CHAPTER - II
REVIEW OF LITERATURE

2.1 INTRODUCTION

The purpose of the present chapter is to focus on scanned literature on citation analysis. Review of related literature forms an integral part of any research. It helps to find out what is already known and what is still unknown and untested. It helps to avoid duplication of research.

For selecting the topic for research, several books, journals, bibliographies were scanned in order to identify the previous similar studies. Search on Internet Bibliography of (AIU, 2009) database of theses and dissertation on (INFLIBNET and Vidyanidhi, 2009) was searched to formulate the topic for research and to check whether the research has been completed on the formulated (problem) topic.

On "Citation analysis" many previous studies were done at MLISc and Ph.D. level. (Kannappanava, 1991; Berhanuddin, 1992; Sangam, 1986; Thoidingjam, 1997; Mishra, 1997; Khaparde, 2004; Khaparde, 2007; Chikate, 2008) studies were conducted at Ph.D level. Whereas (Mutkule, 2002; Dharmapurikar, 1987; Onguso, 1995; Jadhav, 1990; Hambarde, 1989; Horshil, 1992; Deo, 1990; Surve, 1992; Bhand, 1993; Tupkar, 1991) studies were conducted at MLISc Level.

2.2 DEFINITIONAL ANALYSIS

2.2.1 CITATION ANALYSIS

Paul and Roy (1983) defined citation analysis as, "Citation is one branch of bibliometrics where the unit of analysis is a document, that is being cited as a bibliographic reference or as a footnote in a citing document". (p.226)

Martyn (1976) has rightly defined citation analysis as, "The analysis of
citations or references or both which form part of the scholarly apparatus of primary communications. The technique is used for putting items of references in some kind of rank or order, whether they are journals of authors cited".

Ziman (1968) defined citation analysis as, "A scientific paper do not stand alone. It is embedded in 'literature' of the subject".

2.2.2 JOURNAL

A scholarly or academic periodical, often published by an organization or society, collecting the articles written about a subject by and for researchers/academics in a field. Journals specialize in specific fields of study. Some journals are described as peer-reviewed.

2.3 BIBLIOMETRICS

Bibliometrics is the most active field of Library and Information Science. Citation analysis study is the major portion of it. Bibliometrics field is in the information science. A bibliometric size, rate of citation, citedness of paper, index of immediacy, international collaboration and paper and citation distribution by research centers and universities.

Bibliometrics is the study of documents and their bibliographic reference and citation structure. It is a study of quantitative aspect of production, dissemination and retrieval of scientific information. Bibliometric methods have been successfully applied to examine the intellectual structure of several disciplines the quantitative study of publications that have been written by people who have been working with the Bibliometric Research Group (BRG) at City University during the years 2001-2003. Bibliometrics is now very much an International Activity and the Biennial Conferences of the International Society for Scientometrics and Informetrics (ISST) bringing together researchers from 40 countries (Schneider, 2004).

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, purposes of the bibliometrics study is to find out the growth and characteristics of digital library literature. The major objectives of the bibliometrics study is to find out authorship pattern, author productivity, prolific authors, core journals in subject area, indexing terms frequency, Bradford distribution of articles, year-wise distribution of articles, language-wise distribution of articles and country-wise distribution of journals (Singh, 2007).

Bibliometrics is traditionally associated with the quantitative measurement of documentary materials. It refers to a variety of regularities taken from different field and exhibiting a variety of forms. Although bibliometrics distributions differ greatly in appearance, they can be conceptualized as versions of a single regularity, so that we can properly speak of bibliometrics laws and their manifestations. Bradford's law of scattering, Zipf's law and Lotka's Law are the best known laws dealing with important phenomena or "regularities" found in science communication. It is such as orientated for application to science policy, library and information science retrieval. "Bibliometrics", "Informetrics", "Scientometrics" and "Technometrics" are unfortunately not very clear, and there is choice in the terminology (Wormell, 1998).

The popularity of bibliometric techniques is because of easy data availability and the myriad possibilities of mapping linkages between authors, institutions, geographic, location and funding sources (Rangnekar, 2005). Bibliometrics is in particular the extent to which published research is cited by other published research can certainly be used as a means of assessing research quality.

A metrics based system that had no previous set of results to compare it which will always be judged less critically than a new system of metric which is haunted by the perpetual approach of the old. Academic information management departments have long had a rare field interest in bibliometrics which often defies simple understanding and makes little impact on real life information practice. But if it is acceptable to speak on behalf of the mythical "typical librarian", then it is likely that the everyday LIS practitioner would probably have some simple an useful
insights into real life applications of bibliometrics and citation analysis, the application of bibliometrics as a determining factor at a more narrow level is not justified (Joint, 2008).

Bibliometrics is a well-known evaluation method that has been applied to numerous subjects throughout the years. Not only does it help researchers to identify the characteristics of subject literature, but it is also an aid to librarians in the areas of collection development and evaluation by giving them quantifiable figures on journal frequency, use and impact on the field. From these data, librarians can be more comfortably make remote storage weeding and acquisitions decisions. Weakness is that, time-consuming to carryout. Broadly, another weakness is that bibliometrics only gives the user a string of numbers which may not be the most important part of a journals importance and impact on a field of study (Lawe, 2003).

Bibliometric analysis of cancer articles may furnish some useful data that will not only help the librarians and information scientists of the concerned field but also to the working specialists of this field it is, therefore, necessary to make a thorough survey of cancer literature by adopting the technique of bibliometry covering different sub-fields of cancer so that the working scientists may get all authentic and relevant data on the subject. Bibliometrics is an emerging thrust area of research involving researchers from different branches of human knowledge. The term "bibliometrics" is of recent origin and was coined only in 1969. It lies in the border area of social and physical sciences (Sengupta, 1990). The assembling and interpretation of statistics relating to books and periodicals to demonstrate historical movements, to determine national and universal research use of books and journals, and to ascertain in many local situations the general use of books and journals (Raising, 1962).

The purpose of bibliometrics is to shed light on the process of written communication and of the nature and course of development of descriptive (in so far as this is displayed through written communication) means of counting and analyzing the various facets of written communication, its purpose is analysis and
control of the (transfer) process 'measurement is the common theme through
definition and purpose of bibliometrics' and 'the things that we are measuring when
we carry out bibliometric study are the process variable in the information transfer
process (Pritchard, 1969). Bibliometrics provide information about the structure of
knowledge, and how it is communicated. They further point out that bibliometrics
studies fall mainly into two broad groups: (i) descriptive studies and (ii) behavioral
studies. Descriptive studies include those describing the characteristic or features of
a literature while behavioral studies are those examining the relationship formed
between components of literature (Nicholas and Ritchie, 1978).

The scope of bibliometrics includes studying the relationship within a
literature (e.g. citation studies) or describing a literature. Typically these
descriptions focus on consistent patterns, involving authors, monographs, journals or
subject/language (O'Connor, 1981). It is a quantitative science and divides its scope
into two basic categories; (i) Descriptive bibliometrics (e.g. productivity count) and
(ii) evaluative bibliometrics (e.g. literature usage count). The descriptive bibliometrics
i.e. the productivity count can again be subdivided into (i) geographic, (ii) time
period, and (iii) disciplines. The evaluative bibliometrics, i.e. the literature usage
count may be subdivided into (i) reference count and (ii) citation count (Stevens,
1990). For bibliometrics studies, it would be possible to treat the literature of a
subject as more than a 'black box' about which only rudimentary statistical fact can
be ascertained.

Bibliometrics could truly become a branch of epistemology (Small, 1980).
Bibliometrics is a well-established discipline for quantitative study of the various
aspects of literature of a given subject. It is a branch of information theory, which
analyses quantitatively the recorded knowledge to know it properties and behavior.
The recorded knowledge may be in the form of books, journals etc. In almost all
subject disciplines, bibliometrics research has developed a body of theoretical
knowledge and a group of techniques based on bibliographic data elements (Sahoo,
2001).
The bibliometrics is an application of statistical and mathematical methods to bibliographical studies. The word bibliometrics is derived from Latin and Greek word i.e. biblio and metric, etimologically bibliometric. Dr. Ranganathan had narrated the term librametric in 1948. Alan Pritchard suggested the term bibliometric in 1969 and become popular (Kogamuramath and Pothare, 2001). Bibliometrics is the study and measurement of the patterns of all forms of recorded information and the producer (Satish and Kabir, 2001).

Application of bibliometric technique in selecting most important journals on any field of knowledge is now-a-days, a well established fact. Statistical analysis of the hundreds of bibliographies at the end of the scientific communications in the source journals selected for a particular field has provided an authentic and important medium for selecting the most important journals of that field. Gross and Gross initiated the work in the 2nd decade of this century Sengupta suggested an objective approach to citation analysis and developed a new methodology in selecting source journals for bibliometric study (Sengupta, 1980). Using bibliometric analysis Garfield concluded that the impact and quality of Indian research is yet to reach international standards. Garfield's findings were based on data from science citation index (SCI) (Kumari, 1990).

Recent development in library and information science and of science of science may be looked into. These developments are being manifested through the so called scientometrics, bibliometrics and informetrics. The literature in these branches of science is growing rapidly and now accounts for several thousand publications. The situation is reflected in the abstracting journals of various subjects. It may say that these 'metrics' are rapidly forming the methodology or system of methodologies which may put them as candidates to be considered as forming a new scientific branch (Price, 1976; Garfield, 1970; Small, 1980; Lawant, 1981). The term bibliometrics" as a complex of mathematical and statistical methods used to analyze bibliographical characteristics of documents (Pritchard, 1969).
Bibliometrics is a formed scientific sub discipline including the complex of mathematical and statistical methods, used to analyze bibliographical characteristics of documents. Whether bibliometrics becomes the structural part of methodology of library and information science (Voverine, 1994). Bibliometric is the use of mathematical and statistical methods to study document and patterns of research publications. It is core methodology of information science (James, 2008).

Bibliometrics is simply, the study and measurement of the publication patterns of all forms of written communication and their author (Potter, 1981). Bibliometrics has commanded the attention of numerous individuals in library and information science. The measurement of bibliographic information offer the promise of providing a theory that will resolve many practical problems. It is claimed that patterns of author productivity, literature growth rates and related statistical distributions can be used to evaluate authors, assess disciplines and manage collections. Yet, it is unclear if bibliometrics is merely a method or if it meet the test of a theory in its ability to explain and predict phenomena (O'Connor, 1981). The widespread application of practical bibliometric method useful to library managers will continue to be limited until a more general, unified theory is developed.

Another limitation of bibliometric distributions is the use of unidimensional descriptions of consistency in author productivity or journal citation patterns. A sizable body of literature ealing with bibliometric models has developed. The early models were proposed because they were observed to fit graphically certain specific empirical frequency distribution. In many cases their functional forms were identical, the similarity only noted by other writers years later. In each case depending on the subject field they applied to, there was a proliferation on papers which modified, extended, clarified, applied and generalized the initial model. Almost bibliometric models relate, in a simple functional form, one variable with another variable (Hubert, 1981). Price considers his model to be quite general: It provides a sound conceptual basis for such empirical laws as the Lotka's distribution for scientific productivity, the Bradford's law for journal use, the Pareto law of income distribution,
and the Zipf's law for literary word frequencies. It is therefore an underlying probability mechanism of widespread application and versatility throughout the social science (Price, 1976).

Bookstein proposed to find an expression for the expected number of author in a discipline producing articles over a defined period of time, subject to sociological factors influencing productivity and other constraints (Price, 1970). The statistical bibliography is clumsy not very descriptive and can be confused with statistics itself or bibliographies on statistics the bibliometrics is the standard term of metric (Thanuskodi and Ravi, 2012). The application of mathematical and statistical methods to books and other media of communication, bibliometrics is the study dealing with qualification of written communication which helps in the measurement of the published knowledge (Tamilselvi, 2012). Bibliometric techniques using references made to other document can be applied to establish statistical models of scholarly communication flow. Citation can be used to map relationships between documents, between journals or other channels of scholarly communications. It also can be clustered to identify the flow of topics within and among disciplines (Borgman, 1999).

Reference sets are used in bibliometrics to make the citation impact of publications with each other comparable. These reference sets are made up of publications from the same publication year, the same field and the same document type as the publications in question. Fields are frequently delimited in bibliometrics with the aid of journal sets which are used in the literature databases Web of science and Scopus. The arithmetic mean value of the citations for the publications in the reference set is calculated to specify an expected citation impact (Schubert and Braun, 1986). Bibliometrics is a promising area of research in the field of Library and Information Science and has realistic applications in measuring the coverage and quality of books, journals and articles. It helps in formulating need-based collection building policy and provides authentic data to inform managers to take judicious decisions in the process of documents selection (Jena and et. al., 2012). Bibliometrics is of recent origin and relatively a new area. Which emerged as a research front in its own way in Information
Science. The terms like ‘Librametrics’, ‘Informetrics’, and ‘Scientometrics’ have been used synonymously in order to study the growth of literature in a discipline and other aspects of literature quantitatively (Parameswaran and et.al., 2012).

2.3.1 LAWS OF BIBLIOMETRICS

2.3.1.1 BRADFORD'S LAW (1934)

The law provides the fundamental theory of bibliometrics. Bradford's law made in 1934, describe the scattering pattern of journal in the area of applied geophysics lubrication. "Law of scattering describe the distribution of documents usually journal in the discipline or problem area. Bradford's law is based upon an observation that journal article in any specific topic show a particular pattern that a fairly large number of articles (Bandyopadhyay, 1999). Bradford law state that if a large collection of articles is ranked in order of decreasing productivity of journal (source) relevant to a given topic, three zones can be marked off so that each zone produces one third of the total relevant papers (Singh, 2007). Bibliometrics scattering was measured on the basis of Bradford mathematical model (Bhattacharjee, 1975; Afolabi, 1983). Literature on Bradford's law incorporates both theoretical and empirical aspects. These aspects are each coherent and developing areas of scientific inquiry. This law represents an elusive phenomenon. On a hand, it is easy to observe in real situations and can be represented with a fairly simple mathematical formula (Garfield, 1970). Recorded information has once been considered to be randomly dispersed everywhere but Samuel C. Bradford changed this viewpoint, information on a given subject is dispersed in a certain pattern which is known as Bradford distribution or Bradford’s law of scattering Bradford originally developed the basis of studying the distribution of articles in journals in the fields of electrical engineering, applied geophysics and lubrication in the year 1934 (Bradford, 1948).

Bradford in 1934 describes a scattering pattern in the area of applied geo-physics and lubrication. He plotted the partial sums of the references against the natural Logarithm of the partial sums of the number of journals and the line on the basis of this
observation, he suggested the following linear relation to describe a scattering phenomenon:

\[
f(x) = a + b \cdot \log X
\]

\(f(x)\) is the cumulative number of references contained in the first \(x\) most productive journal; \(a\) and \(b\) constant. Bradford thus, based on a semi-logarithmic group argued that: if scientific journals are arranged in an order of decreasing productivity of articles on given subject, they may be divided into a nucleus of periodicals not particularly devoted to subject and several groups or zones containing the sum number of articles the nucleus when zones will be as 1: \(n\): \(n^2\) ------. In 1948 summarized his earlier observation in book which contained a theoretical derivation of his law of scattering (Kumar, 2004).

One of Bradford hypothesis was that references are scattered throughout all periodicals with the frequency approximately related universally to the scope. On this hypothesis, the aggregate of periodicals can be divided in two classes according to relevance scope of to the subject concerned but the remote classes will, in the aggregate, produced as a many references as the more related classes (Bradford, 1934). The bibliometric principle that a disproportionate share of the significant research results on a given subject is published in a relatively small number of the scholarly journals in the field…. first noted by Samuel C. Bradford in 1934…. He found that a few core journals provide 1/3 of the articles on a given subject (Reitz, 2014).

2.3.1.2 LOTKA'S LAW OF SCIENTIFIC PRODUCTIVITY (1926)

Alfred Lotka investigated author productivity and modelled it mathematically during the last century. Essentially his how describe the very regular patterns that are seen in subject bibliography when authors are listed by the number of times they have published (Lotka, 1926).

Lotka’s Law described the frequency of publication by authors in a given field. It states that “the number (of authors) making \(n\) contribution is about \(1/n^2\)” this making 1:
and the proportion of all contributors that make a single contribution is in the region of 60 percent. This means that out of all the authors in an even field 60 percent will have just one publication, 15 percent will have two publications. \((1/2^2 \times 0.60)\), 7 percent will have three publication \((1/3^2 \times 0.60)\) more generally, the low takes the form \(y \times x = \times 0.7\) and so on \(c/x^n\) where \(yx\) is the number of authors created with \(x\) (1,2,3…….) papers, \(c\) is a number of authors contributing one paper and \(n\) is rate (usually \(n=2\)).

Lotka’s Law was calculated following the methods proposed by Pao (1985) according the Lotka’s Law the numbers of authors \((yx)\). With \(x\) number of articles is universally proportional to \(x\). The relation is expressed by the formula;

\[X^n \cdot Yx = c\]

Where \(Yx\) is the number of authors producing \(x\) number of articles in a given research field and \(c\) and \(n\) are constant that can be estimated for the observe data set. All thought many authors take a value of 2 as the value of the exponent, as Lotka’s did in his paper (Lotka,1926). It is known that the \(n\) exponent can vary depending on factors such as inclusion of the co-author in the analysis all the number of pairs included in the calculation of the exponent (Pao, 1985). For this study, least-square method was the procedure used to calculate the \(n\) exponent expressed by the formula;

\[n = \frac{Nxy - ExEy}{NEx^2 - (Ex)^2}\]

Where \(N\) is the number of pairs considered \(x\) is the logarithm of \(x\) and \(y\) is the legalities are the logarithm of \(yx\). The constant \(C\), the proportion of authors who contributor with on article to the subject areas, is calculated using the formula.

\[c = \frac{1}{C \left(\frac{1}{2^n}\right)}\]

Finally in order to verify that the observed data fitted the estimated distribution, the non-parametric Kolmogorov-Smirnov (K-S) goodness of-fit test was applied. Parametric and non-parametric statistical procedures were used as appropriate to study the relationship between variables. A significant difference was considered as \(p < 0.05\).

The parameters \(n\) and \(c\) have been conventionally estimated by the least-square method. In some studies the maximum likelihood approach is applied. The maximum like hood is a good method and that there is a tendency for least-squared fits to
overestimate the slope of the power law since the statistical fluctuations in the logarithms of the data are greater in the down wood directing than in the upward one. (Nicholls, 1986) (Kretschmer and Rousseau, 2001) (Newman, 2000).

In a recent paper, Petek (2008) studied personal name heading in the Slovenian online catalogue COBIB. Pao’s methodology was used by the author taking only senior author count and excluding the most prolific authors. It was found that the value of the exponent $n = 2.2656$ and the constant $c = 0.6890$ for COBIB. Using a K-S test the study concluded that Lotka’s law holds for the occurrences of personal name headings in COBIB. The observed distribution in COBIB was also tested against the inverse square law using the exponent $n$ value as 2; it was found that the COBIB data do not confirm to Lotka’s law.

Lotka’s law seems to be very resilient feature of intellectual productivity in many different subject fields. In an earlier paper Lotka’s law was tested in nutrition literature of Bangladesh by simply examining the observed and theoretical values with $n = 2$. Least – squares and maximum likelihood methods were applied to test the validity of Lotka’s law to nutrition research of Bangladesh. Follow-up Kolmogorov-Smirnov (K-S) tests were conducted for conformity of the results. (Ahmed and Rahman, 2008). The bibliometric principle that the number of authors making $n$ contributions to the scholarly literature of a given field is about $C/na$. Lotka’s empirical law of scientific productivity means that … about 61% of all published authors make just one contribution, about 15% have two publications, about 7% make three contributions, and less than 1% produce ten or more publications (Reitz, 2014).

2.3.1.3 ZIPF’S LAW OF FREQUENCY OF OCCURRENCE OF WORDS (1933)

The third of the triumvirate of bibliometrics laws that of George Kingsley Zipf. While studying linguistics at the university of Berlin, Zipf’s had an idea that speech as a natural phenomena is really “a series of communicative gestures and after extensive
research found that the length of a word; for from being a random matter, is closely related to the frequency, the shorter the word”.

Zipf’s law suggested describing an empirical law, a relation between the rank of a word and the frequency of its appearance in a long text. If ‘r’ is a rank of word and “f” is its frequency, then Zipf’s law is stated as;

\[ r \cdot f = c \]

Where ‘c’ is a constant Zipf derived his law from a general principal of least effect——— words whose cost of usages is small or whose transmitted demands the least effort are frequently used in a large text (Kumar, 2002).

Zipf plotted his observation on double logarithmic paper and after drawing a line approximately thought the centre of the points developed:

The formula \( ab^2 = k \) in which reprints the number of words of given assurance and b the number of occurrences. That is the product of the number or words of given occurrence, when multiplied by the square of their occurrences remains constant, for the great majority of the different words of the vocabulary in the though not for those of highest frequency (Zipf, 1935). The principle that the frequency of the \( r \)th most common word or phrase in a relatively lengthy text (or in any natural language) is approximately \( 1/r \). This means that the 10th most frequent word will be used about twice as often as the 20th most frequent word, and ten times more often that the 100th most frequent word (Reitz, 2014).

### 2.3.2 OTHER EMPIRICAL LAWS

K. P. Vijay Kumar in his article “Applications of Bibliometric in library and information centres says that much if the later bibliometric studies were made either to substantiate, modify, extend, link or challenge these three empirical laws.” The end result of such studies was the emergence of some major empirical laws and many theoretical.
2.3.2.1 PRICE SQUARE ROOT OF SCIENTIFIC PRODUCTIVITY

This law studies that half of the scientific paper are contributed by the squire root of the total number of scientific authors. In other words $N^{1/2}$ sources yield a fraction of $\frac{1}{2}$ of the items. The phenomenon is associated with the occurrences of invisible colleges. This law is sometimes called Rousseau’s law”. Since Jean Jacques Rousseau had mentioned the same thing quite clearly in his social contract about the size of the elite, i.e. those participating in the government. Egghe and Rousseau argue that price’s law is not generally valid. This can also be treated as an extension of the success-breads success principle originally developed by Simon in 1955.

2.3.2.2 SENGUPTA’S LAWS OF BIBLIOMETRICS

This is basically an extension of the Bradford law. It studies that “during phases of rapid growth of knowledge in a scientific disciplined, articles of knowledge to that discipline appear in increasing number of periodicals distant from the field. Mathematically Sengupta’s law stands in the following form,”

$$F(x + y) = a + b \log (x + y)$$

Where $f (x + y)$ is the cumulative number of references as contained, in the first $(x + y)$ most productive journals, $x$ indicate number of journals in the same discipline and $y$ stands for number of journals of unrelated discipline ($y \geq x$) and $b$ are two constant.

2.3.2.3 GARFIELD LAW OF CONCENTRATION

Garfield talked about the number of journals involved in publishing the literature of a single field. He did not say anything about how many the journals in one field might overlap with other fields. In fact, there is a significant degree of overlap. Several studied have shown that relatively few journals are involved in the publishing of a subject. A study of the science citation index (SCI). Database showed that 500 journals accounted for 70% of the Material indexed in SCI in 1969. Almost half of the 3.85 millions references published that yet were found to emanate from only 250 journals. This type of evidence move from Bradford law of dispersion to Garfield law of concentration. (Kumar, 2004).
2.4 CITATION

Citation is widely used in bibliometrics researchers usually "cite" the ideas and papers of pioneers. This behavior is called "citation". A citation includes two objects one is the source work the other is the cited work, the collection of information about cited work is a treasure for citation analysis (Chen, 2004). Citation study is provides helpful guidance in the process of collection development of the library.

Citation study ascertains the half life of literature which helps in deciding how long these documents are useful and should be preserved in library (Barroah and Sharma, 1999). Citations can be used to identify the personalities that are central to a subject field. Citations are an adequate way to measure the quality of scientific work or intellectual influence on it (Kretschmer, 1994). Citations have high quality (Cole and Cole, 1971). Citations have long been thought to represent authoritativeness (Gilbert, 1977). Citations have intellectual influence (Zuckerman, 1987). Citations normally assumed that the greater the number of citations that an item received, then the greater the impact of that item within its particular research community. However the use of the numbers of times that an item is cited as a means of comparing different items makes the assumption that all citations contribute equally to the impact of a cited article instead it has been argued that not all citations are of equal impotance (Sidiropoulos and Manolopoulos, 2006).

Citations are a valuable subset of all the used information the literature offers different interpretations of what that selection represent, studies of citing behavior found two theories one is normative theory stresses the importance of relevance and second is usefulness of source, the social constructive view sees citation as a social process open to personal bias and social pressures (Bonmann and Daniel, 2008).

The citations in an article, book, or report indicate those items from the published literature that the author believes are of importance in that they are related to support, illustrate or elaborate on what the author has to say (Bar-Ilan, 2008; Borgman and Furner, 2002; Garfield, 1979).
Dissemination of information is to make information usable or citable. Citation has been regarded as a good way to clarify the roles and positions of researchers in the whole research structure. Although the reasons to cite other papers are multiple, it is well recognized that at least some connections exist among cited papers and citing papers. Bibliographic couplings and co-citations are two obvious examples. Citation also demonstrates a very special function that is the influence or impact of papers, researchers, and research institutes. Academic evaluation has become an important topic especially the evaluation for universities or research institutes. Citation has been used as a way to evaluate academic performance. To increase citation times of research outputs is a plus point of academic evaluation in research institutes an institutional repository seems to be one of the solutions to increase the citation time (Chen and Hsiang, 2009). Citation scores and growth rates represent an essential component of research assessment. They are distinct from the productivity score or growth rate (Jacso, 2011).

2.4.1 CITATION PATTERNS

The use of bibliometrics methods on the humanities and especially the use of citation analysis constrained because of the limited coverage of databases such as Thomson Reuters Web of Science (Wos) and Elsevier Scopus. These limitations were foremost due to the fact that journals play a minor role in many research fields in the humanities. It is also fields like literature or history usually publish in their local language. Knowledge about citation patterns in publications outside citation databases is scant mainly due to the time consuming nature of semi-automated or manual indexing of references. These limitations have led to a tendency within bibliometric research to almost solely explore citation patterns and structures within commercially available databases. Thus, the exploration of knowledge structures through the use of bibliometric data is limited to a small selection of scholarly literature, especially worrisome in the case of the humanities overwhelming proportion of research is published in monographs and journal. The leading citation databases almost exclusively index publications in the English language which further restrains the possibilities of analyzing fields in the humanities where the local language often is used. The launch of Thomson Reuters Book citation Index will not solve that problem although it might improve the coverage in
English speaking countries. The publication of research, the use of sources and citation patterns are affected by organization of research. Citation patterns in the field of literary studies a field that can be described as rural in its organization. Rural in the sense, that few researchers are involved on each particular topic (Adams and Testa, 2011).

2.4.2 CO-CITATION

Co-citation analysis is, two documents are said to be co-cited if there is a third document that cites both of them. Co-citation network is usually visualized by drawing an undirected arc between two articles that are co-cited by other papers. Two papers are co-cited when a third paper cites them both that is both papers are listed in the reference portion of the third paper (Small, 1973). Co-citations analysis study the structure of scientific research, based upon citations and co-citations (Small and Griffith, 1974). Co-citations applied by researchers in information science to construct the intellectual structure of a discipline in the early 1980s (White and Griffith, 1981). In digital era the dramatic switch from print collections of articles to electronic collections in a library has a large impact on researchers, because the latter method is more convenient and time saving than the former (Kuo and Yang, 2014).

2.4.3 CITATION CLASSICS

Citation classics are designed to identify important papers in a particular discipline or subject area. There type of studies use citation rates to determine the top authors, the most cited articles, or the impact of a particular institution within the field (McMinn, 2011).

2.4.4 CITATION CONTEXT

Citation context is the piece of text that the citation is placed inside. A citation context provides an explicit description of the cited work from the point of view of the citing author (Small, 1982).
2.4.5 CITATION IMPACT

Citation impact of open access against non open access journal this method is less effective for exploring whether open accessibility of research substantially increases citation impact it is a helpful approach for comparing open access and non open access publishing at the journal level (Kousha, 2005).

Open access journals are not necessarily new publications. Many established journals make only a few recent years of content available online, while the majority of content is accessible only through traditional access paths. Other established journals, having moved to open access distribution, offer access to much older content as well. The important factor for all authors is the impact of their work. If author can see improvement in the impact of their work due to open access, they will be willing to use open access routes. Access to content of journals via the web provides a new metrics for measuring the impact of articles, electronic citations which can be considered to be comparable to bibliographic citations in assessing the impact of published works. The correlation between citation counts provides a measure of the usefulness of selected articles called the "citation impact". Citation impact can be used as a measure of the impact an article has within its particular field. An article being widely read and cited is an indication that it has had influence with other researchers within the field (Turk, 2008).

2.4.6 IMPACT FACTOR

The impact factor as a way of evaluating the relative importance of scientific journals (Garfield, 1955). The Journal Citation report are regularly released on the web and on CD in the middle of every year, the important of Journal citation report is enhancements of five year journal impact factor this element complements the traditional journal impact factor scores and data (Jacso, 2011).
2.4.7 CITATION AGE

Calculate the citation age researchers use the publication date a simple practice to adopt and will facilitate comparison among the results of various citation analysis studies (Markwell and Brooks, 2003).

2.4.8 CITATION COUNT

Science Citation Index expanded (SCI- EXPANDED, 1899), Social Science Citation Index (SSCI, 1898), and Arts and Humanities Citation Index (A & HCI- 1975) were used to carry out the search by using the cited work search to find total cites, the results indicated the number of times a journal had been cited by the journals indexed by WoS, limitation with using WoS is that journal may have multi forms and different journals may have similar abbreviation (Smith, 2005).

2.4.9 CITATION REPORT

Thomson Reuters Journal Citation Report is based on a yearly analysis of journal citation patterns, according to the publisher the journal citation reports provides quantitative tools for ranking evaluating, categorizing and comparing journals. The impact factor is one of these it is a measure of the frequency with which the average article in a journal has been cited in a particular year or period (Thomson Reuters, 2005).

2.4.10 CITATION SEARCH

Citation searches provide information to candidates with bibliometrics, the statistical analysis of books, articles or other publication (Oxford University Press, 2013).

2.4.11 AUTHOR SELF CITATION

Self citation is a common phenomenon in citation behavior. Self-citation interlinks various publications and shows their relationships. The author ranking studies often shows the rate of self-citation (Tagliacozzo, 1977). Self citation confined to habits of concerned authors. Moreover senior person will generally get a lot of his earlier works to cite than the younger group of people this will naturally influence the
study of citation analysis, mainly the author ranking, it is suggested that the citation analysis study must pay proper attention to the number of self citations provided in an article (Mahapatra and Kaul, 1992). Self citation refers to the number of times the previous papers published in the same journal; the rate of self citation is lower than other authors’ citations (Balasubramanian and Bhaskar, 1984). Citations are used as indicators to evaluate scientific research, self citations are often considered problematic. Author self-citation refers to citing one’s previous publications in a new publication. Author self-citation exists when the citing and cited papers have at least one author in common. Although authors may have good reasons to cite their own works, these citations do not necessarily reflect the importance of their work or its impact on the rest of scientific community (Fowler and Aksnes, 2006).

2.4.12 JOURNAL SELF CITATION

Journal self citation is an interesting bibliometric indicator that gives an indication about the popularity of the journal among its contributors as well as the reader community. The phenomenon of a journal citing itself is termed as journal self citation. The pattern of journal self citations is part of both the citation identify and the citation image, depending on the perspective from a journal (referencing) or to a journal to which citations can be given. For the practical reasons both the aspects will be treated here in combination, time perspective of a journal, it is supposed that self citations reach an earlier peak after publication than external citations. By age the rate of citation of journal decreases (Mahapatra and Kaul, 1992).

Journal self-citations are citations of previous papers in the same journal. Since the cited object in journal self-citations is the paper, not the author, journal self-citations are different from other kinds of self-citations, which are related to the author’s country, affiliation or research team. The characteristics and patterns of journal self-citation may completely differ from those of author self-citation. Author may never cite their own previously published papers and yet still cite other’s papers published in the same journal, creating an incidence of journal self-citing without author self-citation. Researchers often hold different views on the role played by and meaning of journal self-citations in citation
analysis studies. Journal evaluation systems and policies directly exclude self-citations in evaluating the impact of a researcher, journal or institution with little or no explanation. It seems logical to say that a journal with more self-citations would have a higher number of citations and higher journal impact factor (Brice and Bligh, 2004; Fan and McGhee, 2008; Frandsen, 2007; McVeigh, 2004; Motamed et al., 2002).

2.5 CONTENT ANALYSIS

It is a research methodology it has early origins in the inquisitional pursuits there is more or less similarities in the study of citation analysis and content analysis. The Church became worried about the spread of non-religious printed matter after the invention of the printing press and thus began the pursuit of analyzing texts to ensure they were in keeping with the doctrines of the Church. These early attempts at content analysis of texts were problematic because of the inconsistent and often politically biased manner in which the research was conducted (Dovring, 2008). End of the nineteenth century the proliferation of newspapers reignited interest in content analysis and in 1903 Eugen Lobl published a book in German entitled Publizistik (news paper science) for analyzing the social content of newspapers, content analysis research using newspapers as a source until such time as other forms of mass media, such as radio became prominent (Krippendorff, 2004). The famous sociologist Max Weber in 1910 also proposed a content analysis study of the press based on Lobl’s ideas (Weber, 2008).

2.6 CITATION ANALYSIS

Citation analysis is a technique of bibliometrics. It is an important research tool understanding the subject, which we analyze the structure and direction of the subject and relationship between authors and their documents.

Citation analysis is one of the popular methods employed in recent years for identification of core documents and complex relationship between citing and cited documents for a particular research community in a geographical proximity (Thanuskodi, 2010). Citation Analysis is a branch of bibliometrics that examines the citations found in publications such as journal articles and books to look for patterns of
use. This type of study typically involves recording the details of the reference lists of a number of publications to determine what materials are being consulted and then analyzing those materials by type, frequency, age, local holdings, or other factors. It is an unobtrusive methodology that can often be carried out with readily available data. By conducting a citation analysis, a researcher can better understand scholarly communication trends within a discipline, assess the use or accuracy of citation indexes, create bibliographies, analyze citation trends of specific user groups, or determine the extent to which a library’s collection meets researcher’s needs. (Patel, 1991).

Citation analysis is one of the areas of bibliometrics which is mathematical method which is applied in measuring the bibliographical calculation which is also applied to library management. It is developed through various fields. Now this study in India took in library science field of the main area in field of information science is bibliometrics which has recently been defined as statistical or quantitative description of (scientific scholarly) literature. Bibliometric furnished possible method by which significant feature of literature may be described and working monitored.

Citation analysis technique is very popular to identified core journals authors and other sources of information especially to determine the useful life at literature. It is by for the most written topic in bibliomeric. Citation analysis is a method based by the principle that article citing the same references also have much of their content in common. A reference is the acknowledgement that one document gives to another; a citation is acknowledgement that one document receives from another (Linda, 1981). Citation analysis is the examination of the frequency patterns and graphs of citations in articles and books. It uses citations in scholarly works to establish links to other works or other researchers citation analysis is one of the most widely used methods of bibliometrics. (Rubin, 2010).

Citation analysis is a branch of bibliometrics where the unit of analysis is a document that is being cited as a bibliographic reference. It is the study of the distribution or scattering of references. Citation studies do provide some guidelines for the librarians
and information scientists in the decision making process in their acquisition policy. (Aksnes, 2011).

Citation analysis is quantitative oriented bibliographic approach to determine the structures of scientific fields of study. Since the 1980’s, this area of research that has been increasing application and popularity in the English language. A citation analysis will be used to help analyze the relationships between citing and cited authors and publication as well as which cited sources are the most influential among those publications used in the analysis. This is influence that is based on the fact that the most cited sources provide essential findings, which are in turn influential for the scientific works of other authors (Gundolf; Filser, 2012). A citation is a reference to a document given by a more recently published document. The document citing is the citing document and the document that receives the citation is the cited document. Citation analysis involves counting the number of citations to a particular document for a period of time after its publication. The traditional understanding of the citation function is that the frequency with which a document is cited can be taken as a measure of the impact or influence of that document on the citing literature. Citation analysis leads to more sophisticated methods such as co-citation analysis, mapping of the literature, bibliographic coupling and co-word analysis. These methods/ individually and in combination strides to find information patterns by analysing reference and citation patterns as well as word use frequencies combined with statistical analysis.(Schneider, Borlund, 2004).

2.6.1 DEFINITION OF CITATION ANALYSIS

Citation means a quotation from or reference to a book, paper or author especially in a scholarly work.

“Citation analysis is the analysis of citations or references or both which form part of the scholarly apparatus of primary communications. The technique is used for putting items of reference in some kind of rank or order, whether they are journals or authors cited.”
2.6.2 PURPOSE OF CITATIONS

The citations in papers are provided for a number of reasons. Some of them are ethical and some are non-ethical. The dominant reasons for citing reference are that they provide identification of those earlier researchers whose concepts, methods etc. Has inspired and influenced the researchers. The primary purpose of citation is to enable reader to go referred document for more information on a point or check the authenticity of a particular view, finding or method. According to Kumar(2002), Sen and Chatterjee (1990) Citation studies generally bring out the aspects, viz: Bibliographic coupling; journal clustering; Scholarliness; Obsolescence; Citation analysis of citation indexes; citation cycle, citation etiquette, citation networks or maps, cited half life; co-citation; Degree of collaboration etc.

2.7.3 OBJECTIVES OF CITATION ANALYSIS

The objectives of the citation analysis : (i) to know the distribution of citations in different bibliographic forms, (ii) to examine the authorship pattern, (iii) to identify the core journal, (iv) to know the geographical scattering of citations, (v) to examine the subject wise break up of citation, (vi) to find age of cited documents, (viii) distribution of monographic citations in local and foreign publication, (ix) a comparison of all measure described above in the journal, (x) assess researchers, access to information as reflected from citation analysis, (xi) find out the extent to which the available information resources meet the research needs revealed by the study, (xii) study the distribution by place of publication, (xiii) identify the language wise distribution, (xiv) compile the rank list of the cited author, (xv) deduce the citing half-life of the literature cited in 120 and (xvi) compile a model citation index for the journal (Doreswamy, 2001; Frandsen, 2005; Tang, 2008; Sharif, 2004; Altmann, 1999; Dulle, 2004; Haridasan, 2007; Gupta, 1983; Barroah and Sharma, 1991; Kannappanavar, 1991; Munshi, 1991; Balasubramanian and Bhaskar, 1984; Kogamuramath and Pothare, 2001; Satish and Kabir, 2001; Sahoo, 2001; Lokhand, 2007).
2.6.4 RELATIVE GROWTH RATES (RGP)

Relative Growth Rates (RGR) is a measure to study the increase in number of articles / pages per unit of articles/ pages per unit of time (Mahapatra, 1985). The definition of RGR has been derived from the study of growth analysis of individual plants and effectively applied in the field of Botany, which in turn had its origin from the study of the rate of interest in the financial investment. The mean Relative Growth Rate of articles over a specific period of interval is calculated mathematically as:

\[
R(P) = \frac{\log_e 2P - \log_e 1P}{2^T - 1^T}
\]

Here \( R(P) \) = Relative Growth Rate of articles over the specific period of time

\[
\log_e 1P = \log \text{ of initial number of articles.}
\]

\[
\log_e 2P = \log \text{ of final number of articles.}
\]

\[
2^T - 1^T = \text{The unit difference between the initial time and final times.}
\]

**Doubling Time**:

Doubling time (Dt) is directly related to Relative Growth Rate (RGR). It is the time required for articles / citations to become double of the existing amount. Further, if the number of articles in a subject doubles during a given period then the difference between the logarithms of numbers at the beginning and at the end of this period must be the logarithm of the number 2 (Mahapatra, 1985). If Napier logarithm is used the value of log2 is 0.693. Therefore, once the average growth rate is calculated then it becomes a question as to, What time interval do the Napier logarithm of number increases by 0.693?

Thus the corresponding doubling time is calculated mathematically as:

\[
Dt(p) = \frac{\log_e 2}{R(P)} = \frac{0.693}{R(P)}
\]

\[
Dt(c) = \frac{\log_e 2}{R(P)} = \frac{0.693}{R(P)}
\]
Here, \( Dt (p) \) and \( Dt (c) \) are the average doubling time of articles and citations respectively. The RGR and \( Dt \) are used to express the nature of growth of knowledge.

2.7 METRICS

Metrics are used to outline how the goal is to achieved according to the strategic plan, metric represent the measures upon which success in attaining objectives and goal will be assessed each metric has a target level and target date at which and by when we aim to accomplish each goal, in supporting documentation the library’s collection are listed as metric. The specific library metric seeks to create enhanced library collections in all disciplines (Colorado State University, 2006).

2.7.1 SCIENTOMETRICS

The scientific measurement of the work of scientists, especially by way of analyzing their publications and the citations within them, Scientometrics is the science of method scientific output similar to bibliometrics used by librarians and information scientists. Scientometrics is the science of measuring and analyzing science. In practice, scientometrics is often done using bibliometrics which is a measurement of the impact of publication (Agrwal, 1982).

When referred to scientific production and communication it is usually called scientometrics, this field was immigrated in 1960 by pioneering work of 'Derck de Solla Price', 'Mauric Goldsmith' and 'Eugengent, The common form sources of data for analysis is the SCI and SCI both the institute of the scientific communication (SCI-Science Citation Index), (SSCI-Social Science Citation Index). Correlation between citation impact and peer review to make evaluation studies more reliable, it is well known that the evaluation of a person by scientometrics methods need more caution than bibliometric analysis of countries, institutions or groups (Wormell, 1998). Scientometric research provides an understanding of the process and evolution of science and also its structure and dynamics (Leydesdorff, 1999).
Scientometrics is the newly emerging field that investigates quantitative aspects of science; it is the quantitative arm of the science of science, scientific communication, studies and science policy studies (Conference Report from Library Hi Tech News, 2001). Many types of scientometrics data can be presented as transaction matrix. In all cases the matrix consist of a set of items assigned to each row and column with each cell containing the level of transaction between the row and column items (Kretschmer, 1994).

Scientometrics was suggested by Nalimov and Mulchenko in their book "Scientometrics: the investigation of science as development of information process", 1969. According to them scientometrics is a complex of quantitative (mathematical and statistical) method, which is used to investigate the processes of science (Nalimov and Mulchenko, 1969). Scientometrics is a science about science; it is a distinct, recognized and well established scholarly field with its own identity, history, theories and methodologies. Scientometric projects often present meta analyses of topics and methodologies, identify the most productive individuals, institutions and countries, describe collaboration processes, report on citation and co-citation analyses discover research anomalies and conduct opinion, the value of scientometrics has received recognition in most areas (Price, 1963; Garfield, 1972; Merton, 1973).

Scientometrics is a formed structural part of science methodology. Including, the complex of mathematical and statistical methods, used to analyze the quantitative characteristics of science as an enterprise (Veverience, 1994). Modern scientometrics mostly based on latter founded the institute for scientific information which is heavily used for scientometrics analysis.

The term Scientometric studies mean an analysis of literature with mathematical and statistical methods used in information use and seeking pattern approaches in a particular field of information products and services for knowledge indicators towards organizational development. Scientometrics mapping is considered as the study of the quantitative aspects of science as a discipline or economic activity. Main subject of scientometrics are individual scientific documents, author, scientific institutions,
academic journals and regional aspects of science. The term Scientometrics originated as a Russian term for the application of quantitative methods to the history of science. Its scope and objectives have widened considerably. Scientometrics studies characterize the disciplines using the growth pattern (Surulinathi, et. al., 2012).

2.7.1.1 SCIENTOMETRY

The evaluation of the performance of scientific research is the most important application of Scientometry recently the interest grows in the use of Scientometry techniques for the measurement of the efficiency and productivity of the research. These techniques are not substitutes for expert reviews and evaluations, but are complementary (Gasteiger, 2006).

2.7.2 INFORMETRICS

Informetrics is an umbrella term which covers all form of quantitative research of information, discusses bibliometrics, the concept of internationally, science search data base and science citation index. The application of informetrics methods to the solution of chemical problem (Gasteiger, 2006). "Informetrics studies" signifies the new approach of CIS - Centre for Informetric Studies to the scientific study of information flow: improved bibliometric methods are applied not only to scientometric studies and research evaluations of science and technology (SST) but also to the analysis of their mutual, societal, industrial and other specific relations. CIS has also extended traditional bibliometric analysis to cover non-scholarly communities where information is produced, communicated and used (Wormell, 1998). CIS researcher have studied the interesting idea of utilizing informetrics methods on the World Wide Web (www) and started to lay the basis of an emerging area of "webometrics". Recent publication have presented a workable method for general informetrics analysis on the www, accompanied by case studies analysis Danish Norwegian, Swedish and international web sites, and their relative visibility on the net compared with relevant positions in the scientific databases (Almind and Ingwersen, 1997).
The field of informetrics is concerned with regularities underlying the use of production of information, in particular studying the quantitative properties of information (Ruthvan, 2003). Wolfram outlines the main foundations of informatrics: the law or generalization in information process and production such as Lotka's law, Bradford's law, and Zipf's law.

As Wolfram noted, these mathematical formalizations are not limited to informetrics. Informetrics incorporates the older field of bibliometrics and the new area of cybermetrics and webometrics (Conference Report from : Library Hi Tech News, 2001). "Informetrics" was suggested by German scientist Blackert and Zygel in 1982 as a newly formed branch of science, using mathematical and technical information on theoretical level and practical information activities. Informetrics is a scientific subdiscipline not yet formed. The problem of its research object to be formed on the concept "Information" is not solved yet (Voverine, 1994). Informetrics covers a wider area of the society and also vast and varied type of information and knowledge resources. Informetric studies signify a new approach to scientific study of information generation, dissemination and use (James, 2008).

2.7.3 WEBOMETRICS

Quantitative study of the World Wide Web termed Webometric. It tries to measure the World Wide Web to get knowledge about the number and types of hyperlinks, structure of the World Wide Web and usage patterns. It includes the study of quantitative aspect of web/ website and web related phenomena. Webometrics is a science based on informetrics methods, which studies the nature and characteristics of websites the term webometrics was first coined by Almind and Ingwersen (Almind and Ingwersen, 1997). Webometrics is the study of the quantitative aspects of the construction and use of information resources, structures and technologies on the Web drawing on bibliometric and informetric approaches (Bjorneborn and Ingwersen, 2004). The World Wide Web is one of the main information sources on scientific and research activities; it is a suitable environment for webometrics studies. According to Kousha, the target of all webometrics studies is to
validate web links as the new information resources and to evaluate their impacts on formal and informal relationships. Researchers consider the similarities between citations and web links. For instance, uses the term Sitation to refer to a used site. Web impact factor by analogy with journal impact factor. The similarities between linking and citing Vaughan and Shaw suggested web citations counts can potentially be the appendix or alternative citation counts and as a module for impact factor (Kousha, 2005).

2.7.3.1 WEBOMETRIC ANALYSIS

Traditionally libraries build collection of information in a systematic manner, store and fulfill the information needs of the users. Majority of the information are now available electronically. Technology plays a major role in producing the information at the same time the use of information. This brought the paradigm shift in the libraries. World Wide Web enabled information storage and dissemination for the wider usage.

When a library has access to vast collection of information resources, it is difficult to remember each and every resource subscribed and accessible by the users. Therefore, a website of a library helps in this direction. Websites are acting as a guide to virtual information society. The websites are provided with the links to internal or external information and they are categorized and structured in a way to help the users in location the information. The library website gives information about the library such as collection, services provided by the library. Sometime this is not as simple as the users get the information what they are looking for. The website has to be user friendly and easy to navigate. The user has to get the information as quickly as possible through the website. The website should guide by the shortest possible way to the most used information and users follow the lime of minimum effort (Prabakaran and Lihitkar, 2012).
2.7.3.2 WEB IMPACT FACTOR

The Web Impact Factor provides quantitative tools for ranking, evaluating, categorizing and comparing web sites, top level domains and sub-domains. There are three types of link. Outgoing links from web pages are here named out-links, links coming into a site from other sites are named in-link or back-links and links within the same site are called self-link, high number of self-link on site is a mark of its correct link of information and resources and search engines can provide better representations of sites through such self-links. The number of pages in a web site is a sign of its quantity. Moreover the more in-links the more valid and important a site will be the better also its visibility will be. The quantity of in-links in a web site thus determines its validity importance, quality, and rank it shows the information on the site is considered desired by the user (Osareh, 2007).

2.7.3.3 WEB-CITATIONS

In recent year web sources have gained momentum, which has played an important role in the increase of citations to web resources in scholarly publication in many disciplines. Web resources most likely to be cited by the research community in scholarly work (Davis and Cohen, 2001). Citation behavior of researchers has been affected with the invention of www, and in fact, it can be said that they have been interested in web citations. In India the internet has emerged as one technology that is influencing every sphere of human activity. The internet stared in India in 1994 and in 1998 it was thrown open for private internet service providers (ISPs). India has 35 million internet users and this was an 89 per cent annual growth. The year 2007 was declared as the “broadband year” by the Indian government (UNCTAD, 2005). The internet, a very complex and revolutionary invention of 1955, has played a key role in rapid access to information and the results of other research groups. Accessibility to internet resources is more convenient as well as they are cheaper to create and quicker to disseminate. In other words as the researchers continue to take advantage of the wealth of information resources the use of online references increasing in scholarly researches. Library and information science is also no exception to this increase (Maharana et al, 2006). The growth of scholarly publication on the web all over the world the use of web
links or web citations have become common in journal articles, conference papers and other scholarly publications in all disciplines thus the increased amount of information available on the web has influenced the corresponding use of web citations by author in their scholarly works (Lawrence et al, 2001; Rumsey, 2002; Bhat and Sampath Kumar, 2008; Wu, 2009). The web has become an indispensable source for information and research. Its growth patterns are of interest for theoretical, technical, social and economic reasons the quasi miraculous emergence of the web in 1990s, there continuous increase in the volume of scholarly resources in electronic form, such as e-book, e-journals, e-theses and dissertations, e-prints of research articles and the like. These resources have provided a scope for researchers and authors in various subject fields and stimulated research productivity (Bar-Ilan and Peritz, 2009).

2.7.3.4 HALF LIFE OF WEB-CITATIONS

The major problem in the use of web citation is that many of them are not permanent resulting in access failures when reader attempt to follow them half life of web citation the time required for half of all online citations in journal articles to disintegrate of web citations in various discipline and they found that this amount of time may differ for different discipline (Koehler, 2002; Rumsey, 2002; Markwell and Brooks, 2003; Spinellis, 2003; Bar-Ilan and Pertiz, 2004; Sellitto, 2005; Goh and Ng, 2007; Moghaddam and Saberi, 2010).

2.8 FORM-WISE DISTRIBUTION

Literature cited in the journal is published in different form like books, journals, conference proceedings, thesis etc. The information regarding the form was collected from the source data and tabulated to find out the most dominant form of literature. Form wise distribution of citations has been done in order to know the most dominant form in which the information is cited. The study will be helpful for information scientists as well as researchers, to know the most dominant form in which the information was being cited in the concept. Form-wise distributions of citation analysis results that in many study, most of citations are given of book, less
than that journal citations are given, then other forms of document are cited, online literature citations are also cited, online literature citations are also given. Its citation rate is increasing day by day (Haridasan, 2007; Doreswamy, 2001). In science study journal citations are more than books, patents, proceedings, report, theses (Barroah and Sharma, 1999; Lokhanda, 2007; Satish and Kabir, 2001; Deshpande, 1997).

2.9 AUTHORSHIP PATTERN

The distribution of the citations according to the number of authors, in the particular discipline, that means authorship pattern (Doreswamy, 2001). Single author contribute maximum number of article, large number of articles by single authors means that there are no well-established research groups in the area the subject is a new and emerging one (Chen and Chen, 2005). Single authored and two authored citations are maximum, and more than three authored articles are less in number (Sharif, 2004; Barroah and Sharma, 1999). Analysis of authorship pattern shows that single authored study is more than multi authored study (Sahoo, 2001; Kagamuramath, 2001; Kannappanavar, 1991; Afolabi, 1983; Deshpande, 1997). Collaborative research is the common phenomenon in any field, there has been a consistent trend towards increased collaboration. The collaborative research is a well recognized feature of modern science and there has been a consistent trend towards increased collaboration in all branches of science during the present century (Price, 1963).

2.10 COLLABORATION

Co-authorship index (CAI) defined as the average number of authors per document, inter centre collaboration index (IC), number of centers per document, international collaboration rate (percentage of documents authored by two or more countries) (Bonilld, 2008). Collaboration is a sign of scientific achievement and an indication of teamwork which can take place because there is a recognized theoretical structure about which scientist can easily communicate, lack of collaboration in a discipline a sign of scientific under development or it is an indication that the subject matter and problem of field are more (Lowe, 2003; Li,
Collaboration research has been found to be the dominant pattern in many subject fields. Degree of collaboration is different in different subject (Kannappanavar, 1991). Extend of collaboration can be measured with the help of multi-authored papers. To measure the collaborative research pattern a simple indicator called collaboration coefficient is used. Collaboration co-efficient is the ratio of the number of collaborative research papers during a certain period of time (Subramanyam, 1983).

2.10.1 SCIENTIFIC COLLABORATION

Collaboration appears to have become a characteristic inherent in scientific evolution as a result of such diverse causes as budgetary constraints, new techniques that call for the support of different specialists or the growing complexity of the equipment developed. Co-authorship indicates the number of authors per paper provide another measure of collaboration in terms of the size of the research team. The co-authorship index was determined as the arithmetic mean of the number of authors singing papers (Sanz and Martin, 1997).

2.11 GEOGRAPHICAL DISTRIBUTION

Bibliometrically, the value of place of publication points to the "Nationality" of document. Place of publication is the best guide available to nationality of a document (Singh, 2007). Geographical relationship that can be observed from the data is that journals tend to cite journals from their own region more having controlled for self-citations and geographic origin of the cited journal (Frandsen, 2005). The geographic variables are constructed by determining the geographic location of each journal i.e. their place of publication (Sahoo, 2001).

Country-wise distribution of citations means geographical distribution the foreign distribution is more than Indian citation distribution (Balasubramanian and Bhaskar, 1984). Geographical analysis of citations provides information about the countries active in a subject field and their relative contribution (Chikate, 2008).

2.12 CHRONOLOGICAL DISTRIBUTION

Citations are the references, included by authors in their article. During the period of study which arranges sequential order. Some citations arranged according
to the period of publication of cited journals. If the period of the study is long the
journals are divided into period of years, having periodicity the periodicity mostly
used five, ten years, rarely twenty years periodicity is used. Analysis of
chronological distribution show that older documents are less cited than newer ones
(Singh, 2007; Lokhanda, 2007; Pillai, 2007; Sahoo, 2001; Kogamuramath, 2001;
Mahapatra and Kaul, 1992; Deshpande, 1997; Balasubramanian and Bhaskar, 1984;
James, 2008).

The cited references were distributed in different time intervals according to
their date of publication. This makes the pattern of citations to reveal from quickly
the literature on some subject becomes obsolete (obsolescence) (Haridasan, 2007).
The chronological dimension of information used to investigate how ideas have changed
over time and may suggest ways in which ideas might evolve in the future (Mittal, 2013).

2.13 LANGUAGE-WISE DISTRIBUTION

Language is media for communication authors cites different types of
document for writing. Selection of document depend upon many factors like subject
matter, year of publication, country of origin, method of work, language and
availability of source material.

Most of the literature in science is written in English language. English is at
the medium for study and teaching specially at the higher level of education. Mostly
research scholar in science preferred English language (Beena, 1997; Deshpande
and Rajyalakshmi, 1997; Hasso, 1984). Language distribution study shows the most
dominant language in which the literature on the subject is cited in the journal. This
information is useful for researchers as well as information scientists. English
language is the most dominant language in any literature (Haridasan, 2007).

The great significance for researcher’s to know the language in which their area
of specialization is published. The analysis of the languages used to transmit the subject
literature is useful not only to understand the coverage patterns but also gives an
indication of the foreign language problem likely to be faced by the users (Sudhier and
Ravi, 2012).
2.14 RANKING OF AUTHORS

Rank list of author helps the professionals in many way that is for deciding popularity of author or his work, it help to select reading materials, to decide acquisition policy. It helps to researcher also, which document is popular, it indicates the importance of the author and which author is doing very much work in the particular field. Ranking of author is important to give the direction to the professional and researchers and user.

There are some risks in author ranking that is how many citations authors will accrue relative to others, it does not support or provide any interpretation of why one author get more or less citations. The goal of this work is not to promote the use of citations as a means of ranking (and subsequent hiring and promotion decisions). Citation data may at best be one of several inputs to important decisions, and should definitely not be the decisive one (Feitelson, 2004). Ranking of authors is done to know the eminent personalities in the subject, whose work is used by the authors to refine their idea on the subject or topic (Haridasan, 2007).

2.15 RANKING OF JOURNALS

The ranking of journal is necessary to know the most productive Journals used in references, for further study of the subject. It is cited because of the close association between the subject of the journals and the area of work (Sankar and Ramasesh, 2012). Ranking of knowledge management and intellectual capital journals are based on Hirsch’s h-index and Egghe’s g-index. These indices reflect the citation impacts of journals and offer a supplemental perspective on the recent knowledge management and intellectual capital journal ranking. The journal ranking is an important attribute of discipline identity (Serenko and Bontis, 2009). The rank list provides unbiased data regarding the potentiality of journals that are useful to specialist readers in selecting the ones more relevant to their field, and to keep themselves abreast of new developments in their specialization. This list can be used for effective selection and acquisition in a library. The ranked list prepared as a result of the analysis of citations should reflect the priority given by the readers to the journals. Such ranked lists are very
often used as guidelines in the acquisition of periodical in the library (Banateppanvar and Biradar, 2012).

Ranking of the journals show that the usefulness of journals and their importance in particular subject. This is impact factor on any field of subject. It identify the core journal Solari and Magri told about ranking of journal, it is used in a wide scientific context as a tool for evaluating (researchers and research work) for obtaining overall synthetic perspective of impact factor values, by analyse the ranking of journals. The list is useful only, if it is assumed that all the journals of the ranking are comparable (Frandsen, 2005). It is useful to establish a list of journals mostly cited by the author (Sharif, 2004). There are two approaches to rank the journals (i) using citation scores. Journal were ranked by citation counts and those with high citation counts were considered to be of high use and thus ranked accordingly, (ii) using user opinion. Journals ranked according to user opinions and those with high score were ranked at the top (Dulle, 2004).

Ranking of the journal is necessary to know the most productive journals used in reference, for further study of the subject, this information is useful for the librarians as well as research scholars (Haridasan, 2007; Barroah, 1999). Ranked list of periodicals on a given subject indicating their productivity will serve as an important tool in the hands of the documentlists, librarians, and information scientists in as much as they can review and revise their acquisition list with the help of it. On the other hand measurement of bibliographical scattering of periodicals on a particular subject will reflect the degree of expansion of periodical coverage required in order to achieve optimum bibliographical control (Bhattacharjee, 1975; Deshpande, 1997).
2.16 CITATION INDEXING

Reviewing the 40 years history of the ISI citation databases, the key advantage of the citation indexing is its capacity to bypass the use of normal linguistic forms such as title, keywords or subject heading has not yet been discovered by a large part of the LIS community. The symbolic role played by the citation in representing the content of papers in an important dimension of information retrieval: in combination of various natural language expressions, citation indexes can greatly improve comprehensive literature searches.

Citation indexes enable the searcher to locate subsequent and especially current descendants of particular papers or books. As a tool for navigating the literature, citation indexes can expand the scope of the search by retrieving not only those papers that cited a key work, but also those related to the citing references (Wormell, 1998). The main resources for citation analysis are the citation indexes produced by Thomson scientific (Formerly Institute for Scientific Information). Besides their multidisciplinary nature, citation indexing was the major reason. Why this service had a unique position among bibliographic databases for many years.

Thomson Scientific is however, no longer the only service offering citation-enhanced data based on the market. In recent years, several database producers have noticed the potential of citation indexing and manually added cited references to a subset of their records.

Thomson scientific citation indexes have some limitations that are of crucial relevance for citation analysis as an assessment tool of research performance. Among these constraint is the limited cover of the citation indexes. As outlined above, Thomson Scientific processes only a selected set of journals for its citation indexes. While these accessed journals tend to be the highest impact peer reviewed journals, they represent only a fraction of scientific work that is documented. Hence, coverage relates to the extent to which the citation indexes cover the written scholarly literature in the field (Neuhaus and Daniel, 2008). The origin of citation
analysis as a wide spread assessment tool of research performance can be traced to the mid 1950s, when Garfield proposed the groundbreaking concept of citation indexing. With the introduction of the science citation index (SCI), the social sciences citation index (SSCI) and the Arts and Humanities Citation Index (A&HCI) by the Institute for Scientific Information, systematic analysis of the impact and influence of scholarly work as well as of trends in science became available (Garfield, 1979). The library of the Chinese Academy of Science has produced the Chinese science citation database (CSCD) since 1989 (Meng, 1995). Nanjing University in Mainland China and the Hong Kong University of Science and Technology produce the Chinese Social Science Citation Index (CSSCI) (Su and Han, 2001). These citation indexes databases have a great impact on research. Some researchers apply citation data to evaluate the contribution of research fellows, journals, or institutes. Some apply citation data to analyze the structure of specified research fields. Some apply citation data to retrospectively evaluate research trends, and to make projections about future trends (Garfield, 1979).

Citation indexing for literature, Shepard’s Citations had been used in the legal profession since 1873, a system would be particularly useful when one is trying to evaluate the significance of a particular work and its impact on the literature and thinking of the period, citation databases were developed by as a tool to measure trends in science, as reflected in formal publication and for tracking these changes, connections and developments over time, the system would provide a complete listing for the publications covered of all the original articles that had referred to the article in question (Garfield, 1955).

2.16.1 H-Index

H-Index has been proposed a measure of scientific publishing esteem and simultaneously measures the quality and the sustainability of the impact of a research’s publication. It is based on the quantity and quality as well as the distribution of the citations received by the researcher’s publications. There are many tools available for the
The h-index of an individual author is defined as the maximum number of papers $h$ by a scientist where each of those papers has received $h$ or more citations. The strengths and weaknesses of the h-index are that it is mathematically simple, may be applied to any level of aggregation, it is a robust indicator (Rousseau, 2007). Web of Science and Scopus added the h-index to the bibliometrics and scientometric indicators in their services (Jacso, 2009). Harish developed a new, simple, and intuitively attractive measure of an individual’s impact in his or her field; the h-index. He defined h-index as: A Scientist has an index h if $h$ of his/her $N_p$ papers have at least $h$ citations each and the other papers have no more than $h$ citations (Norris and Oppenheim, 2010).

2.16.2 G-Index

In order to overcome the deficiencies of the H-index, Egghe proposed the G-index to measure the productivity of the researchers based on their publications (Egghe, 2006).

2.17 OBSOLESCENCE

Obsolescence defined by Line and Sandison (1974) as the "decline over time in validity or utility of information". This concept is obvious interest to information theoreticians who concern themselves with the development career and eventual death or incorporation of particular kind of information. But it is also of interest to practical librarians who administer growing collections in finite spaces. Such librarians look to research on obsolescence to help them decide which items to keep and which to store or discard in order to make room for new acquisitions. Ideally for remote storage or discarding, research on obsolescence would culminate in a simple mathematical formula which could be applied with equal success to any and all libraries. Obsolescence research has produced many mathematical formulas, but unfortunately they have been neither simple nor universally applicable. The best researchers are the one who have admitted that obsolescence is a far more
complicated and more hypothetical concept (Gapen and Milner, 1981). Half life is measure of the growth of discipline. In general, within the same subject field, one would expect that a journal that cites primarily newly published material is better than one that cites older source. The citing half life (median citation age) shows how far back in time one must go to account for the age one half of the bibliographic references published in a journal in a particular year (Haridasan, 2007).

The term "obsolescence" occurs frequently in the literature of librarianship and information science. In numerous papers we are told how most published literature becomes obsolete within a measurable time, and that an item receives half the use it will ever receive (half life) in a few years. "Obsolescence" is however very rarely defined, and its validity, interest and practical value are often assumed rather than explained (Meadows, 2005; Ijari and Kannappanavar, 1989). Obsolescence study of literature is one of the main areas of informetrics and it became an important characteristic of scientific and technological literature. The focus of the most of the obsolescence studies are at the individual document level and may extend upto the journal, sub disciplines or discipline level. The growth of literature and their obsolescence are usually treated together because they represent the initial and the final stages of the information cycle. Both are more time dependent than most other areas of informetrics, where time is not treated as a variable, but more as a boundary defining which data are collected. Growth studies investigate regularities in the creation of literatures or documents over time, which is equated with the growth of information. Buckland explained obsolescence as the relative decreases in use of material as it ages. It is the process by materials become no longer useful or reliable.

The term obsolescence is commonly used notions with negative connotation, and is described as the decline of usefulness over time. It can also be described as temporal selective in the use of articles. The late use of nascent information, information is generated that will be used by the other user only when it will be available to him in printed form in the documents. But time is taken in publishing as well as reaching the document to the user. Thus it takes much time in reaching the hands of the user from the information generation. During this period information
loses its importance. This is called obsolescence of information. In context of obsolescence of the information, the committee setup under the chairmanship of V. S. Minhas, reported in its report that if any information loses its correctness in reaching to the users, the work of organizing the information becomes difficult and correct evaluation cannot be done (Pillai, 2007).

2.18 CONCLUSION

The review of literature shows that vast amount of literature was available in citation analysis. Citation analysis is the major technique of bibliometrics which is useful to evaluate collected data or library collection; it is useful for librarian to collection development and research scientists for their study.

Considering published literature present study has used quantitative evaluation of Current Science.

The chapter will be followed by Chapter- 3rd Citation Analysis.