CHAPTER 2

REVIEW OF THE RELATED LITERATURE

2.0 Introduction

The review of relevant literature covers the key sources, relevant to the present research topic. The review of literature is unique and it aims to provide an overview of the sources. The purpose of review is to identify relevant information and to outline the existing information, to identify the gaps in the current field of study and to position the present work, to evaluate and synthesize the information so obtained on par with the concepts that have been set in the present study. This is to provide justification for the study undertaken.

For the present study, the literature pertaining to mapping and social science with regard to scientometric applications has been retrieved from various sources such as Web of Science, Scopus, JCCC, J-GATE and Scientometric Journal, JSTOR, Google Scholar, Books and Thesis.

The research publications gathered from various sources have been documented and the information so collected was used for evaluation. Finally the summary of the papers has been written. Further the papers have been categorized based on chronological and subject field such as Growth, Publication Productivity, Author Productivity, Collaborative Studies, Trends in Research, Journal Ranking, Co-Citation, Mapping and Obsolescence Factor.

2.1 Growth and Publication Productivity

Line et al. (1976) conducted the study on the size, growth, and composition of social science. The study was based on the analysis of available statistics of serials and monograph publication in social science upto 1973. The study reveals that serial titles took exponential growth of 3.44% per annum.
between 1920 and 1970. The annual average mortality rate of current titles was 0.5%. It is seen that the growth was more rapid in case of secondary services than of primary serials. The monographs showed a high linear increase.

Glanzel (1996) conducted the study on National Research Performance in the six selected fields of social science for the period of 1990-1992. In the present study, the bibliometric methods which were used for the evaluation of National Research Performance of hard and Life Sciences were used. The data is made available from SCI and SSCI of ISI. The result of the study shows that SCI and SSCI appears to be identical or similar but there is a difference in coverage of bibliometric data. The SSCI covers fully and selectively journals while SCI covers the publication in any journal. Though the difference seems to be insignificant, it has serious consequences while doing bibliometric macro trend analysis, particularly during subject classification.

Braun (1998) conducted a study on the growth of social science literature during the period 1989-1995 by referring to SSCI, under the context of globalization. The study concludes that there is an exponential growth with doubling time of two years.

Khan et al. (1998) observed LIS literature in Bangladesh for the period 1966-1997. The literature was retrieved from 37 periodicals originating from 14 countries containing 308 articles which were written by 116 librarians. The observation reveals that 256 articles (83%) were published from Bangladesh alone and 21 articles (6.82%) were from India. Out of the total articles published 92% were single author papers and only 25 articles were of multiauthorship.

Jayashree and Arunachalam (2000) have made studies on mapping of fish research in India by referring to six databases, covering 460 papers roughly 5.5% of the world. Of them 82% are journal articles which have appeared in 113 Indian Journals. Less than 33% of articles have been published in journals
indexed in SCI. Studies also include the contribution of papers from different Government laboratories and academic institutions. It is inferred that Kochi, Chennai, Mumbai and Mangalore are the cities and Tamil Nadu and Kerala are the states contributing large number of papers.

**Berthelemot and Russell (2001)** have studied the world distribution of social science journals. The analysis of 4,326 periodicals in the social science was done. These periodicals have been included in 1991 printed edition of the UNESCO, and DARE database. The quantitative studies in the field of social science have focused on the analysis of National Research Performance and Mapping of International Research. The multidisciplinary database SSCI was referred. The research carried by Glanzel and others suggest that SSCI analyses the most important international journals, whereas the locally oriented disciplines are poorly covered. Because the bibliography of books theses, research reports, proceedings and other important literature in the field of social science is problematic. Therefore, it is very difficult to measure the research productivity.

**Wani et al. (2002)** have conducted a study on the growth and development of library and information science literature. The outputs, available through LISTA have been used for the study. The findings reveal that there is an increase in the growth of literature in the field of LIS since the professional and researchers have taken more interest to publish their work. The country-wise analysis shows that USA ranks first with 301 publications and period-wise analysis shows 1980s ranks first with 155 publications. When coverage policy and source type are traced core publication ranks first with a literary output of 485 publications. While academic journals have the first place with 409 publications.

**Gupta et al. (2002)** have conducted a study with an object of finding a suitable growth model applicable to study the growth of publications in the six major sub disciplines of social science in the world. For the study Econolit,
Sociofile, and Psycht databases were referred. In addition, the growth model suggested by Egghe and Rao is utilized. The results of the study reveal that the application of selected growth models to the cumulative growth of publication in anthropology (1963-1997), economics (1969-1997), history (1970-1997), political science (1970-1997), psychology (1974-1998) and sociology (1963-1998) indicate that growth models could explain their growth. The comparative study of all the models was done and ultimately it was inferred that power and logistic models were best for publication in Economics and Sociology. Power model accompanied by logistic model is suitable for history, political science, psychology and lastly logistic model accompanied by power model for publication in anthropology.

Sangam and Keshava (2003) have conducted a study on the growth pattern of literature in the field of social science. For the study the data was derived from CD-ROM version of Wilson Social Science Abstracts for the period 1983-1998. The six disciplines viz, Anthropology, Economics, History, Political Science, Psychology and Sociology were chosen. The calculation of relative growth rates and doubling time for publication has been done in order to determine the rate of growth of social science literature. Further, the study is extended to identify the criteria on which the growth models are to be selected for the appropriate application in the above said six disciplines.

Sangam et al. (2003) conducted a study on the growth and dynamics of Indian and Chinese publication in three sub-fields of social science i.e. Economics, Psychology and Sociology by using growth models. The inference of the study shows that logistic and power model in case of economics, logistic models in psychology and power model in sociology showed the best fits in the growth of Indian social science literature, whereas logistic and power model in economics, logistic and gompertz models in psychology and sociology showed as best fits in case of Chinese social science literature.
Arunachalam and Rino (2003) have studied the growth and development of modern biology considering it in India and China. The study was based on the data retrieved from BBCI and BTCI. This is the information regarding institutions, cities and states which have contributed more number of papers and journals which have published more number of papers along with the subfields. Journal country and impact factor, highly cited papers and internally co-authored papers have been identified. The result of the study shows that China’s publication rate is much more than that of India in 1992-2000. There is a consistent growth during the period 1995-98. It is common in both the countries that highly cited papers were written in collaboration with foreign authors and institutions. In the year 1995, institutions contributed a more number of highly cited papers.

Tsay (2004) conducted the study on literature growth, characteristics of journal and author productivity in the field of LIS pertaining to USA. The study reveals that logistic growth model fits well to the LIS literature for the period 1977 - 2000. The journal distribution is in accordance with Bradford, Zipf’s S-shaped curve. The author productivity follows Lotka’s law, as 76.7% papers are contributed by single author.

Kevin et al. (2005) have prepared maps depicting the structure of all of sciences by referring to journals on both natural and social science. The maps are similar to cartographic maps of our world; and show a bird’s eye view of today’s scientific layout. Maps facilitate us to identify the major areas of science, their structure, similarity and interconnectivity. The present work is aimed at achieving structural accuracy, totally 7,121 journals covering 1 million documents from both SCI and SSCI. The force directed graph layout tool called “VxOrd” was used to study the journal’s similarity measures. The best mutual information values were calculated at each graph at different clustering levels. The best co-citation and inter-citations maps according to local and structural accuracy were selected and then compared. Then the inter-citation maps were used to study the linkages between disciplines. It is found
out from the studies that biochemistry is supposed to be the most interdisciplinary in science.

Angadi et al. (2006) conducted scientometric study by analyzing 358 publications published by different social scientists working in Tata Institute of Social Science during 2001-2004. This was in order to study authorship pattern and collaboration trend. The result of study indicates that 90.22% of papers were by single author, 5.86% were by two authors, and 3.35% were by three authors.

Katy et al. (2006) have collected publication data sets and analyzed them to identify 500 most cited research institutions with spatio temporal changes in their inter-citation patterns. The approach is novel in analysis of the dual role of institutions as producers and consumers of scholarly knowledge and studying the diffusion of knowledge among them. A geographic visualization metaphor has been used to visually depict the production and consumption of knowledge. Finally the maps showing the highest producers and their consumers and highest consumers and their producers have been prepared.

Frizo et al. (2006) have chosen the combination of full text analysis and traditional bibliometrics methods to map the research papers appeared in the journal Scientometrics. The objective of the study was to develop appropriate techniques for full text analysis and to improve the efficiency of individual methods in the mapping of science. The study was made with regard to 5 journals in the field of LIS covering 1000 articles and notes published during 2002-2004. The combination of different mapping techniques applied to the full text of scientific publications, resulted in a characteristic tripod pattern. Totally six clusters were identified in LIS. Out of them two from bibliometrics, one relating to information retrieval and one each from general issues.
Gunasekaran et al. (2006) have conducted studies on chemical science research in India. In order to map the research, the data was collected from CD-ROM versions of Chemistry Citation Index, 2002. The global chemical science research publications have been published by India only in 2002. Indian scientists have published 6186 papers in 569 journals. Of the papers in various journals, more than 45% have impact factor less than 1%. Nearly 2% of the papers published did not have any impact factor. The average impact factor for journal articles during 2002 was 1.359. The Indians published nearly 26% of papers in the US journals. Of them Asian journal of Chemistry could publish 269 papers, Journal of Indian Chemical Society published 224 papers and Indian Journal of Chemistry could publish 209 papers.

Saxena et al. (2007) have written a paper with a aim to forecast a time series using a suitable model based on the analysis of historical data. A model is valued on the basis of its efficiency to perform the task for which it has been designed, and how best it fits the data. Various statistical models have been used to analyze the growth of literature; the one that suits the study is not yet finalized. In view of this, a study has been conducted to explore the models for growth of literature. One approach called multiplicative seasonal model approach and another is nonlinear model where the trend has exponential growth form. The result of the study reveals that adequate number of models came out with good fit parameters. This paper highlights the basic issues that are related to the forecasting growth of literature data.

Surulthinai et al. (2008) have conducted a knowledge management research in India. The Scopus database is referred to obtain the publication output. This is in order to analyze quantitative growth and development of knowledge management research. Totally 51 papers have been contributed in the field of knowledge management covering different domains. The periodical growth of publication was studied. According to the study, nearly 80% of the papers were published in journals. The author contribution was also studied and
it is observed that this publication behavior shows the persons involved in the knowledge management research are selective in publication.

**Basl et al. (2009)** have mapped the publication output produced by Czech sociologist in scientific journals with impact-factor during the last ten years. For this the data is made available from WOS covering 1998 to 2007. The published articles impact factor of journal and co-author share and citation are the bases to judge the productivity of individual authors. The analytical study reveals the fact that similar author rank among the first fifty using the selected indicators of impact factor and citation indexes. This order changes with the change in the indicator. Publication-wise the study shows that there are strongly differentiated groups of sociologist in Czech Republic.

**Davarpanah (2009)** has done an evaluation study on the publication output and citation impact in the social science in Malaysia. The SSCI is the bases of the study for the period 1999-2008. The study covers the analysis of the trend in publication, citation pattern and national publication profiles. In addition to this, the exploration of strengths and weaknesses of different fields is done with the help of new mathematical index called power index (PI). The result of the study shows that publication output in social science is in increasing trend since 1999. The majority of the papers have been published in the journals whose impact factor is 2.72 per paper. Internationally co-authored publications are 77% of all citations and most prolific authors are from productive institutions.

**Sangam et al. (2010)** have conducted studies on growth models suggested by Egghe and Rao. The main objective of the study is to find the applicability of selected growth model to the growth of Indian and Chinese publication and another to verify the criteria for selecting the most appropriate growth models suggested by Egghe and Rao. For the study, the data has been retrieved from SCI. The result of the study reveals that during the period 1997-2006, India has contributed 1,567 papers whereas China has contributed 3,375
papers. India has contributed 193, the highest number of papers during the year 2004-2006 while China has the highest number of papers i.e., 535 during the year 2006. The rest of the countries have 45,217 publications and 4,929 is the highest during 2004. Further studies were conducted to identify appropriate growth models which fit into the Indian and Chinese cumulative growth of publications. An analysis and comparison of the different growth models it is concluded that power growth model is appropriate in Indian literature and linear growth model is appropriate in Chinese literature.

**Sagar et al. (2010)** have made an attempt to study the research publication on Tsunami during 1997-08 by referring Scopus database. 4,338 publications and 21,107 citations were analyzed and the growth of publications, country-wise distribution of publications, and activity index of countries most-frequently cited publications, authorship pattern, co-authorship index and distribution of keywords were traced. Out of the total publications of Tsunami 54.20% has been contributed by USA, Japan, UK, India and Australia. The incident of Indonesia’s tsunami on 26\(^{th}\) December 2009 paved the way for more number of publications.

**Kaur and Gupta (2010)** have focused on the study of dental science research in India. The study was done with an objective to analyze the status, publication share, rank and growth of India’s research output. For the study Scopus database for the period 1999-2008 was referred. Out of the four branches of science and technology literature only health sciences were selected, which comprise dentistry. In addition, the citation data for measuring quality impact and visibility of Indian research output was used.

**Sangam and Meera (2011)** have studied the chemical science research in India and could prepare a map based on publication and citation data. In the study, the quantification of research and growth in the different subfields of chemical science literature has been done. The identification of inter and multidisciplinary characters was done. The investigation in the changes in the
patterns of collaborative research was successfully done. The study was extended even to identify the research institutions which are leading in publishing large number of papers and journals. It was possible to earmark the highly productive academic institutions, who contributed more number of Indian research papers in the field of Indian chemical sciences.

Gupta, Bala and Kaur (2011) have made an attempt to study the research publication on AIDS/HIV during 1999-08 by referring Scopus database. The data was analyzed on the aspects such as the growth, rank, global publication share, citation impact, share of international collaborative papers, contribution of major collaborative partner countries, contribution of various subject-fields and by type of tuberculosis and patterns of research communication in most productive journals. According to the study, India ranks the 12th position in the top 20 countries and its global publication share is higher than Brazil’s. The inference of the study is that India needs to increase its output and bring about improvement in the quality of its research efforts.

Gupta et al. (2011) have made an analysis on the research output of India in computer science during the period 1999-2008. The parameters such as total research output, its growth, its rank and global publication share, citation impact, share of international collaborative papers, major collaborative partner countries and lastly partners of research communication in productive journals were considered. A comparative study of publication output and the impact of India in comparison with China, Taiwan and Brazil was done.

Balasubramani and Murugan (2011) have taken up the study of research performance of India in tapioca. The extent of study extends to the entire globe and the period chosen was 1997 -2010. The main focus of the study in research of tapioca is its growth, share and impact in global publication, the patterns of international and major collaborative partners, the publication productivity and the impact of leading institutions of India, the characteristics of most prolific authors and high-cited papers and patterns of
research communication in the productivity journals. For the study SCI through Web of Science provided by Thomson Reuters was used. Totally 447 records were used and analyzed by using histcite software application in order to fulfill the objective of the study.

**Choudhury and Sarkhel (2011)** have made an attempt to study the research publication on agriculture research in West Bengal for the period 1993-2007 by referring to CAB Abstracts. According to the study, 303 institutions have 10417 author papers in 1178 journals published from 53 countries. Only 8 foreign journals were from the top 50 journals with 30 papers. The institutions which produce high quality papers were noticed. The collaborative research trend was found among the authors.

**Gupta and Bala (2011)** have made an attempt to study the research publications on tuberculosis during 1998-09 by referring to Scopus database. The data was retrieved on the following aspects, the growth, rank and global publication share, citation impact, share of international collaborative papers, contribution of major collaborative partner countries, contribution of various subject fields and by type of tuberculosis and patterns of research communication in most productive journals According to the study, India ranks the 3rd position in the top 21 countries and the global publication share is higher in China. The inference of the study is that India needs to increase its output and bring about improvement in the quality of its research.

**Gupta et al. (2011)** analyzed the Indian research output in diabetes during 1999-2008. By referring to Scopus database, the data was retrieved on the following parameters: its growth, rank of global publications share, citation impact, overall share of international collaborative papers, and share of major collaborative partners. The most productive institutions, authors, and highly-cited papers were analyzed. The publication share of India was compared with China, South Korea and Brazil.
Rita et al. (2011) have conducted a study on publication productivity and career advancement by female and male psychology faculty. The study was concentrated on 511 university psychology professors in which 250 were women. The period of the study was from 1998-2004 and the database referred was PsycINFO. The result of the study reveals that overall women published less than men especially in international journals and as senior authors. Further studies also show that the scientific productivity of women is slower when compared to men’s.

Sudhier and Abhila (2011) have done an analytical study on the research productivity of the social scientists at the Centre for Development Studies, Thiruvananthapur during 1998-2008. For the study, totally 599 research publications by CDS researchers have been considered. This includes 38.32% journal articles, 23.54% chapters in books and 15.03% working papers. The studies reveal that the degree of authorship collaboration is found to be 0.043. More than 66% of articles were published in Indian Journals while 33.19% were published in foreign journals. Economic and Political Weekly contributed the highest number of articles 79 (34.50%) followed by Indian Journal of Labour Economics with 7 (3.06%).

Zafrunnisha (2012) has conducted a study on the application of Bradford’s law. For the study 141 Ph.d theses were considered. An analysis was made to identify Bradford’s Zones and productivity of journals cited in theses. The journals were divided into four equal groups in order to measure the productivity of journals. It is observed that the average rate of productivity of journals in the first group was 254 articles whereas it has come down to 10.73 articles in the fourth group. The journal distribution ratio in psychology has been worked out and dispersion of journal titles in psychology does not fit the Bradford’s law of Scattering.
2.2 Author Productivity and Collaboration

Karisiddappa et al. (1990) conducted studies on authorship research in psychology based on the data which was collected from psychological abstracts for the year 1988. The result of the study shows that the single author papers proportion has come down showing a trend towards multiple authorship. It is observed that the authorship pattern is not uniform throughout the various subfields of the subjects. If 87% of multiauthor papers are in one subfield and it was found to be 20-69% in other subfields. With regard to degree of collaboration in research. It is 0.60 in psychology integrated. Whereas it is ranged between 0.29 to 0.87 in other subfields. However, it is inferred that there is a significant difference with regard to authorship pattern in the subfield of psychology.

Norris (1993) has taken up an authorship pattern studies in CJNR from 1970-1991. For the study, the number of single, double and multiple authorship for each year was considered. Further, the period was divided into 1 seven year period and 3 five year period intervals. The frequency studies, their percentages, Chi-square studies, their computations and author ratio were done year-wise. The result of the study revealed that there is a decrease in the number of single author paper while there is an increase in number of more than 1 author papers from 1982 onwards. As it is true in case of other disciplines, the authorship pattern is found to be changing in the field of nursing.

Sen (1996) has conducted studies to test the validity of Lotka’s law in the field of Library and Information Science. For the studies LIS, 1992 and LISA 1993 in which 7101 and 7591 abstracts of the articles were covered have been used. These articles were written by 8284 and 7664 authors respectively. The application of Lotka’s law was made. The result obtained shows the value of x has been considered as 3.23 in the first case and 3.1 in the second case. Finally it is inferred that the value of n is found to be higher in LIS when
compared to exact sciences. This is because of the fact that the authors contributing two or more papers are less in this field.

**Budd and Seavy (1996)** referred to SSCI for the period 1981-1992 and traced the indicators of Library and Information Science Scientist’s publishing and citation activity. The individual as well as institutional productivity was examined and ranking of publication and citation were done.

**DeHaan (1997)** studied on authorship pattern in Dutch Sociology. The period of study is from 1939-1987. The result of the study reveals that a co-author analysis shows increasing trend in collaboration. Single author publication is with the same pace. The studies with regard to network analysis of co-author relation was done. The period was divided into 2 stage interval of seven year each and one of six years. 37 clusters were identified with 3 or more members. Out of this more number of clusters was identified by experts. Ultimately it is found that the clusters only partially matched their perception of research networks within Dutch sociology.

**Gupta and Karisiddappa (1998)** have done an analytical work on the growth of funded and collaborative research publication and authors. The theoretical population genetics literature from 1956-60 to 1976-1980 was selected. The studies reveal that there is no proportionate increase of funded and collaborative publications along with the growth of total publication and authors. Further, the study made with regard to multiauthor research publications in different countries and growth of multiauthor publications from 1956-60 to 1976-80 and impact of funding and collaboration on the productivity of authors over a period of time reveals that the authors who are more productive are generally found to be more collaborative and funded. Further, the focus of research is shifting from national era to international era, which is supported by government agencies for conducting studies in the field of theoretical population genetics.
O’Neill (1998) conducted the study on authorship pattern in two theory based journals, one from America and another from Canada. The data regarding single, double and multiauthor from 1955 to 1994 was collected by referring to Educational Theory and from 1970 to 1994 by referring to the Journal of Educational Thought. The period was divided into 8 and 5 year intervals respectively. The frequencies and percentages were generated for each interval. The chi-square and ratio analysis was made for educational theory. According to the study, it is found that majority of the authorships were single in both the journals. This is contrary to De Solla Price’s Prediction.

Aparna and Vinu Kumar (2000) have focused their study on international collaboration and the role of Indian science. The data from SCI in 1990 and 1994 was referred. As a result of the study, it is inferred that there is an increase in collaboration both in terms of output and the extent of network and IF. Though there was no significant increase in IF over certain period, there is an increase of it from 1990 to 1994. Normally much of the Indian scientific co-operation was with western countries and Japan. It is also observed that smaller countries with a few coauthored papers show higher average impact.

Garg and Padhi (2001) have conducted studies on collaborative coefficient and co-authorship index. 3174 papers were analyzed in the field of laser science and technology. Out of these, 401 papers were written by single author, and the rest of the 2773 were written jointly. Of these 2773 papers, only 687 were written interdepartmental, interinstitutional and with international collaboration. The inference shows that proportion of mega author papers were more in Japan, France, Israel and Netherland. While the proportion of single author paper were more in Canada, China and Australia. Many of the collaborative papers were national as well as international. International papers were more from USA, Japan, France and Australia, while international collaboration was higher in case of China, Israel, Netherland and Scotland.
Koganuramath et al. (2002) conducted a study on authorship pattern and collaboration. Totally 663 papers were analyzed. These papers were published by social scientists working in the Tata Institute of Social Science. The period considered was 1990-2000. As a result of their study, it is observed the collaboration co-efficient of the 613 single authors papers is 92.46% while 642 two author papers is 6.33%. The highest collaboration co-efficient 0.13 was found during 1996-1997. The most productive authors were Murli Desai, Sarthy Acharya, Lakshmi Lingam, I.U.B Reddy, Kailash, Shalini Bharat and Chaya Datar, publishing between 20-38 papers each. The following are the core journals which have published papers produced by TISS, Indian Journal of Social Work 98, Economic and Political Weekly 26, Perspective of Social Work 7 and All Indian Institute of Local Self government 5.

Farahat (2002) has conducted a study on authorship pattern in agriculture science in Egypt. For the study, nineteen Egyptian journals of agricultural science have been used. The study reveals that multiple authorship is more a predominant trend and co-authored papers share 79% of the total sample. Of the multiple authors 3 author papers are more in number. The co-authorship pattern was found to be more common in social science related to agricultural disciplines. There is no significant difference in the pattern of collaboration in agriculture science fields in Egypt, India and Pakistan.

Kalyane and Sen (2003) have made a special study on an individual eminent scientist by the name Tibor Braun. His papers (single author, 40 and multiauthor 140) published during the period 1954-1995. The productivity coefficient has been worked out to 0.78. Further, the scientist had 80 collaborators. Author productivity in the research group of the above said scientist follows the trend of Lotka’s law. Totally 49 channels of communication were used to publish his research. Of them 33 papers were from the scientometrics, which is the highest.
Wanger and Leydesdorff (2003) have gone through SCI for the period 1990-2000 and analyzed the international co-authorship patterns at regional and global level. Using statistical methods and factor analysis to reveal intense relationship among the core members of network was traced. The inference was that there is an expansion of global network including number of countries. There is an increase in coreset of countries from 6-8 during 1990-2000. The large countries compared with each other for partners in the global network.

Gupta and Singh (2004) have chosen a study on India’s relation with Latin American countries with respect to collaboration studies, with an objective to study the nature of India’s collaboration with Latin American countries in S & T as reflected in coauthor papers, to identify the specific subject areas of Indian collaboration with Latin American, to study the impact of Indian collaborative research with Latin America in different fields, to identify the major Indian institutions involved in the collaborative research with institutions in Latin America.

Tony (2004) has conducted a study on measuring author productivity and citation frequency by referring the proceedings of the Oklahoma Academy of Science. The definitions of productivity, citation frequency, author productivity have been given. The productivity is the number of times an author publishes an article in POAS between 1921-2000. Further he defines citation frequency is the number of times an article or author cited in other journals between 1974-2000 as indexed in citation database Sci Search. The author productivity approximately is an inverse square distribution as predicted by Lotka’s law of bibliometrics. Further, the studies reveal that 75% of the authors published once in POAS.

Fuyuki (2004) has analyzed and compared the characteristics of author productivity in scientific conference papers belonging to four different domains. A focus on the degree of concentration in the distribution was made. In the course of analysis, the attention was paid to the peculiar phenomenon of
author productivity data. Many of the statistical measures showed variation depending on the size of the sample. This becomes a hurdle while comparing different samples of a different size. Hence, a different approach was made for the study.

Moody (2004) in his article entitled “The Structure of Social Science Collaboration Network Disciplinary Cohesion from 1963-1999, has discussed about sociological collaboration network. It is found that a structurally cohesive core is growing steadily since the 1960’s. It is characterized by the disciplines co-authorship networks. The result of the study reveals that participation in sociology collaboration network depends on the type of research. The special and quantitative work is more likely to be coauthored than nonquantitative work. However, collaboration is not related to specialty area.

Asha (2007) conducted an analytical study on articles and citations related to demography studies of India for the period 1970-2001. The study involves enlisting of important areas of demographic studies, contribution of articles institutional wise and area wise. Further, year-wise distribution of collaboration co-efficient was worked out in order to ascertain the trends in the distribution of single and multi author articles. The studies with regard to authorship pattern show a slight inclination towards collaboration.

Kumar and Kumar (2008) have done work on collaboration on research productivity in oilseed research institutes of India. For the study, totally 3330 papers contributed by the scientists working in five major oilseed research institutes in India till 2006 have been considered. The study includes the type of communication channels and authorship pattern. The outcome of the study reveals that 33.77% articles have been published in Indian and foreign journals and 33.25% in conferences. It is found that 21.33% publications are single author and CC is 0.78. Further, the ranking of top 10 authors from each institute has been carried out.
Hunter and Leahey (2008) have discussed about the collaborative research in sociology along with trends and contributing factors. For the study, the data has been collected from random sample of articles appeared in two leading sociology journals during the period 1935 to 2005. The data pooled across all years is used to estimate logistic regression models in order to assess the relative contribution of various factors. It is observed that cross place collaboration has been stagnated between 1980 and 2005; quantitative research is more likely to be collaborative because of the projects which require data collection. The gender differences are insignificant as far as rate of collaboration is concerned. Further, it is observed that coauthors are playing a more important role than sole authors.

Manuel Raj and Amudhvalli (2008) have conducted a study with the purpose to determine whether the most productive authors in the literature of health science for the eight year period 2000-2007 are the most collaborative. The study includes the determination of degree of collaboration and correlation between productivity and collaboration patterns based on works done by healthcare professionals in CMC, Vellore. The Pubmed database was used for analysis. The primary journal indexed in Pubmed and subscribed by CMC library was used in order to get full data. The result of study reveals that the degree of collaboration was very high while the correlation amongst the productivity and collaboration is low. Further intra-collaboration is much more than inter-collaboration across the disciplines and institutions.

Taemin (2008) studied authorship characteristics by selecting top twenty journals in LIS from Asian and Pacific region. The database referred was web of science. 1,317 articles for the period 1967-2005, were referred. After the study it is inferred that the most productive countries are Austria, China, South Korea, Taiwan, Singapore, Japan, New Zealand and Malaysia. 77.6% of authors in the field of LIS contributed single author article. About 50% were written by multiple authors. 73% of articles were written in collaboration. The most productive authors have been identified; strongest
collaboration was between Australia and China, China and Singapore and Australia and New Zealand.

**Zafrunnisha and Pullareddy (2009)** have conducted a study with an objective to determine the nature of authorship pattern and the degree of collaboration in psychology. The data is made available from 141 Ph.D theses submitted during 1963-2003. The data, so collected, includes 22565 citations. Out of this, only journal citations were considered for the study. As a result of this, totally 14374 journal citations were used for investigation. The outcome of the study reveals the predominance of multiauthor paper over single author. 0.53 is the degree of collaboration.

**Akakandelwa (2009)** conducted a detailed study on the author productivity and author collaboration. Zambia University academic faculty research productivity for the period 2002-2007 was chosen, and web of science database was referred. The following facts were observed. The multiple author publication are more than single author publication. Single author publication range between 8-3 per/year. More than 95% multiple author publications are from Veterinary Medicine, General Medicine, and Mines. The study has proved that there is positive a relation between author productivity and author collaboration. The more collaborative author is he who is more productive.

**Ruben (2009)** has conducted a study on “Identification and Analyses of Authors who make up the elite in subareas of bibliometrics fields”. The material for analyses was obtained from 376 different authors who have produced 390 articles, book chapters and work presented in different conferences during the period 1922-2003. The inference is that there are 17 authors who have each participated at least in the production of 5 or more documents.
Yan, Ding and Zhu (2009) have studied the collaboration pattern and network structure of co-authorship network of Library and Information Science. They referred to 18 core journals belonging to LIS covering six years and analyzed the coauthorship network for both macro and micro perspective and identified some important features. The central value of each was calculated and compared it with citation counts. The centrality ranking is highly corrected with citation ranking. It is also dealt with limitation of current centrality measure for co-authorship network analysis.

Chang (2009) has made an analytical study on Asian authorship characteristics and trends in JASIST. The bibliometric studies are based on 1,869 papers with 3,422 frequencies of authorship appeared in JASIST from 1981 to 2005. The results of the study show that Asian researchers have contributed significantly since 1996 to 2000. It is also observed that Asian information science research has expanded to international era, since 2001, with the increase in the frequency of international co-authorship and growth of collaborative countries. The Japanese researchers have preferred to individual contribution or at the most, collaboration amongst with the co-researchers of the same country.

Yin and Chiang (2010) have conducted a study with an object to trace trend analysis of international periodical and literature covered under “Social Capital” at SSCI database from 1956 to 2008. The result of the study reveals that the literature productivity on social capital has attained maximum growth in the last decade. The Lotka’s law does not hold good as far as distribution of author productivity is concerned. The papers generated on social capital were usually written by multiauthor.

Sangam (2012) has conducted a study in order to investigate the pattern of authorship and collaborative studies in the field of demography. The data was made available from the population index for the time span 1988-1999. The span of three years period was considered for assessment. The result of the
study shows that the collaborative index increases from 1.47 during 1988 to 1990 and 1.79 during 1997 to 1999. It is found that the growth in the proportion of collaborated publication shows decreasing value. The computed value of CI and DC shows a consistent trend, reflecting the growing collaboration.

2.3 Social Science Literature

Rees and Potter (1980) have made a study in the field of social science research in Canada. Their study shows that the Canadian to Canadian citation links are stronger than Canadian to NonCanadian citation links. French and English speaking social scientists differ in their citation pattern.

Goel and Garg (1993) have conducted a study on research trends in the field of social science by referring to SSCI. According to the study, most of the papers were written by Indian social scientists published in Indian journals. Most of the articles published in low impact journals have low citation rate. Anthropology, Psychology, and Psychiatry are the areas where social science research is advancing in India.

Gopalakrishnan and Damanpour (1997) discussed the extant innovation research from three fields such as economics, organizational sociology and technology management—in order to find points at which the fields' approaches and assumptions overlap. A comparison of research methods and approaches along three dimensions, stage of adoption, level of analysis, and type of innovation, were found, from the three fields and it was re-mapped into five more specific groups. Then research from different groups can be cross-fertilized to help management of innovation in organizations. The paper suggests that knowing the ways in which different groups of studies differ from each other may lead to a more accurate understanding of the relative value of innovation research from each group, for both theorists and managers.
Suriya (1998) has studied research trends in various aspects of distance education. The study shows that European countries accounted for 40% of the total research productivity in Distance Education, followed by North America and South America 23%, Asia 18%, Oceania 16% and Africa 3%.

Sangam and Kadi (2003) have studied the growth of research and priorities of demography research in different countries of the world i.e. USA, UK, India and China for the period 1986 to 2000. For the study they have employed appropriate growth model to fit the time series data in order to study the trend of growth of subject for each country. The results show that over a period of time there is an increase in publication of literature.

Jain (2003) has worked on the Indian Council of Social Science Research (ICSSR) which was established for the development of social science research in India. It provides grants to 27 research institutes and six regional centers in India. Some of the institutes are closely associated with national and state level planning development agencies and have thereby strengthened the links between research and policy-making. 22 institute libraries and three regional libraries in different Indian states were considered for this study. The analyses of the study is about annual acquisition of books; periodicals; CD-ROMs; annual budgets; computerization; hardware and software; Internet; library network; and interlibrary loan and photocopy facilities available in the libraries. Only a few ICSSR institute libraries are subscribing to electronic journals and have electronic documents. ICSSR institute libraries have started computerized operations and are making attempts to have digitized collections. These libraries are required to understand literature growth and use patterns in social science.
2.4 Ranking of Journals

Oromaner (1977) went through citations to articles published during 1960 in 3 “core” sociological journals cited in 10 sociological journals from 1961 to 1970. The study conveys that the articles were not cited at all, while 11% of cited articles were cited in more than 1/2 of the journals. Many of the articles are found to be published in core journals rather than specialized ones. It is opined that more attention should be given to specialized journals than core journals.

Gordon (1982) has conducted a study on the problems associated with ranking journals in accordance with their relative importance. It is observed that social science journal citation report could be the best available resource for journal selection for libraries and information systems.

Doreian (1989) considers that the ranking of journals is either subjective or objective. A richer set of variables tapping the evaluation base for journals be used for the distribution of journals. The same principle was applied to a set of psychological journals and found a basis for understanding the journal evaluation.

Thaty and Mishra (1990) conducted a study on frequently cited periodicals by Indian Agricultural Economists (1985-89) by analyzing the citation covered under 170 articles published in 5 volumes of Indian Journal of Agricultural Economics. It is found that each journal was cited at least 5 times. In addition to this, they highlighted the type of publication cited, authorship pattern, country-wise distribution of frequently cited periodicals.

Brown (2003) has made a new approach to rank journals namely the number and percent frequency of articles a journal publishes that are heavily downloaded from the social science research network. The topmost 18 accounting and finance journals have been listed and five journals have been
identified which are not considered by the two most recent major published ranking studies performed by accounting faculty. It is observed that financial accounting facilities are interested to publish their papers in SSRN which are highly downloaded.

Kherde (2003) conducted studies to identify the core journals in the field of Library and Information Science. In the study an analysis of the citations appended to articles that appeared in popular Indian Library and Information Science journals during 1996-2001 were considered and attempts were made to identify the core periodicals in the field of Library and Information Science. Finally the study reveals that Annals of Library and Information Science is the most popular Indian journal which is used by researchers and libraries.

Liner (2004) has discussed the methods of ranking economics journals. The international economic journals are ranked and used for analysis. Journal citation over a five year period has been considered for analysis. The study illustrates the importance of the method used in ranking the journals. The Bradley-Terry model is used to estimate the odds ratios. One journal will cite another. The model is also discussed as a possible tool for finding the boundary between fields and field journals.

Kodrzyckri and Yu (2005) have developed a flexible citations adjusted ranking technique that allows a specified set of journals to be evaluated using a wide range of alternative criteria. The top most economics journals change considerably when one examines citations in social science and policy literature, and when one measures citations either within or outside economics on per articles basis rather than in total. The changes in ranking are due to relatively broad interest.
Giles and Garand (2007) have discussed a new approach for ranking of political science journals. The approaches are of two kinds, reputational and citational. The studies with regard to citational approach have relied upon the Institute for Scientific Information, JCR and have adopted a measure of journal status some variant of the ISI impact score. This score measures the citations a journal receives on an average for each article published during a set time period. The reputational approach to assessing journal relies upon the expert opinion based on the terms of the general quality of the article it publishes.

Haddow and Genoni (2010) conducted citation analysis and peer ranking of Australian social science journals in order to determine the differences between data drawn from Web of Science and Scopus. Further citation based indicators including journal impact factor, h-index and a modified journal diffusion factor were calculated to assess whether subsequent analysis influence the ranking of journals. The findings reveal that Scopus database provides higher number of citations for more number of journals.

Mukhopadhyay and Sarkar (2010) have attempted for ranking the economics departments of Indian institutions with a new approach. The ranking is based on publication in international journals and the other publication in domestic journal. The data was obtained using the impact values of 159 international journals and 20 domestic journals. The rankings are given using two approaches namely “the flow approach” and the “stock approach”. In the flow approach the rankings are based on the total output produced by a particular department over a period of time. While under the stock approach the rankings are based on the publication history of existing faculty members in an institution.

Garcia (2011) studied on overall prestige of journals with ranking score above a given threshold. For the study they have considered first quartile journals during the period 1999-2009 on the subject area of Scopus. The study was conducted to analyse the developmental trends over a period of time in
different subject areas with distinct citation and publication patterns. To this aim the introduction of an axiomatic index of the overall prestige of journals with the ranking score above a given threshold was made. The studies show that between 1999 and 2009 there was a high and increasing overall prestige of first quartile journals in only four areas of Scopus. Also there was a high and decreasing overall prestige in five areas. Two subject areas showed high and oscillating overall prestige. And there was a low and increasing overall prestige in four areas since 1999.

Chen and Huang (2011) have used a new method to rank finance journals by using author affiliation index. Author Affiliation Index is defined as the ratio of articles authored by faculties at the world’s top 80 finance programmes divided by the total number of articles by all authors. These 41 finance journals have been ranked. It is the observation of the authors that AAF if properly constructed it is easy and credible way to supplement the existing journal ranking methods.

Bagalkoti and Sangam (2012) have done a study on university ranking and provided the reader with a comprehensive understanding on university ranking schemes based on its methodological issues and impacts on society. The rankings are used in policy and academic discussions. Recently, policymakers and the media often criticize their universities based on their ranking status. Further, many of institutional leaders set ranking as their benchmark in their vision or master plan for the university.

2.5 Application of Bibliometric Laws

Budd (1988) has conducted bibliometric analysis of higher education literature by applying Bradford’s and Lotka law. The laws were applied to citations to journals in 569 articles on higher education. With regard to higher education literature both the laws do not fit perfectly but the results do suggest that the underling concepts of the laws may well have applicability of two examination of discipline.
Boer and Dosa (1992) made the application of Bradford’s law to the purchasing of periodicals in the libraries of all sizes. Totally 16 periodicals were chosen from among 4 related fields for study. The result of the study shows that the cost saving of subscription of journals is upto 39%.

Chung (1994) has conducted a study by applying Bradford’s law to the analysis of the source documents and their reference by classification systems in the world. According to the study, the core authors of International Classification Systems literature are Library of Congress, M Dewey, S Ranganathan, J.Comaromi, A.Neelameghan, L. Chen and K. Markey. The highly cited authors are linked either to the developers of the classification systems or to a research center or else they authored most frequently cited books. The data confirms to the Bradford’s law.

Basu (1998) described the Bradford’s law of scattering and its application in the field of documentation. She also conducts discussion of other informatics laws and their relationship with Bradford’s theoretical foundation in the fields of linguistics, economics and scientometrics.

Tsay et al. (2000) conducted a bibliometric study of semiconductor literature for the period 1978-1997. The present study is based on INSPEC database. The Bradford’s –Zipf’s plot and Lotka’s law have been employed to explore the characteristics of semiconductor literature. The quantitative results on the growth, form of publication, research treatment, publishing, country language and author productivity have been reported. Ultimately 25 core journals in semiconductors were identified and analyzed.

Patra and Chand (2006) worked on the bibliometric study of library and information science research literature of India based on the data abstracted in Library and Information Science Abstracts (LISA). Standard bibliometric techniques were employed to analyse the collected data. Bradford’s law of scattering was used to identify core journals of library and information science
wherein Indian authors publish their research output. To understand the productivity pattern of authors, Lotka’s law has been applied. The identified core journals are mostly published from India. The Indian authors’ contribution in international journals is very less. A list of authors who have published 10 and more papers during 1967-2004 is drawn and presented. Such authors are 37 (1.35%) in number and the authors with single publication have major share (74.63%). The author’s productivity pattern is in conformity to Lotka’s law.

Asha (2007) analyzed articles and citations in demography India from 1972 to 2001. The core areas of demographic studies, institution-wise contribution of articles and geographical area pertaining to the articles determined the trend-line and five yearly moving average of the year-wise distribution of collaboration coefficients for ascertaining the trends in the distribution of single and multi-authored articles. According to the results, it is found that Lotka's relationship is valid for authors with more than three publications only. The findings of this study are compared with the results of similar studies.

Jauhari et al. (2007) studied on Zipf’s law and the number of hits on the www. The arrangement of words in definite manners make up the text meaningful. Perhaps web is probably the largest mass of words of various kinds. Previously attempts have been made to examine the informatics properties of the web in the past. However, only few attempts have been made to investigate relationships like the number of hit words of a text generated in a search engine, their word length and the frequency with which they appear in the text. The authors have also attempted to do so.

Narendra Kumar (2010) examined the applicability of Lotka’s law as a general inverse power (alpha = 2) and as an inverse square power relationship (alpha = 2) to the distribution of the research productivity in Council of Scientific and Industrial Research (CSIR), India. The two data sets of the
research papers (6076 and 17681) contributed by CSIR’s scientists during the period of 1988-1992 and 2004-2008 were collected from SCI-CD-ROM and web of science for analysis. A K-S test was applied to measure the degree of agreement between the distribution of the observed set of data against the inverse general power relationship and the theoretical value of (\(\alpha = 2\)). It was found that the inverse square law of Lotka did not conform as such.

Ahmad et al. (2012) discussed the theoretical and practical aspects of an important bibliometric law known as Lotka’s law of Author Productivity. First the theoretical and mathematical explanation of the law is presented based on various disciplines. In addition, it presents the practical application of the law in the literature of two important disciplines, i.e. Agricultural Sciences and Economics. In practical use the Lotka exponent is applied with different values to check its application in two selected fields of studies.

Zafrunnisha (2012) studied one hundred and forty one Ph.D. theses accepted in the field of psychology for the award of doctoral degrees and analysed to identify the Bradford’s zones and productivity of journals cited in the theses. The productivity of cited journals was measured after dividing the journals into four equal groups. The average rate of productivity of journals in the first group is 254 articles, whereas it has considerably gone down to 10.73 articles in the fourth group. The journal distribution as per the Bradford’s law reveals the ratio as 17:46:358 in psychology, dispersion of journal titles in psychology does not satisfy the Bradford’s Law of Scattering.

Tamilselvan et al. (2013) applied Lotka’s law pertaining to author productivity which is considered as one of the important classical laws of bibliometrics. According to them, the study clearly indicates that Lotka’s generalized inverse square law holds good to Engineering and Technology literature published by the faculty of NIT’s in India during the study period 2001 – 2010. In the study it has been found \(n=1.89\) and c.v. = 0.24 and c=0.59 for overall data using least square method, and hence they are of the opinion
that Lotka’s law can be satisfactory applied to the literature brought out by the faculties of NITs.

2.6 Obsolescence of Literature

**Rouse and Rouse (1979)** conducted the study on analysis of monograph obsolescence at two levels of an interlibrary loan network. They are of the opinion that a negative exponential distribution adequately characterizes regional demand and a statewide demand as a function of publication date for four subject categories. A shorter half-life was found to be more for regional library demand (10.47) than for statewide demand (15.75).

**Kutch (1982)** has discussed in his paper thematic analysis in information science, the example of literature obsolescence. It is arrived at the conclusion by examining four thematic models of change of state of knowledge, as exemplified by terms such as literature obsolescence. The author selected 10 articles from the journal of American society for information science and observed that several of these articles were shown to have thematic content and that they exemplify the four models of change of state of knowledge.

**Hodowanec (1983)** conducted investigation on annual book obsolescence rate for individual and department within a university. The analytical study based on immediacy, intensity of peak usage, use dispersion and commonality of use have helped to develop an acquisition priority, waiting formula.

**Sangam (1989)** conducted a study on the obsolescence in psychology field. For the study the doctoral theses of the period 1982-84 have been considered. The result of the study shows that half life of the cited journals is 10 and books is 13 years. It follows the Bradford’s law of scattering.
Sangam (1989) has studied the obsolescence of literature in Economics with reference to half-life, mean life, utility factor, co-related obsolescence factor for journal literature and books on the basis of citations in doctoral thesis. This facilitates in collection development and in making weeding out policy in the field of economics.

Iruela (1990) conducted the studies on the distribution of demand by journal titles, stability of ranked list of requested educational journals and accessibility in Spanish libraries of the most requested journals in the field of education in Madrid from 1985 to 88. The study reveals that the ten titles most requested in education journals were stable over a period of time and that the majority of collections of common journals in ranked lists were incomplete in Spanish libraries.

Moed (1998) devised a novel system of classification based on ageing characteristics of the journals. It is found that the ageing characteristics are primarily specific to individual journals rather than to the subfields. At the same time the distribution of journals in terms of its rate of maturity is specific to subfields. It is inferred that cited half life, used in printed journal citation record is the most appropriate measure of decline of journal impact.

Sangam (1999) studied an obsolescence of literature in the field of psychology. For the study the data from five psychological periodicals were used. Further the bibliometric techniques of citation analysis were applied. The study with regard to the relation between growth and obsolescence reveals that higher the growth of literature more will be obsolescence and higher the half-life.

Egghe (2003) conducted a study on the influence of growth on obsolescence. An attempt has been made to develop a new model to find different results both for synchronous and diachronous study. It is proved that in case of synchronous an increase of growth implies an increase of the
obsolescence, while in diachronous case exactly the opposite mechanism is found. The proofs are given based on the exponential models for growth as well as obsolescence.

**Tonta and Unla (2005)** have worked to investigate the scattering of journals and literature obsolescence as reflected in more than 1,37,000 documents. After going through all the documents the summary of the major findings were derived, then to identify the core journals from which article requests were made. The following aspects were studied they are, application of Bradford’s law of scattering, relationship between journals and impact factor, relation between usage of journals and citation count, obsolescence, relationship between obsolescence and journal impact factor and relationship between obsolescence and total citation counts. Based on the analysis and findings it is found that distribution of highly and moderately used journal titles hold good with Bradford’s law. Eight years period was considered to be the median age of requested article. Twenty-one years of age of still lower requested articles were ninety percentages. Nearly 168 core journals titles seem to get obsolete more slowly than others.

**Egghe and Rousseau (2012)** have studied the notions, aging, obsolescence, impact, growth, utilization and their relations. It is shown how to correct an observed citation distribution for growth, once the growth distribution is known. The relation of this correction procedure with the calculating of impact measures is explained. They have also shown how the influence of growth on aging can be studied over a complete period as a whole. It is found that the growth can influence aging but that does not cause aging.

**Sangam and Meera (2012)** have conducted a study on obsolescence factors and pattern of citation distribution in the field of chemical science. The study is based on citation received by two journals viz. *Indian Journal of Experimental Biology* and *Asian Journal of Chemistry*. These two journals have received 30,142 references for 3,027 articles at the rate of 9.95 references
per article for 5 year data. The findings of the study are: the value of Annual Ageing Factor (AAF) = "a" as calculated from the graph is found to be A A F =0.948687. The value of half life as observed from the graph is 15 years and calculated value is = 13.15865 years which is almost near to the observed value. The value of utility factor (U) was found to be U = 19.48831 and the value of the mean (m) is = 18.98392 which confirms the exponential nature of the distribution and also justify the correctness of the average value of ‘a’. Citation frequency distribution in chemical science journals follows exponential pattern. The Corrected Obsolescence Factor (a) was found to be = 0.504389.

2.7 Co-Citation Mapping

Braam et al. (1991) conducted studies on joint analysis of co-citation relation and words. This was done to study time dependent aspects of scientific activities manifested in research publications. The study is based on clustering of documents that often co-occur in the reference to list of publication. The analysis of co-citation relation is used to locate and link groups of publications that share a consensus concerning intellectual based literature. The analysis of word profile similarity is used to identify and link publication groups that belong to the same subject matter research specialty. In addition to this, different types of “content words” were analyzed. For the study they have used the data of specialty in atomic and molecular physics. The inference of study reveals that the intellectual base is at a lower level.

Small (1999) has delt on visualizing science by citation mapping. A new work has been done on data sets, comprising about 36000 documents. A simple method for ordination and nesting maps hierarch ally has been used. The integrated maps of data sets show multidisciplinary dimensions of document levels. These maps can be visualized by using advanced virtual reality software.
Garfield et al. (2003) have developed a software entitled “Histcite” which help to generate chronological maps of subjects searched through SCI, SSCI and AHCI on CDROM. The Histcite generates histograms which highlights the most cited works. It also gives the networks, gene flow and also DNA structure. It also includes a provision for detecting the errors or variations in cited references. More than 5000 files can be processed within a minute. Hence the system is used by researchers to identify the most significant work on a topic and its year-wise historical development.

Mittal et al. (2005) have worked on citation mapping of published literature on Embelia Ribes. The citation maps allow browsing through titles and provides the users the direction in which they can obtain the information available and also facilitates the researchers to identify the areas where more scientific study is to be done.

Mc Cain (2010) worked on tri-citation analysis mapping. Eugene Garfield’s citation Image authors were used to identify the major research networks and topics that are linked to his highly cited publications during the period 1978-87, 1988-97, and 1998-2007. The major research topics that are linked with Garfield work include mapping of science, evaluative bibliometrics, scientometrics, webometrics, and sociology of science. The study reveals that twenty three of Garfield’s publications are highly cited by one or more group in at least one of the three decades. Five publications are highly cited in all three decades and two are highly cited by all the groups in all the decades.

Sangam and Mogali (2012) have made an attempt to map social science literature. The mapping of knowledge domains has been done in order to understand the positions of its various subfields and their relative position. The social science forms a very vast field and comprises a number of subfields or disciplines. The different schemes of classification systems have been used to locate the position of each subject which comes under social science namely
DDC, CC, UDC, and web of science. The visual representation of the same has been depicted in order to understand the relation of each subdisciplines of social science.

**Sangam and Mogali (2012)** aimed to highlight the importance of mapping and visualization software tools viz: Bibexcel, CiteSpaceII, CoPalRed, IN-SPIRE, Leydesdorff’s Software, Network Workbench Tool, Sci2 Tool, Vantage Point, and VOS Viewer. Further they covered software models, their use and operational process.

### 2.8 Conclusion

The review of literature with respect to the growth and publication productivity of social science literature reveals that SSCI analyses most important journals whereas locally oriented disciplines are poorly covered. The usage of growth models by various authors shows that logistic model and power model are the best fits for Indian social science literature study. The researchers are also of the opinion that research is advancing more in the field of psychology, anthropology, and psychiatry. The research trend shows that multiauthor culture is more and it varies from one subject to another. It is observed that SSCI report could be the best available resource for journal selection for libraries and information systems. The study w.r.t. growth and obsolescence reveals that higher the growth more will be the obsolescence and higher the half-life.

The study made on mapping w.r.to growth and publication productivity shows that it is gradually getting an impetus in India. The collaboration and author productivity study reveals that the authors who are more productive are generally found to be more collaborative and funded. The co-citation mapping with the help of “Histcite” software helps for detecting errors or variations in the cited references.
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