

## Relationship between Online Journal Usage and their Citations in the Academic Publications: A Case Study

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### ABSTRACT

The advancement of science and technology has impacted functioning of the libraries of higher educational institutions, and the mode of providing resources for various academic activities. For many years, libraries attached to educational institutions have been labouring with the question of how to determine the value of journals in their specific library collection. The Health Sciences Library of Manipal Academy of Higher Education at Manipal, subscribed a vast number of online journals for their users. A relation between the usage and citations of subscribed online journals might provide a basis for the collection management in the libraries of academic and research institutions. The current study resolved to identify whether relationship exists between usage of subscribed online journals and their citations in the academic publications of the health science professionals from 2010 to 2015. The study found a statistically significant relationship between subscribed online journal usage and their citations in the publications through the inferential test of Spearman's rank-order correlation. For collection development of online journals, libraries can utilise the usage or citation data of journals as a decision making tool.

**Keywords:** Online journals; Full text usage; Citations of journals; Spearman's Rank-order correlation; Health sciences library; Journal usage

### 1. INTRODUCTION

Academic communities of higher education are served by libraries that play the pivotal role in providing resources for learning to fulfil the curriculum and research requirements. The advancement of science and technology has impacted the libraries of higher educational institutions, and the mode of providing resources for teaching and learning. Online resources have become the centre of every intellectual undertaking in continuing education today. Compared to other academic fields, the subject of health sciences developed rapidly over the recent decades. The number of publications in the health sciences continue to increase, and so does the number of available publication channels and online journal publishers. The libraries of health sciences institutions are providing online journals that are widely used by the professionals for academic activities, patient care and research purposes. For many years, libraries attached to higher educational institutions have laboured to determine the value of a journal in their specific library collection. The physical resource collection of the libraries was measured with circulation figures and online resource collection through usage reports. Studies pointed to the usage reports of journals and citations of journals as predictors of online journal usage in libraries that could be used as valid guides for the selection of these resources<sup>1-2</sup>. Relation between the usage and citations of online journals is of interest

as it might provide a basis for collection management in specific subject areas in the libraries of academic and research institutions. The study of relationship of online journal usage and their citations in the publications can be used as major indicators of appropriateness of the online journal collection, and to determine whether the journal collection support the needs of research activity of the user community<sup>3</sup>.

#### 1.1 Literature Review

The studies on usage reports of journals and the citations of journals, as well as the relationship between journal usage and citations of journals were collected from literature. According to Lancaster<sup>4</sup> "an electronic journal is one created for the electronic medium and available only in this medium". Further, the electronic journals could be those established in online networks by publishers after their publication in print.

The usage reports gave the number of times the research articles and chapters from books were downloaded per unit time by the user community of an institution. Covey<sup>5</sup> found that usage reports analysis was an unnoticeable way to study the patterns of use and trends over time, an effective way to gather long term usage information and a practical way to find difference between what users say and what they really do, when they use online resources. The study of usage reports of e-resources could also be used for the improvement of user interface, functionality and product training for effective utilisation<sup>6</sup>.

Rathemacher<sup>7</sup> in his article states that "there are a handful

of small publications purchased individually that provide no statistics whatsoever". Usage reports (usage statistics) could be collected from the publisher or through the library website (locally-generated data).

Londhe & Deshpande<sup>8</sup> have shown in their study that usage reports analysis helped to identify important e-journals for the user community helpful for proper allocation of funds. Studies have also given priority for the analysis of the usage reports because of its value for the decision making in the investment on library subscribed resources, especially the e-journals that required long term financial commitment<sup>9</sup>.

Several Studies have demonstrated that in the internet age, usage statistics of e-resources was an important device for measuring the efficiency of science and technology libraries<sup>10-11</sup>. The application of the usage statistics to assess the e-journals usage helped to identify the actual usage and usefulness demonstrated in times of renewal/subscription<sup>12</sup>.

Davis<sup>13</sup> stated that HTML and Pdf downloads combined to create the full text variable for the journals to comply with the standards established by the international project COUNTER (Counting Online Usage of Networked Electronic Resources).

Citations of a publication gives the bibliographic details of journals cited in the publications over a period of time. Though citation checking was time-consuming, it was an in-depth evaluative method to determine usefulness of collection of libraries supporting education as well as research activity<sup>14-15</sup>. Citation checking of scholarly documents and comparison of those citations against the subscribed materials offered an unnoticeable method of evaluation of the collection and usage of subscribed resources<sup>16-17</sup>.

According to Bergstrom<sup>18</sup> librarians could use the data on citation counts to select appropriate journals for library collections. Citation analysis of journals was important for evaluating research articles, researchers, journals, departments, and subject fields<sup>19</sup>.

Study conducted by Gao<sup>20</sup> recommended the usage of journals and citations among the specific groups of its user community, and study of multiple years of usage and citation data to provide information pertinent to collection development.

Kumar, Dora & Desa<sup>21</sup> studied the types of publications of Gujarat University for ten years using Scopus citation database, and retrieved data through institutional affiliation. The study found the publication trend, most prolific author, authorship

pattern, most preferred journals for publication and highly cited papers in this method.

Tsay<sup>22</sup> in a study conducted in a medical library on the relationship of journal usage and citations of journals, showed a significant relation of usage of journals and their citation frequency; that revealed the most-used as well as the most-cited journals, which are most important.

A study conducted by Blečić<sup>23</sup> through collection of journal usage data in three ways : in-house use, circulation and citation by faculty, at University of Illinois probed the correlation of these measures in a health sciences library. The results indicated the importance of carrying out a comparative study of use of journal by identifying the correlation between the actual journal usage and citation data. Both Pearson and Spearman correlation tests, confirmed the correlation between the three types of usage data.

Duy & Vaughan<sup>24</sup> in their study pointed to that local citation data (local to a specific institution) of an institute or university gave a meaningful representation of total journal usage. They assessed whether e-journal usage correlated with citation data, and found that there existed a positive correlation of local citation with the e-journal usage. The study by McDonald<sup>25</sup> found online journal usage reports gathered locally, for the previous year was a helpful model with predictive potential for future citations.

## 2. HEALTH SCIENCES LIBRARY, MANIPAL ACADEMY OF HIGHER EDUCATION

The Health Sciences Library was established in the year 1953 along with its first health sciences institution of MAHE, the Kasturba Medical College. Presently, the Health Sciences Library catered to the information needs of all the health sciences institutions of the Manipal Academy of Higher Education (MAHE) at Manipal - Kasturba Medical College (KMC), Manipal College of Dental Sciences (MCOBS), Manipal College of Nursing (MCON), Manipal College of Pharmaceutical Sciences (MCOPS) and School of Allied Health Sciences (SOAHS). Access to online information resources of the library is provided through different access modes *viz.*, Internet Protocol (IP), user ID with password, Wi-Fi and remote login. A unique 'single window search tool' is also provided for search across all subscribed resources of the library, as well as open access resources. Electronic information resources subscribed by the library is listed in Table 1.

**Table 1. Subscribed electronic information resources of health sciences library, Manipal**

Online Resources subscribed	
Bibliographic databases (5)	Scopus, Web of Science, SciFinder, SciVal, Journal Citation Reports
Full text online databases (4)	CINAHL Plus with Full Text, ProQuest Health & Medical Complete, Springer Link, ClinicalKey
EBM online resources (3)	UpToDate–Clinical Information Resource, BMJ Best Practice, BMJ Case Reports
Online books of various publishers	McGraw Hill/Access Medicine, Lippincott/OvidSp, Springer/ Springer Link
Individual online journals subscribed from various publishers	Elsevier Science, BMJ Publishing Group, Cambridge University Press, Lippincott, Karger, Nature, Medknow, Sage, Oxford University Press, Taylor and Francis, Wiley-Blackwell, Theime, American Medical Association, Quintessence Publishing etc.

### 3. OBJECTIVES

The current study had the following objectives:

- To assess the usage of online journals by the health science professionals of five health sciences institutions
- To assess utilisation of online journals by the health science professionals for academic publications
- To identify whether relationship exists between usage of online journals and their citations in the academic publications of the health science professionals of five health sciences institutions.

### 4. SCOPE OF THE STUDY

The study was conducted in the following five health sciences institutions of Manipal Academy of Higher Education (MAHE), Manipal:

- Kasturba Medical College (KMC), Manipal
- Manipal College of Dental Sciences (MCO DS), Manipal
- Manipal College of Nursing (MCON), Manipal
- Manipal College of Pharmaceutical Sciences (MCOPS), Manipal
- School of Allied Health Sciences (SOAHS), Manipal

### 5. LIMITATIONS OF THE STUDY

- The study was limited to the online subscribed journals of the Health Sciences Library for the period from 2010 to 2015
- The online journals selected for collecting usage reports were restricted to those publishers from whom five or more journals were subscribed by the library
- Citation analysis was limited to the Scopus citation database

### 6. RESEARCH METHODOLOGY

The study adopted quantitative research methodology for collecting data. The details of subscribed online journals' titles were collected publisher-wise, from the year 2010 to year 2015 through the EasyLib automation software of the library. Then the following research methods were adopted for collecting the data for assessing utilisation of subscribed online journals:

- Collection of the usage reports of subscribed online journals from the publishers, and
- Collection of citations of subscribed online journals from the publications of the health science professionals using Scopus citation database

#### 6.1 Collection of the Usage Reports of Subscribed Online Journals

The usage reports of the subscribed online journals of the Health Sciences Library were collected directly from the journal publishers. The study identified 11 publisher of journals from whom five or more than 5 journal were subscribed by the library from 2010 to 2015. The study retrieved usage reports from the journal publishers *viz.*, American Medical Association (AMA), BMJ, Elsevier Science, Karger, Lippincott, Nature, Oxford University Press, Sage, Springer, Taylor & Francis and Wiley. Usage reports of online journals were collected monthly from January to December, in an Excel spreadsheet. The yearly usage data of each journal was thus collected and analysed from

2010 to 2015. Full text usage is defined as the combination of HTML and Pdf downloads. The full text downloads were collected to determine the extent of usage of each subscribed online journal selected for the study.

#### 6.2 Collection of Citation Counts of Online Journals Using Scopus Citation Database

The subscribed online journals for which usage reports obtained were considered (11 publishers of journals) for citation checking in the publications of the health science professionals. The documents published by the five health sciences institution of MAHE, Manipal were retrieved year-wise, through 'affiliation search' of Scopus citation database for the period from 2010 to 2015 using the following keywords:

- Kasturba Medical College, Manipal
- Manipal College of Dental Sciences, Manipal
- Manipal College of Nursing, Manipal
- Manipal College of Pharmaceutical Sciences, Manipal
- Allied Health Sciences, Manipal

The citation details of all types of documents published in Scopus *viz.*, articles, conference papers, conference reviews, notes, letters, reviews and short surveys were collected year-wise for the analysis. After retrieving the publications institution-wise, references appended to the publications of the health science professionals were screened manually to record the number of citations obtained by subscribed online journals of the library<sup>26</sup>. For this, online journals selected for the study were arranged alphabetically (year-wise) in an excel sheet for recording the journal citations. The number of publications and citations of each year of the study were checked till the date of 30<sup>th</sup> August 2016.

### 7. DATA ANALYSIS

The usage reports of journals and the citations obtained by the subscribed journals in the publications of the health science professionals were analysed using excel spread sheet. The relationship between the two variable were determined with Spearman's rank-order correlation test using the Statistical Package for Social Sciences (SPSS version 16.0), currently known as Predictive Analytics Software (PASW).

#### 7.1 Full Text usage of Subscribed Online Journals: Publisher-wise

Table 2 shows the subscribed journals selected for the study and number of journals for which usage reports were collected. The study identified 11 publisher of journals from whom 5 or more than 5 journal were subscribed by the library. Usage reports of journals of a few publishers couldn't be collected due to the change in name of publishers or publishing platforms, change of name of journals and change in interface due to new technology adopted by the publishers in the website. Table also shows that the usage reports of journals were available from five of the publishers in the year 2010. From the years 2011 to 2013, usage reports of journals from 8 publisher each, were procured and for the year 2014, from 9 publisher. For the year 2015 usage reports of majority of the journals from the publishers were procured for the study.

The number of journals subscribed by the library were the

**Table 2. Number of subscribed journals selected for the study and the number of journals for which usage reports NSJ (NSJUC)**

Publishers	2010	2011	2012	2013	2014	2015
AMA	9 (NA)	9 (NA)	9 (NA)	9 (NA)	10 (10 )	10 (10 )
BMJ	11 (NA)	11 (11)	11 (11)	25 (24)	25 (24)	25 (24)
Elsevier Science	112 (109)	112 (109)	109 (107)	111 (102)	10 (101)	105 (105)
Karger	6 (6)	6 (6)	6 (6)	6 (6)	5 (5)	5 (5)
Lippincott	53 (53)	51 (51)	51 (51)	53 (53 )	51 (51)	46 (46)
Nature	10 (NA)	10 (10)	10 (10)	10 (10)	9 (9)	8 (8)
Oxford University Press	18 (NA)	17 (NA)	16 (NA)	16 (16)	15 (15)	16 (16)
Sage	13 (NA)	18 (18)	18 (18)	18 (17)	17 (17)	19 (19)
Springer	25 (23)	22 (21)	22 (22)	22 (NA)	18 (NA)	NA
Taylor & Francis	15 (NA)	14 (NA)	13 (NA)	14 (NA)	11 (NA)	11 (11)
Wiley	76 (76)	78 (78)	78 (78)	78 (77)	73 (73)	69 (69)
Total	348 (267)	348 (304)	343 (303)	362 (305)	337 (305)	314 (313)
Total percentage of usage reports of journals collected from the publishers	76.72%	87.36%	88.34%	84.25%	90.50%	99.68%

Note:- (NSJ= Number of Subscribed Journals selected for study), (NSJUC= Number of Subscribed Journals for which Usage reports were Collected), (NA= Not Available)

highest in the year 2013 (362 journal) and the lowest in 2015 (314 journals) as shown in the table. The percentage of journals for which usage reports were collected was the highest in 2015 (99.68 %), followed by 90.50 per cent in 2014 with the details as shown in Table 2.

The full text usage collected for the subscribed online journals from different publishers from 2010 to 2015 is presented in (Table 3). The usage reports of online journals showed that the full text usage (Html+Pdf) was the highest for the year 2015 with 130461 download and the lowest for the year 2010 with 89460 download as shown in Table 3.

**7.2 Citations of Subscribed Online journals in the Academic Publications: Institution-wise**

The citations in the publications have been used as a standard evaluation tool for assessing the utilisation of online journals at the department, institution or university level. The online journals from 11 publisher for which the usage reports were collected was analysed for the citation counts obtained in the publications of the health science professionals. The Table 4 presents the institution-wise academic publications and citations obtained for the subscribed journals in the publications, from the year 2010 to 2015.

The data revealed that KMC had the highest number of publications (2088), followed by MCOPS (527), MCODES

**Table 3. The full text usages from the subscribed online journals collected from 2010 to 2015 from different publishers**

Publishers	2010	2011	2012	2013	2014	2015
AMA	NA	NA	NA	NA	4758	8646
BMJ	NA	9784	11125	15214	16674	15069
Elsevier Science	58346	52817	64914	43215	45475	54278
Karger	1536	789	1236	3855	2329	1512
Lippincott	8727	8056	11618	6758	12060	8749
Nature	NA	7370	7616	8609	4951	8668
Oxford University Press	NA	NA	NA	7442	12124	9021
Sage	NA	1770	994	1817	1381	1923
Springer	1557	1349	859	NA	NA	NA
Taylor & Francis	NA	NA	NA	NA	NA	698
Wiley	19294	21983	25633	22843	21911	21897
Total	89460	103918	123995	109753	121663	130461

(335), SOAHS (148) and MCON (23) from the year 2010 to 2015. However, it was also found that the highest subscribed online journal citations i.e., 7816 were obtained from the publications of KMC during the period, followed by MCODES with 1972, MCOPS with 1528, SOAHS with 565 and MCON with 26 as shown in Table 4.

At the same time the highest total number of citations

**Table 4. The publications of the five health sciences institutions found in the Scopus and the citations obtained from the subscribed journals in the publications during 2010 to 2015**

Institutions	2010	2011	2012	2013	2014	2015	Total
KMC	320 (934)	359 (1252)	323 (1336)	373 (1253)	408 (1219)	305 (1822)	2088 (7816)
MCODS	31 (212)	80 (504)	52 (262)	66 (247)	65 (408)	41 (339)	335 (1972)
MCON	1 (1)	8 (1)	2 (0)	4 (1)	5 (21)	3 (2)	23 (26)
MCOPS	77 (209)	110 (489)	72 (206)	109 (253)	86 (157)	73 (214)	527 (1528)
SOAHS	11 (31)	28 (79)	18 (52)	27 (98)	29 (124)	35 (181)	148 (565)
Total	440 (1387)	585 (2325)	467 (1856)	579 (1852)	593 (1929)	457 (2558)	3121 (11907)

**Table 5. Citations obtained by subscribed journals from the different publishers for the study period from 2010 to 2015 NSJC (CSJ)**

Publishers	2010	2011	2012	2013	2014	2015
AMA	NA	NA	NA	NA	10 (86)	10 (115)
BMJ	NA	11 (130)	11 (89)	24 (123)	24 (165)	24 (185)
Elsevier Science	109 (549)	109 (989)	107 (827)	102 (787)	101 (787)	105 (1034)
Karger	6 (51)	6 (19)	6 (6)	6 (11)	5 (18)	5 (13)
Lippincott	53 (246)	51 (274)	51 (272)	53 (275)	51 (231)	46 (308)
Nature	NA	10 (80)	10 (68)	10 (64)	9 (76)	8 (108)
Oxford University Press	NA	NA	NA	16 (35)	15 (128)	16 (229)
Sage	NA	18 (40)	18 (42)	17 (68)	17 (18)	19 (50)
Springer	23 (116)	21 (134)	22 (138)	NA	NA	NA
Taylor & Francis	NA	NA	NA	NA	NA	11 (38)
Wiley	76 (425)	78 (659)	78 (414)	77 (489)	73 (420)	69 (478)
Total	267 (1387)	304 (2325)	303 (1856)	305 (1852)	305 (1929)	313 (2558)

Note:- (NSJC= Number of Subscribed Journals for which Citations were Collected), (CSJ= Citations of Subscribed Journals), (NA= Not Available)

(2558 time) was obtained for 457 publication in 2015, followed by 2325 citation from the publications of 585 during 2011 and 1929 citation from the publications of 593 in 2014 (Table 4).

**7.3 Citations of Subscribed Online Journals: Publisher-wise**

The citations of online journals subscribed from the different publishers were analysed for assessing their utilisation in the publications. The total citations obtained in the publications of the health sciences institutions by the subscribed journals from different publishers during the study period (2010 to 2015) are given in Table 5.

Three hundred and thirteen journals subscribed in the year 2015 were cited the most at 2558 times, followed by 2325 citation obtained by 304 journal subscribed in the year 2011 and 1929 citation obtained by 305 journal subscribed in the year 2014 as shown in Table 5.

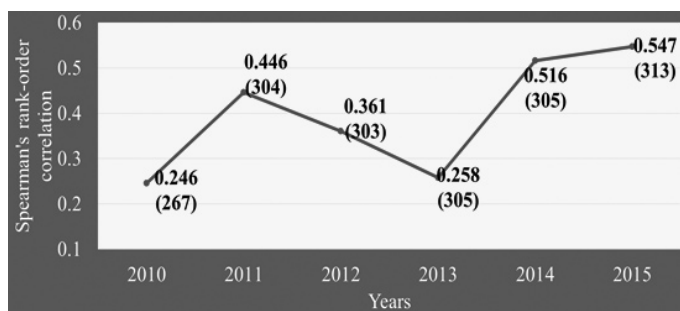
**7.4 Relationship between Usages of Subscribed Online Journals and their Citations in the Publications of the Health Science Professionals**

The subscribed online journals for which both the usage reports (Table 2: NSJUC) and citations of journals were collected (Table 5: NSJC), was analysed to see whether a relationship existed between the two variable (full text usage and citations) from the year 2010 to 2015. Table 6 provides the number of journals for which the usage and citations were collected with mean and Standard Deviation. The two variables were not normally distributed as shown (Table 6). Therefore, Spearman’s rank-order correlation test was used to check whether there is a relationship between the two variables that were not normally distributed. The Spearman correlation coefficient,  $\rho$  (“rho”), when ‘0’, signifies that the ranks of one variable do not co-vary with ranks of the other variable<sup>27</sup>.

Figure 1 depicts the Spearman’s rank-order correlation and the number of journals used/ cited (in parenthesis) for each year from 2010 to 2015. A trend was observed, though uneven, of increased correlation for the number of journals citations with the increasing usage of journals every year from 2010 to 2015. The values of Spearman’s rank-order correlation ( $\rho$ ) indicated the highest positive correlation (0.547) for 313 journal during the year 2015 and the lowest in the year 2010 as shown in the Fig. 1. The average usage of journals ( $335.05 \pm 556.28$ ) and average citations obtained ( $5.19 \pm 9.48$ ) were the least in the year 2010 as shown in Table 6 compared to other years and revealed the lowest correlation of 0.246 (Fig. 1).

**Table 6. The number of subscribed journals for which usage and citations were collected for the study of relationship between journal usage and citations from 2010 to 2015**

Year	Number of journals for which usage reports were collected	Total No. of full text (Html+Pdf) usage collected through usage reports	Average usage of journals (Mean ±SD)	Number of journals considered for collecting citations from the publications for which usage reports were collected	Total number of journal citations in the publications	Average citations of journals (Mean ± SD)
2010	267	89460	335.05 ± 556.28	267	1387	5.19 ± 9.48
2011	304	103918	341.84 ± 593.00	304	2325	7.67 ± 14.01
2012	303	123995	409.22 ± 837.67	303	1856	6.12 ± 10.12
2013	305	109753	359.85 ± 575.33	305	1852	6.07 ± 9.53
2014	305	121663	398.90 ± 673.95	305	1929	6.32 ± 10.32
2015	313	130461	416.81 ± 685.05	313	2558	8.17 ± 11.67



**Figure 1. Spearman's rank-order correlation and the number of journals (parenthesis) for each year from 2010 to 2015.**

**8. FINDINGS**

The findings of the full text usage and the citations of journals demonstrated the extent of utilisation as well as usage and citations of journals from the different publishers in the academic publications of the health science professionals.

- The percentage of subscribed journals for which usage reports were collected were the highest in the year 2015 (99.68 %), followed by 90.50 per cent in 2014, 88.34 per cent in 2012, 87.36 per cent in 2011, 84.25 per cent in 2013 and 76.72 per cent in 2010.
- It was found that due to the different modes of access to the subscribed online resources of the library provided for the users, the library had to depend on the publishers of the journals for collection of the usage reports.
- The usage reports of online journals showed that the full text usage (Html+Pdf downloads) was the highest during 2015 with 130461 download, followed by 123995 download in 2012, 121663 download in 2014, 109753 download in 2013, 103918 download in 2011 and 89460 download in 2010.
- The study found that the highest number of citation (2558 times) were obtained in the publication of health science professionals by the subscribed online journals in the year 2015, followed by 2325 citation in 2011, 1929 citation in 2014, 1852 citation in 2013, 1856 citation in 2012 and

- 1387 citation in 2010.
- The journals for which the average full text usage and citations collected to study the relationship, showed that the highest average usage (416.81 ± 685.05) and average citations (8.17 ± 11.67) of subscribed journals was noted for the journals for the year 2015 (Table 4). However, a trend (uneven) of increased correlation for the number of journal citations with the increasing usage of journals every year from 2010 to 2015 was observed (Fig. 1).
- A statistically significant relationship was found in the study between the two variables - usage of subscribed journals and citations of journals in the publications. The 'ρ' (rho) value indicated a relationship between the usage of subscribed journals and their citations in the publications of the health science professionals.
- The results of Spearman's rank-order correlation test indicated the highest positive correlation (ρ= 0.547) for 313 journal during the year 2015, followed by 305 subscribed journal (ρ= 0.516) during the year 2014 and 304 journal (ρ= 0.446) during the year 2011 (Fig. 2).

**9. DISCUSSION**

Relationship between the usage of subscribed online journals and their citations in the academic publications of the user community have been few and far between, in the literature reviewed. It is an unnoticeable method of intervention to determine the usage of subscribed online resources by the users of the library. This relationship could be taken as an indicator for the utilisation of journals as well as the appropriateness and relevance of the journal collection of the library. The collection of the usage reports of online journals is publisher driven and collecting accurate usage statistics is a demanding task. Based on these findings, suggestions are proposed.

**10. SUGGESTIONS**

- Suggestions based in the findings are as follows:
- Regular monitoring of the usage reports of online journals and their citations that can be a useful instrument for making decisions suitable for increasing the usage of online journals.
  - Development of a software package for recording

and compiling the usage reports of online subscribed electronic information resources to enable libraries to independently generate the usage information from all the access points.

## 11. CONCLUSIONS

The relationship between the usage of subscribed online journals and their citations in the publications provided evidence for the journal usage, indicating its value for determining the suitability of the library collection. The investigation signified that the study of usage reports of online journals was a helpful model with predictive potential for the citations of the journals in the future. It was also evident that the citation analysis of journals is time consuming. A period of nearly two years was required for a published article to be read, and for it to become a part of an author's research and cited eventually. However, either the full text usage or citations of journals can be a useful indicator for the appropriateness of journal subscription and decision making. The study is patterned for helping in the building up of a relevant online journal collection in the library.

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