

Usage pattern of e-resources during COVID-19 and post COVID-19: A study

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The study analyses the usage pattern of e-resources of Shreenivas Deshpande Library IIT(BHU), Varanasi, during the Covid-19 and post Covid-19. The usage data of e-resources is from 2018 until June 2022. The research shows that the usage of e-journals was affected more during the pandemic than e-books. The use of databases and standards also decreased during the pandemic and increased as the Institute reopened and research work started. Highly used journals Science Direct, Springer link, IEEE, and OSA witnessed a sudden fall after March 2020 in usage after the lockdown. Also, access went down even after access to all resources through a remote access facility. The analysis of results will support the library professionals in raising their voices for more budgets before the funding agencies and higher authorities.

Introduction

Users today expect access to information resources from their workplace or home through their chosen devices. They want to search for information in electronic sources and get the full view/download of a document relevant to their interest and research on the screen. That's why libraries worldwide provide access to resources electronically by purchasing or subscribing through licensing agreements. Over the last two decades, the electronic collections of academic libraries have been growing steadily. The library and the users have accepted it. However, the change in formats at very short intervals and access mode has posed a challenge to the library administrators in managing these resources.

The sudden challenges posed by Covid-19 to access the resources in a closed campus situation forced libraries and publishers to rethink the alternate model of access to e-resources. The libraries and publishers supported users during the Covid-19 by extending access to e-resources through remote access, user name password for subscribed resources and free access of Covid-19 related literature. Even after that, most academic libraries witnessed a decline in the usage of e-resources compared to the pre-Covid-19 period (Moody, Daniel and Best, Rickey D., 2021 & Ruth Sara Connell, Lisa C. Wallis, and David Comeaux, 2021)^{1,2}. Many academic libraries self-funded or supported through the eShoodhsindhu faced problems in renewal or dropped renewal due to a budget shortage for 2022-23. Before demanding more budget for the financial year 2023-24 or continuing the e-resources on a limited budget, libraries need to analyse the pre-covid, during-covid and post-covid use of e-resources to draw a valid justification for renewal. It is also necessary to analyse usage to justify the higher authorities for the renewal of existing e-resources if there is a downfall.

The study measures changes in usage of significant e-resources self-subscribed or centrally funded to Shreenivas Deshpande Library IIT(BHU), Varanasi, through the network and remote access during timeframes of before Covid-19, during Covid-19 and post Covid-19. The study found that during Covid-19, the usage decreased, but the virtual communications regarding Interlibrary loans, plagiarism-related issues and general library queries increased. The study found correlations between the use of e-resources and Covid-19 waves. This study will help decide to renew e-resources on a limited budget and demand more funding to sustain the existing resources, which dropped due to budget cuts during the pandemic.

About Shreenivas Deshpande Library IIT(BHU), Varanasi

The Shreenivas Deshpande Library supports the academic needs of more than 9000 graduate, post-graduate, research scholars, faculty members and non-teaching staff through its vast collection of print and e-resources on Engineering, Science & Technology and other disciplines. Besides having an excellent print collection of over 1,45,000 volumes of books, journals, theses, dissertations, reports, standards, and pamphlets, the library also provides access to over 15,000 electronic journals, more than 3,000 e-books and databases in science, engineering, and technology. The library offers various facilities like a collaborative learning space, Document delivery service, Remote Access facility, e-library, Modern reading Halls of more than 600 sitting capacity, online reference service, Ask Librarian, etc.

Access to e-Resources

The library started subscribing to e-resources on Institute IPs only after the separate network from the BHU in 2018. Before 2018, the IPs of BHU and IIT(BHU) Varanasi were shared. Due to shared IPs and many common resources subscribed by both Institutions, it was very challenging to know the actual usage of subscribed e-resources. The library is an active member of EShoodhSindhu and gets access to ACM Digital Library, ASCE, ASME and Springerlink access under a centrally funded scheme. The rest of the e-resources are subscribed to by the library. The library subscribes or has access to the following e-resources:

- ❖ **E-journals packages:** Elsevier Science Direct, Springer Link, Wiley, Taylor & Francis, Institute of Physics, Royal Society of Chemistry, American Physical Society, American Institute of Physics, Optical Society of America, Springer Nature titles, SIAM, Science, Sage IMechE, Project MUSE, PNAS, JSTOR, Informs Pubs Online, IEEE, Begell House, ASME, ASCE, American Chemical Society, ACM Digital Library
- ❖ **Databases:** Web of Science, Scopus, Springer Materials, Scifinder Scholar, Press Reader, MathSciNet, Derwent World Patent Database, Delnet Database, Begell House.
- ❖ **Standards:** ASTM, Indian Standards, ACI MCP
- ❖ **E-Books:** Springer, Elsevier, Wiley, Royal Society of Chemistry, ASM Handbook, CBS Text Books, McGraw Hill, Bloomsbury Architecture Library.

2. Literature Review

Several studies have been conducted on the impact of Covid-19 on library services, information-seeking behaviour, library infrastructure and other aspects of the library but very few studies found on the impact on e-resources going through the SCOPUS databases. The researcher found the following studies related to the impact of Covid-19 on the usage of e-resources in libraries.

The usage of e-books examined at Kyushu University, Japan, showed that the total use of e-books increased in 2020 compared to January 2019 to June 2019. They analysed the e-book usage data of all nine e-book platforms. (Kodama, M., Ishita, E., Watanabe, Y., & Tomiura, Y., 2021)³. The result shows that due to the closure of physical access and teaching through the online mode, the access and usage of e-books increased. Another survey was conducted among the faculty members at the Kuwait University, Kuwait, to know their opinion regarding the benefit of e-resources offered by the library during the COVID-19 pandemic period. The author found significant use of e-resources during the pandemic time. They used e-resources for writing research papers and supporting classroom teaching, and the databases and e-journals were the most preferred resources (Hendal, B. A. 2020)⁴. When asked the nonusers about the need for these resources, they replied that they do not need them. However, the rest replied that they were not aware of it.

COVID-19 affected not only academic libraries but also public libraries' functioning. This fact is reflected in several studies. The usage of public computers by library users at Texas Public dropped around 50% compared to 2018 and 2019. Library also reduced its opening and opened only 76% of the hours in 2020. (Du, Y. 2022)⁵. Another study was conducted at Njegoš public library in Knjaževac, Serbia. The digital library usage during the COVID-19 pandemic showed after the website data analysis that users' most popular times of day and days of the week during the pandemic and in regular times. Mobile devices and up-to-date operating systems were a trend. Most surprisingly, during the restrictive lockdown period, the reading increase time reached its peak in March 2020, and the average reading time also increased approx 130%. It also found that social media was mainly used to promote the digital library during the pandemic (Ciric, J., & Ciric, A. 2021)⁶.

Studies conducted in India mainly focused on the awareness of e-resources, problems faced during and after the pandemic by academic libraries, and usage of library resources and services during and after the pandemic. The study conducted for Manipal Academy of Higher Education libraries found a significant increase in the usage of electronic resources and a decrease in physical resources. Library users used a remote access facility during the pandemic to access library resources for teaching, learning and research. (Mohan, Tej M, Rao, Mahabaleshwara, Bhat k, Shivananda. 2021)⁷. In analysing the usage statistics of e-resources during the pandemic at Chandigarh University Library, India also found that most library users used e-resources efficiently according to their particular needs and were aware of their availability in the library. However, the researcher found that usages are not up to the worth in comparison to investment. (Veer, Ram & Panda, Subhajit. 2021)⁸.

The past studies found that very few studies have been conducted, particularly in the Indian context, showing the online resources usage trend in the COVID-19 period and post COVID-19 period.

3. Significance and Objective of the Study

Evaluating the usage statistics of e-resources is required to satisfy the funding agencies for the subscription budget. Most institutions are facing an acute shortage of funding due to budget cuts and an increase in the exchange rate of foreign currencies. The analysis of results will support the library professionals in raising their voices for more budgets before the funding agencies and higher authorities.

This study aimed to explore the use pattern of e-resources subscribed by the Shreeenivas Deshpande Library IIT(BHU) before the pre-COVID-19, COVID-19 pandemic and post- COVID-19. The following were the key objectives of the study:

- ❖ To analyse the usage of e-resources before COVID-19, during COVID-19 and post-COVID-19;
- ❖ to examine month wise-usage trends of significant resources from January 2019 to June 2022 to correlate the usage with the Covid-19 waves; and
- ❖ to explore the trend of the use of e-resources through remote access.

4. Methodology

The data used to analyse the usage trend was gathered from the publishers and extracted from the InfiStats and the remote access platform. All resources have IP-based access through Institute networks and remote access through the Remote portal. Before the independent network, both the Institutions, BHU and IIT (BHU), used the same IP range to access the resources. The separate Institute network started functioning in late 2018, and the library has been subscribing to remote access facilities since 2019. So the duration of access is from January 2019. The author considers the last four years' data for usage analysis from 2018 to 2021. In the case of many resources, 2022 data till June have also been considered. Statistical software Excel has been used to analyse the collected data and draw the figures and tables.

5. Result Interpretation and Discussion

The first case of COVID-19 was reported on 30th January 2020, in Kerala and on 23rd March, Kerala announced a lockdown. The Government of India announced a countrywide lockdown on 25th March 2020, and suddenly, institutions declared the libraries to close access for its users. The first lockdown phase was strictly observed from March 2020 to August 2020. After a decrease in the cases, the Institute opened labs in September 2020, and final year PhD students were allowed to do academic activities there. But, after the sudden increase in the cases, 2nd lockdown phase started in April 2021, and after July 2021, the situation gradually became normal, and the library started functioning normally.

5.1 Year-Wise Usage of e-Journals (COVID-19 and Post-COVID-19)

Table 1 shows the usage of the journals subscribed to or accessed through eShoodhSindhu between 2018 and June 2022. The usage data for a year is a calendar year. The 2018 to 2019 usage % shows that in most journals, usage is increasing. Only two resources, ACM DL and Springer, witnessed a downfall in use. ASCE, RSC and Springer Nature Usage increased manifold.

As shown in table 1, usage of e-journals decreased during the COVID-19 pandemic by almost 50% in most cases in 2020 compared to 2019. But in 2021, the usage increased or reached the 2019 normal days as the Institute reopened and academic activities started gradually. ASME witnessed a significant increase in 2021 compared to 2019 and 2020. The impact of COVID-19 also reflected in the total usage number. As shown in the table, the usage went down approximately 54% compared to regular days during the pandemic. Most academic activities suddenly stopped due to the COVID-19 pandemic, and Institutions moved to online mode after 21st March 2020. However, the library extended with a Remote access facility in 2019, but it takes time to adapt by faculty and students.

The usage of all the e-resources increased after the normal situation and offline mode (Post-COVID-19), as seen in the table 1. Beginning with the year 2022, all activities at Institute started, and the library also started functioning on normal days. Table 1 shows that ACS, ACM DL and Taylor & Francis witnessed more than a 100% increase in 2022 usage compared to 2021. Except for Sage and Springer Nature, other resources also noticed a more than 50% increase compared to 2021. Overall usage also saw a more than 85% increase.

Table 1: e-Journals uses report (Jan-2018 to June-2022)

Sl No.	Journals/ Years	Pre-COVID-19			COVID-19				Post-COVID-19	
		2018	2018 to 2019 % of Uses changes	2019	2019 to 2020 % of Uses changes	2020	2020 to 2021 % of Uses changes	2021	2021 to 2022 % of Uses changes	Till June 2022
1	ACS	36017	66.69	60035	-51.54	29094	50.62	43821	113.24	46723
2	APS	8392	65.24	13867	-49.09	7060	37.04	9675	73.15	8376
3	ASCE	455	1406.15	6853	-40.81	4056	14.94	4662	50.88	3517
4	ASME	1368	66.67	2280	-29.96	1597	158.48	4128	31.88	2722
5	ACM DL	3282	-5.09	3115	-39.52	1884	50.69	2839	100.77	2850
6	IEEE/IET	153114	19.88	183559	-59.78	73832	24.22	91711	92.88	88445
7	IOP	20,572	16.34	23,934	-53.08	11,229	38.45	15,546	83.46	14260
8	OSA	1552	35.50	2103	-40.37	1254	-8.13	1152	0.00	0
9	RSC	19324	190.73	56181	-56.54	24418	52.29	37186	86.19	34619
10	SAGE	487	43.12	697	-8.90	635	81.89	1155	28.66	743
11	Science Direct	341602	38.10	471757	-55.81	208471	57.59	328527	82.78	300247
12	Springer	114942	-33.90	75981	-38.90	46428	34.24	62326	79.60	55970
13	Springer Nature	3418	228.53	11229	-33.17	7504	27.09	9537	44.68	6899
14	Taylor & Francis	7694	80.23	13867	-46.51	7418	35.32	10038	115.98	10840
15	Wiley	23556	63.81	38588	-45.02	21217	41.29	29977	88.50	28254
	Total->	735775	31.02	964046	-53.73	446097	46.22	652280	85.34	604465

** Before COVID-19 (2018 to 24th March 2020), COVID-19 (25th March 2020 to July 2021), post-COVID-19 (August 2021 onwards)

Abbreviation - ACS: American Chemical Society, APS: American Physical Society, ASCE: American Society of Civil Engineers, ASME: American Society of Mechanical Engineers, ACM DL: Association for Computing Machinery Digital Library, IEEE/IET-IEL: Institute of Electrical and Electronics Engineers/Institution of Engineering and Technology Electronic Library, IOP: Institute of Physics, OSA: Optical Society of America, RSC: Royal Society of Chemistry.

5.2 Month-wise E-journals Usage (COVID-19 and Post COVID-19)

Figure 1 reflects the month-wise trend of usage of e-journals from January 2019 to June 2022. The graph has been drawn to show the correlation between Covid-19 waves (the first wave from March 2020 to August 2020 and the second wave from April 2021 to July 2021) and the usage of e-journal patterns.

As shown in figure 1, beginning with the first wave, highly used journals Science Direct, Springer link, IEEE, and OSA witnessed a sudden fall after March 2020. It was again resuming after September as the cases came down and labs and libraries opened for the Research scholars and faculty. It again went down after April 2021 with the second wave of the Delta version and started going upward until date. The usage of all the above resources resumes up to 2019, and many noticed an increase compared to 2019. Notably, the use of Science Direct noticed an increasing trend post-COVID-19.

It shows that even after accessing the facility of e-resources 24x7 from anywhere, its usage depends upon the regular academic activities, Institute opening and library opening.

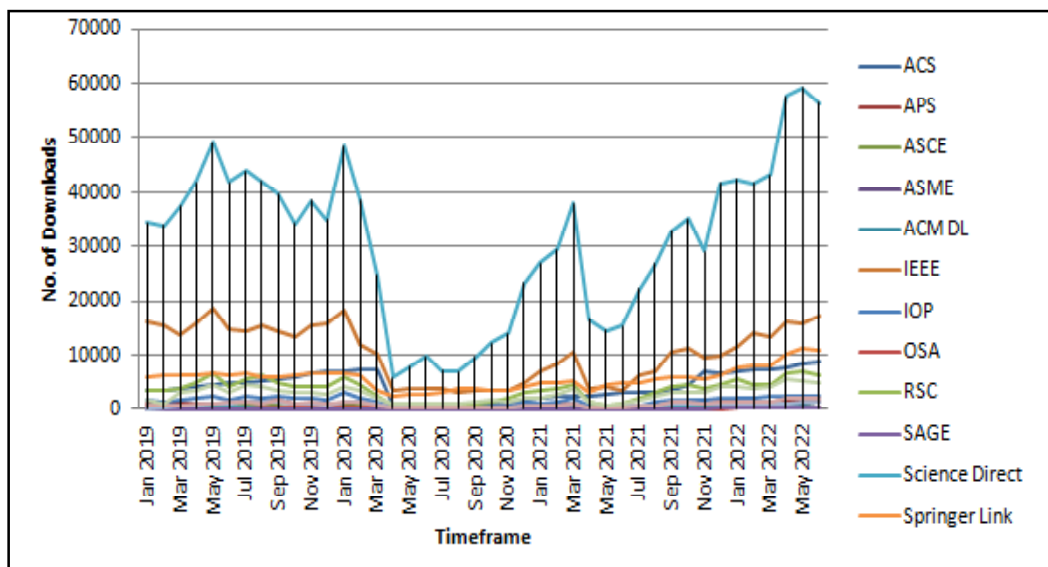


Figure 1: Month-wise e-journals usage report (Jan 2019 to June 2022)

** Before COVID-19 (2018 to 24th March 2020), COVID-19 (25th March 2020 to July 2021), post-COVID-19 (August 2021 onwards)

5.3 Usage of e-Databases and e-Standards (COVID-19 and Post COVID-19)

As seen in Table 2, most databases and standards witnessed an increase in usage in 2019. But it goes down in 2020 compared to 2019 during the first wave. However, it again gained momentum in 2021 as the Covid-19 cases came down, Institute opened labs, and academic activities started. Only two resources, ACI standards and ASTM noticed a decrease in 2021. The total number of downloads increased significantly in 2021 after the normal situation. All standards and databases witnessed an increase in 2022, except Scifinder.

Table 2: e-Databases & e-Standards usage report (Jan 2018 to June 2022)

Sl No.	Databases Standards	Before-COVID-19			COVID-19				Post-COVID-19	
		2018	2018 to Years of Uses changes	2019	2019 to 2019 % of Uses changes	2020	2020 to 2020 % of Uses changes	2021	2021 to 2021 % of Uses changes	Till June 2022
1	MathSciNet	25051	1.70	25478	-49.33	12909	17.72	15196	-35.52	4899
2	PressReader	0	0.00	0	0.00	0	0.00	160153	32.27	105917
3	Scifinder	33121	83.15	60661	-13.48	52,481	15.82	60784	-15.82	25585
4	Scopus	20,443	-1.50	20,137	-53.07	9,450	52.05	14,369	18.12	8486
5	Web of Science	9228	-4.38	8824	-49.05	4,496	168.35	12065	59.52	9623
6	ACI	13	92.31	25	-12.00	22	-77.27	5	0.00	0
7	ASTM	24	7716.67	1876	-31.98	1,276	-5.41	1207	57.91	953
8	BIS	93	48.39	138	-25.36	103	24.27	128	32.81	85
	Total->	87973	33.15	117139	-31.08	80737	226.87	263907	17.88	155548

** BeforeCOVID-19 (2018 to 24th March 2020), COVID-19 (25th March 2020 to July 2021), post-COVID-19 (August 2021 onwards)

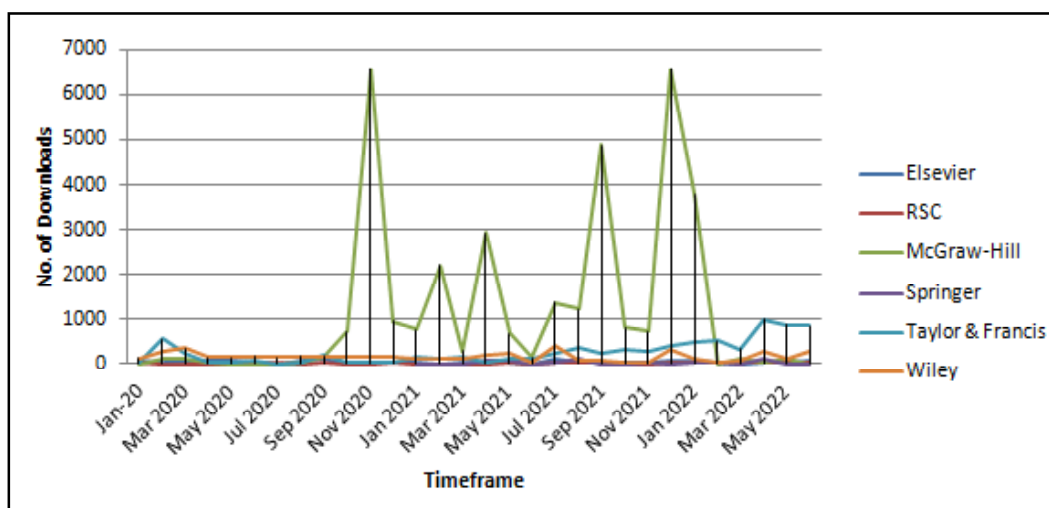
5.4 E-Books Usage (COVID-19 and Post COVID-19)

Table 3 reflects the usage pattern of e-books from 2018 until June 2022. The zero-value data shows that access was not available in a particular year. Before the pandemic, only RSC and Elsevier e-books were available. Elsevier titles witnessed a significant increase (495.83%), but RSC shows a decrease in usage from 2019 to 2020 pre-COVID-19.

The Wiley and Elsevier titles were used less than MacGraw Hill (159%) and Springer (1685%) from 2020 to 2021 during the COVID-19 period. Overall, from 2018 to 2021, the usage increased, but as the situation became normal, the usage decreased in 2022. Particularly the e-books, McGraw Hill, noticed 63.79% reduced usage, as shown in figure 2. Taylor & Francis (218%) and RSC (53%) noticed an increasing trend in usage in post-COVID-19. The reduced use indicates that users still want to read a hard copy of textbooks even after the availability of e-version.

Table 3: Year-wise e-Books usage report (Jan 2018 to June 2022)

Sl No.	e-Books	Before COVID-19			COVID-19				Post-COVID-19	
		2018	2018 to 2019 % of Uses changes	2019	2019 to 2020 % of Uses changes	2020	2020 to 2021 % of Uses changes	2021	2021 to 2022 % of Uses changes	Till June 2022
1	Elsevier	0	0.00	96	495.83	572	-23.43	438	8.22	237
2	RSC	101	59.41	161	-24.22	122	51.64	185	53.51	142
3	McGraw-Hill	0	0.00	0	0.00	8720	159.04	22588	-63.79	4090
4	Springer	0	0.00	0	0.00	14	1685.71	250	30.40	163
5	Taylor & Francis	0	0.00	0	0.00	1358	86.60	2534	218.71	4038
6	Wiley	0	0.00	0	0.00	2151	-19.29	1736	11.98	972
	Total->	101	154.46	257	4933.85	12937	114.35	27731	-30.46	9642

**Figure 2: Month-wise e-books usage report (Jan 2020 to June 2022)**

** Before COVID-19 (2018 to 24th March 2020), COVID-19 (25th March 2020 to July 2021), post-COVID-19 (August 2021 onwards)

5.5 Usage of e-Journals (Access Through Remote Access During COVID-19 and Post-COVID-19)

The library started access to e-resources through remote access in 2019. Table 4 presents the data extracted from the Admin page of “RemoteXs”. As shown in Table 4, most e-journals except IOP and Sage witnessed a significant increase in usage through remote access from 2019 to 2020 pre-COVID-19. The trend continues from 2020 to 2021 for all resources except APS (-77.50%) and Springer Nature (-27.50%) during COVID-19. As the situation became normal and Institute and library reopened, the access to IEEE and ACM DL

decreased. However, other resources witnessed an increase in their usage. During post-COVID-19, the access of ASME (217%), IOP (180%), RSC(106%), Springer (122%), Springer Nature (86%), and Science Direct (71%) through remote access increased. It shows that users still use a remote access platform to access the e-resources even after physically opening Institute.

Table 4: E-Journals uses report access through Remote Login (Jan 2019 to June 2022)

Sl.No	Journals/ Years	Before COVID-19		COVID-19		Post-COVID-19		
		2019	2019 to 2020 % of Uses changes	2020	2020 to 2021 % of Uses changes	2021	2021 to 2022 % of Uses changes	Till June 2022
1	ACS	30	1396.67	449	20.94	543	93.74	526
2	APS	115	143.48	280	-77.50	63	23.81	39
3	ASCE	2	900.00	20	520.00	124	45.16	90
4	ASME	5	120.00	11	54.55	17	217.65	27
5	ACM DL	25	708.00	202	105.45	415	-50.36	103
6	IEEE-IEL	108	3538.89	3930	114.40	8426	-33.85	2787
7	IOP	58	-34.48	38	44.74	55	180.00	77
8	OSA	5	80.00	9	155.56	23	0.00	0
9	RSC	24	754.17	205	32.20	271	106.64	280
10	SAGE	13	-61.54	5	920.00	51	-1.96	25
11	Science Direct	118	1590.68	1995	36.49	2723	71.94	2341
12	Springer	45	508.89	274	14.23	313	122.36	348
13	Springer Nature	22	445.45	120	-27.50	87	86.21	81
14	Taylor & Francis	25	240.00	85	36.47	116	46.55	85
15	Wiley	53	426.42	279	98.21	553	4.88	290
	Total->	648	1119.44	7902	74.39	13780	3.03	7099

Abbreviation - ACS: American Chemical Society, APS: American Physical Society, ASCE: American Society of Civil Engineers, ASME: American Society of Mechanical Engineers, ACM DL: Association for Computing Machinery Digital Library, IEEE/IET-IEL: Institute of Electrical and Electronics Engineers/Institution of Engineering and Technology Electronic Library, IOP: Institute of Physics, OSA: Optical Society of America, RSC: Royal Society of Chemistry.

5.6 Overall Usage of E-resources

As Table 5 and Figure 3 show, e-journals usage was at its peak in 2019 and suddenly started declining. In 2020 during COVID-19, it went down approx 54%, and after the slowdown of COVID-19, it went up, and in 2022, it just doubled compared to 2021. However, using e-databases and standards shows that the usage went down during the pandemic and increased in the post-COVID-19 period. E-books usage went high

during the pandemic; it is going down post-pandemic. There may be some reason behind it, which could be found in the user's feedback.

Table 5: Total e-resources usage report (Jan 2018 to June 2022)

Total e-Resources/ Years	2018	2019	2020	2021	Till June 2022
e-Journals	735775	964046	446097	652280	604465
e-Database & e-Standards	87973	117139	80737	263907	155548
e-Bosks	101	257	12937	27731	9642

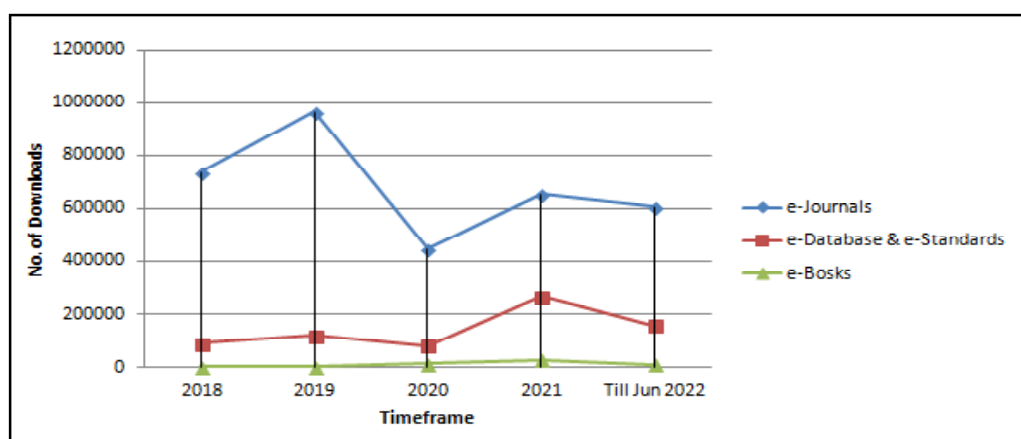


Figure 3: Total e-resources usage report (Jan 2018 to June 2022)

The library could satisfy its users and fulfil their demands during the pandemic through the facility of remote access. The most used and trusted library service was the e-mail service libraryservices@iitbhu.ac.in. The usage pattern shows that very soon, the usage will be resumed normal, and the trend shows a significant increase in 2022 for most e-resources.

6. Conclusion

The Covid-19 pandemic suddenly forced a change in the traditional mode of library services and research support to the academic community. The library first witnessed such a situation and prepared to provide its services even after hurdles. The study found that the usage of e-journals was affected more during the pandemic than e-books. The usage of databases and standards also went down during the pandemic and started increasing as the Institute reopened and research work started. It also noticed that the access went down even after access to all resources through a remote access facility. As a general observation, the usage of e-books does not witness a significant increase during the lockdown or closure of the library. The analysis of results will support the library professionals in raising their voices for more budgets before the funding agencies and higher authorities.

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