# Impact of Library Collection Towards Doctoral Studies
# A Case Study on Citation Analysis of PhD Dissertations in the School of Science & Technology in Tezpur University

**Tilak Hazarika** **Dipak Sarma** **Anjan Gohain**

*Impact of library holdings in terms of physical and online access on the doctoral studies in Tezpur University have been studied based on citation appended to the PhD dissertations in four subjects clubbed under the School of Science & Technology. Two latest dissertations (degree awarded) from each four subjects have been taken for the study selected through systematic sampling method. Category wise distribution of the cited items viz. journals, books & monographs, conference proceedings, electronic sources, web citations and others have been studied. Category wise percentile distribution and availability of cited items in the parent library have been calculated for journals and books followed by preparation of rank list of journals for each four subjects studied. Some well known statistical and bibliometric parameters have been applied for the study. Suggestive approach to re-engineering of collection development policy of the university libraries have been lined up based on the findings.*

**Keywords:** Citation Study, PhD Dissertations, Doctoral Studies, Tezpur University, Collection Development Policy

## 1. Introduction

Library collection development invites a significant portion of the budget allocation of the parent institution. In a University system the library's major responsibility is to support study and research of its academic community by literature and information services up to an optimum extent. Being the research is one of the major activities of any university system, it is obvious that the research out put invariably reflects the productivity of a given university. The Library of a university system shoulders the major responsibility to extend the literature and information services to the academia in pursuit to attain their activities. In this venture, the university invests a significant portion of its budget to the library and the libraries invest a major part of their budget in collection of literature including purchase of scholarly journals, books and other reference materials. In return, the university administrators expect to get a return on investment in university libraries (Luther, 2008).

Obviously, it is a challenge before the library management to acquire, gather and package information resources so as to serve the readers community with an objective to optimize their requirement for literature and information. The availability of scholarly literature has witnessed a cultural shift from the

print to electronically available or accessible ones (Wolf, 2001). The acquisition of resources is expected to be guided by the principle that each and every material gets its users, and this is a challenging task before the library management. In order to line up a sound collection development strategy, the library management has to study the patter of use of the existing resources before turning up to acquire the next. Some tools and techniques have to be adopted to draw a roadmap towards better and effective collection development in the library. One of the well established tools is the study of citations appended to the research outputs of the university. PhD dissertations are particularly useful objects of research in finding out the impact of library collections because they are both a result of independent research and a product of scientific graduate studies, and therefore they represent both the university's research and study. Buttlar (1999) remarks that the doctoral dissertation is evidence of the author's ability to carry out scientific research, and the citations reflect his/her familiarity with the discipline. It has also been found that students' research interests often reflect those of their faculty advisors (Edwards, 1999; Smith, 2003). Baile et al (2004) observed that doctoral students rely on the university library's collection and use information sources that are available and owned locally. As such, the quality of doctoral studies in a university will mostly govern by the availability of the resources in the university library. Therefore the citations studies on the doctoral dissertations will reveal what material is used in that certain university environment and that may explore a guide map for tuning up collection development practices in a university library. A good number of studies have already been carried out in this regard and some latest studies are Iivonen et al (2009), Rodriguez-Ruiz (2009), Tenopir et al (2008), Vallmitjana and Sabate (2008) Braddy et al (2006), Fuchs et al (2006), Baile et al (2004), Haycook (2004), Smith (2003), Vaughan (2003) Tenopir and King (2001), Buttlar (1999).

In this study, the visibility of library collection in the references of PhD dissertations is examined. The present study is focused on the availability, and not the quality, of the works cited in dissertations. The assumption was that since the dissertations had been accepted in the normal academic order, their references would meet at least the minimal requirements of scientific quality. The main focus of this study is to explore how well the university's own library's collections could support the completion of dissertations.

So far no study has been carried out in the Tezpur University, and this is the rationale of this study and accordingly the following objectives have been lined up.

## 2. Objectives

The broad objective of the study was to analyze the impact of the parent university library in PhD studies by investigating the availability of the references appended in the dissertations in the university's own library collection. Category wise distribution of cited references was carried out to reflect the

representation of library's collection. As such following four objectives have been lined up for the study.

(1) What percentage of different types of resources is cited in the dissertations, catagorywise viz. Journals, Books, Conference proceedings, Thesis and electronically available resources?
(2) How extensively are the references of doctoral dissertations available in the collection of the university library?
(3) If there is a difference in the availability of references in different subjects ?
(4) If there is a difference in the availability of various types of references cited in the dissertations?
(5) How old citations do the researchers use?

### 3. Materials and Methods

Since inception in the year 1994, the university has awarded 102 PhD degrees. School wise and then departments under school wise distribution of the PhDs has been presented in Table-1. Highest 57 number of PhD has been awarded under the school of Science & Technology which is further distributed to Chemistry 17, Mathematics 16, MBBT 10 and Physics 15. Two latest Ph D dissertations in each disciplines in the School of Science & Technology encompassing the four subjects is the source of the study. The School of Science & Technology has been chosen based on two perspectives; first, highest number of PhD has been awarded, and the second, Tezpur University is slant to Science and Technology study & research as reflected in the objectives of establishing the university. All four subjects placed in the school of Science & Technology viz. Chemical Sciences (Chemistry), Mathematical Sciences (Mathematics), Molecular Biology and Biotechnology (MBBT) and Physics have been taken for the study. Citations appended to the dissertations were scrutinized and categorized under six different categories viz. Journals, Books and Monographs, Conference Proceedings, Theses and dissertations and Web citations. Citations which could not be clubbed under the above mentioned five categories i.e. letter to editor, research note, reports, maps, travelogue, etc are clubbed under the head "Others" .Data gathered were tabulated to analyze and inferences were made as per the objectives set above.

The availability of references was checked by a search in the libraries' own online catalogues (OPAC search), UGC-Infonet search interface for journals and finally in the Google search. Where there was a positive hit, either in the libraries' OPAC or in UGC-Infonet site, repetition was not carried out. However, in certain cases, repeated search was carried out in Google to ascertain if any given title of journal was available in the publisher's site as priced publication well as in Open access.

## 4. Result and Discussion

### 4.1 Category wise Distribution of Citation Pattern in Different Subjects

The availability of the references appearing in the doctoral dissertations in the parent university was studied by tabulating the references category wise viz. Journals, Books & Monographs, Conference Proceedings, Theses & Dissertations, Web citations and Others. Table 1-4 giving the details of the citation count categorywise and availability of the citations in the parent library under different subjects studied.

In this study, the total number of citations in the category of Journals and Books & monographs in all the eight dissertations is 1440, of which 1193 from journals and 247 from books. An average 77% of the all citations are from 'Journals' within a range of 41-79 in the four subjects studied while citations in the category of 'Books and monographs' constitute 16% of the total citations.

Percentile citation share of citations from journal is found to be highest in Chemistry with 92%, followed by Physics (79%), Mathematics (63%), and MBBT (41%). Distribution of percentile citation from Books & monographs in the four subjects is found to be highest 38% in MBBT followed by Mathematics (31%), Physics (14%) and Chemistry (7%). Citation count from the category head Conference Proceedings is found to be highest in Physics with 7 followed by Chemistry with 4 citations. No citation in the category conference proceedings was recorded in case of Mathematics and MBBT. Count of citation in the category Thesis & dissertation is found as 4 in Mathematics, 3 in Chemistry, 1 in MBBT and no citation recorded in Physics. Likewise, web citations found only in the subject MBBT with 7 citations. Highest 36 citations in this category "Others" was recorded in MBBT, followed by Physics with 12, Chemistry (4) and Mathematics.

Availability of the cited sources in the parent library i.e. Tezpur University library was scrutinized for each cited source for the categories journals, books & monographs and PhD thesis. On an average 51% of the Journal sources are available in the library either subscribed by the library of its own regular subscription or provided by the UGC-Infonet consortia. In Chemistry, total 736 citations were recorded in the category "Journals" represented by 171 source titles. Out of the total 171 source titles of journals 74 (i.e. 47%) are available in the library. Availability distribution was further analyzed to availability in the University libraries own subscription, provided through UGC-Infonet consortia and those available as open access. It is found in Chemistry that out of 81 sources of journals, 15 (i.e. 9%) are available in the parent library's own subscription, while 59 (i.e. 35%) in UGC Infonet consortia and rest 7(i.e. 4%) title

is accessible through the open network. The infrastructure required for accessing the open access journals is available in the Tezpur University library. With this background, the journals available in the open network are clubbed under the availability in the library. As such, out of the total 171 journals contributing 736 citations in Chemistry 47% are available through the library facilities.

Books and Monographs citations in Chemistry are found to be 57 represented by 50 titles of which 19 titles are found available in the University library holdings. As such, the availability of citations in Chemistry in the category Books & Monographs in Chemistry is found to be 17%.

Accordingly, In Mathematics, total 90 citations were recorded in the category "Journals" represented by 41 source titles. Out of the total 41 source titles of journals 24 (i.e. 59%) are available in the library. This availability is distributed to 6 (i.e.15%) in University libraries own subscription, 13 (i.e.32%) in UGC-Infonet consortia while 5 (i.e.12%) in the open access. Books and Monographs citations in Mathematics are found to be 44 represented by 40 titles of which 15 titles are found available in the university library. As such, the availability of citations in Mathematics in the category "Books & Monographs" is found to be 38%.

In case of MBBT, total 115 citations were recorded in the category "Journals" represented by 43 source titles. Out of the total 43 source titles of journals 26 (i.e. 60%) are available in the library. This availability is distributed to 3 (i.e.7 %) in University libraries own subscription, 8 (i.e.19%) in UGC-Infonet consortia while 15 (i.e.35%) in the open access. Books and Monographs citations in MBBT are found to be 108 represented by 108 titles among with only 5 titles are found available in the library. The availability of citations in MBBT in the category "Books & Monographs" is found to be a meager 5%.

The citation pattern in Physics is distributed to 213 from journals represented by 62 source titles. Out of these 62 source titles, total 31 (i.e. 50%) are available in the library. This availability is distributed to 8 (i.e.13 %) in University libraries own subscription, 21 (i.e.34%) in UGC-Infonet consortia while 2 (i.e.3%) in the open access. Books and Monographs citations in Physics are found to be 38 represented by 38 titles among with only 13 titles are found available in the library. The availability of citations in Physics in the category "Books & Monographs" is found to be 34%.

Seven number of was citation was recorded only in the MBBT. Citation of web sites was completely lacking in other six dissertations under three subjects studied.

**Table-1 Department wise distribution of PhD thesis in Tezpur University**

| Schools & Departments | No. of Theses | % Share of Deptt. | % Share of School |
|---|---|---|---|
| School of Management Sciences | | | 16 |
| Business Administration | 16 | 16 | |
| School of Engineering | | | 12 |
| Civil Engineering | | | |
| Computer Science & Engineering | 10 | 10 | |
| Electronics & Communication Engineering | 2 | 2 | |
| Food Processing Technology | | | |
| Mechanical engineering | | | |
| School of Humanities & Social Science | | | 10 |
| Cultural Studies | 5 | 5 | |
| English & Foreign Languages | 5 | 5 | |
| Mass Communication & Journalism | | | |
| Sociology | | | |
| School of Energy Environment and Natural Resources | | | 6 |
| Energy | 3 | 3 | |
| Environmental Science | 3 | 3 | |
| School of Science & Technology | | | 57 |
| Chemical Sciences | 17 | 17 | |
| Mathematical Sciences | 16 | 16 | |
| Molecular Biology & Biotechnology | 10 | 10 | |
| Physics | 15 | 15 | |
| Total | 102 | 100 | |

It is observed in the table 1-4 that number of citation count other than Journals and Books and Monograph category is very less and this sources has very little or no impact in the libraries' collection management practices. This is the rationale, the share percentage studies for the category 'Conference proceedings' 'Theses and dissertations' and other were not carried out.

The total number of references cited in the 8 dissertations was 1503, ranging from 37 to 448 per dissertation. The average number of references was 188. This is nearly at par the Edward's (1999) study, where he found the average 114 (ranges 33-196) number of reference per dissertations in polymer science and polymer engineering but far below the Iivonen's (2009) study where the average number of references in PhD dissertations in economics and management was 319.

**Table-2 Category wise Distribution of Cited Sources in Chemistry**

| Category | No. of Citation | | | No. of Source Title | Availability | | | | % Availability |
|---|---|---|---|---|---|---|---|---|---|
| | Chem1 | Chem2 | Total | | TU | UGC-Infonet | OA | Total | |
| Journals | 419 | 321 | 736 | 171 | 15 | 59 | 7 | 81 | 47.37 |
| Books & Monographs | 23 | 34 | 57 | 50 | 19 | | | 19 | 38.00 |
| Conference proceedings | 0 | 4 | 4 | 4 | | | | | |
| Thesis & Dissertations | 2 | 1 | 3 | 3 | | | | | |
| Others | 4 | 0 | 4 | 4 | | | | | |
| Web citations | 0 | 0 | 0 | 0 | | | | | |
| | 448 | 360 | 804 | 232 | 34 | 59 | 7 | 100 | 85.37 |

**Table 3-Category wise Distribution of Cited Sources in Mathematics**

| Category | No. of Citation | | | No. of Source Title | Availability | | | | % Availability |
|---|---|---|---|---|---|---|---|---|---|
| | Math 1 | Math 2 | Total | | TU | UGC-Infonet | OA | Total | |
| Journals | 22 | 68 | 90 | 41 | 6 | 13 | 5 | 24 | 58.54 |
| Books & monographs | 12 | 32 | 44 | 40 | 15 | | | 15 | 37.50 |
| Conference proceedings | 1 | 3 | 4 | 4 | | | | 0 | |
| Thesis & dissertations | 2 | 2 | 4 | 4 | | | | 0 | |
| Others | 0 | 1 | 1 | 1 | | | | 0 | |
| Web citations | 0 | 0 | | | | | | | |
| Total | 37 | 106 | 143 | 90 | 21 | 13 | 5 | 39 | 96.04 |

**Table 4-Category wise distribution of cited sources in MBBT**

| Category | No. of Citation | | | No. of Source Title | Availability | | | | % Availability |
|---|---|---|---|---|---|---|---|---|---|
| | MBBT 1 | MBBT 2 | Total | | TU | UGC-Infonet | OA | Total | |
| Journals | 57 | 58 | 115 | 43 | 3 | 8 | 15 | 26 | 60.47 |
| Books & Monographs | 46 | 62 | 108 | 108 | 5 | | | 5 | 4.63 |
| Conference proceedings | 8 | 7 | 15 | 15 | | | | 0 | |
| Thesis & dissertations | 0 | 1 | 1 | 1 | | | | 0 | |
| Others | 15 | 21 | 36 | | | | | 0 | |
| Web citations | 1 | 6 | 7 | | | | | | |
| Total | 127 | 155 | 282 | 167 | | | | 27 | 65.1 |

**Table 5-Category wise distribution of cited sources in Physics**

| Sources | No. of Citation | | | No. of Source Title | Availability | | | | % Availability |
|---|---|---|---|---|---|---|---|---|---|
| | Phys 1 | Phys 2 | Total | | TU | UGC-Infonet | OA | Total | |
| Journals | 83 | 130 | 213 | 62 | 8 | 21 | 2 | 31 | 50.0 |
| Books & Monographs | 25 | 13 | 38 | 38 | 13 | | | 13 | 34.2 |
| Conference proceedings | 2 | 5 | 7 | 7 | | | | | |
| Thesis & Dissertations | 0 | 0 | 0 | | | | | | |
| Others | 9 | 3 | 12 | | | | | | |
| Web citation | 0 | 0 | | | | | | | |
| Total | 119 | 151 | 270 | 107 | 21 | 21 | 2 | 44 | 84.2 |

### 4.2 Age of the Citations use by the Doctoral Students

In order to develop the library collections it is important to examine the publication dates of the references. The age of references cited in the PhD dissertations also giving a glimpse on the information use patter as well as information relevancy parameters of the researchers in a given institution. This has immediate impacts on the library acquisition and de-acquisition policy. Iivonen (2009) opined for transferring the older literature to a repository library if not been used.

Table 6-9 giving the details of the distribution of the citations from Journals and Books & monographs arranged in the age intervals of five year in four subjects studied viz. Chemistry, Mathematics, MBBT and Physics respectively. Distribution of the citation reveals that more than one third (i.e.40%) of the citations are in the age of 0-10 years, while citations in the age of 0-15 year constitute nearly 60%. Citations in the category journals in the age rage of 0-10 year constitute 43%, 0-15 years 62%. Journal citation in the age of and 0-25 year constitute approximately 80%. Books citations in the age of 0-15 years constitute 46%, which is 63% in the age of 0-20 years and 80% of the books citations are distributed in the age of 0-30 years.

**Table 6- Citation Age in Chemistry**

| Sl | Age | Mid-Point | f1 (Journal) | f2 (Books) | ? f | $x^1$ | $fx^1$ | Cum. Freq. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0-5 | 2.5 | 129 | 2 | 131 | -6 | -799 | 131 |
| 2 | 6-10 | 8 | 224 | 3 | 227 | -5 | -1135 | 358 |
| 3 | 11-15 | 13 | 124 | 3 | 127 | -4 | -508 | 485 |
| 4 | 16-20 | 18 | 95 | 16 | 111 | -3 | -333 | 596 |
| 5 | 21-25 | 23 | 47 | 8 | 55 | -2 | -110 | 651 |
| 6 | 26-30 | 28 | 29 | 10 | 39 | -1 | -39 | 690 |
| 7 | 31-35 | 33 | 35 | 4 | 39 | 0 | 0 | 729 |
| 8 | 36-40 | 38 | 13 | 5 | 18 | 1 | 18 | 747 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 | 40-45 | 43 | 6 | 3 | 9 | 2 | 18 | 756 |
| 10 | 46-50 | 48 | 6 | | 6 | 3 | 18 | 762 |
| 11 | 51-55 | 53 | 5 | 1 | 6 | 4 | 24 | 768 |
| 12 | 56-60 | 58 | 10 | 1 | 11 | 5 | 55 | 779 |
| 13 | 61-65 | 63 | 6 | | 6 | 6 | 36 | 785 |
| 14 | 66-70 | 68 | 5 | | 5 | 7 | 35 | 790 |
| 15 | 71-75 | 73 | 1 | | 1 | | | 791 |
| 16 | 76-80 | 78 | | | | | | 791 |
| 17 | 81-85 | 83 | | 1 | 1 | | | 792 |
| 18 | 86-90 | 88 | | | | | | 792 |
| 19 | 91-95 | 93 | | | | | | 792 |
| 20 | 96-100 | 98 | 1 | | 1 | | | 793 |
| 21 | >100 | | | | | | | |
| | Total | | 736 | 57 | 793 | 7 | -2720 | |
| | Mean age | 16 | | | | | | |

**Table 7- Citation Age in Mathematics**

| Sl | Age | Mid-Point | *f1* (Journal) | *f2* (Books) | *?f* | $x^1$ | $fx^1$ | Cum. Freq. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0-5 | 2.5 | 14 | 6 | 20 | 6 | 120 | 20 |
| 2 | 6-10 | 8 | 4 | 2 | 6 | 5 | 30 | 26 |
| 3 | 11-15 | 13 | 5 | 7 | 12 | 4 | 48 | 38 |
| 4 | 16-20 | 18 | 6 | 4 | 10 | 3 | 30 | 48 |
| 5 | 21-25 | 23 | 5 | 3 | 8 | 2 | 16 | 56 |
| 6 | 26-30 | 28 | 3 | 2 | 5 | 1 | 5 | 61 |
| 7 | 31-35 | 33 | 13 | 5 | 18 | 0 | 0 | 79 |
| 8 | 36-40 | 38 | 6 | 4 | 10 | -1 | -10 | 89 |
| 9 | 41-45 | 43 | 9 | 3 | 12 | -2 | -24 | 101 |
| 10 | 46-50 | 48 | 12 | 4 | 16 | -3 | -48 | 117 |
| 11 | 51-55 | 53 | 8 | 2 | 10 | -4 | -40 | 127 |
| 12 | 56-60 | 58 | 2 | 2 | 4 | -5 | -20 | 131 |
| 13 | 61-65 | 63 | 2 | | 2 | -6 | -12 | 133 |

**Table 8- Citation Age in MBBT**

| Sl | Age | Mid-Point | f1 (Journal) | f2 (Books) | ? f | $x^1$ | $fx^1$ | Cum. Freq. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0-5 | 2.5 | 31 | 6 | 36 | -4 | -144 | 36 |
| 2 | 6-10 | 8 | 39 | 37 | 76 | -3 | -228 | 112 |
| 3 | 11-15 | 13 | 20 | 31 | 51 | -2 | -102 | 163 |
| 4 | 16-20 | 18 | 9 | 16 | 25 | -1 | -25 | 188 |
| 5 | 21-25 | 23 | 5 | 2 | 7 | 0 | 0 | 195 |
| 6 | 26-30 | 28 | 3 | 3 | 6 | 1 | 6 | 201 |
| 7 | 31-35 | 33 | 2 | 11 | 13 | 2 | 26 | 214 |
| 8 | 36-40 | 38 | 1 | 1 | 2 | 3 | 6 | 216 |
| 9 | 40-45 | 43 | 1 | 1 | 2 | 4 | 8 | 218 |
| 10 | 46-50 | 48 | 2 |  | 2 | 5 | 10 | 220 |
| 11 | 51-55 | 53 |  |  |  |  |  | 220 |
| 12 | 56-60 | 58 |  |  |  |  |  | 220 |
| 13 | 61-65 | 63 |  |  |  |  |  | 220 |
| 14 | 66-70 | 68 |  |  |  |  |  | 220 |
| 15 | 71-75 | 73 |  |  |  |  |  | 220 |
| 16 | 76-80 | 78 |  |  |  |  |  | 220 |
| 17 | 81-85 | 83 | 2 |  | 2 |  |  | 222 |
| 18 | 86-90 | 88 |  |  |  |  |  | 222 |
| 19 | 91-95 | 93 |  |  |  |  |  | 222 |
| 20 | 96-100 | 98 |  |  |  |  |  | 222 |
| 21 | >100 |  |  |  |  |  |  | 222 |
|  | Total |  | 115 | 108 | 222 | 5 | -443 |  |
|  | Mean age | 13 |  |  |  |  |  |  |

**Table 9- Citation Age in Physics**

| Sl | Age | Mid-Point | f (Journal) | f (Books) | ?f | $x^1$ | $fx^1$ | Cum. Freq. |
|---|---|---|---|---|---|---|---|---|
| 1 | 0-5 | 2.5 | 13 | 0 | 13 | -5 | -66 | 13 |
| 2 | 6-10 | 8 | 62 | 9 | 71 | -4 | -284 | 84 |
| 3 | 11-15 | 13 | 75 | 7 | 82 | -3 | -246 | 166 |
| 4 | 16-20 | 18 | 31 | 6 | 37 | -2 | -74 | 203 |
| 5 | 21-25 | 23 | 10 | 3 | 13 | -1 | -13 | 216 |
| 6 | 26-30 | 28 | 10 | 4 | 14 | 0 | 0 | 230 |
| 7 | 31-35 | 33 | 2 | 2 | 4 | 1 | 4 | 234 |
| 8 | 36-40 | 38 | 4 | 1 | 5 | 2 | 10 | 239 |
| 9 | 41-45 | 43 | 43 | 3 | 46 | 3 | 138 | 285 |
| 10 | 46-50 | 48 | 1 |  | 1 | 4 | 4 | 286 |
| 11 | 51-55 | 53 |  | 1 | 1 | 5 | 5 | 287 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12 | 56-60 | 58 | | | | | | 287 |
| 13 | 61-65 | 63 | | | | | | 287 |
| 14 | 66-70 | 68 | | | | | | 287 |
| 15 | 71-75 | 73 | | 1 | 1 | | | 288 |
| 16 | 76-80 | 78 | | | | | | 288 |
| 17 | 81-85 | 83 | 1 | | 1 | | | 289 |
| 18 | 86-90 | 88 | | | | | | 289 |
| 19 | 91-95 | 93 | | | | | | 289 |
| 20 | 96-100 | 98 | | | | | | 289 |
| 21 | >100 | | | 1 | 1 | | | 290 |
| | Total | | 252 | 38 | 290 | | -522 | |
| | Mean age | 19 | | | | | | |

Mean age of citation in all the subjects studied was calculated excluding the citations older than 70 years as those aged more than 70 constitute negligible percentage (i.e. 0.3% in Chemistry, 0.7% in Mathematics, 0.8% in Mathematics and 1% in Physics). As such, the mean age of citations calculated in the four subjects is Chemistry 16, Mathematics 36, MBBT 13, and Physics 19.

Obsolescence of citations was calculated plotting the cumulative of the citations in the y axis against the ages in x axis. Then a line parallel to x axis from the point of half of the citations (point A) in y axis was drawn to touch the graph (point B), again a line parallel to y axis was drawn to touch the x axis (point C). The value at the intersecting point C was counted to be the obsolescence age value or 50% citation age for the given subject. Fig. 1-4 giving the details of the obsolescence age respectively for Chemistry, Mathematics, MBBT and Physics. It is approximately 11-12 years in Chemistry, 34-35 year in Mathematics, 9-10 year in MBBT and 13-14 year in Physics. Overall age of obsolescence ranges between 9-35 years, which is shortest in MBBT (9-10) and longest in Mathematics (35-35 years).

Fig.1- Obsolescence of Citation in Chemistry

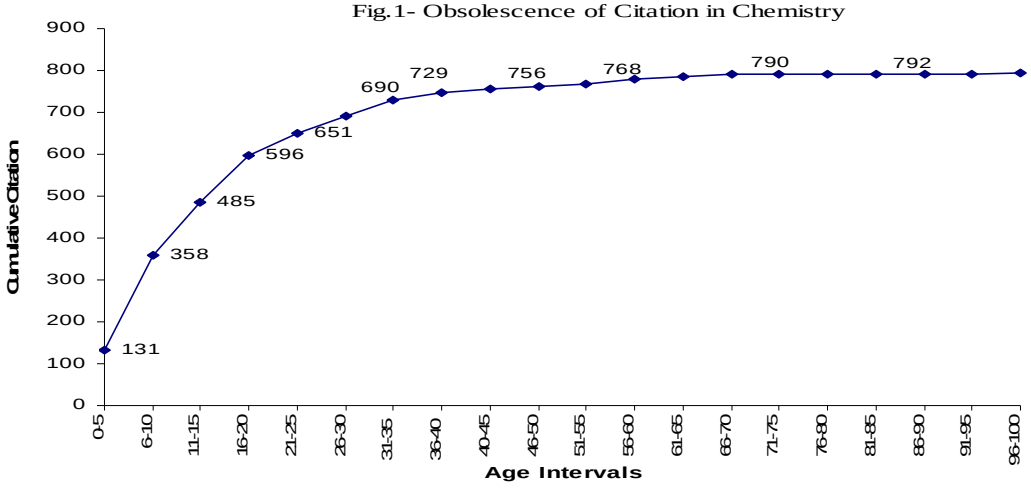


Fig.2- Obsolescence of Citation in Mathematics

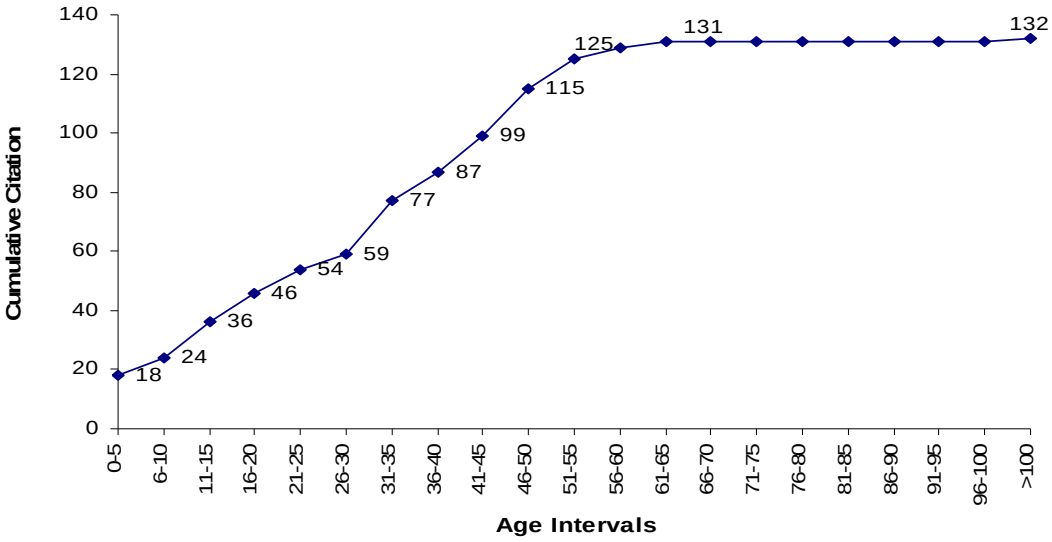



Fig- 3 Obsolescence of Citation in MBBT

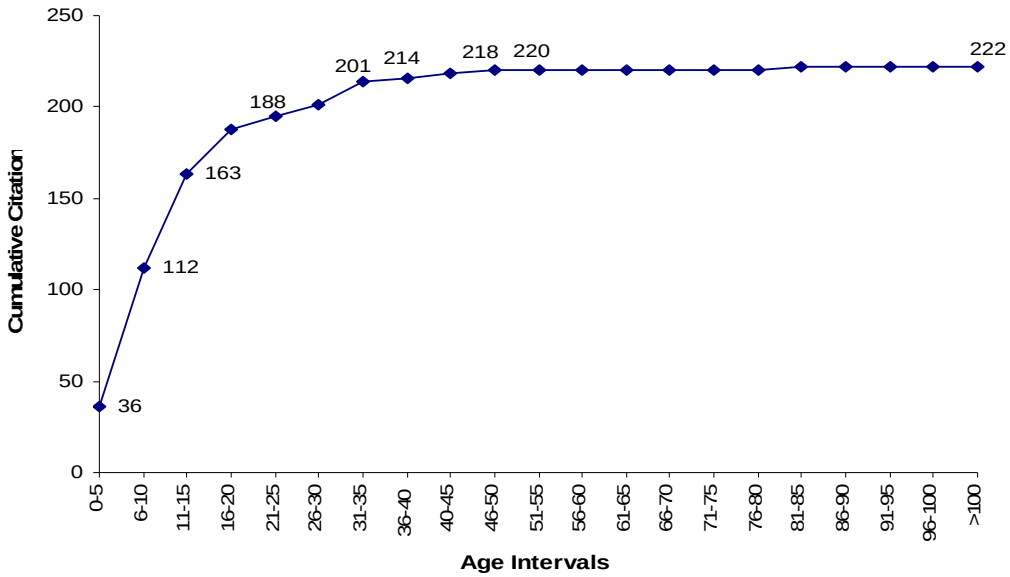
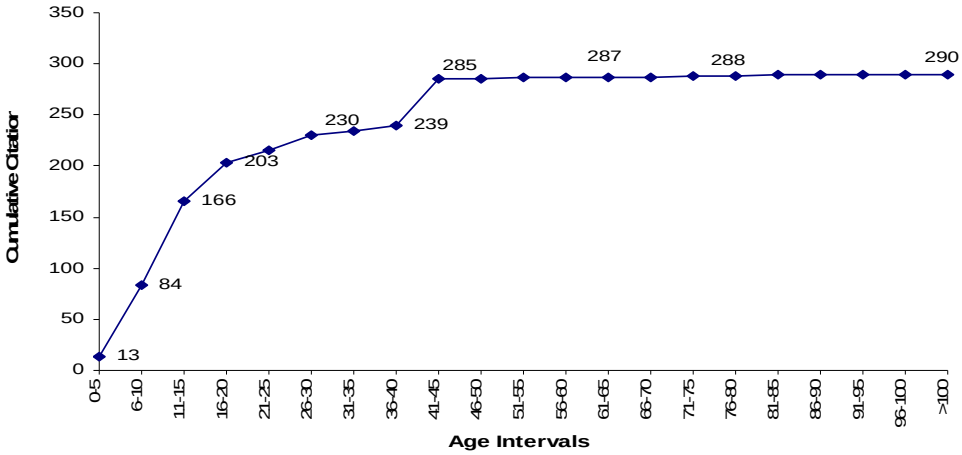


Fig.4- Obsolescence of Citation in Physics




### 4.3 Rank List of Journals for the Subjects Studied with Availability

Rank list of journals in a given subjects helps library management in selecting subscription of journals. Citation studies on a given subject yield a rank list of journals based on the number of citation received against a title. As such rank list of journals have been prepared for each subject studied, giving details of the number of citation received, availability with site name and publishers. Rank list of journals for the subjects Chemistry (43 titles with at least 4 citations), Mathematics (14 titles representing at least 2 citations), MBBT (14 titles representing at least 2 citations) and Physics (19 titles representing at least 3 citations) have been presented in Table 10-13 respectively.

**Table 10-Core Journals in Chemistry**

| Sl | Title with Publisher | No. of Citation | Availability |
|---|---|---|---|
| 1 | Macromolecules (ACS) | 76 | UI |
| 2 | The Journal of Physical Chemistry A (ACS) | 42 | UI |
| 3 | J American Chemical Society (ACS) | 30 | UI |
| 4 | Polymer (Elsevier) | 26 | NA |
| 5 | Langmuir (ACS) | 25 | UI |
| 6 | Dyes and Pigments (Elsevier) | 23 | NA |
| 7 | Journal of American Chemical Society(ACS) | 23 | UI |
| 8 | Journal of Colloid and Interface Science (Elsevier) | 23 | NA |
| 9 | J Polymer Science A (Wiley) | 20 | UI |
| 10 | Journal of the Chemical Society, Faraday Transactions (RSC) | 18 | UI |

| | | | |
|---|---|---|---|
| 11 | J Appl Polym Sci (Wiley) | 15 | UI |
| 12 | Polym Degradation and Stability (Elsevier) | 12 | NA |
| 13 | Chemical Communications (RSC) | 11 | UI |
| 14 | Bulletin of the Chemical Society of Japan (Chem. Soc. Japan) | 10 | TU |
| 15 | Indian Journal of Chemistry (NISCAIR) | 10 | TU |
| 16 | Colloid Surface (Elsevier) | 9 | NA |
| 17 | Talanta (Elsevier) | 9 | NA |
| 18 | Accounts of Chemical Research (ACS) | 8 | UI |
| 33 | Analytical Chemistry (ACS) | 8 | UI |
| 19 | Polymer International (Wiley) | 8 | UI |
| 20 | Spectrochimica Acta A (Elsevier) | 8 | NA |
| 21 | Angewandte Chemie International Edition (Wiley) | 7 | TU |
| 22 | Colloid Polymer Sc. (Springer) | 7 | UI |
| 23 | Journal of Photochemistry and Photobiology A: Chemistry (Elsevier) | 7 | NA |
| 24 | Macromolecular Rapid Communications (Wiley) | 7 | UI |
| 25 | Advanced Materials (Wiley) | 6 | UI |
| 26 | Chemical Reviews (ACS) | 6 | UI |
| 27 | European Polymer Journal (Elsevier) | 6 | NA |
| 28 | J Physycal Chemistry B (ACS) | 6 | UI |
| 29 | Nanotechnology (IOP) | 6 | UI |
| 30 | Polymer Prepr (ACS) | 6 | NA |
| 31 | Prog Org Coat (Elsevier) | 6 | NA |
| 32 | Progress in Polymer Science (Elsevier) | 6 | NA |
| 34 | Chemical Review (ACS) | 5 | UI |
| 35 | J Chemical Society, Chemical Communications (RSC) | 5 | NA |
| 36 | Macromolecular Chemistry and Physics (Wiley) | 5 | UI |
| 37 | Thin Solid Films (Elsevier) | 5 | NA |
| 38 | Canadian Journal of Chemistry (Nat Res Council Canada) | 4 | TU |
| 39 | J Chemical Society, Perkin Transactions (RSC) | 4 | UI |
| 40 | J Polymer Materials (T&F) | 4 | NA |
| 41 | Journals of The Indian Chemical Society (The Indian Chemical Society) | 4 | TU |
| 42 | Polymeric Materials: Science and Engineering (ACS) | 4 | NA |
| 43 | Synthetic Metals (Elsevier) | 4 | NA |

**Table 11- Core Journals in Mathematics**

| Sl | Journal title | Total Citation | Availability |
|---|---|---|---|
| 1 | Biometrics (Wiley) | 10 | UI |
| 2 | Biometrika (OUP) | 9 | TU |
| 3 | Annals of Mathematical Statistics (Project Euclid) | 7 | UI |
| 4 | Biometrische Zeitschrift (Wiley) | 6 | N |
| 5 | Ramanujan Journal (Springer) | 6 | TU |
| 6 | J. of the Royal Statistical Society Series A (Wiley) | 5 | N |
| 7 | Proceedings of the London Mathematical Society (OUP) | 5 | UI |
| 8 | Biometrical Journal (Wiley) | 3 | N |
| 9 | SIAM Journal of Applied Mathematics (SIAM) | 3 | UI |
| 10 | Communication in Statistics Theory and Method (T&F) | 2 | UI |
| 11 | J. of Indian Statistical Association (ISA) | 2 | N |
| 12 | Journal of Number Theory (Elsevier) | 2 | TU |
| 13 | Sankhya (ISI) | 2 | TU |
| 14 | Utilitus Mathematica (Utilitas Math. Pub.) | 2 | OA |

**Table 12- Core Journals in MBBT**

| Sl | Title | Total Citation | Availability |
|---|---|---|---|
| 1 | J of Ethnopharmacology (Elsevier) | 21 | N |
| 2 | Annals of Botany (OUP) | 17 | UI |
| 3 | J of Ethnobiology and Ethnomedicine (Open Access Pub) | 8 | OA |
| 4 | Journal of Natural Productivity * | 7 | N |
| 5 | Phytochemistry (Springer) | 5 | UI |
| 6 | Current Science (IAS) | 4 | OA |
| 7 | Ind J of Chemistry (NISCAIR) | 4 | TU |
| 8 | African Journal of Biotechnology (Academic Journals) | 3 | OA |
| 9 | Asian Journal of Plant Sciences (ANSI) | 3 | OA |
| 10 | J of Biological Chemistry (Am Soc Bioch Mol Bio) | 3 | OA |
| 11 | J of Science Technology (indjst.com) | 3 | OA |
| 12 | Ind J of Traditional Knowledge (NISCAIR) | 3 | N |
| 13 | Annals of Biochemistry (Assoc for Clinical Biochem) | 2 | N |
| 14 | J of Med Arom Pl Sc (CIMAP) | 2 | N |
| | * Could not be ascertained | | |

**Table 13- Core Journals in Physics**

| Sl | Journal titles | Total Citation | Availability |
|---|---|---|---|
| 1 | Physical Review D (APS) | 18 | UI |
| 2 | Journal of Applied Physics (AIP) | 17 | UI |
| 3 | Journal of Physical Chemistry (ACS) | 17 | UI |
| 4 | Physics Letters B (Elsevier) | 14 | TU |
| 5 | Nuclear Physics B (Elsevier) | 12 | N |
| 6 | J of the American Chemical Society (ACS) | 8 | UI |
| 7 | Nature (NPG) | 8 | TU |
| 8 | Chemical Physics Letters (Elsevier) | 7 | N |
| 9 | Pramana: Journal of Physics (IAS) | 7 | TU |
| 10 | The European Physics Journal C (Springer) | 7 | OA |
| 11 | Applied Physics Letters (AIP) | 6 | UI |
| 12 | Indian Journal of Physics (IAS) | 6 | TU |
| 13 | Journal of Chemical Physics (AIP) | 5 | UI |
| 14 | Nanostructured Materials (IOP) | 5 | UI |
| 15 | Phys Rev. Lett (AIP) | 5 | UI |
| 16 | IEEE Journal of Quantum Electronics (IEEE) | 3 | TU |
| 17 | Nuovo Cimento (Springer) | 3 | N |
| 18 | Phys Review B (AIP) | 3 | UI |
| 19 | Soviet Physics JETP * | 3 | N |
| | * Could not be ascertained | | |
| UI- UGC-Infonet, TU-Tezpur University, OA-Open Access, N- Not available | | | |

## 5. Suggestive Approach Toward Re-engineering Library Collection Development Strategy

Based on the study, following suggestive measures may be forwarded for consideration by the library management towards better exhaustivity, accessibility of literature for the patron s in general and the doctoral students in the university in particular.

(1) With citation analysis, the libraries can evaluate the suitability of the collection with the needs of their patrons. University libraries can take advantage of citation analysis as a budget allocation tool for determining the ratio of monographs to journals, and as a collection development tool for guiding especially journal selection, retention, and weeding out decision. We think that citation analysis also a good method when studying the impact of the university library through the availability of the sources used in dissertations, as we did in our study.

(2) It is reflected that nearly 77% of the citation is from journals with a variation of 41-79 over subjects, while it is 16% in case of books & monographs with a variation of 7-38. Tezpur University library may consider significant portion of budget allocation for journals followed for Books & monographs.

(3) On an average 51% of the Journal sources are available in the library either subscribed by the library of its own regular subscription or provided by the UGC-Infonet consortia. So as to attain at least 80% availability, i.e. to increase 29-30% coverage of journals, the library has to add another 95 titles to the current subscription list. The variations over subjects are Chemistry 15, Mathematics12, MBBT 32 and Physics 11. The rank list of journals prepared for different subjects may be guiding tool in this venture.

(4) The average availability percentage for Books & monograph is 36. In order to attain another 44% availability so as to attain at least 80% availability of books in these four subjects, the library has to add another 16632 books to the present collection. (Total book collection in the as on 30th Dec 09 is 38811 volumes comprising 27898 titles).

(5) Nearly 32% of the available journals are recorded from UGC-Infonet e resource consortia. All the journals provided by the UGC-Infonet consortia are from leading publishers and inviting a significant portion of library budget for any institution to subscribe. As such, UGC-Inflibnet being the nodal agency in promoting e-resources including e- journals, the consortia may consider for subscribing to more journals from the rank list revealed in this study and give access to the universities. This may be a significant addition to the richness of the library resources.

(6) The library may increase its computer infrastructure in terms of number of terminals and seating accommodations in the library for better accessibility of the electronic resources. Open access journals may be made popularize among the academic community by arranging tutorial sessions. Increase of internet bandwidth may be an added boon towards accessibility to electronic resources (at present 2Mbps).

The assumption lined up at the introduction of this study that since the dissertations had been accepted in the normal academic order, their references would meet at least the minimal requirements of scientific quality. The assumption was found not satisfied in the eight dissertations studied. There observed a lack of standard for arranging the references in the PhD dissertations selected in this study. In order to have a better visibility of the cited works a uniform standard is expected to be adopted. The concern authority may adopt a standard of its own or the Indian Standard for this purpose may be adopted.

## 6. Conclusion

Evaluation of the impact of the library's collection towards attainment of the objectives of the library is expected to be carried out for better policy making for library management. Citation study of the works in a given institution is an established area towards exploring various parameters of collection i.e. adequacy, accuracy, sufficiency and fitness of the collection in a given library to the requirements of the patrons. In this study only the school of Science & Technology in Tezpur University was choose encompassing four subjects under the school. Due to a number of constraints, most retarding was the time factor, only tow latest dissertations from each four subjects was studied. It is sure; a wider coverage of the sample population for the study will yield more fascinating facts towards re-engineering library management policy and thereby harnessing the face-lifting of the entire library services.

## References


1. BEILE, P.M., Boole, D.N. and Killingsworth, E.K. (2004), A microscope or a mirror? A question of study validity regarding the use of dissertation citation analysis for evaluation research collection, The Journal of Academic Librarianship, Vol. 30 No. 5, pp. 347-53.
2. BRADY, E.E., McCord, S.K. and Galbraith, B. (2006), Print versus electronic journal use in three sci/tech disciplines: the cultural shift in process, College & Research Libraries, Vol. 67 No. 4, pp. 354-63.
3. BUTTLAR, L. (1999), Information sources in library and information science doctoral research, Library & Information Science Research, Vol. 21 No. 2, pp. 227-45.
4. EDWARDS, S. (1999), Citation analysis as a collection development tool: a bibliometric study of polymer science theses and dissertations, Serials Review, Vol. 25, pp. 11-21.
5. FUCHS, B.E., Thomsen, C.M., Bias, R.G. and Davis, D.G. (2006), Behavioral citation analysis: toward collection enhancement for users, College & Research Libraries, Vol. 67 No. 4, pp. 304-24.
6. HAYCOCK, L.A. (2004), Citation analysis of education dissertations for collection development, Library Resources & Technical Services, Vol. 48 No. 2, pp. 102-6.
7. IIVONEN, M., Nygren, U.,Valtari, A., and Heikkila, T. (2009), Library collections contribute to doctoral studies: citation analysis of dissertations in the field of economics and administration, Library Management, Vol..30 No. 3, pp 185-203.
8. LUTHER, J. (2008), University investment in the library: what's the return?, paper presented at Library Connect Seminar, Que´bec, 13 August.

9. RODRIGUEZ-RUIZ, O. (2009), The citation index and the question of knowledge, Journal of Educational Administration, Vol. 47 No.2, 2009, pp 250-256.
10. SMITH, E.T. (2003), "Assessing collection usefulness", College & Research Libraries, Vol. 64 No. 5, pp. 344-55.
11. TENOPIR, C. and King, D.W. (2001), The use and value of scientific journals: past, present and future, Serials, Vol. 14 No. 2, pp. 113-20.
12. TENOPIR, C., Wilson, C.S., Vakkari, P., Talja, S. and King, D.W. (2008), Scholarly e-reading patterns in Australia, Finland, and the United States: a cross country comparison, World Library and Information Congress, Que´bec, 14 August, available at: www.ifla.org/IV/ifla74/papers/160enopir_Wilson_Vakkari_Talja_King-en.pdf
13. VALLMITJANA, N. and Sabate, L.G. (2008), Citation analysis of PhD dissertations' references as a tool for collection management in an academic chemistry library, College & Research Libraries, Vol. 65 No. 1, pp. 72-81.
14. VAUGHAN, K.T.L. (2003), Changing use patterns of print journals in the digital age: impact of electronic equivalents on print chemistry journal use", Journal of the American Society for Information Science and Technology, Vol. 54 No. 12, pp. 1149-52.
15. WOLF, M. (2001), Electronic journals – use, evaluation and policy, Information Services & Use, Vol. 21, pp. 249-61.

**About Authors**

**Mr. Tilak Hazarika,** Information Scientist, Central Library, Tezpur University, Tezpur
E-mail: tilak@tezu.ernet.in
**Mr. Dipak Sarma,** Professional Assistant, Central Library, Tezpur University, Tezpur
**Mr. Anjan Gohain,** Professional Assistant, Central Library, Tezpur University, Tezpur