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MEASURE THE USAGE OF E-RESOURCES: SCIENTOMETRIC MODEL

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Abstract

It is essential to evaluate the use of every resource that is acquired by the institute or through consortia. Therefore the objective of the study is to find trends in the usage of e-resources. The study emerged with three formulas such as Ratio of Resources, Ratio of Utilization and Resource Impact Factor. The study derived three axioms such as axiom 1 that Total number of downloads was directly proportional to the number of resources; Axiom 2 : Total number of downloads was directly proportional to the number of users and Axiom 3: Uses of e-resources were directly proportional to the number of resources and number of users. To prove the axioms, the data available regarding of usage of e-resources through e-ShodhShiindu (eSS) Consortium at the <https://infostat.inflibnet.ac.in/> has been taken for analysis. The usage trends of nine full-text journals of the Gandhigram Rural Institute – Deemed to be University were taken up from 2012 to 2019. Use of e-resources was directly proportional to the number of resources and the number of users and not by the number of downloads. This paper emphasizes different parameters in measuring the use of e-resources subscribed based on the number of downloads.

Keywords: Evaluation of Usage of E-resources, eShodhSindhu Consortia, **axioms** for e-resources, Scientometric model.

1. Introduction

It is essential to evaluate the use of every resource that is acquired by the institute or through consortia. Journal article metrics, author metrics were few methods adopted for evaluation of resources. Normally the evaluation of e-resources was carried out based on the number of downloads of e-resources. The data were provided by the vendor of the databases or the organizations responsible for providing the e-resources. Based on the effective use of the resources, it may be continued to subscribe for next year and so on. For this purpose, it needs a system to gather all these views and downloads and gets the usage report. The COUNTER and SUSHI standards have the potential for measuring the usage of e-resources at the national level consortia for journal subscription by the INFLIBNET centre. Majority of the e-resources studies were to find out the usage, popularity of publishers, year-wise access to resources through the number of downloads. Download from e-resource databases was primarily based on the number of resources, number of users, and the resource impact. This study attempted to formulate a standard for evaluating the e-resources based on three parameters, such as the number of resources, number of users, and the resource impact. Further, the study formulates the axioms based on the number of resources, users and the impact. For measuring use of digital resources helps the way to increase or encourage the use the resources.

2. Review of Literature

Luther (2002) compared for deciding on to retain both print and online journals in the library. Davis & Solla (2003) analyzed the usage statistics based on IP-level for electronic journals in Chemistry. Shepherd (2004) studied the COUNTER to use on reliable usage statistics and COUNTER 2005 code of practice (Shepherd, 2005) and performance measurement (Shepherd, 2006). Susheela (2011) assessed the usage of e-journals in University of Hyderabad. Pesch (2007) compared COUNTER and SUSHI initiatives on the usage of online journals.

Various indices such as h-index (Hirsch, 2005), g-index (Egghe, 2006) etc. were used for evaluation of individual authors, papers, institutions, organizations. Few methods such Richness Factor Index and Reach Activity Index, thus developed by Tamizhchelvan & Gopalakrishnan (2018a, 2018b, 2018c, 2018d, 2019a,2019b,2019c) for three varieties like Reach, Unreach/Reach

and Unreach activity indices. The new alternative approach for h-index is calculated for specifically on paper, organization, year and author with four Richness Factor Indices.

Botero, Carrico & Tennant (2008) compared online journal usage statistics derived from COUNTER-compliant publishers. The study explored the relationship between large publisher and online journal usage and the effects of a Big deal package on library budgets. Cox (2011) studied the usage statistics for journals and e-books.

The INFLIBNET e-consortia implemented COUNTER and SUSHI standards to track the access in various universities and their usage at administrative level Pradhana, Raib & Arora (2012). Londhe & Deshpande (2013) studied usage trends a usage of statistics of 13 full-text databases during 2007-2012 and found that usage is increasing trend. Subject-specific databases are highly used than multi-subject databases. Titles-wise usage study is useful for effective planning and taking an important decision on the subscription of databases. Pradhan (2018) studied the trend and statistics of usage by month, by year, by databases, and by journals, etc. Ganesan & Thirunavukkarasu (2018) analyzed that Elsevier Science Direct access is the most used online database compared with IEEE. Also, the number of articles downloaded from the Elsevier Science Direct is the highest one. Ye, Yang & Lin (2018) studies usage practice of e-resources implementing of the Standardized Usage Statistics Harvesting Initiative (SUSHI) at DRAA, China. It created awareness about normalizing usage statistics. Esh (2019) identified the trend in the use of e-journal facilities during 2012-2018 with the help of INFISTATS (usage statistics portal for e-Resource). The study found that J-STOR and Science Direct, ACS, Springer link, Wiley-Blackwell, RSC, Taylor & Franc are the highest usage as 91%. In the year 2013 is the highest usage of e-resources. Further, it is found that the usage trend was not conventional. Tamizhchelvan & Muthuraj (2020) studied the use of eShodhSindhu e-resources of Gandhigram Rural Institute.

The usage of e-resources was discussed based on download, infrastructure – global, national, regional and local, and economic environment.

3. Objectives of the Study

These are the major objectives of the study

1. To find out the year wise and resource-wise usage.

2. To find out the ratio of resources and ratio of Utilization of resources.
3. To enable to derive the Resource Impact Factor.
4. To find out the Utilization of single disciplinary and multi-disciplinary resources.

4. Methodology

INFLIBNET Centre, India, has developed a portal known as Infistats which adopts the SUSHI (Standardized Usage Statistics Harvesting Initiative) and the Protocol (ANSI/NISO Standard No. Z39.93-2007). Using Infistats, which has the potential for measuring the usage of e-resources at the national level consortia for e-resource subscription, the usage of nine databases by the users of Gandhigram Rural Institute – Deemed to be University academic community, Tamil Nadu, India from 2012 through 2019 were taken up.

5. Axioms

Based on the objectives the following axioms were developed

- *Axiom 1 : Total number of downloads was directly proportional to the number of resources*
- *Axiom 2 : Total number of downloads was directly proportional to the number of users*
- *Axiom 3: Uses of e-resources were directly proportional to the number of resources and number of users.*

6. Data Capture

Databases of eShodhSindhu usage have been monitored by INFLIBNET to inform the participating institutions about the utility of e-resources. INFLIBNET has developed a portal known as Infistats. Infistats adopts the SUSHI (Standardized Usage Statistics Harvesting Initiative) and the Protocol (ANSI/NISO Standard No. Z39.93-2007). Infistats harvests the usage data automatically from different Web servers and updates Infistats database for the purposes of analyzing the use of e-resources. The InfiStats interface provides title level COUNTER reports to member institute. The member institutions can log in to this portal using the URL <https://infistat.inflibnet.ac.in/> for monitoring the usage of their respective e-resources. Every institute members provided username and password to access the user data. In this study, the data

usage of “The Gandhigram Rural Institute – Deemed to be University” was taken up from 2012 to 2019.

7. The Gandhigram Rural Institute – Deemed to be University

The Gandhigram Rural Institute (GRI) was founded in 1956, on Mahatma Gandhiji’s call for serving local people in and around Gandhigram, by the disciple couple Dr. G. Ramachandran and Dr.T.S. Soundaram, with the aims of promoting classless and casteless society through teaching, research and extension activities. GRI is located in nestling in the breezy and luxuriant landscape in the lower slope of Sirumalai Hill in the rural part of Dindigul district of Tamil Nadu. Due recognition of its exemplary services and contributions in the field of rural higher education, the institute was conferred with Deemed to be University status in 1976. The institute was accredited with Five Star status in February 2002; re-accredited with 'A' grade status in 2010 and accredited by NAAC with 'A' grade (3rd cycle) 2016. Today, GRI-DU has emerged as a premier institute for advanced learning and research, perhaps, the best in rural oriented courses and extension. Started in a small way, the institute has developed a big campus comprising eight different schools, offering about fifty different programmes.

The Gandhigram Rural Institute Library, named after the Founder Vice-Chancellor Dr. G. Ramachandran, was established in 1956, stocking over 1,70,000 books. The library has been extensively using Information and Communication Technology. Lending and tracking of documents have been monitored with RFID technology using KOHA free, open-source software. The digitization of library documents has also been in progress. The library has UGC-INFONET E-journals access facility with 1 GB connectivity provided by UGC-INFLIBNET Centre, through ERNET India, New Delhi. The list of e-resources made available to users as shown in Table 1

Table 1
Subscribed e-resources by The Gandhigram Rural Institute

Subscribed by the Institute			Through Consortia
E-Books	Online Journals	Database	eShodhSindhu
<ul style="list-style-type: none"> • ASAP • Informatics 	<ul style="list-style-type: none"> • Indian Journals • Sage Journals 	<ul style="list-style-type: none"> • DELNET • Indiastat.com 	<ul style="list-style-type: none"> • Economic & Political Weekly • Institute for Studies in

<ul style="list-style-type: none"> • Oxford University Press • Pearson • Videeya 	<ul style="list-style-type: none"> • ARCC Journals • NISCAIR Journals • Elsevier Publication • Indian Academy of Sciences Online Journals • Other individual Journals 	<ul style="list-style-type: none"> • EPWRF Online Database 	<ul style="list-style-type: none"> Industrial Development (ISID) Database • J-Gate Plus (JCCC) • JSTOR • Oxford University Press • Project Muse • Springer Link 1700 Collection and Nature Journal • Taylor and Francis • NDL e-resources • World e-book Library • South Asia Archive (SAA)
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The above table shows that the e-resources both subscribed by the institute and through eSS consortia. For the study, nine e-resources of eShodhSindhu (eSS) consortia were alone taken for analysis.

8. Research Methodology










The data were collected from InfiStats (Usage Statistics Portal for e-resources) website (<https://infistat.inflibnet.ac.in/index.php>). The e-resource access management system (InfiStats) developed by Information and Library Network Centre, Gandhinagar, Gujarat. The nine publishers' journals have been accessed through e-ShodhSindhu. The period selected for the study is 2011-2019. The study aims to analyze Year wise access of e-resources, Usage of Cambridge University Press, Institute of Physics, JCCC, Oxford University Press, Royal Society of Chemistry, Springer Link, Taylor and Francis, JSTOR and Project Muse.

9. Data Analysis and Interpretation

The data has been collected e-resources details from the www.ruraluniv.ac.in and provided by the INFLIBNET centre and evolution software also. Table 2 provided with the name of the e-resources and type of users.

Table 2
E-Resources with the users

S. No	Name of the resource	Icon	Type of user-preferred
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1	Cambridge University Press		General in nature, political, Philosophy
2	Institute of Physics		Physics users
3	JCCC		All users
4	JSTOR		All users
5	Oxford University Press		Language & Literature
6	Project Muse		Social Science
7	Royal Society of Chemistry		Chemistry users
8	Springer Link		All users
9	Taylor and Francis		All users

9.1 Publisher wise access to e-resources

For the last eight years, usage data has been collected and provided in table 3 with the number of individual e-resources and the total number of downloads/views with percentage and their rank. Further, it is presented to get a clear view of the usage, the ratio of the download is calculated by the total number of downloads divided by the number of unique resources and their rankings.

To enhance user perspectives and Utilization of e-resources, it has been derived the formula for the Ratio of Resources, Ratio of Utilization and Resource Impact Factor.

User = u

Resources = r

Download = d

Download Ratio = d/r

- **Axiom 1 : Total number of down loads were directly proportional to number of resources**

Ratio of Resources (RoR) = Total number of download (td) / Total number of resources (tr)

$$RoR = \frac{td}{tr} \dots\dots\dots (1)$$

For example:

Total number of downloads of CUP (td) = 1084

Total number of resources of UCP (tr) = 224

Therefore RoR = 1084/224 = 4.84

Table 3
Publisher wise access to e-resources

S.No.	Name of the publisher	No. of individual resources	Total no. of downloads/views	%	Rank	The ratio of down load	Rank
1	Cambridge University Press	224	1084	0.61	8	4.84	7
2	Institute of Physics	46	4162	2.34	6	90.48	2
3	JCCC	7900	10527	5.91	5	1.33	8
4	Oxford University Press	262	3429	1.92	7	13.09	5
5	Royal Society of Chemistry	29	13336	7.48	4	459.86	1
6	Springer Link	1722	96176	53.96	1	55.85	3
7	Taylor and Francis	1078	16902	9.54	3	15.68	4
8	JSTOR	3165	32242	18.09	2	10.19	6
9	Project Muse	676	276	0.15	9	0.41	9
	Total	15102	178134	100		11.80	

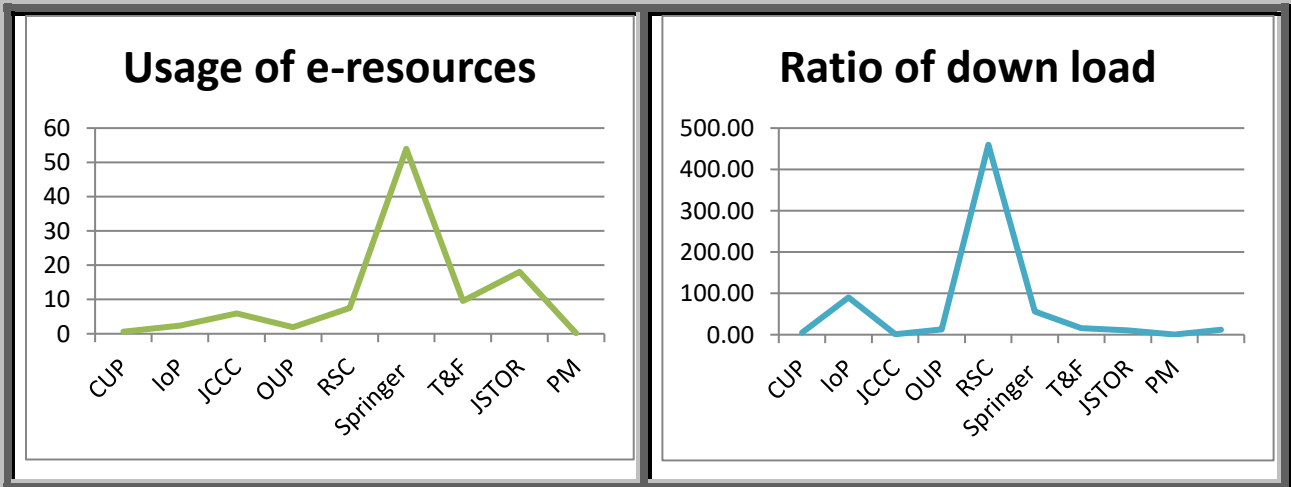


Figure 1. Publisher wise usage for download and ratio

Table 3 indicates that year-wise access to e-resources. The nine publishers' e-journals are accessed through e-ShodhSindhu in Gandhigram Rural Institute. The 1,78,134 articles are downloads/views in during 2012- 2019. It is found that Springer Link has downloads /views the highest number of 96,176 (53.96%) times and placed the first rank and it is followed by JSTOR has downloads 32,242 (18.09%) times have placed the second rank. It is further found that Project Muse has downloads least number of 276 (0.15%) times have placed ninth rank. However, the rankings are varied on the values based on downloads and download ratio. It shows from the table 2, the first and second rank goes to Springer and JSTOR on the base of download and whereas the same ranking goes to Royal Society of Chemistry and Institute of Physics on the base of download ratio is concerned.

9.2 Year-wise Vs Publisher-wise downloads/views

The data has further tabulated with Year-wise vs Publisher-wise and their number of downloads and views with percentage and overall total with ranking provided in table 4. Further, to get a clear cut idea of users and downloads, the ratio of downloads and users calculated as downloads divided by the number of users and their rankings. The users were calculated the teaching staff and research scholar in the full time only taken for the calculation, and it is an estimation and approximate value.

- *Axiom 2 : Total number of downloads was directly proportional to the number of users*

The ratio of Utilization = Total number of downloads / Total number of Users

$RoU = \frac{td}{tu} \dots\dots\dots(2)$
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For Example

Total number of downloads of (IoP) = 4162

Total number of users from Institute (tu) = 40

Therefore RoU = 4162/40 = 104.05

Table 4
Year-wise Vs Publisher-wise downloads/views

S.No	Publisher	2012	2013	2014	2015	2016	2017	2018	2019	Total	No. of users	Ratio of use	Rank
1	CUP	174 (16.05)	309 (28.51)	159 (14.67)	251 (23.15)	191 (17.62)	-	-	-	1084	180	6.02	8
2	IOP	76 (1.83)	332 (7.98)	403 (9.68)	606 (14.56)	914 (21.96)	973 (23.38)	484 (11.63)	374 (8.99)	4162	40	104.05	4
3	JCCC	-	-	1065 (34.96)	516 (21.6)	2701 (2.76)	291 (25.66)	2274 (4.9)	3680 (10.12)	10527	300	35.09	6
4	OUP	109 (3.18)	278 (8.11)	363 (10.59)	366 (10.67)	615 (17.94)	509 (14.84)	678 (19.77)	511 (14.9)	3429	180	19.05	7
5	RSC	-	-	-	1550 (11.62)	4687 (35.15)	4160 (31.19)	2232 (16.74)	707 (5.3)	13336	57	233.96	2
6	Springer	1884 (1.96)	16700 (17.36)	10332 (10.74)	14070 (14.63)	15225 (15.83)	13314 (13.84)	11802 (12.27)	12849 (13.36)	96176	300	320.59	1
7	T&F	817 (4.83)	2186 (12.93)	1548 (9.16)	2798 (16.55)	2390 (14.14)	1645 (9.73)	2558 (15.13)	2960 (17.51)	16902	300	56.34	5
8	JSTOR	2503 (7.76)	4792 (14.86)	4230 (13.12)	6216 (19.28)	3627 (11.25)	3993 (12.38)	5047 (15.65)	1834 (5.69)	32242	300	107.47	3
9.	PM	-	-	-	-	67 (24.28)	77 (27.9)	87 (31.52)	45 (16.3)	276	180	1.53	9
Total		5563	24597	18100	26373	30417	24962	25162	22960	178134	1837	96.97	
Rank		8	5	7	2	1	4	3	6				

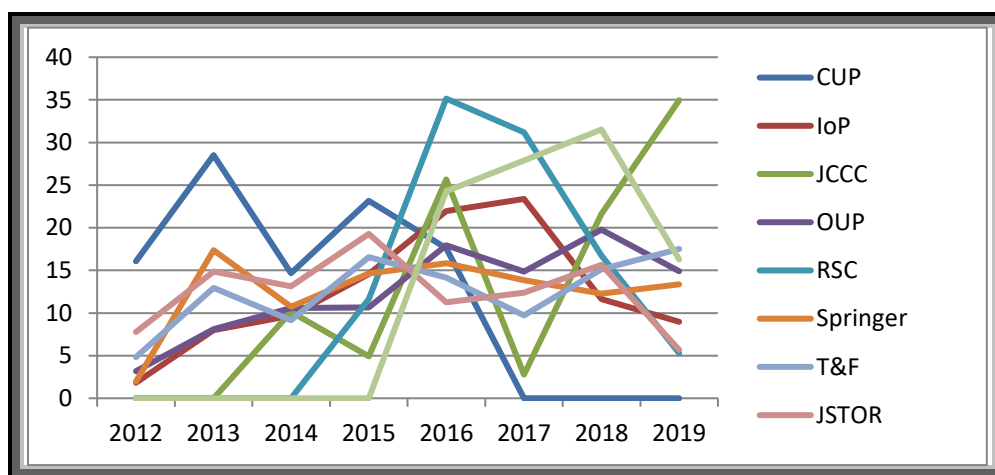


Figure 2 Year-wise E-resources Utilization

It also indicates that year-wise highly used e-resources and overall downloads of the year and publishers. The Cambridge University Press journals subscribed from 2012 to 2016 and discontinued afterwards; likewise, the Royal Society of Chemistry and Project Muse started subscribing from 2015 and 2016 respectively. Further RSC subscription discontinued from 2018 onwards, however, the access of the e-resources permitted because of the subscribed for two years period, i.e. 2015 and 2016. Further, Table 4 indicates that in the year 2016, 30,417

downloads and views and highest in the year and followed by 2015 with 26,373 downloads. The down from Springer and JSTOR are 96176 and 32,242 respectively and hold the first two places.

Further, the axiom 2 has been used in table 3 with the number of users and ratio of users and also their rankings. On the Utilization of resources by the users found the Springer and RSC resources in the first and second place, respectively. It differs with the ratio of downloads concerned.

9.3 Resource Impact Factor on Resources and Users

As enumerated three axioms for Utilization of resources, the two axioms are presented in table 3 and 4. The Resource Impact Factor calculated (RIF) and presented in table 5.

Axiom 3: Uses of e-resources were directly proportional to the number of resources and number of users.

*Resource Impact Factor = Total number of downloads / (Total number of resources * Total number of users)*

$$RIF = \frac{td}{tr*tu} \dots\dots\dots(3)$$

For Example

Total number of downloads of Springer (td) = 96176

Total number of Resources (tr) = 1722

Total number of users (tu) = 300

Therefore RIF = 96176/(1722*300) = 320.59

Table 5
Resource Impact Factor on Resources and Users

S.No.	Name of the publisher	Total no. of downloads/ views	No. of Resources	No. of users	RIF = downloads / (resources* users)	Rank
1	Cambridge University Press	1084	224	180	0.027	7
2	Institute of Physics	4162	46	40	2.262	2
3	JCCC	10527	7900	300	0.004	8
4	Oxford University Press	3429	262	180	0.073	4

5	Royal Society of Chemistry	13336	29	57	8.068	1
6	Springer Link	96176	1722	300	0.186	3
7	Taylor and Francis	16902	1078	300	0.052	5
8	JSTOR	32242	3165	300	0.034	6
9	Project Muse	276	676	180	0.002	9
	Total	178134	15102	1837	0.006	

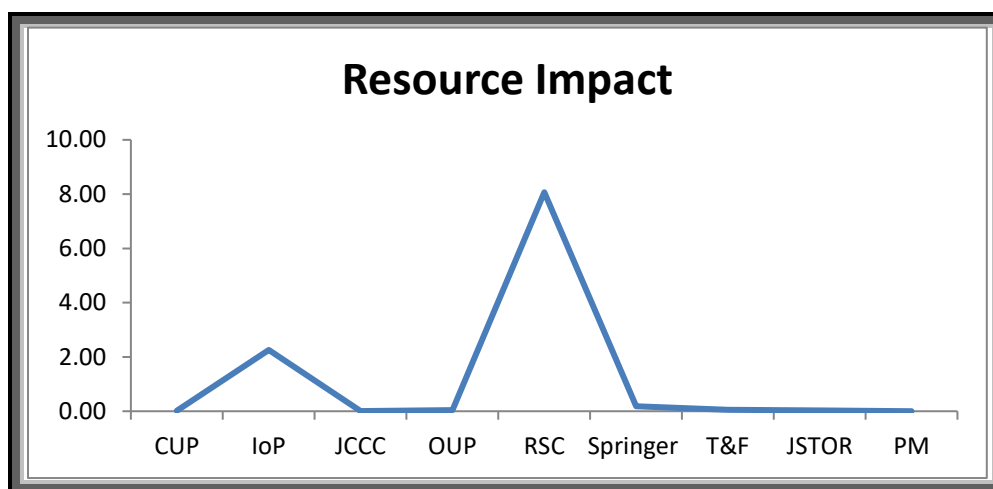


Figure 3 Resource Impact Factor

It is observed from the table that the Royal Society of Chemistry and Institute of Physics have secured the first and second rank in the Resource Impact Factor. The Publishers Springer, Taylor and Francis and JSTOR have secured the third, fourth and sixth rank respectively.

9.4 Ranking of usage of resources

All the nine resources subscribed by the institute on the ratio of resources, ratio of Utilization and Resource Impact Factor with their rankings and also download rankings are presented in table 6.

Table 6
Overall rankings of usage of resources

S.NO.	Name of the publisher	Download Rank	The ratio of Resources rank	The ratio of Utilization Rank	RIF
1	CUP	8	7	8	7

2	IoP	6	2	4	2
3	JCCC	5	8	6	8
4	OUP	7	5	7	4
5	RSC	4	1	2	1
6	Springer	1	3	1	3
7	T&F	3	4	5	5
8	JSTOR	2	6	3	6
9	PM	9	9	9	9

It is observed from the table that RSC secured first place in the ratio of resource and Resource Impact Factor followed by IoP and third and fourth by Springer and OUP respectively. It is confirmed the axiom 3 that use of e-resources was directly proportional to the number of resources and number of users and not by the number of downloads.

10. Findings

The mere download is alone not sufficient in measuring the use of e-resources, but the number of resources in a particular database matter. Further, the usage depends on the number of users of the particular domain. Hence the uses of e-resources were directly proportional to the number of resources and number of users.

- To study the usage trends a usage statistics of nine publishers' full-text journals during 2012-2019.
- Usage of e-resources is increasing from 2012 to 2016 and decrease afterwards.
- Users from science faculty members and researchers in their field are more active in using e-journals when compare to arts.
- Subject-specific journals are highly used than multi-subjects journals.
- Use of e-resources was directly proportional to the number of resources and number of users and not by the number of downloads
- To increase the usage of e-resources, the remote access facilities to be extended to faculty members and research scholars.

- Three formulae such as *Ratio of Resources (RoR)*, *Ratio of Utilization (RoU)*, *Resource Impact Factor (RIF)* has been identified for measuring the use of e-resources.
- The methods enable to derive three axioms for the use of e-resources. The usage reports based on three formulae were helpful to the library in deciding on renewals of subscriptions.
- The use of higher the journals because of the more e-journals it contains
- The potential users are more from Science faculty than Arts faculty.

11. Conclusion

Modern libraries are subscribing to more e-resources. It appears that lots of funds are utilized on subscribing these e-resources. Therefore, it is important to find the usage of these resources. In the Gandhigram Rural Institute – Deemed to be University, usage of e-resources is increasing day-by-day. The Science faculty does use more e-resources than arts, but it is to be changed and should be given equal usage on the part of usage, which will be reflected in the form of publications. If more research takes place in the arts, then it will automatically use of resources increased. Users from the chemistry department are more active in using e-journals that may be due to more research is on-going in Chemistry. Some publishers' journals contain very fewer titles, but the usage of these journals was very high. Subject-specific publishers' journals are highly used than multi-subject journals. To increase the usage of e-resources, the remote access facility extended to the faculty members and research scholars from 2019 onwards. The study indicates that the three axioms thus derived hold well. Thus the evaluation of e-resources can be evaluated using the formula such as Ratio of Resources, Ratio of Utilization and Resource Impact Factor instead of measuring the download and percentile alone.

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