e. 66) were published by maximum number of authors (i.e. 126) and in the year 2005, minimum numbers of articles (i.e. 13) were published by minimum number of authors (i.e. 31). It is also observed that contribution per year increases over ten year of study periods.

Table-4.8: Authorship Pattern in DJLIT

Authorship	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Single	03	03	18	28	17	14	20	22	25	18	168
Double	05	09	07	13	19	24	25	31	25	28	186
Triple	02	02	06	03	10	06	07	11	08	09	64
Four	03	02	02	04	02	01	02	01	02	05	24
Five	-	01	01	-	01	01	01	01	-	-	06
Six	-	01	-	-	-	01	-	-	-	-	02
Total	13	18	34	48	49	47	55	66	60	60	450
Total Authors	31	46	63	79	98	95	104	126	107	121	870

Academic background of 870 authors contributed in DJLIT during the

study periods shown in Table-4.9. Academic background of 34 authors' couldn't identify due to insufficient affiliation. Total 673 authors (i.e. 77.36%) were from LIS field of study. Rest of the authors (i.e. 197) was from 23 non-LIS disciplines. Most of the authors other than LIS field were from computer science (7.24%), followed by engineering (2.41%), management (1.84%), mathematics (1.49%), and physics (0.92%). Authors from computer science discipline made contributions throughout the study periods. Authors from engineering discipline contributed 8 years out of 10 years. In the year 2005, non-LIS authors were from two non-LIS disciplines. In the year 2008, authors from 10 different disciplines contributed their knowledge in DJLIT.

Table-4.9: Academic Background of Authors in DJLIT

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	01	-	03	-	-	-	-	-	04
Archaeology	-	-	-	02	-	-	-	-	-	01	03
Biology	-	-	-	01	-	-	-	-	-	01	02
Chemical	01	01	-	-	-	-	-	01	-	-	03
engineering											
Commerce	-	-	-	-	01	-	-	-	-	-	01
Computer	06	06	05	06	05	08	09	08	05	05	63
science											
Economics	-	-	-	-	-	-	-	01	-	-	01
Education	-	-	-	-	-	-	-	-	01	-	01
Engineering	-	-	02	02	01	02	05	01	03	05	21
Knowledge &	-	-	-	-	01	-	01	-	-	-	02
systems											
Law	-	-	03	02	-	-	-	-	-	-	05
Linguistics	-	-	-	-	-	01	-	-	-	-	01
LIS	23	35	47	55	75	79	75	101	83	100	673
Management	-	01	-	03	01	-	-	04	06	01	16
Mathematics	-	02	03	-	02	-	02	01	-	03	13
Medical science	-	-	01	-	01	-	-	01	-	01	04

News media & publishing	-	-	-	-	-	-	01	-	-	-	01
Philosophy	-	-	-	02	-	-	-	-	-	-	02
Physics	-	01	01	03	02	01	-	-	-	-	08
Psychology	-	-	-	01	-	-	-	-	01	01	03
Science	-	-	-	-	-	-	01	-	03	-	04
Sociology	-	-	-	-	-	-	-	02	-	-	02
Technology	-	-	-	-	-	-	-	01	-	-	01
Zoology	-	-	-	02	-	-	-	-	-	-	02
Unidentified	01	-	-	-	06	04	10	05	05	03	34
Total	31	46	63	79	98	95	104	126	107	121	870

4.2.3 Authorship Study for IASLIC Bulletin

Total 360 authors contributed 223 articles in *IASLIC Bulletin* during the year 2005-2014. Table-4.10 shows year-wise distribution of 223 contributions. The average number of articles was approximately 22 per year and mean authors was 36 per year. Maximum number of authors (i.e. 42) contributed in 2012 and minimum number of authors (i.e. 28) in the year 2007. Table-4.10 indicated that single authored articles were pre-dominant during the study periods. But in terms of collaborative works (double and triple), it was found that 51.57 % contributions were collaborative works.

Table-4.10: Authorship Pattern in IASLIC Bulletin

Authorship	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Single	09	09	14	07	08	19	12	09	08	13	108
Double	08	11	07	11	12	08	08	09	09	10	93
Triple	05	01	-	03	03	01	03	05	01	-	22
Total	22	21	21	21	23	28	23	23	18	23	223
Total Authors	40	34	28	38	41	38	37	42	29	33	360

Academic backgrounds of the authors contributed in *IASLIC Bulletin* were shown in the Table-4.11.

Table-4.11: Academic Background of Authors in IASLIC Bulletin

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Bengali literature	-	-	-	-	-	-	-	01	-	-	01
Computer science	01	-	-	-	01	-	-	-	-	-	02
Education	-	01	-	-	-	-	01	-	-	-	02
History	-	-	-	-	-	-	-	01	-	-	01
LIS	38	32	28	38	39	36	36	39	29	32	347
Management	-	01	-	-	01	-	-	-	-	-	02
Science	-	-	-	-	-	01	-	01	-	-	02
Unidentified	01	-	-	-	-	01	-	-	-	01	03
Total	40	34	28	38	41	38	37	42	29	33	360

Seven basic disciplines of the authors were identified. Majority of authors were from LIS disciplines (96.39%). Other than LIS subject domain, there were 17 authors from Bengali literature, computer science, education, history, management, and science disciplines with more or less equal contributions.

4.2.4 Authorship Study for LH

Total 371 authors contributed 220 articles in Library Herald during the study periods. Table-4.12 indicates that out of 220 articles in source journal, most of contributions were contributed by singled author. But research collaboration was predominating over single contribution works. Only 17

authors contributed in the year 2005 and 45 authors contributed in the year 2006, 2007, 2010, and 2013. Only one article produced by four authors in the year 2012 and one by five author in the year 2013 under study.

Table-4.12: Authorship Pattern in LH

Authorship	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Single	11	12	13	07	10	12	12	07	08	11	103
Double	03	15	10	11	05	12	06	06	07	11	86
Triple	-	01	04	03	03	03	06	01	06	02	29
Four	-	-	-	-	-	-	-	01	-	-	01
Five	-	-	-	-	-	-	-	-	01	-	01
Total	14	28	27	21	18	27	24	15	22	24	220
Total Author	17	45	45	38	29	45	42	26	45	39	371

Table-4.13 shows the academic disciplines of the contributing authors in LH during 2005-2014. Contribution by non-LIS authors were also found in LH almost all years except 2008. Most of the contributing authors were from LIS (i.e. 94.61%) discipline, followed by education (1.62%), psychology, anthropology, computer science, law, management etc. Seven authors' discipline was unidentified because of insufficient data regarding the author's affiliation.

Table- 4.13: Academic Background of Authors in LH

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Anthropology	-	-	01	-	-	-	-	-	-	-	01
Computer science	-	-	-	-	01	-	-	-	-	-	01
Education	01	-	-	-	-	-	01	03	01	-	06
Law	-	-	-	-	-	-	01	-	-	-	01
LIS	16	44	43	38	28	44	38	22	40	38	351
Management	-	-	-	-	-	01	-	-	-	-	01

Psychology	-	01	-	-	-	-	-	-	01	-	02
Public administration	-	-	-	-	-	-	-	-	-	01	01
Unidentified	-	-	01	-	-	-	02	01	03	-	07
Total	17	45	45	38	29	45	42	26	45	39	371

4.2.5 Authorship Study for SJIM

Authorship pattern of the articles published in SJIM presented in the Table-4.14. Total 947 numbers of authors contributed 504 articles in SJIM during the year 2005-2014. Table-4.14 shows the year-wise distribution of authorship pattern of the contributions. Maximum number of authors (i.e. 124) published maximum number of articles (i.e. 68) in the year 2013. The publication of articles increases over the study period. Most of the articles (52.38%) were published by double authored; followed by individual authored (32.34%), triple authored (12.3%) and so on. It was found that the collaborative works were pre-dominating over individual works during the study periods.

Table-4.14: Authorship Pattern in SJIM

Authorship	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Single	12	10	18	16	16	18	18	23	23	09	163
Double	22	18	14	27	25	31	36	32	34	25	264
Triple	03	05	02	05	03	10	05	08	11	10	62
Four	-	01	01	01	-	03	02	-	-	-	08
Five	-	-	-	-	-	-	01	02	-	02	05
Six	-	-	01	-	-	-	-	-	-	-	01
Seven	-	01	-	-	-	-	-	-	-	-	01
Total	37	35	36	49	44	62	62	65	68	46	504
Total Authors	65	72	62	89	75	122	118	121	124	99	947

Academic background of 947 authors contributed in SJIM was shown in the Table-4.15. Total twenty-one disciplines of the contributing authors were identified in the study. Most of the authors (89.86%) were from LIS field of studies. Most of the contributing authors with non-LIS academic background were from computer science (1.69%), followed by management (1.16%), engineering (0.63%), physics, medical science respectively. In the year 2013, eleven non-LIS disciplines of twenty authors were identified.

Table-4.15: Academic Background of Authors in SJIM

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	01	-	-	-	-	-	-	-	-	01
Biology	-	-	-	-	-	-	-	-	01	-	01
Chemical engineering	-	-	-	-	-	-	-	-	01	-	01
Chemistry	-	-	-	-	-	01	-	-	-	-	01
Commerce	-	-	-	-	01	-	01	-	01	-	03
Computer science	04	-	-	02	02	02	01	-	04	01	16
Economics	-	-	-	-	-	-	01	-	-	-	01
Education	-	-	-	-	-	-	-	-	01	01	02
Engineering	-	-	-	-	02	03	-	-	-	01	06
English literature	-	-	-	-	-	01	-	01	-	-	02
History	-	-	-	-	-	01	-	-	01	-	02
Knowledge & systems	-	-	-	-	-	01	-	-	-	-	01
LIS	60	70	58	83	69	106	110	110	97	88	851
Management	01	-	-	01	-	04	01	01	02	01	11
Mathematics	-	-	-	-	-	-	-	-	02	01	03
Medical science	-	-	-	-	-	-	-	-	04	-	04
Music	-	-	-	-	-	-	-	-	01	01	02
Physics	-	01	01	01	-	02	-	-	-	-	05
Psychology	-	-	-	-	-	-	-	-	-	01	01
Science	-	-	-	-	-	01	-	-	02	-	03

Sociology	-	-	01	01	-	-	-	01	-	-	03
Unidentified	-	-	02	01	01	-	04	08	07	04	27
Total	65	72	62	89	75	122	118	121	124	99	947

4.2.6 Discipline-wise distribution of Authors

Total thirty-three disciplines were identified for the contributing authors of ALIS, DJLIT, IASLIC Bull, LH, and SJIM. Table-4.16 and Figure-4.1 presented the data regarding academic background of the contributing authors.

Table-4.16: Disciplinary Distribution of Authors

Disciplines	ALIS	DJLIT	IASLIC Bull	LH	SJIM	Total	Percentage	Rank
Agriculture	03	04	-	-	01	08	0.26	9
Anthropology	-	-	-	01	-	01	0.03	16
Archaeology	-	03	-	-	-	03	0.10	14
Bengali literature	-	-	01	-	-	01	0.03	16
Biology	01	02	-	-	01	04	0.13	13
Botany	03	-	-	-	-	03	0.10	14
Chemical engineering	03	03	-	-	01	07	0.23	10
Chemistry	04	-	-	-	01	05	0.16	12
Commerce	-	01	-	-	03	04	0.13	13
Computer science	13	63	02	01	16	95	3.08	2
Economics	-	01	-	-	01	02	0.06	15
Education	01	01	02	06	02	12	0.39	7
Engineering	05	21	-	-	06	32	1.04	4
English literature	-	-	-	-	02	02	0.06	15
History	-	-	01	-	02	03	0.10	14
Knowledge & systems	-	02	-	-	01	03	0.10	14
Law	01	05	-	01	-	07	0.23	10
Linguistics	-	01	-	-	-	01	0.03	16
LIS	548	673	347	351	851	2770	89.76	1
Management	03	16	02	01	11	33	1.07	3

Mathematics	06	13	-	-	03	22	0.71	5
Medical science	04	04	-	-	04	12	0.39	7
Music	-	-	-	-	02	02	0.06	15
News media & publishing	01	01	-	-	-	02	0.06	15
Philosophy	-	02	-	-	-	02	0.06	15
Physics	06	08	-	-	05	19	0.62	6
Psychology	-	03	-	02	01	06	0.19	11
Public administration	-	-	-	01	-	01	0.03	16
Science	01	04	02	-	03	10	0.32	8
Social science	03	-	-	-	-	03	0.10	14
Sociology	02	02	-	-	03	07	0.23	10
Technology	01	01	-	-	-	02	0.06	15
Zoology	-	02	-	-	-	02	0.06	15
Total	609	836	357	364	920	3086	100	

Table-4.16 shows that LIS scholars were the maximum contributors (89.76%) under the study periods in the source LIS journals published from India. Out of total 3,086 contributors, 316 authors were from non-LIS field. Contributing authors from outside of the LIS domain were high in DJLIT with 19.5% in compare to other source journals. The contributions by authors from outside of the core disciplines were 10.02% for ALIS, 7.50% for SJIM, 3.57% for LH, and 2.80% for IASLIC Bulletin respectively. Authors from computer science (3.08%) were the most knowledge contributing non-LIS disciplines. Authors from management science (1.07%), and engineering (1.04%) were the next contributing disciplines. Authors from mathematics, physics, and education were also contributed their knowledge in LIS literature publications during the study periods. Authors from computer science, education, and management disciplines have significant influence in the article publications as

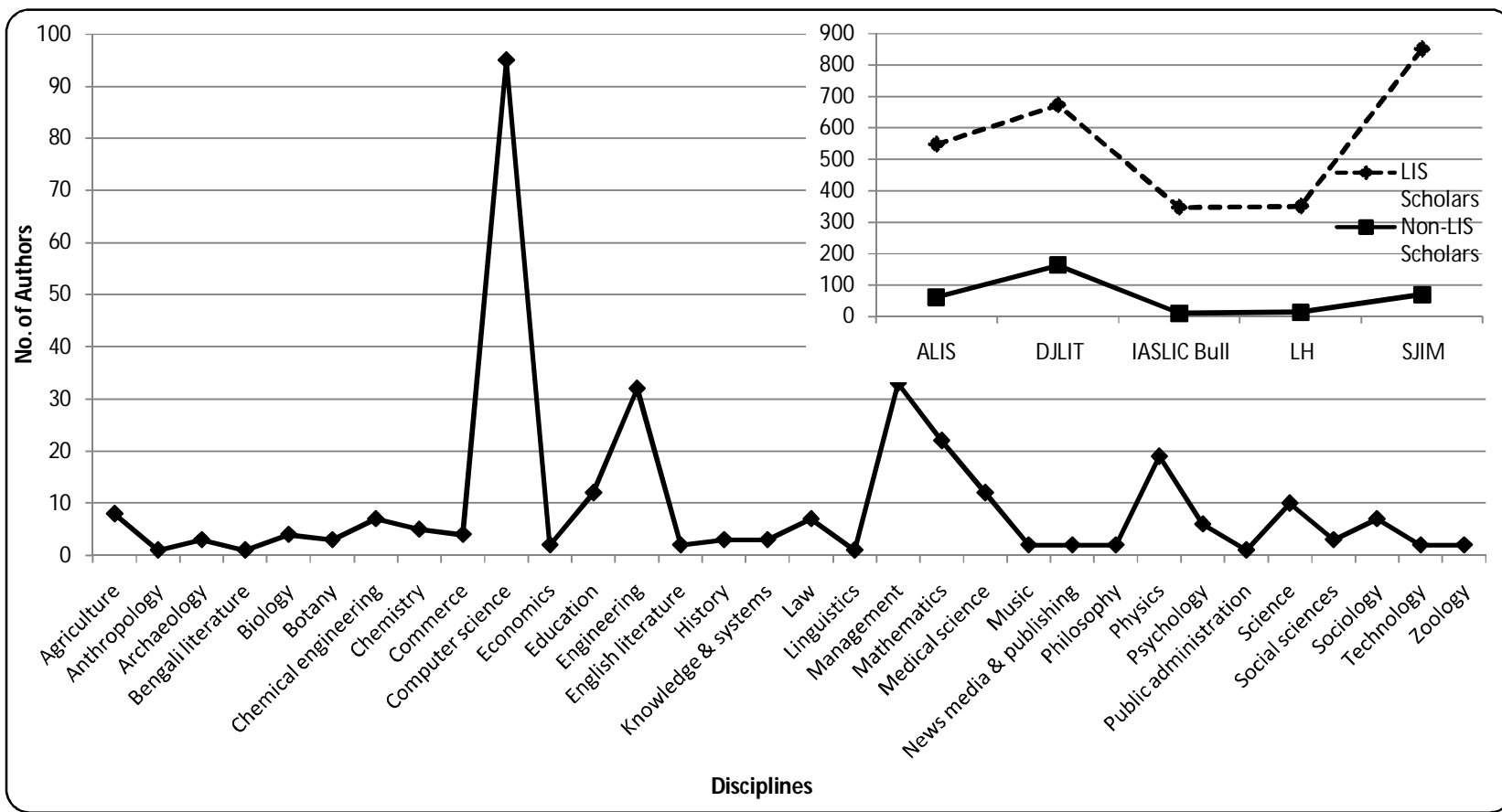


Figure-4.1: Academic Background of the Authors

they contributed in the entire five selected journals under the study periods. Authors from general science made contributions in the 4 out of 5 LIS source journals during the study periods. Authors from agriculture, biology, chemical engineering, engineering, law, mathematics, medical science, physics, psychology, and sociology made contribution in 3 out of 5 LIS source journals during 2005-2014. Figure-4.1 displays the contributions from the LIS and non-LIS disciplines as identified by way of authors' academic disciplines.

4.3 Disciplinary Collaboration

4.3.1 Collaborative Publications in ALIS

Research collaboration between LIS professionals and authors from other non-LIS field as represented in ALIS during 2005-2014 were shown in Table-4.17. Total 321 articles were published in ALIS during the study periods. Out of which 213 articles were published by more than one author. It was identified that 34 articles were collaborative works between LIS and non-LIS authors where atleast one author has LIS knowledge background.

Table-4.17: LIS Collaboration with other Disciplines in ALIS

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	-	-	-	-	02	-	-	-	02
Botany	-	-	-	-	-	01	-	-	-	-	01
Chemical engineering	-	01	-	-	01	-	-	-	-	-	02
Chemistry	01	01	-	-	-	-	-	-	-	-	02
Computer science	-	-	-	01	-	01	-	02	-	-	04
Engineering	-	-	-	-	-	01	01	-	-	-	02

Management	-	-	-	-	01	-	-	01	-	-	02
Mathematics	01	01	01	-	-	01	01	-	-	-	05
Medical sciences	-	01	-	-	01	-	01	-	-	-	03
News media & publishing	-	-	-	-	-	-	01	-	-	-	01
Physics	01	-	-	03	01	-	-	-	-	-	05
Science	-	-	-	-	-	-	-	01	-	-	01
Social sciences	-	02	-	-	-	01	-	-	-	-	03
Sociology	-	-	-	-	-	-	01	-	-	-	01
Total	03	06	01	04	04	05	07	04	-	-	34

Analysis shown in Table-4.17 indicates that LIS peoples were more collaborative with the mathematicians, followed by physicians, computer scientists, medical practitioners, and social scientists. Mathematics was the most influencing discipline as it contributed 5 out of 10 years of the study. In the year 2011, highest collaborative works was done between LIS and non-LIS authors. Table-4.17 also shows that in the very recent year (i.e. 2013 and 2014) there was no disciplinary collaboration between LIS and non-LIS authors. Disciplinary collaboration among the authors was equivalent in the first five year of study and the next five year of study.

4.3.2 Collaborative Publications in DJLIT

DJLIT published 450 articles during the year 2005-2014. Out of which 282 articles were collaborative works. Table-4.18 shows that 51 articles were published collaboratively by LIS and non-LIS scholars during the year 2005-2014 in DJLIT. Eleven disciplines were identified for the non-LIS scholars contributed knowledge in LIS journals along with LIS experts. Majority of

disciplinary collaboration (i.e. 11 articles) was found in the year 2014 and minimum disciplinary collaboration (i.e. 1 article) in the year 2006.

Table-4.18: LIS Collaboration with other Disciplines in DJLIT

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Biology	-	-	-	-	-	-	-	-	-	01	01
Chemical engineering	01	01	-	-	-	-	-	-	-	-	02
Commerce	-	-	-	-	01	-	-	-	-	-	01
Computer science	01	-	02	-	03	02	03	02	01	01	15
Engineering	-	-	01	-	01	-	02	01	03	04	12
Management	-	-	-	01	-	-	-	-	-	01	02
Mathematics	-	-	03	-	01	-	01	01	-	02	08
Medical science	-	-	-	-	01	-	-	-	-	01	02
Physics	-	01	01	01	02	01	-	-	-	-	06
Psychology	-	-	-	-	-	-	-	-	01	-	01
Science	-	-	-	-	-	-	-	-	01	-	01
Total	02	01	07	02	09	03	06	04	06	11	51

LIS peoples were more collaborative with the authors from computer science by publishing 15 articles (29.41%) during the study period. Other non-LIS disciplines that contributed knowledge along with LIS scholars were engineering (23.53%), mathematics (15.69%), and physics (11.76%). Chemical engineering, management, medical science, biology, commerce, psychology, and science also input knowledge with LIS professionals by way of collaborative publications. Cross-disciplinary collaboration found significant in the second half of the study periods with 58.82% collaborative works. It is also revealed that LIS scholars were more collaborative with the science peoples and less collaborative with arts and humanities for their publications as reflected by DJLIT.

4.3.3 Collaborative Publications in IASLIC Bulletin

IASLIC Bulletin published 223 articles during 2005-2014, where 115 articles were collaborative works. Only nine articles found to be collaborative between LIS and non-LIS professionals as reflected in Table-4.19. It was observed that LIS professionals were importing less knowledge from other disciplines as per *IASLIC Bulletin* publications. Five disciplines were identified that provided knowledge in LIS research articles. Authors from computer science, education, management, and science in general disciplines contributed equally with LIS professionals during the study periods. No cross-disciplinary contributions were found during the four years i.e. 2007, 2008, 2013, and 2014.

Table-4.19: LIS Collaboration with other Disciplines in IASLIC Bulletin

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Computer science	01	-	-	-	01	-	-	-	-	-	02
Education	-	01	-	-	-	-	01	-	-	-	02
History	-	-	-	-	-	-	-	01	-	-	01
Management	-	01	-	-	01	-	-	-	-	-	02
Science	-	-	-	-	-	01	-	01	-	-	02
Total	01	02	-	-	02	01	01	02	-	-	09

4.3.4 Collaborative Publications in LH

LH published 220 articles during the years 2005-2014 out of which 117 articles were collaborative contributions (Table-4.20). Only seven articles were identified that was written by LIS scholars with the collaboration to the authors outside of their own domain. Cross-disciplinary contributions were found more in the second half (2010-2014) of the study periods. Experts from

anthropology, education, computer science, law, management, psychology were contributed with LIS professionals during the study periods.

Table-4.20: LIS Collaboration with other Disciplines in LH

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Anthropology	-	-	01	-	-	-	-	-	-	-	01
Education	-	-	-	-	-	-	01	-	01	-	02
Computer science	-	-	-	-	01	-	-	-	-	-	01
Law	-	-	-	-	-	-	01	-	-	-	01
Management	-	-	-	-	-	01	-	-	-	-	01
Psychology	-	-	-	-	-	-	-	-	01	-	01
Total	-	-	01	-	01	01	02	-	02	-	07

4.3.5 Collaborative Publications in SJIM

SJIM published 504 articles during the year 2005-2014 of which 341 articles were contributed by more than one author. Out of 341 articles, 38 articles were jointly contributed by LIS experts and experts from other disciplines. In the 2013, maximum number (i.e. 12) of cross-disciplinary collaboration was found and in the year 2009, no disciplinary collaborative was found. Table-4.21 shows that LIS professionals were more collaborative with science disciplines. Management science (18.42%), physics (13.16%), computer science (10.53%), medical science (7.89%) were highly knowledge contributing disciplines by way of research collaborations.

Table-4.21: LIS Collaboration with other Disciplines in SJIM

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	01	-	-	-	-	-	-	-	-	01
Biology	-	-	-	-	-	-	-	-	01	-	01

Chemical engineering	-	-	-	-	-	-	-	-	01	-	01
Commerce	-	-	-	-	-	-	01	-	01	-	02
Computer science	01	-	-	01	-	01	-	-	-	01	04
Economics	-	-	-	-	-	-	01	-	-	-	01
Education	-	-	-	-	-	-	-	-	01	01	02
English	-	-	-	-	-	01	-	01	-	-	02
History	-	-	-	-	-	-	-	-	01	-	01
Management	01	-	-	01	-	-	01	01	02	01	07
Mathematics	-	-	-	-	-	-	-	-	01	-	01
Medical sciences	-	-	-	-	-	-	-	-	03	-	03
Music	-	-	-	-	-	-	-	-	01	01	02
Physics	-	01	01	01	-	02	-	-	-	-	05
Psychology	-	-	-	-	-	-	-	-	-	01	01
Science	-	-	-	-	-	01	-	-	-	-	01
Sociology	-	-	01	01	-	-	-	01	-	-	03
Total	02	02	02	04	-	05	03	03	12	05	38

4.3.6 Analysis of Disciplinary Collaborations

Research collaboration between LIS and non-LIS authors is presented in Table-4.22 and Figure-4.2 which shows that 139 contributions were published by LIS scholars with the collaboration of twenty-nine non-LIS scholars. Table-4.22 shows that LIS peoples are more collaborative with the scholars from computer science (18.71%), followed by physics (11.51%), engineering (10.71%), management (10.71%), mathematics (10.07%), medical science (5.76%), chemical engineering (3.6%), education (4.32%), science in general (3.6%), sociology (2.88%), agriculture (2.16%), commerce (2.16%), psychology (2.16%), and social science (2.16%). Rest of the disciplines contributed knowledge in LIS literature publications were less than 2% of total contributions.

Table-4.22: LIS Research Collaboration with Non-LIS Authors

Disciplines	ALIS	DJLIT	IASLIC Bulletin	LH	SJIM	Total	Percentage	Rank
Agriculture	02	-	-	-	01	03	2.16	8
Anthropology	-	-	-	01	-	01	0.72	11
Biology	-	01	-	-	01	02	1.44	10
Botany	01	-	-	-	-	01	0.72	11
Chemical engineering	02	02	-	-	01	05	3.60	6
Chemistry	02	-	-	-	-	02	1.44	10
Commerce	-	01	-	-	02	03	2.16	9
Computer science	04	15	02	01	04	26	18.71	1
Economics	-	-	-	-	01	01	0.72	11
Education	-	-	02	02	02	06	4.32	5
Engineering	02	12	-	-	-	14	10.07	3
English literature	-	-	-	-	02	02	1.44	10
History	-	-	01	-	01	02	1.44	10
Law	-	-	-	01	-	01	0.72	11
Management	02	02	02	01	07	14	10.07	3
Mathematics	05	08	-	-	01	14	10.07	3
Medical science	03	02	-	-	03	08	5.76	4
Music	-	-	-	-	02	02	1.44	10
News media & publishing	01	-	-	-	-	01	0.72	11
Physics	05	06	-	-	05	16	11.51	2
Psychology	-	01	-	01	01	03	2.16	9
Science	01	01	02	-	01	05	3.60	6
Social science	03	-	-	-	-	03	2.16	9
Sociology	01	-	-	-	03	04	2.88	7
Total	34	51	09	07	38	139	100	

Research collaboration of LIS scholars with the scholars from computer science and management were viewed in all the selected journals during the study periods. Research collaborations between LIS and science discipline were found in 4 out of 5 selected journals under study. Research collaboration

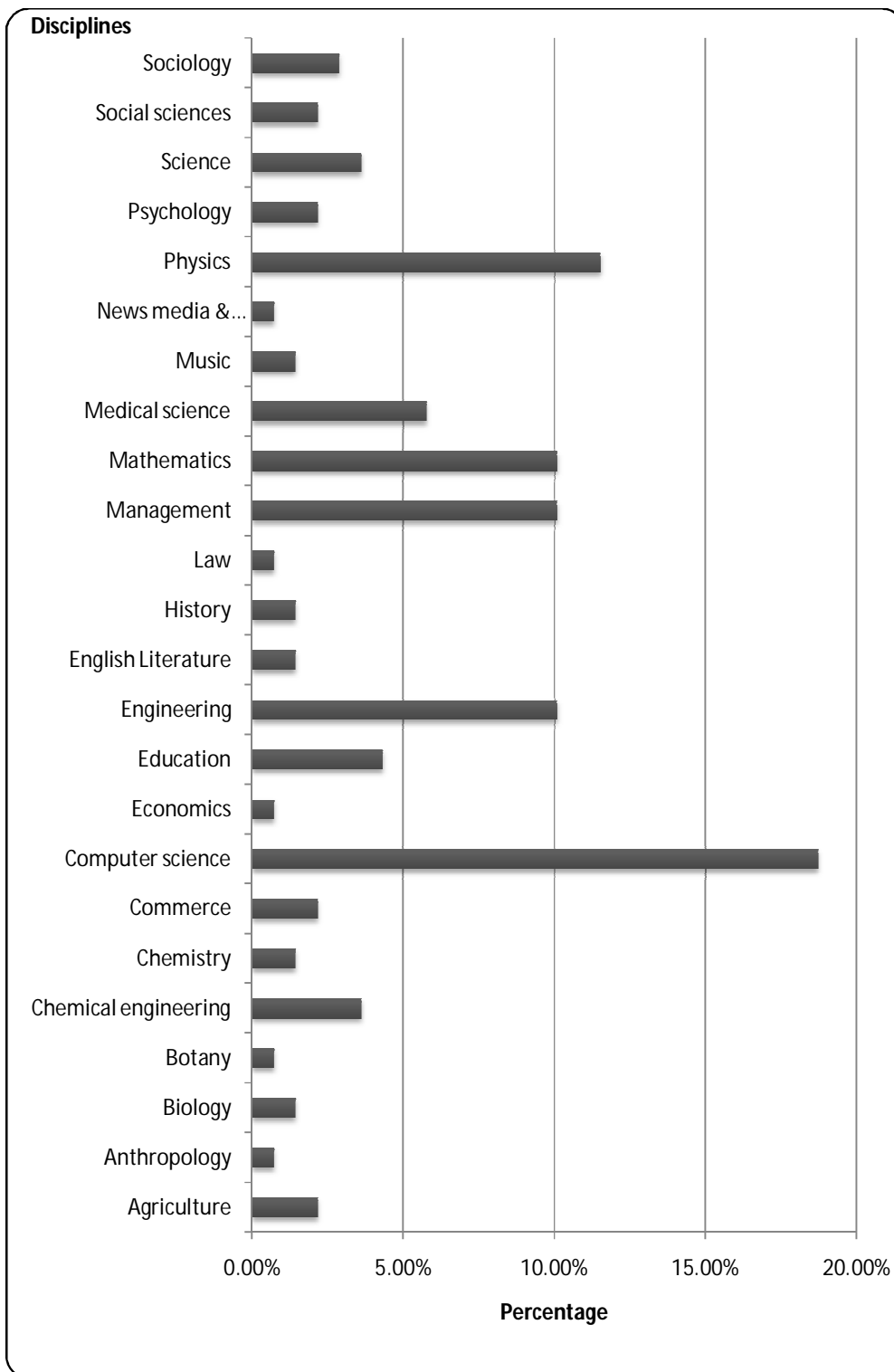


Figure-4.2: LIS Research Collaboration with Non-LIS Authors

between LIS scholars and non-LIS scholars mainly from chemical engineering, education, mathematics, medical science, physics, and psychology was found in 3 out of 5 selected Indian LIS journals.

4.4 Across Disciplinary Publications

4.4.1 Contributions by Non-LIS Authors in ALIS

Table-4.23 indicates the contributions by non-LIS authors in ALIS during the years 2005-2014. Total twelve articles were published by non-LIS authors during the study periods. Second half (2010-2014) of the study periods included more contributions from non-LIS authors than first half (2005-2009) of the study periods. In the 2010, maximum number of contributions came from outside of the LIS domain.

Table-4.23: Contributions by Non-LIS Authors in ALIS

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Botany	-	-	-	-	-	-	-	01	-	-	01
Chemical engineering	-	-	-	-	-	-	-	-	-	01	01
Chemistry	-	-	-	-	-	01	-	-	-	-	01
Computer science	01	-	-	-	-	01	-	-	-	01	03
Education	-	-	-	-	-	01	-	-	-	-	01
Engineering	-	-	-	-	-	-	-	-	01	-	01
Law	01	-	-	-	-	-	-	-	-	-	01
Physics	-	-	-	-	-	-	-	-	-	01	01
Sociology	-	-	-	-	-	01	-	-	-	-	01
Technology	-	-	-	-	-	-	-	-	01	-	01
Total	02	-	-	-	-	04	-	01	02	03	12

Authors from computer science discipline contributed 3 articles during the study periods. Three computer scientists contributed one article in the year 2005, one article in the year 2010 contributed by two chemistry and one mathematician consider under chemistry discipline as chemistry was the first author. Again one article in the year 2014 contributed by three computer scientists and one biologist consider under computer science discipline.

4.4.2 Contributions by Non-LIS Authors in DJLIT

Contributions by non-LIS author(s) in DJLIT was more than other selected journals under study. Total 60 out of 450 articles were made by non-LIS scholars as shown in Table-4.24. In 2008, maximum number of contributions was come from non-LIS fields. Minimum across disciplinary contribution (i.e. 2) were in the year 2005 and 2010.

Table-4.24: Contributions by Non-LIS Authors in DJLIT

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	01	-	01	-	-	-	-	-	02
Archaeology	-	-	-	02	-	-	-	-	-	01	03
Biology	-	-	-	01	-	-	-	-	-	-	01
Computer science	02	02	01	01	01	02	04	04	01	02	20
Economics	-	-	-	-	-	-	-	01	-	-	01
Engineering	-	-	-	01	-	-	02	-	-	01	04
Knowledge	-	-	-	-	01	-	01	-	-	-	02
Law	-	-	03	02	-	-	-	-	-	-	05
Mathematics	-	01	-	-	-	-	01	-	-	-	02
Management	-	01	-	01	01	-	-	01	04	-	08
Medical science	-	-	01	-	-	-	-	01	-	-	02
Philosophy	-	-	-	02	-	-	-	-	-	-	02
Physics	-	-	-	02	-	-	-	-	-	-	02

Psychology	-	-	-	01	-	-	-	-	-	01	02
Science	-	-	-	-	-	-	-	-	01	-	01
Sociology	-	-	-	-	-	-	-	01	-	-	01
Technology	-	-	-	-	-	-	-	01	-	-	01
Zoology	-	-	-	01	-	-	-	-	-	-	01
Total	02	04	06	14	04	02	08	09	06	05	60

Authors from computer science published highest number of articles in DJLIT during the year 2005-2014 under study. Management scientists were the second highest contributors in LIS knowledge development as represented by DJLIT. Other non-LIS disciplines that input knowledge were law, engineering, archaeology, agriculture, mathematics, medical sciences, philosophy, physics, and psychology. Computer science experts contributed their knowledge in articles in DJLIT every year under study. It was found that 37 computer scientists contributed 20 articles, 11 management scientists contributed 8 articles in DJLIT during the year under study.

4.4.3 Contributions by Non-LIS Authors in IASLIC Bull

Contribution of non-LIS scholars found very low in IASLIC Bull. during 2005-2014. Only one article found to be contributed by the authors with Bengali literature background in IASLIC bulletin during the ten year study.

Table-4.25: Contributions by Non-LIS Authors in IASLIC Bull.

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Bengali literature	-	-	-	-	-	-	-	01	-	-	01
Total	-	-	-	-	-	-	-	01	-	-	01

4.4.4 Contributions by Non-LIS Authors in LH

Contributions by non-LIS scholars in LH were shown in Table-4.26. Across disciplinary contributions were low in LH in comparison to others selected source journals under study.

Table-4.26: Contributions by Non-LIS Authors in LH

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Education	01	-	-	-	-	-	-	02	-	-	03
Psychology	-	01	-	-	-	-	-	-	-	-	01
Public Administration	-	-	-	-	-	-	-	-	-	01	01
Total	01	01	-	-	-	-	-	02	-	01	05

Only six articles contributed by the authors from education, psychology and public administration. Out of which educationist contributed maximum (i.e. 4) articles in LH during the years of study. There was no symmetric distribution of contributions during ten years of study. In the year 2012, one article published by two educationist.

4.4.5 Contributions by Non-LIS Authors in SJIM

Authors from eight disciplines other than LIS made 17 contributions in SJIM during the years 2005-2014. In the year 2010, 7 articles contributed by different non-LIS authors. More contributions made by the non-LIS authors in the second half (2010-2014) of the study periods. Influence of computer science was significant which published 41.18% contributions in SJIM. Eleven

computer scientists contributed seven articles in SJIM during the study periods.

Management scientists contributed 3 articles during the ten years of study.

Computer science authors contributed five out of ten years of study periods.

Table-4.27: Contributions by Non-LIS Authors in SJIM

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Commerce	-	-	-	-	01	-	-	-	-	-	01
Computer science	01	-	-	01	02	01	-	-	02	-	07
Engineering	-	-	-	-	-	01	-	-	-	01	02
History	-	-	-	-	-	01	-	-	-	-	01
Knowledge & systems	-	-	-	-	-	01	-	-	-	-	01
Management	-	-	-	-	-	03	-	-	-	-	03
Medical science	-	-	-	-	-	-	-	-	01	-	01
Science	-	-	-	-	-	-	-	-	01	-	01
Total	01	-	-	01	03	07	-	-	04	01	17

Eleven computer scientists contributed seven articles, four management scientists contributed three articles, and three engineers contributed two articles in SJIM during the study periods.

4.4.6 Analysis of Contributions by Non-LIS Authors

Researchers from non-LIS disciplines also contributed their research result in the Indian LIS journals. Total 95 numbers of research articles were identified that have been contributed by non-LIS researchers in the LIS journals. Table-4.28 and Figure-4.3 shows that researchers from computer science contributed highest (31.58%) articles, followed by management

(11.58%), engineering (7.37%), law (6.32%), education (4.21%), archaeology (3.16%), knowledge & systems (3.16%), medical science (3.16%), physics (3.16%), and psychology (3.16%). Other disciplines contributed two or less articles in the five selected journals during the period of study.

Table-4.28: Distribution of Contributions by Non-LIS Authors

Disciplines	ALIS	DJLIT	IASLIC Bull	LH	SJIM	Total	Percentage	Rank
Agriculture	-	02	-	-	-	02	2.11	7
Archaeology	-	03	-	-	-	03	3.16	6
Bengali literature	-	-	01	-	-	01	1.05	8
Biology	-	01	-	-	-	01	1.05	8
Botany	01	-	-	-	-	01	1.05	8
Chemical engineering	01	-	-	-	-	01	1.05	8
Chemistry	01	-	-	-	-	01	1.05	8
Commerce	-	-	-	-	01	01	1.05	8
Computer science	03	20	-	-	07	30	31.58	1
Economics	-	01	-	-	-	01	1.05	8
Education	01	-	-	03	-	04	4.21	5
Engineering	01	04	-	-	02	07	7.37	3
History	-	-	-	-	01	01	1.05	8
Knowledge & systems	-	02	-	-	01	03	3.16	6
Law	01	05	-	-	-	06	6.32	4
Management	-	08	-	-	03	11	11.58	2
Mathematics	-	02	-	-	-	02	2.11	7
Medical science	-	02	-	-	01	03	3.16	6
Philosophy	-	02	-	-	-	02	2.11	7
Physics	01	02	-	-	-	03	3.16	6
Psychology	-	02	-	01	-	03	3.16	6
Public administration	-	-	-	01	-	01	1.05	8
Science	-	01	-	-	01	02	2.11	7
Sociology	01	01	-	-	-	02	2.11	7
Technology	01	01	-	-	-	02	2.11	7
Zoology	-	01	-	-	-	01	1.05	8
Total	12	60	01	05	17	95	100	

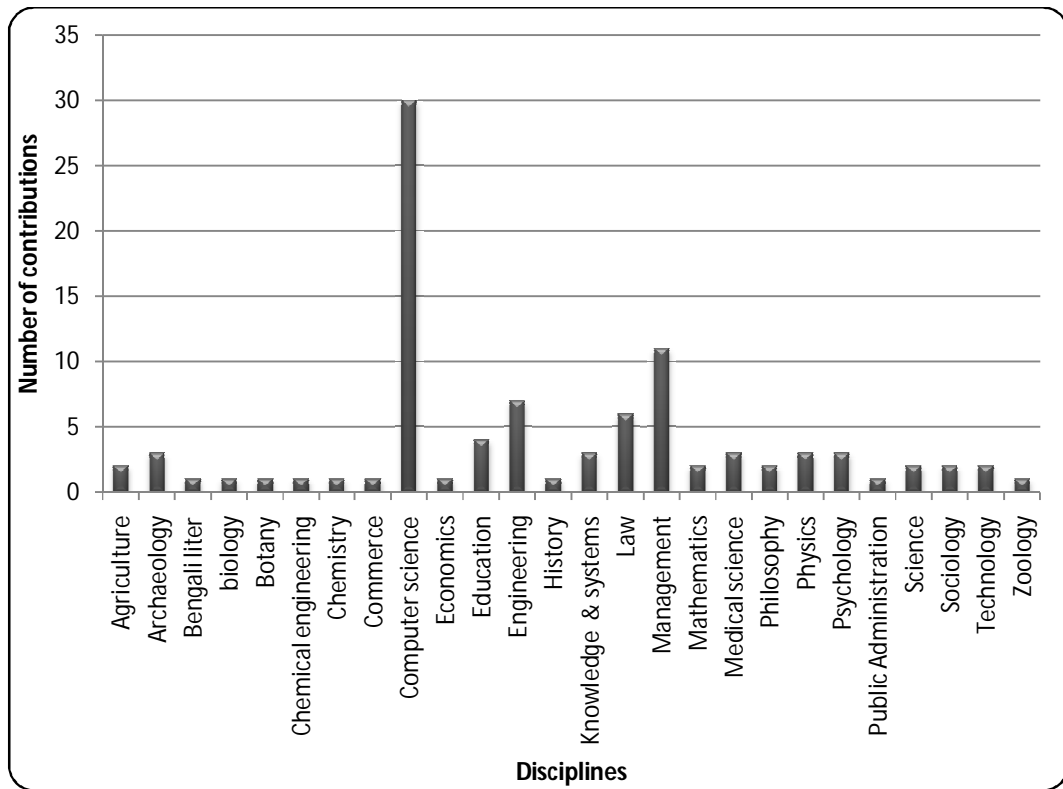


Figure-4.3: Contributions by Non-LIS Authors

4.5 Form of Cited Documents

Documents referred by the contributors of articles in ALIS during the year 2005-2014 were shown in Table-4.29. Table-4.29 revealed that journals citations were the high (61.99%), followed by books/book chapters (15.24%), web-resources (11.44%), conference publications (6.20%), and dissertations (1.63%). The web-resources include web documents such as web pages, web sites, online databases, etc. References such as study materials, annual report, syllabuses, news articles, course materials, workshop materials, brochure pre-

prints, editorials etc. were classed as other type of cited documents.

Table-4.29: Type of Documents Cited by ALIS

Documents	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Journals	155	222	194	294	444	497	384	235	545	557	3527
Books	60	49	66	77	54	194	94	61	137	75	867
Conference publications	06	30	28	24	28	70	35	39	38	55	353
Dissertations	-	05	03	04	13	14	10	19	14	11	93
Web-resources	05	17	25	84	30	138	98	92	69	93	651
Others	16	35	25	24	31	11	20	12	19	06	199
Total	242	358	341	507	600	924	641	458	822	797	5690

Table-4.30 listed the type of documents cited by the articles published in DJLIT during the year 2005-2014. Journals references were highly cited with 48.27% of total references. But web-resource citations occupied the second place with 22.67% references, followed by books (13.42%) and conference publications (9.67%) respectively. Other type of cited documents includes report, newspaper articles, guidelines, interviews etc.

Table-4.30: Type of Documents Cited by DJLIT

Documents	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Journals	57	116	141	201	198	269	552	350	382	489	2755
Books	19	50	85	91	56	100	92	82	105	86	766
Conference publications	29	53	44	68	28	99	89	51	48	43	552
Dissertations	03	03	01	05	01	02	04	02	11	11	43
Web-resources	45	47	37	164	99	157	140	296	98	211	1294
Others	12	22	34	24	24	36	19	63	30	33	297
Total	165	291	342	553	406	663	896	844	674	873	5707

Documents cited by the articles published in *IASLIC Bulletin* during 2005-2014 were shown in Table-4.31. Journals citations were maximum (45.33%) in *IASLIC Bulletin* during the study periods. Next cited documents were web-resources (22.37%), followed by books (20.44%), conference publications (5.99%). Few numbers (1.55%) of dissertations were also cited by *IASLIC Bulletin* during the study period.

Table-4.31: Type of Documents Cited by IASLIC Bulletin

Documents	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Journals	116	68	109	77	89	108	141	162	91	121	1082
Books	36	42	30	42	50	69	62	69	28	60	488
Conference publications	17	18	09	04	07	20	19	08	29	12	143
Dissertations	02	01	02	02	05	12	03	02	04	04	37
Web- resources	84	29	30	29	57	76	86	43	71	29	534
Others	08	22	03	05	16	16	06	09	05	13	103
Total	263	180	183	159	224	301	317	293	228	239	2387

Table-4.32 shows the types of documents cited by the contributors of articles published in LH during 2005-2014. It revealed that journals citations were the high with 48.16%, followed by books (21.45%), web-resources (15.44%), conference publications (6.65%) and other type of documents (6.69%). Web resources includes web pages, web sites, databases, blog etc. and other type of documents includes research proposals, annual report, newspapers articles, interviews, case studies, souvenir etc.

Table-4.32: Type of Documents Cited by LH

Documents	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Journals	41	162	103	87	144	90	111	84	232	228	1282
Books	49	102	59	45	43	54	67	54	44	54	571
Conference publications	03	28	06	05	19	36	14	18	33	15	177
Dissertations	01	09	03	01	05	04	13	01	03	03	43
Web-resources	12	49	46	17	34	27	48	56	50	72	411
Others	11	15	24	25	18	23	07	10	12	33	178
Total	117	365	241	180	263	234	260	223	374	405	2662

Types of documents cited by the articles published in SJIM shown in Table-4.33. Journals references were highly cited documents during the period with 2817 references (i.e. 46.98%), followed by books (20.13%), web-resources (19.55%), conference publications (7.59%), dissertations (1.47%). Other document includes CD- ROM, diary, information booklet, lectures notes, reports, interview, letters, newspapers articles etc.

Table-4.33: Type of Documents Cited by SJIM

Documents	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Journals	104	124	178	225	155	390	369	332	676	264	2817
Books	62	87	116	96	116	138	128	216	192	56	1207
Conference publications	28	41	28	25	46	52	67	57	83	28	455
Dissertations	07	02	04	10	05	16	16	11	12	05	88
Web-resources	84	78	73	90	97	219	205	119	131	76	1172
Others	21	17	17	26	37	35	16	39	33	16	257
Total	306	349	416	472	456	850	801	774	1127	445	5996

4.6 Analysis of Journal Citations

4.6.1 Analysis of Journals Cited by ALIS

Forty-two disciplines were identified for the journals references cited by articles published in ALIS during the year 2005 to 2014. Table-4.34 shows the subjects descriptors of the journals with citation frequency over the ten years. Computer science, education, engineering, management, mathematics, medical sciences, sociology were the continuously influencing disciplines.

Table-4.34: Main Class of Journals Cited by ALIS

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	01	-	-	01	03	02	01	-	03	-	11
American literature	-	-	-	01	-	-	-	-	-	-	01
Astronomy	-	-	-	-	-	-	02	-	-	-	02
Bibliographies	01	-	-	01	-	13	-	01	-	01	17
Biology	-	-	-	-	-	05	02	01	02	03	13
Botany	01	-	-	-	01	01	-	-	-	-	03
Chemical engineering	-	-	-	-	02	01	-	-	-	-	03
Chemistry	01	-	01	02	02	02	-	01	01	01	11
Communication	-	-	-	02	-	-	01	04	04	05	16
Computer science	06	03	03	10	07	11	14	07	11	30	102
Earth science	02	-	-	01	01	01	-	-	02	-	07
Economics	-	02	01	-	04	04	03	-	04	02	20
Education	05	04	04	02	10	13	08	09	18	04	77
Engineering	03	01	01	05	02	02	-	03	05	02	24
Ethics	-	-	-	-	-	-	01	-	-	-	01
Geography & travel	-	-	-	-	-	-	-	-	03	-	03
History	01	-	-	01	-	-	-	-	-	-	02
History of Asia	-	-	-	04	-	-	-	-	02	-	06
Home management	-	-	-	-	-	-	-	-	01	-	01

News media & publishing	03	-	-	-	01	01	-	01	02	07	15
Knowledge & systems	01	03	-	-	-	01	04	-	04	01	14
Language	-	-	-	02	-	-	-	-	-	-	02
Law	01	-	-	01	-	01	04	-	01	-	08
Literature	05	-	-	-	-	-	-	-	-	-	05
LIS	75	146	142	212	345	292	231	169	278	340	2230
Management	02	01	03	11	06	02	15	10	50	28	128
Manufacturing	-	-	-	-	-	-	-	-	01	-	01
Mathematics	-	-	01	-	-	01	01	-	01	01	05
Medical Science	01	04	05	05	03	29	20	05	45	06	123
Music	-	-	-	-	-	-	-	-	01	-	01
Paleontology	-	-	-	-	01	-	-	-	-	-	01
Physics	-	02	01	05	01	02	-	-	-	02	13
Political science	-	01	-	01	-	-	-	-	-	-	02
Psychology	01	02	-	-	09	01	06	-	07	04	30
Public administration	-	-	-	-	01	01	-	-	-	-	02
Science	42	49	26	21	35	102	56	19	67	109	526
Social problems & services	-	-	-	-	01	-	02	01	07	-	11
Social Science	-	03	-	03	-	02	05	02	08	04	27
Sociology	01	01	06	03	04	05	05	02	12	02	41
Sports & recreation	-	-	-	-	-	-	-	-	-	01	01
Technology	02	-	-	-	01	-	01	-	-	-	04
Zoology	-	-	-	-	01	-	-	-	-	-	01
Unidentified	-	-	-	-	03	02	02	-	05	04	16
Total	155	222	194	294	444	497	384	235	545	557	3527

Most of the non-LIS journals references were from science in general discipline (14.91%), followed by management (3.63%), medical science (3.49%), computer science (2.89%), and education (2.18%). Rest of the non-LIS disciplines contributed less than two percent of the total.

4.6.2 Analysis of Journals Cited by DJLIT

During the study period, 2755 journals references were cited by the contributors of DJLIT out of which four were unidentified. Table-4.35 shows the disciplines of journals cited by the DJLIT authors. It was revealed from the study that near about 41% references were from non-LIS disciplines. Science was the highest (i.e. 11.62%) contributory discipline among all the non-LIS disciplines.

Table-4.35: Main Class of Journals Cited by DJLIT

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	-	-	-	-	-	-	01	03	04
American literature	-	-	-	01	-	-	-	-	-	-	01
Anthropology	-	-	-	-	-	-	-	-	-	01	01
Architecture	-	-	-	-	-	-	-	-	01	-	01
Arts	-	-	-	-	-	-	-	-	-	01	01
Astronomy	-	-	-	-	-	-	-	-	01	-	01
Bibliographies	-	-	-	-	-	-	-	-	01	02	03
Biology	01	-	-	-	-	-	04	01	-	06	12
Botany	-	-	-	-	-	03	01	-	-	-	04
Chemical engineering	-	-	-	01	-	-	-	-	-	-	01
Chemistry	-	-	-	01	-	-	02	04	01	01	09
Communication	-	-	-	01	-	-	03	01	-	-	05
Computer science	17	13	16	31	16	14	91	19	15	28	260
Earth Science	-	-	-	-	03	-	-	-	-	-	03
Economics	-	-	-	02	01	02	08	04	-	06	23
Education	02	01	03	05	07	12	20	06	07	17	80
Engineering	03	03	02	01	07	02	03	04	01	04	30
Ethics	-	-	-	-	01	-	-	-	-	-	01
History	-	-	-	-	-	-	-	01	-	-	01
News media & publishing	-	-	-	-	01	06	-	06	-	05	18
Knowledge &	-	-	02	01	-	02	04	01	-	01	11

System											
Language	-	-	-	-	-	-	01	02	01	-	04
Law	-	-	05	-	-	-	05	01	-	02	13
Linguistics	-	-	-	-	-	04	-	-	-	03	07
LIS	20	78	60	98	124	182	251	249	287	273	1622
Literature	-	-	-	-	-	01	-	-	-	-	01
Management	03	02	20	17	03	11	19	05	05	08	93
Mathematics	-	-	-	-	01	-	05	-	01	01	08
Medical science	02	02	-	06	08	01	15	01	27	34	96
Organizations & museums	-	-	-	-	-	-	-	-	03	-	03
Painting	01	-	-	-	-	-	-	-	-	-	01
Philosophy	-	-	-	-	-	-	01	-	-	-	01
Physics	-	03	03	-	-	05	04	-	-	-	15
Political science	-	-	-	01	-	-	-	-	-	01	02
Psychology	01	01	01	-	02	01	03	-	01	15	25
Public Administration	-	-	-	01	-	-	-	01	-	01	03
Science	07	12	26	31	20	20	102	16	23	63	320
Social problems & services	-	-	-	01	-	-	01	02	01	02	07
Social Sciences	-	-	01	-	01	02	04	04	04	06	22
Sociology	-	01	-	-	-	-	02	03	01	04	11
Technology	-	-	02	01	03	-	01	19	-	-	26
Zoology	-	-	-	-	-	01	-	-	-	-	01
Unidentified	-	-	-	01	-	-	02	-	-	01	04
Total	57	116	141	201	198	269	552	350	382	489	2755

The other non-LIS disciplines that made contribution in LIS publication were computer science (9.44%), medical science (3.48%), management (3.38%), education (2.9%), engineering (1.09%), and 35 disciplines contributing less than 1%. It also identified that computer science, education, engineering, management, science were contributing throughout the study period. Medical science contributed 9 out of 10 years of study.

4.6.3 Analysis of Journals Cited by IASLIC Bulletin

During the 2005-2014, 1082 journal references were cited by the authors contributed in *IASLIC Bulletin*. Twenty-two disciplines of the cited journals were identified during the study periods. Most of the references (74.58%) were from LIS journals. The next contributions came from science journals (6.65%), followed by computer science (4.07%), education (3.23%), management (2.96%), medical science (2.59%). Table-4.36 shows that in the year 2009, rate of non-LIS articles were more (38.2%) than of the other years and in the year 2013, lowest numbers (9.9%) of non-LIS articles cited by the contributors of *IASLIC Bulletin*. But the second half of the study period (2010-2014) cited 56.73% articles published in non-LIS journals

Table-4.36: Main Class of Journals Cited by IASLIC Bulletin

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Chemistry	-	-	-	-	-	-	-	-	01	02	03
Communication	-	-	-	-	-	-	-	-	-	01	01
Computer science	08	02	01	02	03	03	13	08	-	04	44
Economics	01	01	-	01	-	01	-	-	-	08	12
Education	01	03	-	04	02	09	05	02	03	06	35
Engineering	-	01	-	-	-	02	01	02	-	-	06
Geography & travel	-	-	-	-	-	01	-	-	-	01	02
History	-	-	02	-	-	-	-	-	-	-	02
History of Asia	-	01	-	-	-	-	-	-	-	-	01
History of North America	-	-	-	-	-	-	-	-	01	-	01
News media & publishing	01	-	02	-	-	01	-	-	02	-	06
Law	-	-	01	-	-	-	-	-	-	04	05
LIS	98	43	83	61	55	83	92	127	82	83	807

Management	01	01	04	02	04	03	03	13	-	01	32
Medical science	01	-	04	01	03	-	11	05	02	01	28
Political Science	01	-	01	-	-	-	-	-	-	-	02
Psychology	-	-	-	-	05	-	-	02	-	-	07
Religion	-	-	-	-	-	-	-	-	-	02	02
Science	01	15	10	04	15	04	14	03	-	06	72
Social Science	01	01	-	02	02	-	01	-	-	02	09
Sociology	01	-	-	-	-	01	01	-	-	-	03
Technology	-	-	01	-	-	-	-	-	-	-	01
Unidentified	01	-	-	-	-	-	-	-	-	-	01
Total	116	68	109	77	89	108	141	162	91	121	1082

4.6.4 Analysis of Journals Cited by LH

During the year 2005-2014, contributors in LH referred 1,282 number of journal references. Table-4.37 shows the distributions of thirty-six disciplines of the cited journals. The most contributing discipline was LIS (63.11%), followed by education (8.74%), science (4.52%), medical science (3.74%), management (3.12%), and computer science (3.04%).

Table-4.37: Main Class of Journals Cited by LH

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	01	02	01	-	01	-	-	-	-	05
American literature	-	-	-	-	-	-	-	-	-	01	01
Arts	-	-	-	-	-	-	-	-	-	01	01
Biology	-	-	-	-	-	-	-	01	-	-	01
Chemical engineering	-	-	-	-	-	-	-	01	01	-	02
Communication	-	-	-	-	-	-	02	-	-	-	02
Computer science	03	01	01	02	08	01	03	01	10	09	39
Economics	-	03	07	-	-	03	-	-	03	05	21

Education	02	30	09	07	05	04	06	07	18	24	112
Engineering	-	02	-	-	01	02	-	-	-	01	06
Ethics	-	-	-	-	-	-	-	-	-	04	04
Geography & travel	-	-	-	-	-	01	-	-	-	-	01
History	-	-	01	-	-	-	-	-	-	-	01
History of Africa	-	-	-	-	-	01	-	-	-	-	01
History of Asia	-	-	-	-	-	-	01	-	-	-	01
Indic literature	-	-	-	-	-	-	01	-	-	-	01
Knowledge & systems	-	-	-	-	-	-	-	-	01	02	03
Law	-	-	-	-	-	-	04	-	-	06	10
Linguistics	-	-	01	-	-	-	-	-	-	-	01
LIS	23	101	56	65	117	69	70	49	138	121	809
Literature	-	-	-	-	02	-	-	-	-	-	02
Management	08	14	01	01	-	02	02	-	06	06	40
Mathematics	-	-	-	-	-	-	01	-	-	-	01
Medical science	01	02	07	01	02	01	03	11	13	07	48
News media & publishing	-	-	01	01	01	-	01	01	02	12	19
Physics	-	-	-	-	-	-	-	-	01	-	01
Political Science	-	01	-	-	-	-	-	-	-	-	01
Psychology	01	02	06	-	02	01	03	03	01	01	20
Public Administration	-	01	-	-	-	-	-	-	01	-	02
Religion	-	-	-	-	-	-	04	-	-	-	04
Science	01	01	03	01	05	-	08	07	19	13	58
Social Science	01	02	-	02	01	01	01	01	05	06	20
Social problems & services	-	-	01	-	-	-	-	-	09	01	11
Sociology	-	01	07	03	-	03	01	-	-	01	16
Technology	01	-	-	-	-	-	-	-	01	06	08
Unidentified	-	-	-	03	-	-	-	02	03	01	09
Total	41	162	103	87	144	90	111	84	232	228	1282

The contribution of non-LIS disciplines as represented by journal citations were highest (46.93%) in the year 2014 and lowest (25.29%) in the year 2009. Again, non-LIS contribution in the second half of the study period

(2010-2014) contributed 63%, whereas first half (2005-2009) of the study period contributed only 37%. Computer science, education, and medical science disciplines contributed knowledge in LIS articles publications in all the year under study i.e. 2005-2014. Psychology, science in general, and social science journals has contributed knowledge in 9 out of 10 years under study and Management disciplines contributed 8 out of 10 years under study.

4.6.5 Analysis of Journals Cited by SJIM

During the year 2005-2014, 2,817 journal references were cited by the contributors of the SJIM. Total thirty-nine disciplines were identified for the cited journals during the study periods and shown in Table-4.38. Most of the cited articles were from LIS (70.22%) discipline, followed by science in general (7.85%), management (5.15%), computer science (3.34%), Education (2.7%), medical science (2.59%). Near about 30% cited articles were from non-LIS disciplines. Computer science, education, management, science in general was contributed continuously in all the year under study.

Table-4.38: Main Class of Journals Cited by SJIM

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	03	-	-	02	-	02	-	01	-	08
Anthropology	-	-	-	-	-	-	-	-	01	-	01
Bibliographies	01	-	01	-	-	-	-	-	02	-	04
Biology	-	-	-	-	-	-	01	01	05	01	08
Botany	-	-	-	-	-	-	-	01	-	-	01
Chemical engineering	-	-	-	-	-	-	-	-	01	01	02
Chemistry	-	-	-	-	-	-	-	-	02	02	04

Communication	-	-	-	-	-	01	-	-	01	-	02
Computer science	13	15	02	09	13	11	02	08	08	13	94
Earth science	-	-	-	-	-	-	-	-	01	-	01
Economics	01	02	03	01	-	09	03	04	-	04	27
Education	02	03	07	16	08	16	02	06	05	11	76
Engineering	01	-	02	03	-	04	-	02	04	01	17
Ethics	-	-	-	01	-	-	-	-	01	-	02
Geography & travel	-	-	-	-	-	-	-	-	01	01	02
History	-	-	-	01	-	-	-	-	-	01	02
News media & publishing	04	02	05	-	01	04	01	04	-	-	21
Knowledge & systems	02	-	-	-	-	-	-	-	03	03	08
Language	-	-	-	-	-	-	-	01	01	-	02
English language	-	-	-	-	-	-	-	-	01	-	01
Linguistics	-	-	-	-	-	-	-	-	03	-	03
Law	-	-	-	-	-	-	03	04	01	03	11
Literature	-	-	02	-	-	-	05	01	-	01	09
Indic literatures	-	-	-	-	-	02	-	-	01	-	03
LIS	63	79	127	140	103	268	298	268	453	179	1978
Management	02	06	02	30	19	35	20	03	26	02	145
Mathematics	-	-	-	-	-	-	01	-	02	01	04
Medical science	-	-	-	03	01	03	05	13	35	13	73
Philosophy	-	-	-	-	-	-	-	01	08	-	09
Physics	-	-	-	-	-	01	-	-	05	-	06
Political science	-	01	-	-	-	-	-	01	-	-	02
Psychology	-	02	-	-	03	03	01	01	-	01	11
Public Administration	-	01	-	-	-	-	01	-	01	-	03
Religion	-	-	-	-	01	-	-	-	-	-	01
Science	13	10	26	17	03	27	10	06	91	18	221
Social Sciences	-	-	-	02	-	-	-	04	01	01	08
Sociology	-	-	-	-	-	02	08	01	06	03	20
Social problems & services	01	-	-	02	-	-	01	01	02	02	09
Technology	-	-	-	-	01	04	03	-	03	-	11
Unidentified	01	-	01	-	-	-	02	01	-	02	07
Total	104	124	178	225	155	390	369	332	676	264	2817

4.6.6 Comparative Analysis of Journal Citations

Fifty-four disciplines of cited journals references were identified that were contributed knowledge in LIS publications. Table-4.39 shows these disciplines according to their contributions as referred in the five Indian LIS journal under study i.e. *ALIS*, *DJLIT*, *IASLIC Bull*, *LH*, and *SJIM* during the period January, 2005 to December, 2014. LIS was the highest contributing discipline with 65.17% journal references. There was 44.83% non-LIS journals citation that contributed in the articles published in five selected LIS journals during the study periods. Science in general was the second highest contributing discipline with 10.47% references, followed by computer science (4.72%), management (3.83%), education (3.33%), medical science (3.22%), economics (0.9%), and psychology (0.81%). Again, it was found that the disciplines communication, computer science, economics, education, engineering, history, management, medical sciences, news media & publishing, political science, psychology, science in general, social sciences in general, sociology, and technology were contributed to the literature of LIS irrespective of journal studied. Most of the cited journals are belongs to science (DCC 500-599) and technology (DCC 600-699) classes other than LIS. Communication, computer science, economics, education, engineering, history, law, management, medical science, news media & publishing, political science, psychology, science, social sciences, sociology, and technology were most influencing disciplines contributed in all the selected source journals in respects of cited journal articles.

Table-4.39: Discipline-wise Distribution of Journal Citations

Disciplines	ALIS	DJLIT	IASLIC Bull	LH	SJIM	Total	Percentage	Rank
Agriculture	11	04	-	05	08	28	0.245	19
American literature	01	01	-	01	-	03	0.026	31
Anthropology	-	01	-	-	01	02	0.018	32
Architecture	-	01	-	-	-	01	0.009	33
Arts	-	01	-	01	-	02	0.018	32
Astronomy	02	01	-	-	-	03	0.026	31
Bibliographies	17	03	-	-	04	24	0.210	22
Biology	13	12	-	01	08	34	0.298	18
Botany	03	04	-	-	01	08	0.070	28
Chemical engineering	03	01	-	02	02	08	0.070	28
Chemistry	11	09	03	-	04	27	0.236	20
Communication	16	05	01	02	02	26	0.228	21
Computer science	102	260	44	39	94	539	4.717	3
Earth science	07	03	-	-	01	11	0.096	25
Economics	20	23	12	21	27	103	0.901	7
Education	77	80	35	112	76	380	3.326	5
Engineering	24	30	06	06	17	83	0.726	11
English language	-	-	-	-	01	01	0.009	33
Ethics	01	01	-	04	02	08	0.070	28
Geography & travel	03	-	02	01	02	08	0.070	28
History	02	01	02	01	02	08	0.070	28
History of Africa	-	-	-	01	-	01	0.009	33
History of Asia	06	-	01	01	-	08	0.70	28
History of North America	-	-	01	-	-	01	0.009	33
Home management	01	-	-	-	-	01	0.009	33
Indic literatures	-	-	-	01	03	04	0.035	30
Knowledge & systems	14	11	-	03	08	36	0.315	16
Language	02	04	-	-	02	08	0.070	28
Law	08	13	05	10	11	47	0.411	14
Linguistics	-	07	-	01	03	11	0.096	25
LIS	2230	1622	807	809	1978	7446	65.167	1
Literature	05	01	-	02	09	17	0.149	24

Management	128	93	32	40	145	438	3.833	4
Manufacturing	01	-	-	-	-	01	0.009	33
Mathematics	05	08	-	01	04	18	0.158	23
Medical science	123	96	28	48	73	368	3.221	6
Music	01	-	-	-	-	01	0.009	33
News media & publishing	15	18	06	19	21	79	0.691	12
Organizations & museums	-	03	-	-	-	03	0.026	31
Painting	-	01	-	-	-	01	0.009	33
Paleontology	01	-	-	-	-	01	0.009	33
Philosophy	-	01	-	-	09	10	0.088	26
Physics	13	15	-	01	06	35	0.306	17
Political science	02	02	02	01	02	09	0.079	27
Psychology	30	25	07	20	11	93	0.814	8
Public administration	02	03	-	02	03	10	0.088	26
Religion	-	-	02	04	01	07	0.061	29
Science	526	320	72	58	221	1197	10.476	2
Social problems & services	11	07	-	11	09	38	0.333	15
Social sciences	27	22	09	20	08	86	0.753	10
Sociology	41	11	03	16	20	91	0.796	9
Sports & recreation	01	-	-	-	-	01	0.009	33
Technology	04	26	01	08	11	50	0.438	13
Zoology	01	01	-	-	-	02	0.018	32
Total	3511	2751	1081	1273	2810	11426	100	

Figure-4.4 indicates the citation trend over ten years of study. The trend line (as per appendix-3) by least squares equation clearly indicates the positive trend in the uses of non-LIS journal citation in LIS publications. Year-wise distribution of disciplines of the cited journals citations (as per appendix-2) reveals that computer science, economics, education, engineering, management, medical science, news media & publishing, science in general, social science in general, sociology, were the disciplines having influence in LIS publication in

all the ten years under study. Again agriculture, chemistry, knowledge & systems, psychology, technology contributed in LIS in nine out of ten years of study.

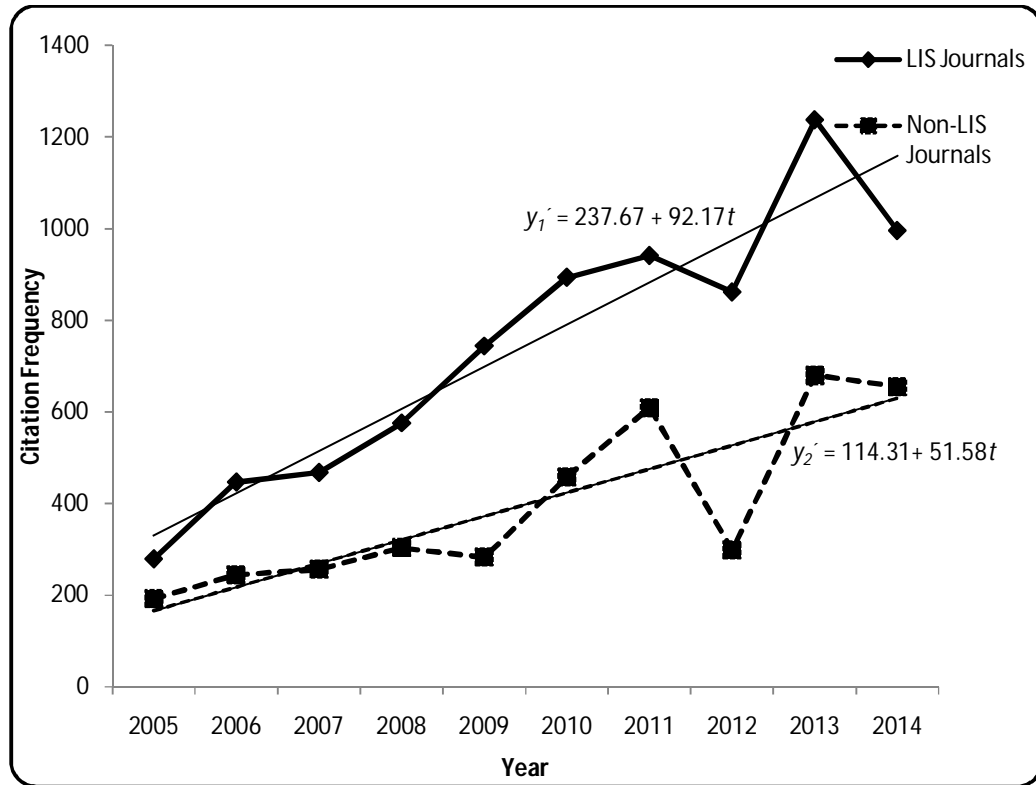


Figure-4.4: Trend Analysis of Journal Citations

4.7 Analysis of Book Citations

4.7.1 Analysis of Books Cited by ALIS

All books that were cited by *ALIS* were grouped into forty-two subject classes. Table-4.40 shows the frequency distribution of the disciplines of cited books. Books of non-LIS disciplines influenced LIS research articles very much. It was found that 51.1% cited books were from non-LIS disciplines.

Library and information science (48.9%) is the most cited class, and followed by computer science (7.38%), management (6.95%), Indic literature (5.42%), science in general (4.26%), education (3.69%), sociology (3.69%). Computer science and management were found to be the only disciplines that contributed to the literature of LIS every year during the ten years of this study.

Table-4.40: Main Class of Books Cited by ALIS

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	02	-	-	03	01	-	-	01	07
American literature	-	-	-	-	-	-	-	-	-	01	01
Anthropology	-	-	-	01	01	-	-	-	-	-	02
Bibliographies	-	03	-	03	-	-	03	-	03	01	13
Biology	-	-	-	-	-	01	-	-	-	-	01
Botany	-	-	01	-	01	-	02	-	-	-	04
Chemical engineering	-	-	-	-	-	01	-	-	-	-	01
Chemistry	01	-	-	-	-	-	-	-	-	03	04
Commerce	-	-	-	-	-	-	-	-	-	01	01
Computer science	05	01	03	06	01	15	22	02	04	05	64
Economics	01	-	-	-	02	03	02	03	01	-	12
Education	03	01	04	-	05	04	05	03	02	05	32
Encyclopedias	-	01	-	-	-	-	-	01	-	-	02
Engineering	-	-	-	02	-	-	-	-	-	-	02
English language	-	02	02	-	03	-	-	-	-	03	10
Ethics	-	-	-	-	-	-	02	-	-	01	03
History	-	-	-	-	-	-	-	01	-	-	01
History of Asia	02	-	-	01	-	-	-	-	-	-	03
History of New Zealand	-	-	-	01	-	-	-	-	-	-	01
Indic languages	-	-	-	-	-	-	-	02	-	-	02
Indic literatures	08	-	-	-	01	-	06	11	21	-	47
Knowledge & systems	-	-	01	03	02	06	01	03	04	01	21
Language	-	-	-	01	-	-	-	-	-	04	05
Law	-	-	-	06	-	-	01	-	-	-	07

Linguistics	-	-	-	-	-	01	-	-	03	02	06
LIS	29	25	45	46	22	125	26	25	45	36	424
Management	03	03	02	02	08	06	08	02	23	03	60
Mathematics	01	01	-	-	-	-	-	02	01	01	06
Medical Science	-	-	03	-	01	03	-	-	01	-	08
News media & publishing	-	-	-	02	-	01	-	-	02	01	06
Organizations & museums	-	-	01	-	-	-	01	-	-	-	02
Philosophy	-	-	-	-	-	-	-	-	01	-	01
Physics	02	03	-	-	-	-	01	-	-	-	06
Political science	-	-	-	-	03	-	-	-	-	-	03
Psychology	01	04	-	01	-	-	-	01	07	-	14
Public administration	-	01	-	-	-	-	-	-	02	-	03
Religion	-	-	-	01	-	-	-	-	-	-	01
Science	03	02	02	-	01	18	04	01	04	02	37
Social problems & services	-	-	-	-	-	-	01	-	01	-	02
Social Science	-	01	-	-	01	01	01	01	01	-	06
Sociology	01	01	-	01	02	04	07	03	09	04	32
Sports & recreation	-	-	-	-	-	-	-	-	01	-	01
Unidentified	-	-	-	-	-	02	-	-	01	-	03
Total	60	49	66	77	54	194	94	61	137	75	867

Three disciplines: education, science in general, sociology cited in nine years out of the ten years of the study. Computer science was the highest cited discipline among the non-LIS disciplines. Contributions from computer science were relatively high (75%) during the second half (2010-2014) of the whole study periods. Similar result found in the case of management where 70% management books were cited during the second half (2010-2014) of ten years of study. It implied that during more recently LIS professionals are depending on the knowledge outside their own domain.

4.7.2 Analysis of Books Cited by DJLIT

Thirty-seven main classes of the books cited by DJLIT were identified. Table-4.41 shows the details list of contributing disciplines in LIS literatures published in DJLIT during 2005-2014. 47.65% books were of LIS disciplines and rests (i.e. 52.35%) were of non-LIS disciplines. Computer science (15.14%) was the highest contributing disciplines, followed by education (7.44%), management (6.4%), law (4.44%), and science (1.83%). Computer science was the only discipline that referred every year by the contributors of DJLIT. Education, management, science in general was the disciplines contributing atleast eight years of the ten years of this study. Computer science was cited relatively high (61.21%) during the second half (2010-2014) of the study periods. 57% non-LIS books were cited in the second half of the study periods.

Table-4.41: Main Class of Books Cited by DJLIT

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	-	01	01	-	-	05	-	01	08
American literature	-	-	-	-	-	-	-	-	01	-	01
Bibliographies	-	-	-	01	-	-	-	-	-	-	01
Biology	-	-	-	-	-	01	02	02	-	-	05
Botany	-	-	-	-	-	08	-	-	-	-	08
Chemistry	-	-	-	-	-	-	-	02	-	-	02
Commerce	-	-	01	-	-	-	-	-	-	-	01
Computer science	07	02	15	13	08	01	32	10	05	23	116
Economics	-	02	01	02	-	01	02	03	01	-	12
Education	-	06	02	02	08	13	10	07	04	05	57
Encyclopedias	01	-	-	-	-	-	-	-	01	01	03

Engineering	-	-	-	-	-	05	01	-	-	-	06
English language	-	-	-	01	-	-	-	-	-	-	01
History of Asia	-	-	-	-	-	02	-	-	-	01	03
Knowledge & systems	-	-	-	02	-	-	02	-	-	02	06
Language	-	-	-	-	-	-	-	-	-	01	01
Law	-	-	25	04	01	-	-	03	-	-	33
Linguistics	-	-	-	-	-	-	-	-	-	02	02
LIS	11	35	16	43	23	59	29	39	79	31	365
Literature	-	-	-	01	-	-	01	-	-	-	02
Management	-	-	14	09	04	07	04	05	02	04	49
Mathematics	-	01	02	01	04	-	-	-	03	-	11
Medical Science	-	-	-	-	-	-	02	-	-	02	04
Organizations & museums	-	-	-	03	-	-	-	-	05	02	10
Paintings	-	-	-	-	02	-	-	-	-	-	02
Philosophy	-	-	-	-	-	-	-	01	-	-	01
Physics	-	02	02	02	01	-	01	-	-	-	08
Political science	-	-	-	01	-	-	-	-	-	-	01
Psychology	-	-	-	-	01	01	-	-	01	03	06
Public administration	-	-	-	01	-	-	-	-	-	-	01
News media & publishing	-	-	-	01	-	-	-	03	-	-	04
Science	-	01	-	01	03	01	03	01	02	02	14
Social science	-	01	-	-	-	-	-	-	01	01	03
Social problems & services	-	-	01	-	-	-	-	-	-	01	02
Sociology	-	-	02	02	-	-	03	-	-	03	10
Technology	-	-	04	-	-	-	-	01	-	-	05
Zoology	-	-	-	-	-	01	-	-	-	-	01
Unidentified	-	-	-	-	-	-	-	-	-	01	01
Total	19	50	85	91	56	100	92	82	105	86	766

4.7.3 Analysis of Books Cited by IASLIC Bulletin

Distribution of thirty-four disciplines of the cited books was shown in

Table-4.42. LIS identified as most contributing discipline with 60% book citations. Management (11.48%) was the most contributing discipline among the non-LIS group. Other than management, education (4.3%), computer science (3.28%), science (2.25%), and news media & publishing (2.05%) were the significant contributing disciplines. In the year 2012, contribution of non-LIS disciplines was highest (69.57%) and lowest in the year 2014 with 30% books citations. But it was revealed from the Table-4.42 that more non-LIS books (62.44%) were referred in the second half (2010-2014) of the study period than the first half study period.

Table-4.42: Main Class of Books Cited by IASLIC Bulletin

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	01	-	-	-	01	-	-	-	-	02
Anthropology	-	01	-	-	-	-	-	-	-	-	01
Bibliographies	-	-	-	06	-	-	01	-	-	-	07
Biology	-	-	-	-	-	-	-	-	-	01	01
Communication	-	-	-	-	-	01	-	-	-	-	01
Computer science	06	-	02	02	-	-	05	-	01	-	16
Economics	-	-	-	-	-	02	-	-	-	-	02
Education	-	03	-	01	03	04	04	03	-	03	21
Encyclopedias	-	-	-	-	-	-	01	01	01	-	03
Engineering	-	-	-	-	01	-	-	-	-	-	01
English language	-	-	01	-	02	-	01	-	-	01	05
English literature	-	-	-	-	-	-	-	-	01	-	01
Geography & travel	-	01	-	-	-	-	-	01	-	-	02
History	-	-	-	-	-	-	-	01	01	-	02
History of Asia	-	-	-	-	01	-	01	-	02	-	04
History of Europe	-	-	-	-	-	-	-	-	01	-	01
Indic literatures	-	-	-	02	-	-	-	05	-	02	09
Knowledge & systems	-	-	-	-	02	-	-	01	-	-	03
Language	03	-	-	-	-	01	-	-	-	-	04

Law	-	-	01	-	-	-	-	05	-	-	06
LIS	24	32	20	17	30	41	37	21	19	42	283
Management	-	02	04	04	01	09	07	22	02	05	56
Mathematics	-	-	-	-	-	01	01	01	-	-	03
Medical Science	-	-	-	-	03	-	-	01	-	02	06
News media & publishing	-	-	-	05	-	05	-	-	-	-	10
Philosophy	01	-	-	-	-	-	-	-	-	-	01
Physics	-	-	-	-	01	-	-	-	-	-	01
Psychology	-	01	-	-	04	02	01	-	-	-	08
Public administration	-	-	01	-	-	-	-	-	-	-	01
Religion	-	01	-	-	-	-	-	-	-	01	02
Science	01	-	-	05	-	01	02	-	-	02	11
Social science	01	-	-	-	01	-	-	-	-	01	03
Social problems & services	-	-	-	-	01	01	-	02	-	-	04
Sociology	-	-	01	-	-	-	01	05	-	-	07
Total	36	42	30	42	50	69	62	69	28	60	488

4.7.4 Analysis of Books Cited by LH

Total thirty disciplines of the books cited by LH were identified that had contributed knowledge in LIS publications. Table-4.43 shows subject disciplines of the cited books referred in LH during the study periods. Most of the cited books were from LIS (49.56%) discipline. Management (8.58%) was the highly contributing discipline among all non-LIS disciplines. Other significantly influencing disciplines were education (7.01%), law (4.55%), English language (4.2%), computer science (2.98%), and sociology (2.45%) as reflected in LH publications. Maximum number of non-LIS books (71.43%) referred in the year 2005 and minimum number of non-LIS books (29.41%)

referred in the year 2006. Second half of the study periods (2010-2014) were more influenced by non-LIS disciplines with 57.6% citations.

Table-4.43: Main Class of Books Cited by LH

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	-	-	-	-	-	02	-	05	07
Architecture	-	-	-	-	-	01	-	-	-	-	01
Communication	-	-	-	-	02	-	01	-	02	-	05
Computer science	02	05	02	02	03	-	01	-	-	02	17
Economics	-	01	01	-	-	-	02	-	-	-	04
Education	03	06	02	02	-	04	02	02	12	07	40
Encyclopedias	-	-	-	-	01	03	-	-	-	-	04
Engineering	-	-	-	-	-	-	-	-	-	01	01
English language	01	-	-	05	-	02	02	14	-	-	24
English literature	-	-	-	-	-	01	-	01	-	-	02
Ethics	-	-	-	-	-	-	-	-	-	10	10
Geography & travel	-	-	-	01	-	-	-	-	-	-	01
History of Asia	-	-	-	03	-	02	-	-	-	01	06
Home management	-	-	-	-	-	-	-	-	-	02	02
Indic literatures	-	-	-	-	01	-	-	-	-	-	01
Knowledge & systems	09	-	-	-	01	01	-	-	01	-	12
Law	-	01	02	05	05	02	04	-	-	07	26
LIS	14	70	44	19	26	29	34	08	23	16	283
Literature	-	-	-	-	-	-	-	05	-	01	06
Management	12	10	-	03	-	04	15	01	02	02	49
Medical science	-	-	06	-	-	-	-	01	01	-	08
News media & publishing	-	01	01	-	-	-	01	05	-	-	08
Political science	-	-	-	-	02	-	-	01	-	-	03
Psychology	-	03	-	-	-	03	02	-	-	-	08
Religion	-	-	-	-	-	01	-	07	-	-	08
Science	01	03	-	-	01	-	-	04	01	-	10

Social science	01	-	-	-	-	-	-	01	02	-	04
Social problems & services	-	-	-	01	-	-	-	-	-	-	01
Sociology	06	-	-	02	01	01	03	01	-	-	14
Technology	-	-	-	-	-	-	-	01	-	-	01
Unidentified	-	02	01	02	-	-	-	-	-	-	05
Total	49	102	59	45	43	54	67	54	44	54	571

4.7.5 Analysis of Books Cited by SJIM

During the year of study, forty-six disciplines of the cited books were identified that were referred by the authors published articles in SJIM. Most of the books (44.9%) were from LIS discipline which implied that 55.1% books were from non-LIS disciplines. Management was the highly influencing discipline with 9.36% books citations during the study periods in SJIM. Other non-LIS disciplines that influenced the publications in SJIM were Indic literature (7.54%), computer science (5.88%), education (3.81%), economics (2.24%), law (2.24%), science (2.24%), and sociology (2.15%). In the year 2012, the volume of non-LIS books citation was high (69.9%) and in the year 2009 the same was 40.52%. It was evident from the Table-4.44 that the books from non-LIS disciplines were more (62.72%) contributing during the second half of the study periods.

Table-4.44: Main Class of Books Cited by SJIM

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	02	-	01	-	-	-	02	03	-	-	08
American literature	-	01	-	-	-	-	-	-	-	-	01
Anthropology	-	-	-	-	-	-	-	02	-	-	02

Bibliographies	-	-	-	-	-	-	02	02	01	01	06
Biology	-	-	-	-	-	-	01	01	-	-	02
Botany	-	-	-	-	-	-	-	01	-	-	01
Chemistry	-	-	02	-	-	-	-	-	-	-	02
Communication	-	-	-	-	-	-	01	01	-	-	02
Computer science	23	05	02	03	01	07	07	09	06	08	71
Customs & folklore	-	-	-	-	-	-	-	-	01	-	01
Decorative arts	-	-	-	-	-	-	-	-	01	-	01
Earth science	-	-	-	02	01	-	-	-	-	-	03
Economics	01	-	-	02	07	08	02	01	01	05	27
Education	03	02	-	07	13	08	05	06	-	02	46
Encyclopedias	-	-	-	-	-	-	-	02	02	-	04
Engineering	-	-	03	-	-	08	01	01	02	-	15
English language	-	-	01	-	02	01	02	01	-	-	07
English literature	-	-	01	-	-	01	-	01	01	-	04
Geography & travel	-	-	-	-	-	01	01	01	-	01	04
Home management	-	-	-	-	-	-	-	01	-	-	01
History	-	-	01	01	04	-	-	-	-	-	06
History of Asia	-	01	02	-	-	-	01	-	-	-	04
Indic languages	-	-	01	-	-	-	-	-	-	-	01
Indic literatures	-	01	15	-	-	01	01	71	02	-	91
Knowledge & systems	-	03	02	03	02	05	01	02	04	-	22
Language	01	-	-	-	-	-	-	-	07	-	08
Law	01	07	02	01	-	02	11	02	01	-	27
Linguistics	01	-	01	-	-	01	-	-	04	-	07
LIS	24	39	48	57	58	49	72	64	107	24	542
Logic	-	-	-	-	-	-	-	01	-	-	01
Management	02	24	15	13	12	23	06	06	09	03	113
Manuscripts	-	-	-	-	-	-	02	-	-	-	02
Mathematics	-	-	-	01	-	-	03	01	-	02	07
Medical Science	-	-	-	01	-	-	03	-	-	-	04
News media & publishing	-	-	01	-	-	-	-	02	-	-	03
Philosophy	01	-	04	-	-	-	-	02	13	-	20
Physics	-	01	01	-	-	01	-	-	-	01	04
Political science	-	-	-	-	-	-	-	-	03	-	03

Psychology	-	03	01	01	-	07	01	04	05	01	23
Public Administration	-	-	-	-	03	-	-	01	-	-	04
Science	01	-	02	02	01	06	01	02	08	04	27
Social Science	-	-	-	01	-	03	01	01	02	-	08
Sociology	01	-	10	01	01	05	01	02	05	-	26
Music	-	-	-	-	-	-	-	19	-	-	19
Technology	-	-	-	-	-	01	-	02	-	-	03
Unidentified	01	-	-	-	11	-	-	01	07	04	24
Total	62	87	116	96	116	138	128	216	192	56	1207

4.7.6 Comparative Analysis of Book Citations

Sixty-one disciplines were identified as contributing disciplines cited by the authors of the articles published in five selected journals for the study period 2005-2014. Non-LIS books citation were predominating (51.9%) over LIS books (49.1%). Disciplines like agriculture, computer science, economics, education, encyclopedias in general, engineering, English language, history of Asia, knowledge & systems, law, management, medical science, news media & publishing, psychology, general science, social science in general and sociology were significantly influencing in the publications of contributions of all the selected journals during the study periods.

Table-4.45: Discipline-wise Distribution of Book Citations

Disciplines	ALIS	DJLIT	IASLIC	Bull	LH	SJIM	Total	Percentage	Rank
Agriculture	07	08	02	07	08	32	0.83	12	
American literature	01	01	-	-	01	03	0.08	32	
Anthropology	02	-	01	-	02	05	0.13	31	
Architecture	-	-	-	01	-	01	0.03	34	
Bibliographies	13	01	07	-	06	27	0.70	15	

Biology	01	05	01	-	02	09	0.23	28
Botany	04	08	-	-	01	13	0.34	24
Chemical engineering	01	-	-	-	-	01	0.03	34
Chemistry	04	02	-	-	02	08	0.21	29
Commerce	01	01	-	-	-	02	0.05	33
Communication	-	-	01	05	02	08	0.21	29
Computer science	64	116	16	17	71	284	7.35	3
Customs & folklore	-	-	-	-	01	01	0.03	34
Decorative arts	-	-	-	-	01	01	0.03	34
Earth science	-	-	-	-	03	03	0.08	32
Economics	12	12	02	04	27	57	1.47	10
Education	32	57	21	40	46	196	5.07	4
Encyclopedias	02	03	03	04	04	16	0.41	22
Engineering	02	06	01	01	15	25	0.65	16
English language	10	01	05	24	07	47	1.22	11
English literature	-	-	01	02	04	07	0.18	30
Ethics	03	-	-	10	-	13	0.34	24
Geography & travel	-	-	02	01	04	07	0.18	30
History	01	-	02	-	06	09	0.23	28
History of Asia	03	03	04	06	04	20	0.52	19
History of Europe	-	-	01	-	-	01	0.03	34
History of New Zealand	01	-	-	-	-	01	0.03	34
Home management	-	-	-	02	01	03	0.08	32
Indic languages	02	-	-	-	01	03	0.08	32
Indic literatures	47	-	09	01	91	148	3.83	5
Knowledge & systems	21	06	03	12	22	64	1.66	8
Language	05	01	04	-	08	18	0.47	21
Law	07	33	06	26	27	99	2.56	6
Linguistics	06	02	-	-	07	15	0.39	23
LIS	424	365	283	283	542	1897	49.07	1
Literature	-	02	-	06	-	08	0.21	29
Logic	-	-	-	-	01	01	0.03	34
Management	60	49	56	49	113	327	8.46	2
Manuscripts	-	-	-	-	02	02	0.05	33
Mathematics	06	11	03	-	07	27	0.70	15
Medical science	08	04	06	08	04	30	0.78	14
Music	-	-	-	-	19	19	0.49	20

News media & publishing	06	04	10	08	03	31	0.80	13
Organizations & museums	02	10	-	-	-	12	0.31	25
Paintings	-	02	-	-	-	02	0.05	33
Philosophy	01	01	01	-	20	23	0.59	18
Physics	06	08	01	-	04	19	0.49	20
Political science	03	01	-	03	03	10	0.26	27
Psychology	14	06	08	08	23	59	1.53	9
Public administration	03	01	01	-	04	09	0.23	28
Religion	01	-	02	08	-	11	0.28	26
Science	37	14	11	10	27	99	2.56	6
Social problems & services	02	02	04	01	-	09	0.23	28
Social science	06	03	03	04	08	24	0.62	17
Sociology	32	10	07	14	26	89	2.30	7
Sports & recreation	01	-	-	-	-	01	0.03	34
Technology	-	05	-	01	03	09	0.23	28
Zoology	-	01	-	-	-	01	0.03	34
Total	864	765	488	566	1183	3866	100	

Again, bibliographies, biology, Indic literature, languages, mathematics, philosophy, physics, political science, and social problems & services disciplines were contributed in four out of five selected journals studied during the periods 2005-2014. Table-4.45 shows the distribution of disciplines contributed in LIS publications during the study periods.

Table-4.45 shows that LIS books have major contribution in LIS publications. Management was the highest (8.46%) non-LIS contributing discipline, followed by computer science (7.35%), education (5.07%), Indic literatures (3.83%), law (2.56%), science in general (2.56%), sociology (2.30%), knowledge & systems (1.66%), psychology (1.53%) and economics

(1.47%). Figure-4.5 shows that non-LIS books citation were predominating in case of all the selected journals under study except IASLIC Bulletin.

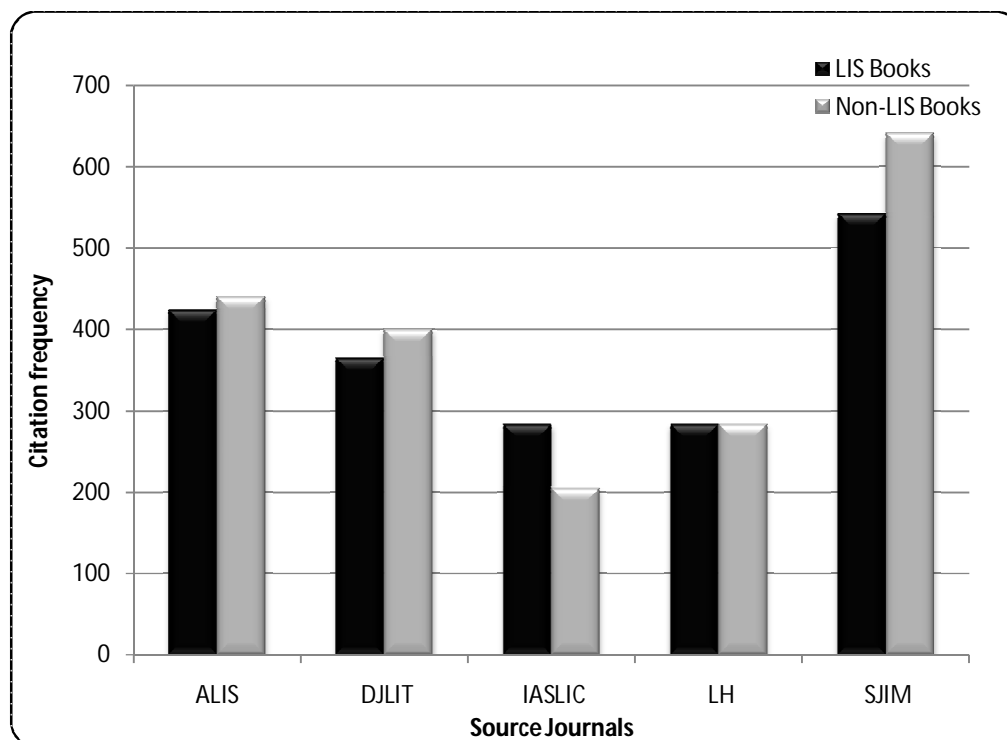


Figure-4.5: Disciplinary Distribution of Book Citations

Year-wise disciplinary distribution of cited books (as per appendix-2) shows that computer science, economics, education, Indic literatures, knowledge & systems, law, management, mathematics, psychology, science in general, and sociology have contribution in all the ten years under study and agriculture, English language, history of Asia, and social science in general have contribution in nine out of ten years under study. Figure-4.6 shows the trend line (as per appendix-3) by least squares equation clearly indicates the positive trend in the uses of non-LIS books citation LIS publications during the study periods 2005-2014 in five selected Indian LIS journals. It is also shows that trend value at $t = 0$, LIS books citation (i.e. 155) was greater than non-LIS

books citation (i.e. 123). But the slope (i.e.13.43) is greater in case of non-LIS books citation which results the increasing trends in non-LIS books citation

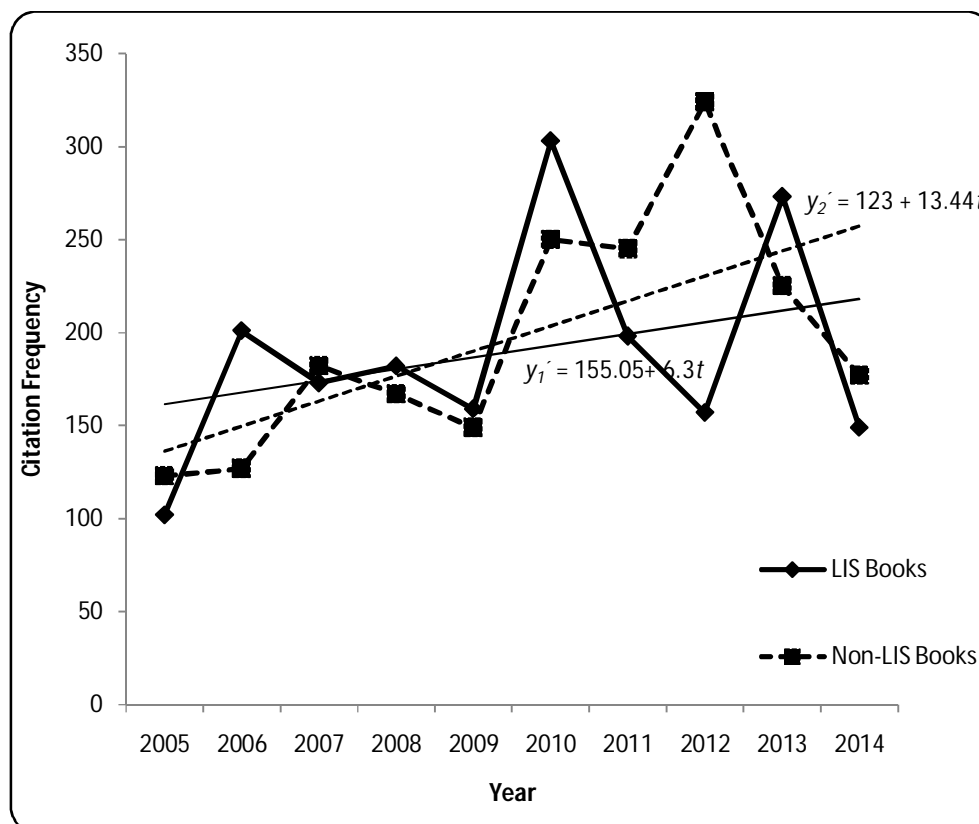


Figure-4.6: Trend Analysis of Book Citations

4.8 Analysis of Conference Citations

4.8.1 Analysis of Conference Publications Cited by ALIS

During the year 2005-2014, 353 conference publications were cited by the authors publishing articles in ALIS. Total sixteen disciplines of the cited conference publications were identified that was cited by the authors of the articles published in ALIS. LIS contribution was highest (72.24%), followed by computer science (11.9%), science in general (2.55%), education (2.27%).

Contribution of non-LIS conference publications increases during the study periods. In the year 2005, rate of non-LIS conference citation were high (66.67%) and same was low (10.71%) in the year 2007.

Table-4.46: Main Class of Conference Publications Cited by ALIS

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	-	-	-	-	-	-	01	-	01
Computer science	03	-	02	03	-	13	02	02	-	17	42
Earth science	-	-	-	-	-	01	-	-	02	-	03
Economics	-	-	01	-	-	01	-	-	-	-	02
Education	-	01	-	-	-	03	01	01	01	01	08
Knowledge & systems	-	01	-	-	-	-	-	-	-	02	03
Law	-	-	-	01	-	-	-	-	-	-	01
LIS	02	26	25	20	26	40	28	30	27	31	255
Linguistics	-	-	-	-	-	04	-	-	-	-	04
Management	-	-	-	-	-	01	-	-	01	02	04
Medical science	-	-	-	-	-	01	-	-	-	01	02
News media & publishing	-	-	-	-	-	-	01	02	04	-	07
Psychology	-	-	-	-	02	-	-	-	-	01	03
Religion	-	-	-	-	-	-	01	-	-	-	01
Science	01	01	-	-	-	05	01	01	-	-	09
Sociology	-	01	-	-	-	-	01	-	01	-	03
Unidentified	-	-	-	-	-	01	-	03	01	-	05
Total	06	30	28	24	28	70	35	39	38	55	353

4.8.2 Analysis of Conference Publications Cited by DJLIT

During the study periods, 552 conference publications were referred by the authors published articles in DJLIT. Table-4.47 shows that LIS discipline was highly (49.82%) cited discipline of conference publications. Among the

non-LIS disciplines, computer science conference publications contributed 30.25% contributions, followed by education (2.72%), linguistics (2.36%), physics (2.17%), and management (1.81%).

Table-4.47: Main Class of Conference Publications Cited by DJLIT

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Archaeology	-	-	-	-	-	-	-	-	02	-	02
Architecture	-	-	-	-	-	-	-	01	-	-	01
Botany	-	01	01	-	-	-	-	-	-	-	02
Chemistry	-	-	-	01	05	-	-	02	-	-	08
Communication	-	-	-	02	-	-	-	-	02	-	04
Computer science	18	18	04	32	07	13	40	07	19	09	167
Economics	-	-	-	-	-	01	-	-	-	-	01
Education	-	-	-	05	-	02	04	02	-	02	15
Engineering	-	-	-	04	01	-	-	-	01	01	07
History	-	-	-	-	-	-	-	02	-	-	02
Knowledge & systems	-	-	-	-	-	-	05	-	-	-	05
Language	-	-	-	-	-	-	-	-	-	01	01
Law	-	-	02	-	-	-	-	02	-	-	04
Linguistics	-	-	-	-	-	13	-	-	-	-	13
LIS	11	28	34	17	15	67	31	29	20	23	275
Management	-	-	02	01	-	01	04	01	-	01	10
Medical Science	-	-	-	-	-	-	01	01	-	-	02
Music	-	-	-	02	-	-	-	-	-	-	02
News media & publishing	-	-	-	-	-	01	-	02	-	01	04
Organizations & museums	-	-	-	02	-	-	-	-	04	02	08
Physics	-	06	-	02	-	-	03	-	-	01	12
Science	-	-	01	-	-	01	-	-	-	-	02
Social science	-	-	-	-	-	-	-	-	-	01	01
Sociology	-	-	-	-	-	-	-	01	-	-	01
Technology	-	-	-	-	-	-	-	01	-	-	01
Unidentified	-	-	-	-	-	-	01	-	-	01	02
Total	29	53	44	68	28	99	89	51	48	43	552

4.8.3 Analysis of Conference Publications Cited by IASLIC Bulletin

Contributions of non-LIS disciplines as represented by conference publications in IASLIC bulletin was very less. Only 19 conference publications out of 143 were from non-LIS discipline i.e. 13.29% conference of total. Computer science publications play vital role in case of IASLIC bulletin articles. Other than LIS and computer science, all the non-LIS conference papers were less significant.

Table-4.48: Main Class of Conference Publications Cited by IASLIC Bulletin

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	01	-	-	-	-	-	-	-	-	01
Computer science	-	-	-	-	-	-	01	02	01	02	06
Education	-	01	-	-	-	-	-	01	-	-	02
Knowledge & systems	-	-	-	-	-	-	-	-	01	-	01
Law	-	-	-	-	-	-	-	-	-	01	01
LIS	17	15	09	04	07	20	17	05	25	08	127
Management	-	-	-	-	-	-	-	-	01	-	01
News media & publishing	-	01	-	-	-	-	-	-	01	-	02
Physics	-	-	-	-	-	-	01	-	-	-	01
Sociology	-	-	-	-	-	-	-	-	-	01	01
Total	17	18	09	04	07	20	19	08	29	12	143

4.8.4 Analysis of Conference Publications Cited by LH

Table-4.49 shows the distribution of six main classes of the conference publications cited by the authors in LH during 2005-2014. LIS conference publications were the highest (93.22%) contributing discipline. Other than LIS,

education was the next highest (3.39%) contributing discipline as represented by conference publications. Computer science, medical science, news media & publishing, and science in general were the other non-LIS conference publications that were knowledge contributing disciplines in the LIS journal contributions.

Table-4.49: Main Class of Conference Publications Cited by LH

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Computer science	-	-	-	-	-	-	-	01	01	-	02
Education	-	-	-	-	01	-	-	-	04	01	06
LIS	03	26	06	05	18	36	14	15	28	14	165
Medical science	-	01	-	-	-	-	-	-	-	-	01
News media & publishing	-	-	-	-	-	-	-	01	-	-	01
Science	-	01	-	-	-	-	-	01	-	-	02
Total	03	28	06	05	19	36	14	18	33	15	177

4.8.5 Analysis of Conference Publications Cited by SJIM

During the year of study period, analysis of cited conference publications as cited by the authors indicate twenty-three disciplines. Conference publications from LIS were highly referred by the authors of the SJIM. Computer science was the only one non-LIS discipline that contributed every year of the study periods. Computer science conference publications were contributed 8.13% of the total references. Education (3.08%) was the next contributing discipline by way of conference publications followed by science in general (1.54%), management (1.1%). All others non-LIS disciplines

contributed knowledge less than 1% publications during the ten year of study.

Table-4.50: Main Cass of Conference Publications Cited by SJIM

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	01	-	-	-	-	-	02	-	01	04
Botany	02		-	-	-	-		-	-	-	02
Chemical engineering	-	-	-	-	-	-	01	01	-	-	02
Chemistry	-	-	-	-	-	-	02	-	-	-	02
Communication	-	-	-	-	-	-	-	-	-	01	01
Computer science	07	01	01	01	01	03	02	03	11	07	37
Economics	-	02	-	-	-	-	-	-	-	-	02
Education	-	03	02	-	01	03	02	02	-	01	14
Engineering	-	-	-	-	-	03	-	-	01	-	04
Indic languages	-	-	-	-	-	-	02	-	-	-	02
Knowledge & systems	-	-	-	-	-	-	-	01	01	-	02
Language	-	-	-	-	-	-	01	-	-	-	01
LIS	18	34	23	21	42	40	51	47	62	18	356
Linguistics	-	-	01	-	-	-	-	-	-	-	01
Management	-	-	-	01	01	02	01	-	-	-	05
Medical science	-	-	-	01	-	-	-	-	-	-	01
News media & publishing	-	-	-	-	01	-	-	-	-	-	01
Philosophy	-	-	-	-	-	-	-	-	01	-	01
Physics	-	-	-	-	-	-	02	-	-	-	02
Political science	-	-	-	01	-	-	-	-	01	-	02
Science	-	-	-	-	-	-	01	-	06	-	07
Sociology	-	-	-	-	-	01	-	-	-	-	01
Technology	01	-	01	-	-	-	02	-	-	-	04
Unidentified	-	-	-	-	-	-	-	01	-	-	01
Total	28	41	28	25	46	52	67	57	83	28	455

4.8.6 Comparative Analysis of Conference Citations

During the period 2005-2014, total 1,672 conference publications were consulted by the authors of the articles published in five selected journals.

Table-4.51 and Figure-4.7 shows that LIS conference publications were highly (70.46%) referred by the authors. Only 29.63% citations were contributed by LIS conference publications. Computer science (15.19%), education (2.69%), management (1.20%), and linguistics (1.08%) respectively were the non-LIS conference publications highly influencing LIS research literatures.

Table-4.51: Discipline-wise Distribution of Conference Citations

Disciplines	ALIS	DJLIT	IASLIC Bull	LH	SJIM	Total	Percentage	Rank
Agriculture	01	-	01	-	04	06	0.36	10
Archaeology	-	02	-	-	-	02	0.12	14
Architecture	-	01	-	-	-	01	0.06	15
Botany	-	02	-	-	02	04	0.24	12
Chemical engineering	-	-	-	-	02	02	0.12	14
Chemistry	-	08	-	-	02	10	0.60	8
Communication	-	04	-	-	01	05	0.30	11
Computer science	42	167	06	02	37	254	15.19	2
Earth science	03	-	-	-	-	03	0.18	13
Economics	02	01	-	-	02	05	0.30	11
Education	08	15	02	06	14	45	2.69	3
Engineering	-	07	-	-	04	11	0.66	7
History	-	02	-	-	-	02	0.12	14
Indic languages	-	-	-	-	02	02	0.12	14
Knowledge & systems	03	05	01	-	02	11	0.66	7
Language	-	01	-	-	01	02	0.12	14
Law	01	04	01	-	-	06	0.36	10
Linguistics	04	13	-	-	01	18	1.08	5
LIS	255	275	127	165	356	1178	70.45	1
Management	04	10	01	-	05	20	1.20	4
Medical sciences	02	02	-	01	01	06	0.36	10
Music	-	02	-	-	-	02	0.12	14
News media & publishing	07	04	02	01	01	15	0.90	6
Organizations & museums	-	08	-	-	-	08	0.48	9

Philosophy	-	-	-	-	01	01	0.06	15
Physics	-	12	01	-	02	15	0.90	6
Political science	-	-	-	-	02	02	0.12	14
Psychology	03	-	-	-	-	03	0.18	13
Religion	01	-	-	-	-	01	0.06	15
Science	09	02	-	02	07	20	1.20	4
Social science	-	01	-	-	-	01	0.06	15
Sociology	03	01	01	-	01	06	0.36	10
Technology	-	01	-	-	04	05	0.30	11
Total	348	550	143	177	454	1672	100	

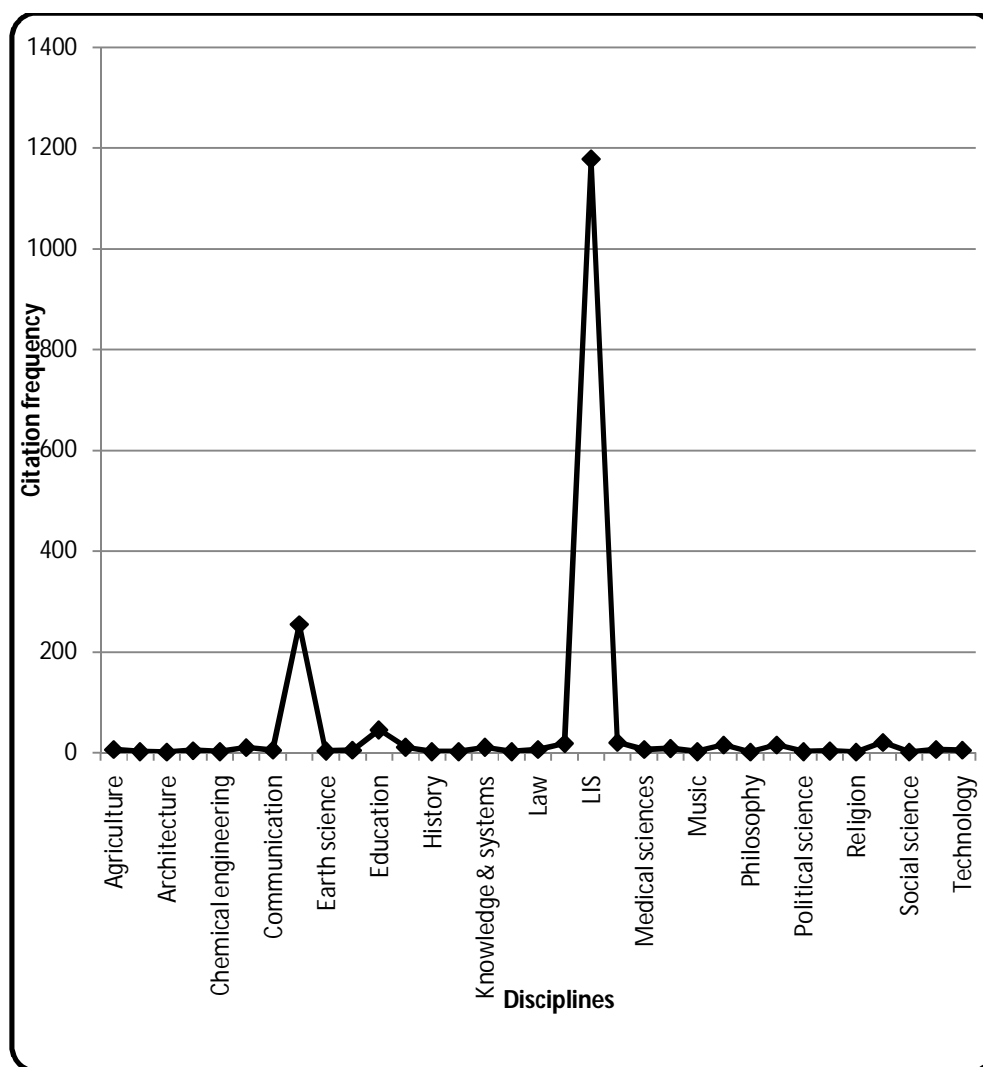


Figure-4.7: Disciplinary Distribution of Conference Citations

Computer science, education, and news media & publishing were the disciplines contributed in the five selected journals publications. Knowledge & systems, management, medical sciences, science in general, and sociology had contributions atleast four LIS journals during the study periods. Year-wise distribution of cited conference publications (as per appendix-2) reveals that computer science was the only discipline that contributed knowledge in LIS publications in all the years under study. Non-LIS contributions as reflected by citation of conference publications not so much influencing (29.55%).

But it is clear from the Figure-4.8 that the trend line (as per appendix-3) by least squares equation clearly indicates the positive trend in the uses of non-LIS conference citation LIS publications during the study periods 2005-2014 in five selected Indian LIS journals.

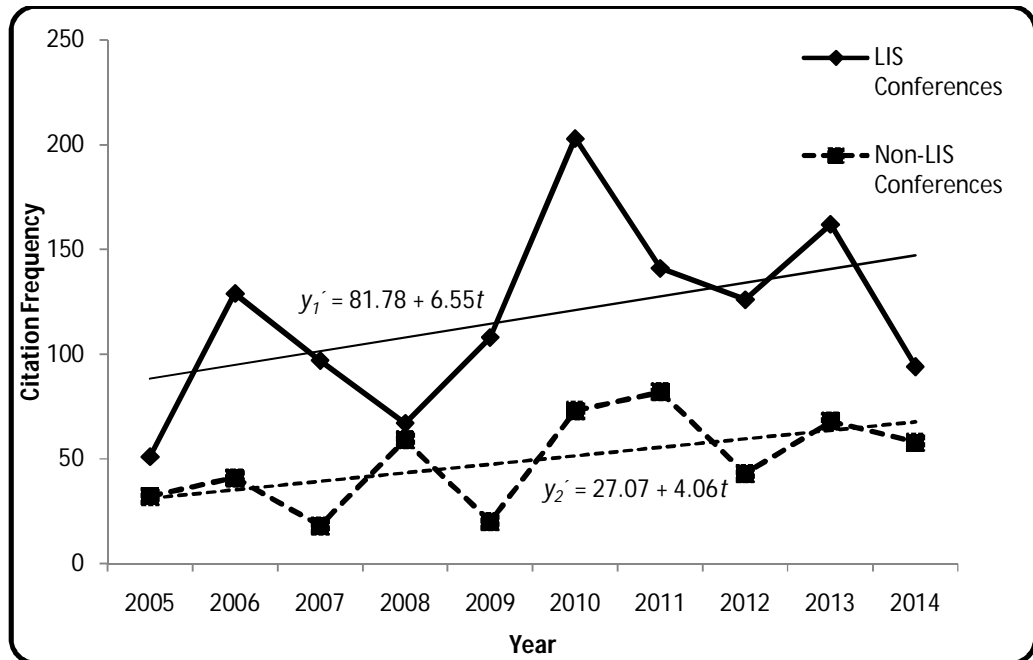


Figure-4.8: Trend Analysis of Conference Citations

4.9 Analysis of Dissertation Citations

4.9.1 Analysis of Dissertations Cited by ALIS

Contributors in ALIS referred 93 dissertations during the study periods i.e. 2005-2014. Total nine disciplines of cited dissertations were identified and shown in Table-4.52. Most of the dissertations (80.65%) were from LIS discipline. Computer science was the next contributing subject as represented by dissertations. Other non-LIS disciplines had few contributions in LIS publications. It was found that contributions of non-LIS dissertations increased in the second half (2010-2014) of the study periods.

Table-4.52: Main Class of Dissertations Cited by ALIS

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Computer science	-	-	-	-	-	02	01	01	03	01	08
Education	-	01	-	-	-	-	01	-	01	-	03
History	-	-	-	-	-	-	-	01	-	-	01
LIS	-	04	03	04	13	11	07	16	08	09	75
Management	-	-	-	-	-	-	-	-	01	01	02
Physics	-	-	-	-	-	01	-	-	-	-	01
Psychology	-	-	-	-	-	-	-	01	-	-	01
Sociology	-	-	-	-	-	-	-	-	01	-	01
Technology	-	-	-	-	-	-	01	-	-	-	01
Total	-	05	03	04	13	14	10	19	14	11	93

4.9.2 Analysis of Dissertations Cited by DJLIT

Forty-three dissertations were cited by the contributors in DJLIT during the study periods. Majority of the dissertations (72.09%) were from LIS discipline as shown in Table-4.53. Only 12 out of 43 dissertations were from

non-LIS disciplines. Computer science has significant contribution (16.28%) among the non-LIS disciplines. Disciplines of other non-LIS dissertations that input knowledge in LIS were education, engineering, news media & publishing, and sociology. In the year 2008, three dissertations were cited from two non-LIS disciplines, which is maximum non-LIS citations and in 2009 only one dissertation was cited from computer science discipline.

Table-4.53: Main Class of Dissertations Cited DJLIT

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Computer science	-	01	-	02	01	-	01	-	02	-	07
Education	-	-	-	-	-	-	-	01	-	-	01
Engineering	01	-	-	01	-	-	-	-	-	-	02
LIS	02	02	01	02	-	02	02	01	09	10	31
News media & publishing	-	-	-	-	-	-	01	-	-	-	01
Sociology	-	-	-	-	-	-	-	-	-	01	01
Total	03	03	01	05	01	02	04	02	11	11	43

4.9.3 Analysis of Dissertations Cited by IASLIC Bulletin

All the dissertations cited by the contributors of *IASLIC Bulletin* during the study period were from LIS discipline. There was no contribution by any other disciplines as represented by dissertations. Table-4.54 shows the distribution of cited dissertations.

Table-4.54: Main Class of Dissertations Cited by IASLIC Bulletin

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
LIS	02	01	02	02	05	12	03	02	04	04	37
Total	02	01	02	02	05	12	03	02	04	04	37

4.9.4 Analysis of Dissertations Cited by LH

Total forty-three dissertations were cited by the authors of the contributors in LH. Subject of the four dissertations cited in the year 2011 were unclassified as they were written in Persian language and not found in the selected databases. Table-4.55 shows that dissertations from LIS discipline were highly referred by the authors in LH. Dissertations from non-LIS disciplines were less significant in LH.

Table-4.55: Main Class of Dissertations Cited by LH

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	-	-	-	-	01	-	-	-	01
Arts	-	-	-	-	-	-	-	-	01	-	01
Education	-	01	-	-	-	-	-	-	01	-	02
LIS	01	08	01	01	05	04	04	01	01	03	29
Literature	-	-	-	-	-	-	01	-	-	-	01
Medical science	-	-	02	-	-	-	01	-	-	-	03
Psychology	-	-	-	-	-	-	01	-	-	-	01
Sociology	-	-	-	-	-	-	01	-	-	-	01
Unidentified	-	-	-	-	-	-	04	-	-	-	04
Total	01	09	03	01	05	04	13	01	03	03	43

4.9.5 Analysis of Dissertations Cited by SJIM

During the year of study i.e. from 2005 to 2014, eighty-eight dissertations were cited by the contributors of articles in SJIM. It was found from the Table-4.56 that LIS dissertations were highly cited with 77.27%. Rest of the dissertations i.e. 32.73% were from non-LIS disciplines. Education was the most influencing discipline among the non-LIS disciplines with 5.68%,

followed by law (4.55%), management (3.41%), computer science (2.27%), and engineering (2.27%).

Table-4.56: Main Class of Dissertations Cited by SJIM

Subjects	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Biology	-	-	-	-	-	-	-	-	01	-	01
Computer science	-	-	-	-	-	-	01	-	01	-	02
Economics	-	-	-	-	-	-	01	-	-	-	01
Education	-	-	-	-	01	01	-	03	-	-	05
Engineering	-	-	-	-	-	-	02	-	-	-	02
Law	-	-	-	-	-	-	04	-	-	-	04
LIS	07	01	04	09	04	13	08	08	09	05	68
Management	-	01	-	01	-	01	-	-	-	-	03
Science	-	-	-	-	-	01	-	-	-	-	01
Sociology	-	-	-	-	-	-	-	-	01	-	01
Total	07	02	04	10	05	16	16	11	12	05	88

4.9.6 Comparative Analysis of Dissertation Citations

Total three hundred dissertations were cited by the contributors of articles in the five selected journals during 2005-2014 (as per Table-4.57 and Figure-4.9). Most of the dissertations (80%) were from LIS field. Only 20% dissertations were from the non-LIS field of study.

Table-4.57: Discipline-wise Distribution of Dissertation Citations

Disciplines	ALIS	DJLIT	IASLIC	Bull LH	SJIM	Total	Percentage	Rank
Agriculture	-	-	-	01	-	01	0.33	8
Arts	-	-	-	01	-	01	0.33	8
Biology	-	-	-	-	01	01	0.33	8
Computer science	08	07	-	-	02	17	5.67	2

Economics	-	-	-	-	01	01	0.33	8
Education	03	01	-	02	05	11	3.67	3
Engineering	-	02	-	-	02	04	1.33	5
History	01	-	-	-	-	01	0.33	8
Law	-	-	-	-	04	04	1.33	5
LIS	75	31	37	29	68	240	80.0	1
Literature	-	-	-	01	-	01	0.33	8
Management	02	-	-	-	03	05	1.67	4
Medical sciences	-	-	-	03	-	03	1.00	6
News media & publishing	-	01	-	-	-	01	0.33	8
Physics	01	-	-	-	-	01	0.33	8
Psychology	01	-	-	01	-	02	0.67	7
Science	-	-	-	-	01	01	0.33	8
Sociology	01	01	-	01	01	04	1.33	5
Technology	01	-	-	-	-	01	0.33	8
Total	93	43	37	39	88	300	100	

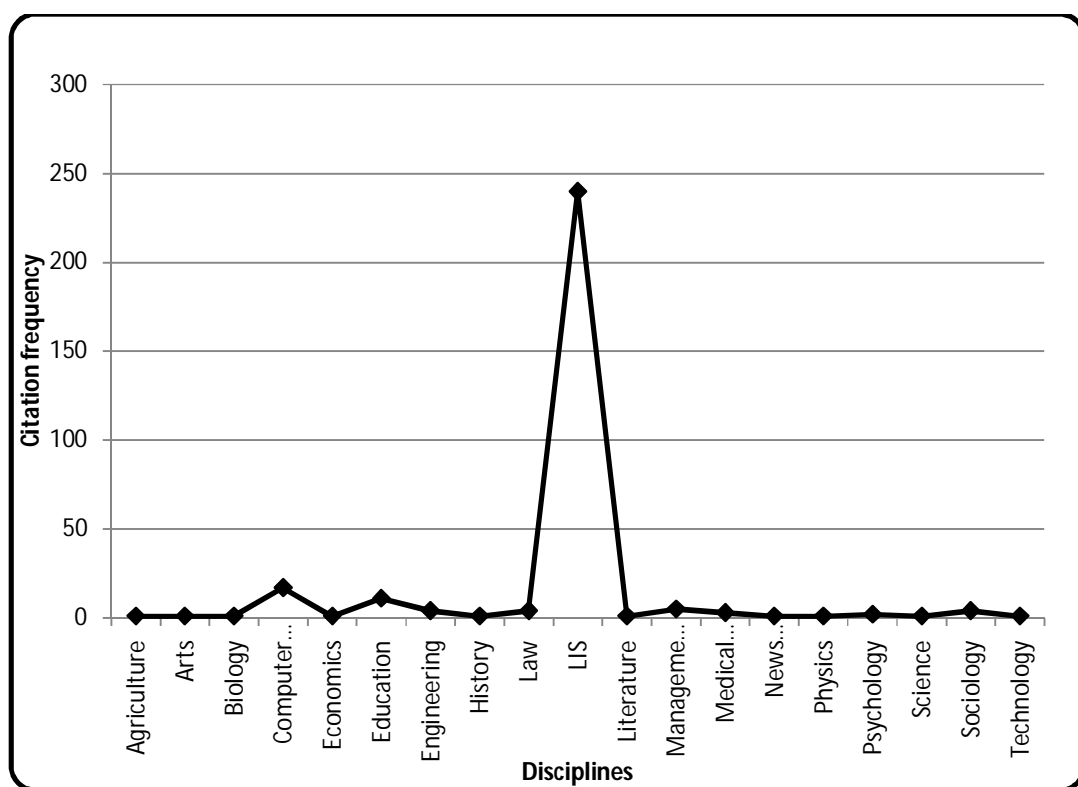


Figure-4.9: Disciplinary Distribution of Dissertation Citations

Contribution of computer science discipline was the high (5.67%) among the others non-LIS dissertations, followed by education (3.67%), management (1.67%), engineering (1.33%), law (1.33%), sociology (1.33%), medical science (1%). Education and sociology were the two disciplines that contributed in any four LIS journals contributions out of five selected journals during the study periods.

Year-wise distribution of disciplines for cited dissertations (as per appendix-2) shows that none of the non-LIS disciplines have significant contributions in LIS publications during the ten year of under study. Computer science has contribution in LIS publications only in eight years out of ten years under study. No other non-LIS disciplines had such significant influence in core publications. But Figure-4.10 shows that the trend line (as per appendix-3) by least squares equation has positive trend in the uses of non-LIS conference citations in LIS publications during 2005-2014.

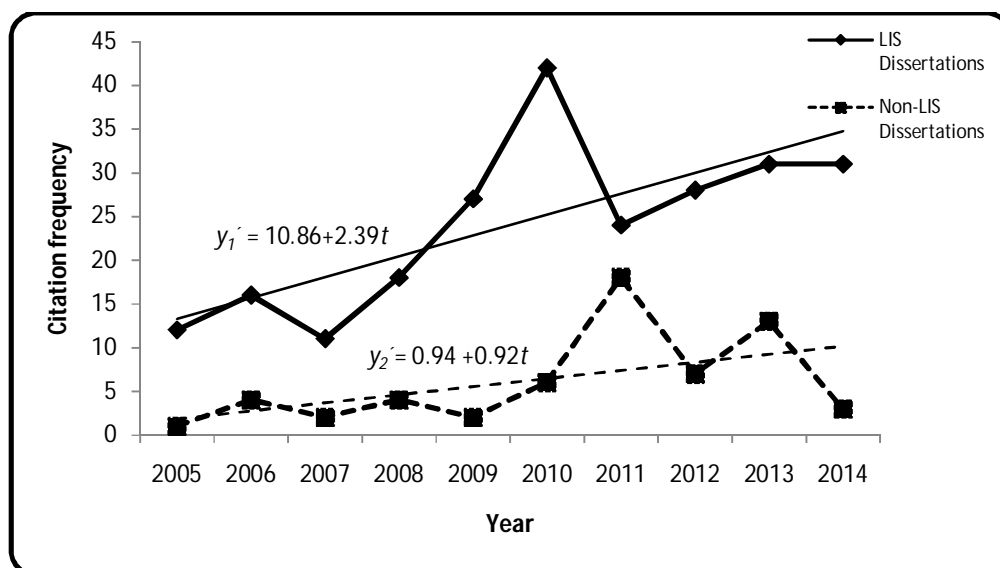


Figure-4.10: Trend Analysis of Dissertation Citations

4.10 Comparative Analysis of Cited Documents

Total sixty-five disciplines of the documents cited by the contributors of the selected journals during 2005-2014 were identified. Contributors were highly referred LIS documents (62.332%) for their contributions. Science in general was the highest (7.629%) contributing disciplines among the non-LIS disciplines as represented by cited documents. Table-4.58 shows that computer science (6.337%), management (4.576%), education (3.661%), medical science (2.358%), sociology (1.101%), economics, psychology, law, new media & publishing, engineering, physics, agriculture, technology, history were the disciplines that made influence the LIS publications in all the selected document under study. Knowledge & systems, social science, chemistry, biology, linguistics, communication, philosophy, language, literature, botany, organizations & museum, music, political science, religion, earth science, chemical engineering, and architecture influences LIS publications by contributing any three out of four documents under study.

Table-4.58: Discipline-wise Distribution of Cited Documents

Sl. No.	Rank	Disciplines	Journals	Books	Conference Pubs	Dissertations	Citation frequency	Percentage
1	1	LIS	7446	1897	1178	240	10761	62.332
2	2	Science	1197	99	20	1	1317	7.629
3	3	Computer science	539	284	254	17	1094	6.337
4	4	Management	438	327	20	5	790	4.576
5	5	Education	380	196	45	11	632	3.661
6	6	Medical science	368	30	6	3	407	2.358
7	7	Sociology	91	89	6	4	190	1.101

8	8	Economics	103	57	5	1	166	0.962
9	9	Psychology	93	59	3	2	157	0.909
10	10	Law	47	99	6	4	156	0.904
11	11	Indic literature	4	148	-	-	152	0.880
12	12	News media & publishing	79	31	15	1	126	0.730
13	13	Engineering	83	25	11	4	123	0.712
14	14	Knowledge & systems	36	64	11	-	111	0.643
15	14	Social science	86	24	1	-	111	0.643
16	15	Physics	35	19	15	1	70	0.405
17	16	Agriculture	28	32	6	1	67	0.388
18	17	Technology	50	9	5	1	65	0.377
19	18	Bibliographies	24	27	-	-	51	0.295
20	19	English language	1	47	-	-	48	0.278
21	20	Social problems & services	38	9	-	-	47	0.272
22	21	Chemistry	27	8	10	-	45	0.261
23	21	Mathematics	18	27	-	-	45	0.261
24	22	Biology	34	9	-	1	44	0.255
25	22	Linguistics	11	15	18	-	44	0.255
26	23	Communication	26	8	5	-	39	0.226
27	24	Philosophy	10	23	1	-	34	0.197
28	25	History of Asia	8	20	-	-	28	0.162
29	25	Language	8	18	2	-	28	0.162
30	26	Literature	17	8	-	1	26	0.151
31	27	Botany	8	13	4	-	25	0.145
32	28	Organization & museum	3	12	8	-	23	0.133
33	29	Music	1	19	2	-	22	0.127
34	30	Ethics	8	13	-	-	21	0.122
35	30	Political science	9	10	2	-	21	0.122
36	31	History	8	9	2	1	20	0.116
37	32	Public administration	10	9	-	-	19	0.110
38	32	Religion	7	11	1	-	19	0.110
39	33	Earth science	11	3	3	-	17	0.098
40	34	Encyclopedias	-	16	-	-	16	0.093
41	35	Geography & travel	8	7	-	-	15	0.087
42	36	Chemical	8	1	2	-	11	0.064

		engineering						
43	37	Anthropology	2	5	-	-	7	0.041
44	37	English literature	-	7	-	-	7	0.041
45	38	American literature	3	3	-	-	6	0.035
46	39	Indic language	-	3	2	-	5	0.029
47	40	Home management	1	3	-	-	4	0.023
48	41	Architecture	1	1	1	-	3	0.017
49	41	Arts	2	-	-	1	3	0.017
50	41	Astronomy	3	-	-	-	3	0.017
51	41	Painting	1	2	-	-	3	0.017
52	41	Zoology	2	1	-	-	3	0.017
53	42	Archaeology	-	-	2	-	2	0.012
54	42	Commerce	-	2	-	-	2	0.012
55	42	Manuscripts	-	2	-	-	2	0.012
56	42	Sports & recreation	1	1	-	-	2	0.012
57	43	Customs & folklore	-	1	-	-	1	0.006
58	43	Decorative arts	-	1	-	-	1	0.006
59	43	History of Africa	1	-	-	-	1	0.006
60	43	History of Europe	-	1	-	-	1	0.006
61	43	History of New Zealand	-	1	-	-	1	0.006
62	43	History of North America	1	-	-	-	1	0.006
63	43	Logic	-	1	-	-	1	0.006
64	43	Manufacturing	1	-	-	-	1	0.006
65	43	Paleontology	1	-	-	-	1	0.006
Total			11426	3866	1672	300	17264	100

4.11 Quantitative Analysis

4.11.1 Coefficient of Correlation Analysis

Correlation coefficient between two variables reflects the relatedness between the variables. It is important to know that whether the computed correlation has any significant meaning or not. Significance of correlation is tested in the usual way with the help of z -test (for large sample, $n > 30$) or t -test

(for small samples, $n < 30$) with zero relation as null hypothesis.

For small samples, $n < 30$, following formula is used to test the significance of correlations:

$$t = \frac{r}{\sqrt{1 - (r)^2}} \times \sqrt{N - 2}$$

and degree of freedom (d.f.) = $N - 2$

Table-4.59: Correlation Coefficient between Authors' Disciplines

Year	LIS Authors (X)	Non-LIS Authors (Y)	x =X-277	y =Y-32	x^2	y^2	xy
2005	175	21	-102	-11	10404	121	1122
2006	227	23	-50	-9	2500	81	450
2007	222	20	-55	-12	3025	144	660
2008	276	34	-1	2	1	4	-2
2009	276	30	-1	-2	1	4	2
2010	329	43	52	11	2704	121	572
2011	316	36	39	4	1521	16	156
2012	314	34	37	2	1369	4	74
2013	320	43	43	11	1849	121	473
2014	315	32	38	0	1444	0	0
Total	2770	316	0	-4	24818	616	3507

Correlation coefficient,

$$r = \frac{10 \times 3507 - (0) \times (-4)}{\sqrt{10 \times 24818 - 0^2} \times \sqrt{10 \times 616 - (-4)^2}}$$

$$= 0.8981 \text{ (approx.)}$$

and

$$t = \frac{0.8981}{\sqrt{1 - (0.8981)^2}} \times \sqrt{10 - 2}$$

$$= 3.149$$

$$df = N - 2 = 10 - 2 = 8$$

Here, critical value of t at 5% level is 2.306.

The calculated t value (3.149) is greater than critical value, it is inferred that authors were significantly correlated and magnitude is very high as $+0.75 \leq r \leq +1.00$.

Table-4.60: Correlation Analysis between Journal Citations

Year	LIS Journals (X)	Non-LIS Journals (Y)	x =X-745	y =Y-398	x^2	y^2	xy
2005	279	192	-466	-206	217156	42436	95996
2006	447	245	-298	-153	88804	23409	45594
2007	468	256	-277	-142	76729	20164	39334
2008	576	304	-169	-94	28561	8836	15886
2009	744	283	-1	-115	1	13225	115
2010	894	458	149	60	22201	3600	8940
2011	942	609	197	211	38809	44521	41567
2012	862	298	117	-100	13689	10000	-11700
2013	1238	680	493	282	243049	79524	139026
2014	996	655	251	257	63001	66049	64507
Total	7446	3980	-4	0	792000	311764	439265

Correlation of coefficient,

$$r = \frac{10 \times 439265 - (-4) \times (0)}{\sqrt{10 \times 792000 - (-4)^2} \times \sqrt{10 \times 311764 - (0)^2}}$$

$$= 0.8840$$

and

$$t = \frac{0.8840}{\sqrt{1 - (0.8840)^2}} \times \sqrt{10 - 2}$$

$$= 3.199$$

$$df = N - 2 = 10 - 2 = 8$$

Here, critical value of t at 5% level is 2.306.

The calculated t value (3.199) is greater than critical value, it is inferred that citation were significantly correlated and magnitude is very high as $+0.75 \leq r \leq +1.00$.

Table-4.61: Correlation Analysis between Book Citations

Year	LIS Books (X)	Non-LIS Books (Y)	x =X-190	y =Y-197	x^2	y^2	xy
2005	102	123	-88	-74	7744	5476	6512
2006	201	127	11	-70	121	4900	-770
2007	173	182	-17	-15	289	225	255
2008	182	167	-8	-30	64	900	240
2009	159	149	-31	-48	961	2304	1488
2010	303	250	113	53	12769	2809	5989
2011	198	245	8	48	64	2304	384
2012	157	324	-33	127	1089	16129	-4191
2013	273	225	83	28	6889	784	2324
2014	149	177	-41	-20	1681	400	820
Total	1897	1969	-3	-1	31671	36231	13051

Correlation coefficient,

$$r = \frac{10 \times 13051 - (-3) \times (-1)}{\sqrt{10 \times 31671 - (-3)^2} \times \sqrt{10 \times 36231 - (-1)^2}}$$

$$= 0.3853 \text{ (approx.)}$$

and

$$t = \frac{0.3853}{\sqrt{1 - (0.3853)^2}} \times \sqrt{10 - 2}$$

$$= 1.1810$$

$$df = N - 2 = 10 - 2 = 8$$

Here, critical value of t at 5% level is 2.306.

The calculated t value (1.181) is less than critical value, it is inferred that cited books were insignificantly correlated and magnitude is low as $+0.25 < r < +0.50$.

Table-4.62: Correlation Analysis between Conference Citations

Year	LIS Conferences (X)	Non-LIS Conferences (Y)	x =X-118	y =Y-50	x^2	y^2	xy
2005	51	32	-67	-18	4489	324	1206
2006	129	41	11	-9	121	81	-99
2007	97	18	-21	-32	441	1024	672
2008	67	59	-51	9	2601	81	-459
2009	108	20	-10	-30	100	900	300
2010	203	73	85	23	7225	529	1955
2011	141	82	23	32	529	1024	736
2012	126	43	8	-7	64	49	-56
2013	162	68	44	18	1936	324	792
2014	94	58	-24	8	576	64	-192
Total	1178	494	-2	-6	18082	4400	4855

Correlation coefficient,

$$r = \frac{10 \times 4855 - (-2) \times (-6)}{\sqrt{10 \times 18082 - (-2)^2} \times \sqrt{10 \times 4400 - (-6)^2}}$$

$$= 0.5444$$

and

$$t = \frac{0.5444}{\sqrt{1 - (0.5444)^2}} \times \sqrt{10 - 2}$$

$$= 2.1885$$

$$df = N - 2 = 10 - 2 = 8$$

Here, critical value of t at 5% level is 2.306.

The calculated t value (2.1885) is less than critical value, it is exhibited that cited conference publications were insignificantly correlated and magnitude is high as $+0.50 < r < +0.75$.

Table-4.63: Correlation Analysis between Dissertation Citations

Year	LIS Dissertations (X)	Non-LIS Dissertations (Y)	x =X-24	y =Y-6	x^2	y^2	xy
2005	12	01	-12	-5	144	25	60
2006	16	04	-8	-2	64	4	16
2007	11	02	-13	-4	169	16	52
2008	18	04	-6	-2	36	4	12
2009	27	02	3	-4	9	16	-12
2010	42	06	18	0	324	0	0
2011	24	18	0	12	0	144	0
2012	28	07	4	1	16	1	4
2013	31	13	7	7	49	49	49
2014	31	03	7	-3	49	9	-21
Total	240	60	0	0	860	268	160

Correlation coefficient,

$$r = \frac{10 \times 160 - (0) \times (0)}{\sqrt{10 \times 860 - 0^2} \times \sqrt{10 \times 268 - (0)^2}}$$

$$= 0.33328 \text{ (approx.)}$$

and,

$$t = \frac{0.33328}{\sqrt{1 - (0.33328)^2}} \times \sqrt{10 - 2}$$

$$= 1.0605$$

$$df = N - 2 = 10 - 2 = 8$$

Here, critical value of t at 5% level is 2.306.

The calculated t value (1.0605) is less than critical value, it is exhibited that cited dissertations were insignificantly correlated to them and magnitude is low as $+0.25 < r < +0.50$.

4.11.2 Interdisciplinary Borrowing Index

Interdisciplinary borrowing indices for the cited journals were shown in the Table-4.64. The borrowing index was high in the year 2013 (i.e. 53.66) because the existence of maximum number of disciplines outside of the core discipline. Again the same was low in the year 2006 (i.e. 22.79) because the existence of minimum number of disciplines outside of the core subject.

Table-4.64: Interdisciplinary Borrowing Index for Journal Citations

Year	LIS (i)	Non- LIS	Total (n)	i/n	$0.1+i/n$	d	$d/(0.1+i/n)$
2005	279	192	471	0.592	0.692	25	36.11
2006	447	245	692	0.646	0.746	17	22.79
2007	468	256	724	0.646	0.746	24	32.15
2008	576	304	880	0.655	0.755	28	37.11
2009	744	283	1027	0.724	0.824	26	31.54

2010	894	458	1352	0.661	0.761	30	39.41
2011	942	609	1551	0.607	0.707	30	42.41
2012	862	298	1160	0.743	0.843	26	30.84
2013	1238	680	1918	0.645	0.745	40	53.66
2014	996	655	1651	0.603	0.703	35	49.77
Total	7446	3980	11426				

Table-4.65 shows the distribution of interdisciplinary borrowing indices for the books cited by the contributors of selected journals under study. The index was maximum (i.e. 86.77) in the year 2012 and minimum (i.e. 33.67) in the year 2006.

Table-4.65: Interdisciplinary Borrowing Index for Books Citations

Year	LIS (<i>i</i>)	Non- LIS	Total (<i>n</i>)	i/n	$0.1+i/n$	<i>d</i>	$d/(0.1+i/n)$
2005	102	123	225	0.453	0.553	21	37.95
2006	201	127	328	0.613	0.713	24	33.67
2007	173	182	355	0.487	0.587	28	47.67
2008	182	167	349	0.521	0.621	30	48.27
2009	159	149	308	0.516	0.616	28	45.44
2010	303	250	553	0.548	0.648	32	49.39
2011	198	245	443	0.447	0.547	29	53.02
2012	157	324	481	0.326	0.426	37	86.77
2013	273	225	498	0.548	0.648	33	50.91
2014	149	177	326	0.457	0.557	34	61.04
Total	1897	1969	3866				

Interdisciplinary borrowing indices for cited conference publications were shown in the Table-4.66. The interdisciplinary borrowing index was highest (i.e. 22.27) in the year 2014 and lowest (i.e. 5.6) in the year 2005. It was also revealed that number of disciplines out the core discipline was same (i.e. 15), but the interdisciplinary borrowing index varies depending on the ratio

between LIS and non-LIS citation.

Table-4.66: Interdisciplinary Borrowing Index for Conference Citations

Year	LIS (<i>i</i>)	Non- LIS	Total (<i>n</i>)	<i>i/n</i>	(0.1+ <i>i/n</i>)	<i>d</i>	<i>d</i> /(0.1+ <i>i/n</i>)
2005	51	32	83	0.614	0.714	4	5.60
2006	129	41	170	0.759	0.859	11	12.81
2007	97	18	115	0.843	0.943	9	9.54
2008	67	59	126	0.532	0.632	12	18.99
2009	108	20	128	0.844	0.944	7	7.42
2010	203	73	276	0.736	0.836	11	13.17
2011	141	82	223	0.632	0.732	15	20.48
2012	126	43	169	0.746	0.846	15	17.74
2013	162	68	230	0.704	0.804	15	18.65
2014	94	58	152	0.618	0.718	16	22.27
Total	1178	494	1672				

Table-4.67 shows the interdisciplinary borrowing indices for cited dissertations. It was found that the index was high (i.e. 17.872) in the year 2011 because the existence of twelve non-core disciplines in citation and lowest (i.e. 0.977) in the year 2005.

Table-4.67: Interdisciplinary Borrowing Index for Dissertation Citations

Year	LIS (<i>i</i>)	Non- LIS	Total (<i>n</i>)	<i>i/n</i>	0.1+ <i>i/n</i>	<i>d</i>	<i>d</i> /(0.1+ <i>i/n</i>)
2005	12	1	13	0.923	1.023	1	0.977
2006	16	4	20	0.800	0.900	3	3.333
2007	11	2	13	0.846	0.946	1	1.057
2008	18	4	22	0.818	0.918	3	3.267
2009	27	2	29	0.931	1.031	2	1.940
2010	42	6	48	0.875	0.975	5	5.128
2011	24	18	42	0.571	0.671	12	17.872
2012	28	7	35	0.800	0.900	4	4.444
2013	31	13	44	0.705	0.805	6	7.458
2014	31	3	34	0.912	1.012	3	2.965
Total	240	60	300				

Figure-4.11 shows the distribution of interdisciplinary borrowing indices for the documents (i.e. journals, books, conference publications, dissertations) cited by the contributors of articles published in the five selected journals during the years 2005 – 2014 under study. Interdisciplinary borrowing indices for books were high in comparison to others cited documents.

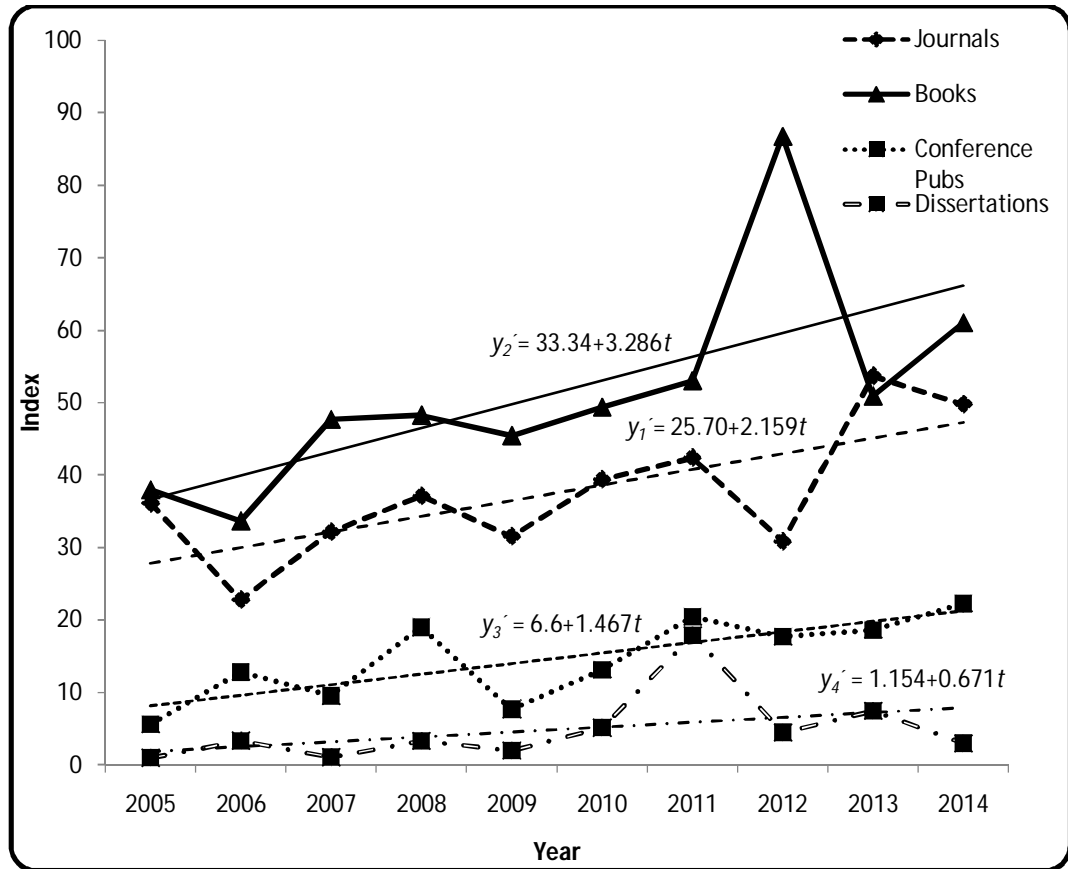


Figure-4.11: Interdisciplinary Borrowing Trend of Cited Documents

Seasonal trend lines (as per appendix-3) of interdisciplinary borrowing indices for all the documents were upward rising. The slope of the trend line of interdisciplinary borrowing indices was high in case of books citations. It reveals that interdisciplinary borrowing found more in books citations and least in case of dissertation citations.

4.11.3 Chi-square Testing

The *Chi-square test* is one of the most prominent and frequently used statistical tests in social science literatures. It is a statistical test commonly used to compare observed data with data we would expect to obtain according to a specific hypothesis. Chi-square distribution was mainly used here to test for independence of attributes.

Table-4.68 shows the citation frequency of the documents cited in the five selected journals published in India during 2005-2014 and chi-square value have been calculated using Karl Pearson's chi-square test formula.

Table-4.68: Calculation for Chi-Square Test

Disciplines	Observed Citation frequency (f _o)					Expected Citation frequency (f _e)				
	Journals	Books	Conference	Theses	Total	Journals	Books	Conference	Theses	Total
LIS	7446	1897	1178	240	10761	7122	2410	1042	187	10761
Non-LIS	3980	1969	494	60	6503	4304	1456	630	113	6503
Total	11426	3866	1672	300	17264	11426	3866	1672	300	17264

The Chi-square statistic

$$\chi^2 = (7446-7122)^2/7122 + (1897-2410)^2/2410 + (1178-1042)^2/1042 + (240-187)^2/187 + (3980-4304)^2/4304 + (1969-1456)^2/1456 + (494-630)^2/630 + (60-113)^2/113 = 416.0657$$

$$\text{Degrees of freedom, } df = (2-1) \times (4-1) = 1 \times 3 = 3$$

For 3 *df* the tabulated value of χ^2 at 5% level is 12.838 and at 1% level is 11.345. Since the observed value of χ^2 exceeds even the 5% tabulated value, it is highly significant that the citation data are not independent or associated to them.

4.11.4 Two-way ANOVA Testing

Analysis of Variance (ANOVA) is one of the most powerful tools for statistical analysis. The equality of several population means were tested by comparing the sample variances using F-distribution. This technique used to test the difference between the means of three or more populations is significant or not. Two-way ANOVA model used test for the effect of two independent factors on response variable of interior.

Table 4.69: Calculation for Analysis of Variance

Disciplines	Cited Documents				Sum	Average	Variance
	Journals	Books	Conference	Dissertation			
LIS	7446	1897	1178	240	10761	2690.25	10512343
Non-LIS	3980	1969	494	60	6503	1625.75	3130915
Sum	11426	3866	1672	300	17264		
Average	5713	1933	836	150			
Variance	6006578	2592	233928	16200			

Table 4.70: ANOVA Table for Two-way Classified Data

<i>Source of Variation</i>	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F(obs.)</i>	<i>P-value</i>	<i>F crit.</i>
<i>Between Disciplines</i>	1	2266321	2266321	1.70273	0.283002	10.12796
<i>Between Documents</i>	3	36936796	12312265	9.250439	0.050188	9.276628
<i>Error</i>	3	3992978	13309933			
<i>Total</i>	7	43196095				

The observed F_{obs} for disciplines, is smaller than critical value and hence insignificant at both the levels. Again the observed F_{obs} for documents is lesser than the critical value and hence insignificant at both the levels. This indicates that the disciplines affect the mean value of cited documents in the same manner and the mean citation data does not differ with the variation in disciplines.

Chapter- V

Summary and Conclusions

The present study is conducted to identify the disciplines that have influences on library and information science (LIS) literature publications in India over the period of last ten years starting from January, 2005 to December, 2014. Five LIS journals published in India i.e. *ALIS*, *DJLIT*, *IASLIC Bulletin*, *LH*, and *SJIM* were selected to identify the disciplinary influences on LIS publications. The disciplinary influences were identified by measuring knowledge inflow from the various disciplines in LIS. The analyses considered the identification of disciplines of the contributing authors and the documents cited by them. Authors' academic background was identified through the analysis of their institutional affiliation. The subject disciplines of the cited documents such as journals references, books/book chapters, conference publications, and dissertations were analysed by finding the dewey decimal class number of the documents. An attempted has been made to solve the research questions. Few recommendations were also highlighted to continue this study in future.

The basic objectives of the study were

- to identify the major contributory disciplines used for the development of LIS publications in India
- to examine the relationship between the LIS and other field of study, and
- to identify the resource utilization in LIS publication

5.1 Research Summary

This study analyzed the articles published in *ALIS*, *DJLIT*, *IASLIC Bulletin*, *LH*, and *SJIM* during the period 2005-2014. Selection of source of data to be investigated was done by studying publication growth of LIS in India. The population for the study included all the research articles published during the study periods in the selected source journals. Total 229 issues of the selected journals were studied which produced 1,718 research articles by 3,169 authors during the study periods. Only 3,076 authors were included for the analysis, others (2.94%) were excluded because there was lack of information about their affiliation. Contributing authors cited 22,442 documents in their articles published in the selected journals during the study periods. Cited documents were grouped as journal references, books/book chapters, conference publications, doctoral and masters' dissertations, web-resources and others. Web-resources such as websites, web page, web articles not published in e-journals and other categories of documents such as study notes, course materials, annual reports, syllabuses, news articles, brochure/souvenir,

editorials, guidelines, interviews consisting 5,096 references (22.71% of total references) were excluded from the discipline identification analysis. The final population size of referred documents to be study comes to 17,346.

5.2 Research Outcomes

The basic objective to discuss the research outcomes is to answer the research questions. Frequency distributions, tables and other statistical tools and techniques were used to present the data and findings of the study.

The first research question is:

What is the academic background of the authors contributed in LIS journals in India?

Analysis of the collected data shows that contributing authors were from thirty-three disciplines (as per Table-4.16) had influences in library and information publications during the study period. Authors from nineteen disciplines contributed in ALIS (as per Table-4.7) during the study periods. Most of the authors were from LIS, followed by computer science, mathematics, physics, engineering, and medical science. Twenty-four different disciplines were identified as the academic background of the authors contributed in DJLIT during the study periods (as per Table-4.9). Most of the authors were from LIS, followed by computer science, engineering, management, mathematics, and physics. Only seven variant disciplines of the

contributing authors were identified in case of IASLIC Bulletin (as per Table-4.11). Computer science, education, management, science in general, Bengali literature, and history are the disciplines of the contributing authors other than LIS which was maximum in count. Eight variant disciplines of the authors contributed in LH were identified (as per Table-4.13). The disciplines are LIS, education, psychology, anthropology, computer science, law, management, public administration respectively. Twenty-one disciplines of contributing authors of SJIM were identified (as per Table-4.15). Most of the contributing authors were from LIS, followed by computer science, management, engineering, physics, medical science, commerce, science in general, sociology etc. Therefore, it is clear from the analysis that the major portion of contributing authors were from LIS but there were other 318 authors those who were from non-LIS field of study. Computer scientists, management scientists, engineers, mathematicians, physicist, educationist etc were highly influence the scholarly communication in LIS publications.

Second research question is:

Whether LIS professionals work collaboratively with the scholars from other field of studies?

Table-4.17 shows that 15.96% collaborative works done by LIS and non-LIS professionals in ALIS during the study periods. Table-4.18 shows that 18.09% articles were disciplinary collaborative works in DJLIT. 7.83% collaborative articles were made by LIS and non-LIS scholars in IASLIC

Bulletin during 2005-2014 (as per Table-4.19). LH produced 5.98% of collaborative articles were by LIS professionals with outsider of the discipline (as per Table-4.20). In case of SJIM, disciplinary collaboration was 11.14% during the study periods (Table-4.21). Table-4.22 shows the distribution of joint collaboration between LIS and non-LIS authors. Total 139 contributions were published by LIS authors with the collaboration of 29 non-LIS disciplines. Computer science, physics, engineering, management, mathematics, medical science, chemical engineering, education, science in general, sociology are the top ten disciplines influencing LIS publication by collaborative works during the study periods. Hence the research question two solved.

Third research question is:

Is any Non-LIS scholar do contribution in LIS literature?

Authors outside of the core domain also contributed in LIS journals published in India as reflected in Table-4.28. Twelve articles were published by non-LIS scholars in ALIS during the study periods (as per Table-4.23). DJLIT published 60 articles written by non-LIS professionals (see Table-4.24). IASLIC Bulletin published only one article by Bengali literature scholar (as per Table-4.25). LH published five and SJIM published 17 articles by non-LIS professionals (as per Table-4.26 and Table-4.27). The quantity of contributions by non-LIS authors making independent contributions in the five selected LIS journals were presented in Table-4.28. It is proved from the table-4.28 that authors from non-LIS disciplines also contributed their knowledge in LIS

publications. The top five contributing disciplines are computer science, management, engineering, law, and education that contributed in LIS publications.

Fourth research question is:

What is the trend of documents utilization by LIS professionals?

Most of the documents cited by the contributors of five selected journals were journal references. But other documents like books, conference publications, dissertations, web-resources were varying on the source journals. Book citations were second and web-resources were third in position in the case of ALIS, LH, and SJIM. Again web-resource citation was second and books citation was third in the case of DJLIT, IASLIC Bulletin. Other than journal articles, books/book chapters, web-resources there were conference publications, dissertations, and miscellaneous (as per Table-4.29, Table-4.30, Table-4.31, Table-4.32, and Table-4.33). Hence the research question four solved.

Fifth research question is:

Whether LIS publications in India influenced by other disciplines or not?

Interdisciplinary borrowing indices as measured in Table-4.64 for cited journal references, Table-4.65 for cited books references, Table-4.66 for cited conference publications, and Table-4.67 for cited dissertation reveals the

existence of non-LIS disciplines in LIS primary literature publications. And Figure-4.11 measured the seasonal trend line of interdisciplinary borrowing indices, which indicated the upward rising trend of using non-LIS documents in future. Chi-square test also confirmed that the LIS and non-LIS documents are not “independent” or they are “associated” to them and little change of any variables influence the change of other. Two-way ANOVA test proved that mean citation data does not vary with the variation in disciplines. Hence it is proved that non-LIS literatures input knowledge in LIS publications during the study periods and will influenced accordingly in future.

Sixth research question is:

What disciplines input knowledge in Indian LIS literatures?

Disciplinary analysis of cited journals shows that 44.83% journal citations were from non-LIS disciplines. Table-4.39 reveals that computer science have more influence in LIS publications, followed by management, education, medical science, and news media & publishing. Table-4.45 shows that 51.9% books cited by contributors were from non-LIS disciplines. They are management, computer science, education, Indic literatures, law, science in general, and sociology. Main class of cited conference publications were computer science, education, management, linguistics influencing the LIS publications during the study periods. Disciplines of cited dissertations from non-LIS were computer science, education, management, engineering, law, sociology, and medical science as shown in Table-4.57. Overall distribution (as

shown in Table-4.58) of non-core disciplines reveals that science in general was the highest contributing discipline, followed by computer science, management, education, medical science, sociology, economics, psychology, law, new media & publishing, engineering, physics, agriculture, technology, and history. All this discussion provides the evidence of influence by non-LIS disciplines in LIS publications over the study periods.

Seventh research question is:

What is the degree of relationship between the LIS and non-LIS disciplines?

Coefficient of correlations was calculated for the authors' disciplines and cited documents' disciplines and small sample test was done to verify the relationship between the disciplines. The degree of relationship between LIS and non-LIS authors is positive and the correlation coefficient is highly significant (as per Table-4.59). Correlation coefficient for cited journals calculated to be 0.884 which is very high in magnitude and small sample test indicated that significant relationship between LIS and non-LIS journals. But in case of others cited documents such as books, conferences and dissertations, the degree of correlations was positive in magnitude but not always significantly related among the disciplines (as per Table-4.61, Table-4.62, and Table-4.63).

Last research question is:

Is LIS communities biased by disciplinary influences?

LIS scholars were found to be collaborative with the scholars from non-LIS disciplines (Table-4.22). Disciplinary collaboration was found to be 8.09% of total contributions published in all the source journals. Disciplinary collaboration was high in DJLIT (11.33%), followed by ALIS (10.59%), SJIM (7.54%), IASLIC Bull. (4.04%), and LH (3.18%). Correlation coefficient between authors' disciplines was very high and statistically significant (Table-4.59). Correlation coefficients between citations are positive in magnitude in case of all the type of documents, i.e. journal citations, book citations, conference publication citations, and dissertation citations. Trend of using non-LIS documents by the contributors in LIS literature shows their favourism to those literatures (Figure-4.11). ANOVA test shows that there was no significant difference of citing documents due to variations in the disciplines. But all these calculations will vary when individually applied for each source journal. Disciplinary influences were found more in DJLIT, ALIS, SJIM and to some extent to LH and IASLIC Bulletin. Hence it may conclude that though LIS communities collaborative with the other field of studies and citing literatures from non-core disciplines, but they are biased on their own field of study.

This study revealed the following findings:

- (1) Most of the contributions were collaborative works in all the five selected source journals under study.
- (2) Most of the contributing authors were from LIS disciplines in all the five source journals and 10.24% authors were from non-LIS field of studies in all.

- (3) LIS professionals were produced collaborative works with the scholars from outside of their own domain during the study periods. They were more collaborative with the computer scientist, followed by physicians, engineers, medical practitioners, chemical engineers, educationist, scientists, sociologists, agriculturists, psychologists, and social scientists.
- (4) Independent contributions also made by non-LIS professionals. Major contributors were from management, engineering, law, education, archaeology, knowledge & systems, medical science, physics, and psychology disciplines.
- (5) Journals references were the most cited document, followed by books, web-resources, conference publications, dissertations respectively in case of ALIS, LH and SJIM. But in case of DJLIT and IASLIC Bulletin, web-resources were the second highest cited document.
- (6) The top ten non-LIS disciplines of the cited journals were science in general, computer science, management, education, medical science, economics, psychology, sociology, and social sciences in general greatly influenced LIS publications. It is clear from the analysis that yearly trend for uses of non-LIS journals articles is upward moving.
- (7) Majority of cited books are from non-LIS disciplines that input knowledge in LIS literature publications and they are from management, computer science, education, Indic literature, law,

science in general, sociology, knowledge & systems, psychology, economics, English language etc. Trend of using non-LIS books in LIS literature publications was more than LIS books from the fifth year of the study periods.

- (8) Maximum cited conference publications were from LIS disciplines. Other than core disciplines, computer science was the highly contributing discipline as calculated on the basis of cited conference. Education, management, science in general, linguistics, news media, physics, engineering was the other non-LIS disciplines influencing LIS publications.
- (9) Major cited dissertations were from LIS discipline, few were from non-LIS disciplines i.e. computer science, education, management, engineering, law, sociology, medical science etc providing knowledge to LIS.
- (10) Interdisciplinary borrowing exists in case of all the cited documents in the periods under study and the trend of borrowing was upward rising. Regression coefficient was high in the case of journals citation and books citations rather than conference publications and dissertation citations.
- (11) It is found from the study that there was a positive relation between the disciplines of cited documents and between the Authors. The degree of inter-relationship was high in the case of disciplines of contributing authors, journals citations, and cited

conference publications. But it was low in the case of disciplines of the cited books and cited dissertations.

- (12) It is also found that the data regarding the disciplines of cited documents are not independent or in opposite, they are associated to them.
- (13) Analysis of the data also confirmed that mean citation data varies in the same manner with the variation in disciplines.

This study has confirmed that LIS is more and more influenced by many others disciplines. It was found in this study that contributors have cited publications from 65 disciplines. Researchers in LIS most frequently referred publications of LIS, followed by science in general, computer science, management, education, medical science, sociology, economics, psychology, law, news media & publishing, engineering, physics, agriculture, technology, history. Academic background of the maximum contributing authors was LIS. Though there was less collaboration between LIS and non-LIS researchers, but there were varieties of authors from different disciplines. The co-authors were from anthropology, computer science, law, management, and psychology disciplines. Again authors from computer science, management, engineering, law, and education also contributed their knowledge independently in LIS journals which enriches the LIS discipline. The quantitative data regarding co-authorship and references shows that library professionals tend to cite more publications from outside of their own disciplines and produces collaborative researches in diverse disciplines. However it is to be noted that this study only

identified the disciplines that have relationship with LIS publications in India. The reasons behind this behavior are beyond of this study.

5.3 Recommendations for Future Studies

After analyzing the findings of the study, it is necessary to do additional research to establish the truth that LIS is very much influenced by other disciplines by means of publications and study-teaching. This may provide more support to the identification of disciplinary influence on library and information science. The following studies are recommended for further research.

- (1) A bibliometric study may be conduct taking other LIS journal published in India as source of data.
- (2) A consideration of other issues that may have influence the LIS publications is suggested. These issues may be existence of keywords from other disciplines, tools & techniques used in the text of the articles that are belonging to other disciplines, subject analysis of cited documents other than journals / books/ theses/ conference publications.
- (3) A study to investigate the LIS academic programmes that are reshaping with the introduction of interdisciplinary techniques.
- (4) A study on the basic academic background of the LIS contributors prior to being a LIS professionals also recommended to identify the disciplinary knowledge transfer in LIS.

- (5) A study on influence of library and information science on other disciplinary publications is also recommended.
- (6) Study on subject classification of individual articles published in the LIS journals is also recommended to identify the influences on the field of study.
- (7) Identification of non-influential LIS publications is also recommended for future study.
- (8) A critical evaluation on choice of Non-LIS scholars to publish their result results in LIS journals is also recommended as further study.

Finally, this study used DDC as classification scheme to identify the class number of the cited documents and disciplines of the documents identified as the second summary of the schema with little modifications. It was found that disciplines were clubbed under the broad discipline i.e. commerce and communication (380-389), social sciences, sociology and anthropology (300-309). The use of another classification scheme may identify the higher rate of influencing disciplines.

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Appendix-I

Table-A1.1: List of Subjects with DDC code

DDC Code	Subjects	Cited Documents			
		Journals	Books	Conference Pubs	Dissertations
001-003	Knowledge & Systems	36	64	11	-
004-006	Computer Science	539	284	254	17
010	Bibliographies	24	27	-	-
020	LIS	7446	1897	1178	240
030	Encyclopedias	-	16	-	-
060	Organizations & Museum	3	12	8	-
070	News Media & Publishing	79	31	15	1
090	Manuscripts	-	2	-	-
100	Philosophy	10	23	1	-
150	Psychology	93	59	3	2
160	Logic	-	1	-	-
170	Ethics	8	13	-	-
200	Religion	7	11	1	-
300	Social Sciences	86	24	1	-
301-309	Anthropology	2	5	-	-
	Sociology	91	89	6	4
320	Political Science	9	10	2	-
330	Economics	103	57	5	1
340	Law	47	99	6	4
350	Public Administration	10	9	-	-
360	Social Problems & Services	38	9	-	-
370	Education	380	196	45	11

380-382	Commerce	-	2	-	-
383-389	Communication	26	8	5	-
390	Customs & Folklore	-	1	-	-
400	Language	8	18	2	-
410	Linguistics	11	15	18	-
420	English Language	1	47	-	-
490	Indic Language	-	3	2	-
500	Science	1197	99	20	1
510	Mathematics	18	27	-	-
520	Astronomy	3	-	-	-
530	Physics	35	19	15	1
540	Chemistry	27	8	10	-
550	Earth Science	11	3	3	-
560	Paleontology	1	-	-	-
570	Biology	34	9	-	1
580	Botany	8	13	4	-
590	Zoology	2	1	-	-
600	Technology	50	9	5	1
610	Medical Science	368	30	6	3
620	Engineering	83	25	11	4
630	Agriculture	28	32	6	1
640	Home & Family Management	1	3	-	-
650	Management	438	327	20	5
660	Chemical Engineering	8	1	2	-
670	Manufacturing	1	-	-	-
700	Art	2	-	-	1
720	Architecture	1	1	1	-
740	Decorative Arts	-	1	-	-
750	Painting	1	2	-	-
780	Music	1	19	2	-
790	Sports & recreation	1	1	-	-
800	Literature	17	8	-	1
810	American Literature	3	3	-	-
820	English Literature	-	7	-	-
890	Indic Literature	4	148	-	-
900	History	8	9	2	1
910	Geography & travel	8	7	-	-
930	Archaeology	-	-	2	-
940	History of Europe	-	1	-	-

950	History of Asia	8	20	-	-
960	History of Africa	1	-	-	-
970	History of North America	1	-	-	-
990	History of New Zealand	-	1	-	-

Appendix-II

Table-A2.1: Year-wise Distribution of Cited Journals' Disciplines

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	01	04	02	02	05	03	03	-	05	03	28
American literature	-	-	-	02	-	-	-	-	-	01	03
Anthropology	-	-	-	-	-	-	-	-	01	01	02
Architecture	-	-	-	-	-	-	-	-	01	-	01
Arts	-	-	-	-	-	-	-	-	-	02	02
Astronomy	-	-	-	-	-	-	02	-	01	-	03
Bibliographies	02	-	01	01	-	13	-	01	03	03	24
Biology	01	-	-	-	-	05	07	04	07	10	34
Botany	01	-	-	-	01	04	01	01	-	-	08
Chemical engineering	-	-	-	01	02	01	-	01	02	01	08
Chemistry	01	-	01	03	02	02	02	05	05	06	27
Communication	-	-	-	03	-	01	06	05	05	06	26
Computer science	47	34	23	54	47	40	123	43	44	84	539
Earth science	02	-	-	01	04	01	-	-	03	-	11
Economics	02	08	11	04	05	19	14	08	07	25	103
Education	12	41	23	34	32	54	41	30	51	62	380
Engineering	07	07	05	09	10	12	04	11	10	08	83
English language	-	-	-	-	-	-	-	-	01	-	01
Ethics	-	-	-	01	01	-	01	-	01	04	08
Geography & travel	-	-	-	-	-	02	-	-	04	02	08
History	01	-	03	02	-	-	-	01	-	01	08
History of Africa	-	-	-	-	-	01	-	-	-	-	01
History of	-	01	-	04	-	-	01	-	02	-	08

Asia												
History of	-	-	-	-	-	-	-	-	01	-	01	
North												
America												
Home	-	-	-	-	-	-	-	-	01	-	01	
management												
Indic	-	-	-	-	-	02	01	-	01	-	04	
literatures												
Knowledge &	03	03	02	01	-	03	08	01	08	07	36	
systems												
Language	-	-	-	02	-	-	01	03	02	-	08	
Law	01	-	06	01	-	01	16	05	02	15	47	
Linguistics	-	-	01	-	-	04	-	-	03	03	11	
LIS	279	447	468	576	744	894	942	862	1238	996	7446	
Literature	05	-	02	-	02	01	05	01	-	01	17	
Management	16	24	30	61	32	53	59	31	87	45	438	
Manufacturing	-	-	-	-	-	-	-	-	01	-	01	
Mathematics	-	-	01	-	01	01	08	-	04	03	18	
Medical	05	08	16	16	17	34	54	35	122	61	368	
science												
Music	-	-	-	-	-	-	-	-	01	-	01	
News media	08	02	08	01	04	12	02	12	06	24	79	
& publishing												
Organizations	-	-	-	-	-	-	-	-	03	-	03	
& museums												
Painting	01	-	-	-	-	-	-	-	-	-	01	
Paleontology	-	-	-	-	01	-	-	-	-	-	01	
Philosophy	-	-	-	-	-	-	01	01	08	-	10	
Physics	-	05	04	05	01	08	04	-	06	02	35	
Political	01	03	01	02	-	-	-	01	-	01	09	
science												
Psychology	03	07	07	-	21	06	13	06	09	21	93	
Publics	-	02	-	01	01	01	01	01	02	01	10	
administration												
Religion	-	-	-	-	01	-	04	-	-	02	07	
Science	64	87	91	74	78	153	190	51	200	209	1197	
Social	01	-	01	03	01	-	04	04	19	05	38	
problems &												
services												
Social	02	06	01	09	04	05	11	11	18	19	86	
sciences												
Sociology	02	03	13	06	04	11	17	06	19	10	91	

Sports & recreation	-	-	-	-	-	-	-	-	-	-	01	01
Technology	03	-	03	01	05	04	05	19	04	06	06	50
Zoology	-	-	-	-	01	01	-	-	-	-	-	02
Total	471	692	724	880	1027	1352	1551	1160	1918	1651	11426	

Table-A2.2: Year-wise Distribution of Cited Books' Disciplines

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	02	01	03	01	01	04	03	10	-	07	32
American literature	-	01	-	-	-	-	-	-	01	01	03
Anthropology	-	01	-	01	01	-	-	02	-	-	05
Architecture	-	-	-	-	-	01	-	-	-	-	01
Bibliographies	-	03	-	10	-	-	06	02	04	02	27
Biology	-	-	-	-	-	02	03	03	-	01	09
Botany	-	-	01	-	01	08	02	01	-	-	13
Chemical engineering	-	-	-	-	-	01	-	-	-	-	01
Chemistry	01	-	02	-	-	-	-	02	-	03	08
Commerce	-	-	01	-	-	-	-	-	-	01	02
Communication	-	-	-	-	02	01	02	01	02	-	08
Computer science	43	13	24	26	13	23	67	21	16	38	284
Customs & folklore	-	-	-	-	-	-	-	-	01	-	01
Decorative arts	-	-	-	-	-	-	-	-	01	-	01
Earth science	-	-	-	02	01	-	-	-	-	-	03
Economics	02	03	02	04	09	14	08	07	03	05	57
Education	09	18	08	12	29	33	26	21	18	22	196
Encyclopedias	01	01	-	-	01	03	01	04	04	01	16
Engineering	-	-	03	02	01	13	02	01	02	01	25
English language	01	02	04	06	07	03	05	15	-	04	47
English literature	-	-	01	-	-	02	-	02	02	-	07
Ethics	-	-	-	-	-	-	02	-	-	11	13

Geography & travel	-	01	-	01	-	01	01	02	-	01	07
History	-	-	01	01	04	-	-	02	01	-	09
History of Asia	02	01	02	04	01	04	02	-	02	02	20
History of Europe	-	-	-	-	-	-	-	-	01	-	01
History of New Zealand	-	-	-	01	-	-	-	-	-	-	01
Home management	-	-	-	-	-	-	-	01	-	02	03
Indic languages	-	-	01	-	-	-	-	02	-	-	03
Indic literatures	08	01	15	02	02	01	07	87	23	02	148
Knowledge & systems	09	03	03	08	07	12	04	06	09	03	64
Language	04	-	-	01	-	01	-	-	07	05	18
Law	01	08	30	16	06	04	16	10	01	07	99
Linguistics	01	-	01	-	-	02	-	-	07	04	15
LIS	102	201	173	182	159	303	198	157	273	149	1897
Literature	-	-	-	01	-	-	01	05	-	01	08
Logic	-	-	-	-	-	-	-	01	-	-	01
Management	17	39	35	31	25	49	40	36	38	17	327
Manuscripts	-	-	-	-	-	-	02	-	-	-	02
Mathematics	01	02	02	02	04	01	04	04	04	03	27
Medical science	-	-	09	01	04	03	05	02	02	04	30
Music	-	-	-	-	-	-	-	19	-	-	19
News media	-	01	02	08	-	06	01	10	02	01	31
Organizations & museums	-	-	01	03	-	-	01	-	05	02	12
Paintings	-	-	-	-	02	-	-	-	-	-	02
Philosophy	02	-	04	-	-	-	-	03	14	-	23
Physics	02	06	03	02	02	01	02	-	-	01	19
Political science	-	-	-	01	05	-	-	01	03	-	10
Psychology	01	11	01	02	05	13	04	05	13	04	59
Public administration	-	01	01	01	03	-	-	01	02	-	09
Religion	-	01	-	01	-	01	-	07	-	01	11
Science	06	06	04	08	06	26	10	08	15	10	99

Social problems	-	-	01	01	01	01	01	02	01	01	09
Social science	02	02	-	01	02	04	02	03	06	02	24
Sociology	08	01	13	06	04	10	15	11	14	07	89
Sports & recreation	-	-	-	-	-	-	-	-	01	-	01
Technology	-	-	04	-	-	01	-	04	-	-	09
Zoology	-	-	-	-	-	01	-	-	-	-	01
Total	225	328	355	349	308	553	443	481	498	326	3866

Table-A2.3: Year-wise Distribution of Cited Conference Publications

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	02	-	-	-	-	-	02	01	01	06
Archaeology	-	-	-	-	-	-	-	-	02	-	02
Architecture	-	-	-	-	-	-	-	01	-	-	01
Botany	02	01	01	-	-	-	-	-	-	-	04
Chemical engineering	-	-	-	-	-	-	01	01	-	-	02
Chemistry	-	-	-	01	05	-	02	02	-	-	10
Communication	-	-	-	02	-	-	-	-	02	01	05
Computer science	28	19	07	36	08	29	45	15	32	35	254
Earth science	-	-	-	-	-	01	-	-	02	-	03
Economics	-	02	01	-	-	02	-	-	-	-	05
Education	-	05	02	05	02	08	07	06	05	05	45
Engineering	-	-	-	04	01	03	-	-	02	01	11
History	-	-	-	-	-	-	-	02	-	-	02
Indic languages	-	-	-	-	-	-	02	-	-	-	02
Knowledge & systems	-	01	-	-	-	-	05	01	02	02	11
Language	-	-	-	-	-	-	01	-	-	01	02
Law	-	-	02	01	-	-	-	02	-	01	06
Linguistics	-	-	01	-	-	17	-	-	-	-	18
LIS	51	129	97	67	108	203	141	126	162	94	1178
Management	-	-	02	02	01	04	05	01	02	03	20
Medical science	-	01	-	01	-	01	01	01	-	01	06

Music	-	-	-	02	-	-	-	-	-	-	02
News media	-	01	-	-	01	01	01	05	05	01	15
Organizations & museums	-	-	-	02	-	-	-	-	04	02	08
Philosophy	-	-	-	-	-	-	-	-	01	-	01
Physics	-	06	-	02	-	-	06	-	-	01	15
Political science	-	-	-	01	-	-	-	-	01	-	02
Psychology	-	-	-	-	02	-	-	-	-	01	03
Religion	-	-	-	-	-	-	01	-	-	-	01
Science	01	02	01	-	-	06	02	02	06	-	20
Social science	-	-	-	-	-	-	-	-	-	01	01
Sociology	-	01	-	-	-	01	01	01	01	01	06
Technology	01	-	01	-	-	-	02	01	-	-	05
Total	83	170	115	126	128	276	223	169	230	152	1672

Table-A2.4: Year-wise Distribution of Cited Dissertations

Disciplines	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Total
Agriculture	-	-	-	-	-	-	01	-	-	-	01
Arts	-	-	-	-	-	-	-	-	01	-	01
Biology	-	-	-	-	-	-	-	-	01	-	01
Computer science	-	01	-	02	01	02	03	01	06	01	17
Economics	-	-	-	-	-	-	01	-	-	-	01
Education	-	02	-	-	01	01	01	04	02	-	11
Engineering	01	-	-	01	-	-	02	-	-	-	04
History	-	-	-	-	-	-	-	01	-	-	01
Law	-	-	-	-	-	-	04	-	-	-	04
LIS	12	16	11	18	27	42	24	28	31	31	240
Literature	-	-	-	-	-	-	01	-	-	-	01
Management	-	01	-	01	-	01	-	-	01	01	05
Medical science	-	-	02	-	-	-	01	-	-	-	03
News media & publishing	-	-	-	-	-	-	01	-	-	-	01
Physics	-	-	-	-	-	01	-	-	-	-	01
Psychology	-	-	-	-	-	-	01	01	-	-	02

Science	-	-	-	-	-	01	-	-	-	-	01
Sociology	-	-	-	-	-	-	01	-	02	01	04
Technology	-	-	-	-	-	-	01	-	-	-	01
Total	13	20	13	22	29	48	42	35	44	34	300

Appendix-III

The trend equation is, $y' = a + b t$ where,

$$\text{The slope, } b = \frac{n\sum ty - (\sum y)(\sum t)}{n\sum t^2 - (\sum t)^2} \dots\dots\dots(1)$$

$$\text{The intercept, } a = \frac{\sum y}{n} - b\left(\frac{\sum t}{n}\right) \dots\dots\dots(2)$$

Table-A3.1: Calculation for Trend Analysis of Journal Citations

Year	LIS Journals (y_1)	Non-LIS Journals (y_2)	t	t^2	ty_1	ty_2
2005	279	192	1	1	279	192
2006	447	245	2	4	894	490
2007	468	256	3	9	1404	768
2008	576	304	4	16	2304	1216
2009	744	283	5	25	3720	1415
2010	894	458	6	36	5364	2748
2011	942	609	7	49	6594	4263
2012	862	298	8	64	6896	2384
2013	1238	680	9	81	11142	6120
2014	996	655	10	100	9960	6550
Total	7446	3980	55	385	48557	26146

For LIS journal citations

$$b = \frac{10 \times 48557 - 7446 \times 55}{10 \times 385 - (55)^2} = 92.17 \text{ and}$$

$$a = \frac{7446}{10} - 92.17 \times \left(\frac{55}{10}\right) = 237.67$$

For Non-LIS journal citations

$$b = \frac{10 \times 26146 - 3980 \times 55}{10 \times 385 - (55)^2} = 51.58 \text{ and}$$

$$a = \frac{3980}{10} - 51.58x\left(\frac{55}{10}\right) = 114.31$$

The trend equation for LIS journal citations is, $y_1' = 237.67 + 92.17 t$

and the trend equation for Non-LIS journal citations is, $y_2' = 114.31 + 51.58 t$

Table-A3.2: Calculation for Trend Analysis of Book Citations

Year	LIS Books (y_1)	Non-LIS Books (y_2)	t	t^2	ty_1	ty_2
2005	102	123	1	1	102	123
2006	201	127	2	4	402	254
2007	173	182	3	9	519	546
2008	182	167	4	16	728	668
2009	159	149	5	25	795	745
2010	303	205	6	36	1818	1500
2011	198	245	7	49	1386	1715
2012	157	324	8	64	1256	2592
2013	273	225	9	81	2457	2025
2014	149	177	10	100	1490	1770
Total	1897	1969	55	385	10953	11938

For LIS book citations

$$b = \frac{10x10953-1897x55}{10x385-(55)^2} = 6.30 \text{ and}$$

$$a = \frac{1897}{10} - 6.3 x\left(\frac{55}{10}\right) = 155.05$$

For Non-LIS book citations

$$b = \frac{10x11938-1969x55}{10x385-(55)^2} = 13.44 \text{ and}$$

$$a = \frac{1969}{10} - 13.44x\left(\frac{55}{10}\right) = 123$$

The trend equation for LIS book citations is, $y_1' = 155.05 + 6.3 t$

and the trend equation for Non-LIS book citations is, $y_2' = 123 + 13.44 t$

Table-A3.3: Calculation for Trend Analysis of Conference Citations

Year	LIS Conferences (y_1)	Non-LIS Conferences (y_2)	t	t^2	ty_1	ty_2
2005	51	32	1	1	51	32
2006	129	41	2	4	258	82
2007	97	18	3	9	291	54
2008	67	59	4	16	268	236
2009	108	20	5	25	540	100
2010	203	73	6	36	1218	438
2011	141	82	7	49	987	574
2012	126	43	8	64	1008	344
2013	162	68	9	81	1458	612
2014	94	58	10	100	940	580
Total	1178	494	55	385	7019	3052

For LIS conference citations

$$b = \frac{10 \times 7019 - 1178 \times 55}{10 \times 385 - (55)^2} = 6.55 \text{ and}$$

$$a = \frac{1178}{10} - 6.55 \times \left(\frac{55}{10}\right) = 81.78$$

For Non-LIS conference citations

$$b = \frac{10 \times 3052 - 494 \times 55}{10 \times 385 - (55)^2} = 4.06 \text{ and}$$

$$a = \frac{494}{10} - 4.06 \times \left(\frac{55}{10}\right) = 27.07$$

The trend equation for LIS conference citations is, $y_1' = 81.78 + 6.55 t$

and trend equation for Non-LIS conference citations is, $y_2' = 27.07 + 4.06 t$

Table-A3.4: Calculation for Trend Analysis of Dissertation Citations

Year	LIS Dissertations (y_1)	Non-LIS Dissertations (y_2)	t	t^2	ty_1	ty_2
2005	12	1	1	1	12	1
2006	16	4	2	4	32	8
2007	11	2	3	9	33	6

2008	18	4	4	16	72	16
2009	27	2	5	25	135	10
2010	42	6	6	36	252	36
2011	24	18	7	49	168	126
2012	28	7	8	64	224	56
2013	31	13	9	81	279	117
2014	31	3	10	100	310	30
Total	240	60	55	385	1517	406

For LIS dissertation citations

$$b = \frac{10 \times 1517 - 240 \times 55}{10 \times 385 - (55)^2} = 2.39 \text{ and}$$

$$a = \frac{240}{10} - 2.39x\left(\frac{55}{10}\right) = 10.86$$

for Non-LIS dissertation citations

$$b = \frac{10 \times 406 - 60 \times 55}{10 \times 385 - (55)^2} = 0.92 \text{ and}$$

$$a = \frac{60}{10} - 0.92x\left(\frac{55}{10}\right) = 0.94$$

The trend equation for LIS dissertation citations is, $y_1' = 10.86 + 2.39 t$

and trend equation for Non-LIS dissertation citations is, $y_2' = 0.94 + 0.92 t$

Table-A3.5: Calculation of Interdisciplinary Borrowing Trend for Journal Citations and Books Citations

Year	Journal Citations (y_1)	Book Citations (y_2)	t	t^2	ty_1	ty_2
2005	36.11	37.95	1	1	36.11	37.95
2006	22.79	33.67	2	4	45.58	67.34
2007	32.15	47.67	3	9	96.45	143.01
2008	37.11	48.27	4	16	148.44	193.08
2009	31.54	45.44	5	25	157.7	227.2
2010	39.41	49.39	6	36	236.46	296.34
2011	42.41	53.02	7	49	296.87	371.14
2012	30.84	86.77	8	64	246.72	694.16

2013	53.66	50.91	9	81	482.94	458.19
2014	49.77	61.04	10	100	497.7	610.4
Total	375.79	514.13	55	385	2244.97	3098.81

For interdisciplinary borrowing trend of journal citations

$$b = \frac{10 \times 2244.97 - 375.79 \times 55}{10 \times 385 - (55)^2} = 2.159 \text{ and}$$

$$a = \frac{375.79}{10} - 2.159 \times \left(\frac{55}{10}\right) = 25.70$$

The trend equation of interdisciplinary borrowing index for journals citations is,

$$y_1' = 25.70 + 2.159 t$$

For interdisciplinary borrowing trend of books citations

$$b = \frac{10 \times 3098.81 - 514.13 \times 55}{10 \times 385 - (55)^2} = 3.286 \text{ and}$$

$$a = \frac{514.13}{10} - 3.286 \times \left(\frac{55}{10}\right) = 33.34$$

The trend equation of interdisciplinary borrowing index for books citations is,

$$y_2' = 33.34 + 3.286 t$$

Table-A3.6: Calculation for Interdisciplinary Borrowing Trend of Conference Citations and Dissertation Citations

Year	Conference Citations (y_3)	Dissertation Citations (y_4)	t	t^2	ty_3	ty_4
2005	5.6	0.997	1	1	5.6	0.977
2006	12.81	3.333	2	4	25.62	6.666
2007	9.54	1.057	3	9	28.62	3.171
2008	18.99	3.267	4	16	75.96	13.068
2009	7.42	1.94	5	25	37.1	9.7
2010	13.17	5.128	6	36	79.02	30.768
2011	20.48	17.872	7	49	143.36	125.104
2012	17.74	4.444	8	64	141.92	35.552

2013	18.65	7.458	9	81	167.85	67.122
2014	22.27	2.965	10	100	222.7	29.65
Total	146.67	48.441	55	385	927.75	321.778

For interdisciplinary borrowing trend of conference citations

$$b = \frac{10 \times 927.75 - 146.67 \times 55}{10 \times 385 - (55)^2} = 1.467 \text{ and}$$

$$a = \frac{146.67}{10} - 1.467 \times \left(\frac{55}{10}\right) = 6.6$$

The trend equation of interdisciplinary borrowing index for conference citations

$$\text{is, } y_3' = 6.6 + 1.467 t$$

For interdisciplinary borrowing trend of dissertations citations

$$b = \frac{10 \times 321.778 - 48.441 \times 55}{10 \times 385 - (55)^2} = 0.671 \text{ and}$$

$$a = \frac{48.441}{10} - 0.671 \times \left(\frac{55}{10}\right) = 1.154$$

The trend equation of interdisciplinary borrowing index for dissertation

$$\text{citations is, } y_4' = 1.154 + 0.671 t$$
