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Ever Increasing Cost of Knowledge: Challenges for Libraries for Electronic Resources A Case Study

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ABSTRACT

The article highlights the total expenditure on various databases in general and subject-wise by University of Delhi and discusses an annual average increase in foreign databases and impact of exchange rates on expenditure. It highlights the cumulative annual growth rate in general and subject-wise also. The various reasons presented by the publishers for increase in subscription are also discussed. The paper also presents solutions to meet the challenge of ever increasing cost of databases.

Keywords: Electronic databases, cost of knowledge, database subscription

1. INTRODUCTION

Libraries are spending bulk of its financial allocations to have access to the information needed by its users. Academic librarians in the last year about the allocation of their collections budgets, most mention that 70 % to 90 % is devoted to electronic resources with the remainder to print materials[1]. However, the question remains that whether the libraries will be able to sustain the subscription of various databases being subscribed by keeping in view the price cap and the impact of currency exchange rates. A case study of university of delhi has taken to discuss the impact of price cap along with exchange rates on sustainability of e-resources. Based on the empirical data a projection is made for the next ten years regarding expected growth in the prices of e-resources and need of the financial allocations for retaining the subscription of databases.

The University of Delhi with modest beginning with just three colleges, two faculties (Arts and Science) and about 750 students has now become one of the India's largest institutions of higher learning, and among the largest in the world. Presently the university has 85 constituent and affiliated colleges, 16 faculties, 82 departments and 14 centres. The total number of students enrolled in the university during the academic year 2014-15 was 6,28,443. Of these 2,03,460 students were enrolled in the colleges, 17,098 in the university departments, 3,91,344 in the school of open learning and 16,541 in the Non-collegiate women's education board2.

2. METHODOLOGY

Subscription costs of all the databases being subscribed by university of delhi in original cost were collected. The original cost, in case of foreign databases, converted into at exchange rates of reserve bank of India as on 1st January of the concerned year. Since bulk of the budget of electronic databases is being spent on foreign databases the cost only of foreign database has been analysed on the basis of various indicators like average increase, cumulative average increase, subject wise expenditure and growth in subscription rates, tables and graphs are prepared. On the basis of analysis, a projected growth for next 10 years has been made references are given as per IEEE.

3. EXPENDITURE ON E-RESOURCES

Being ranked number one among the universities it has been spending substantial amount on electronic resources since 2006 besides getting access through INFLIBNET. In fact University of Delhi is the highest subscriber of databases among the universities in India. It has access to science direct, sage online, wiley online, lexis-nexis, scopus, springer online, scifinder, IEL onlinemention few. University of delhi has also been ranked one for usage of INFLIBNET databases. University of Delhi also purchased number of archives, e.g., Science Direct, Sage Online, Emerald Management Extra, etc., in the year 2010.

Table 1 provides a glimpse of spending on e-resources and number of electronic databases being subscribed by university of delhi since 2006. Table 1 and Fig. 1 reveal that the university has started subscription of electronic databases for it users in 2006 with 14 foreign databases spending approx 1.23 crore which has enhanced to 4.02 crore in the current year i.e., 2016 Delhi University renewed the subscription of 47 databases (39 foreign and 8 Indian) and adding two new foreign database.

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Table 1. Expenditure on electronic resources

Year	Foreign databases		Indian databases		Total	
	No.	Expenditure in	No.	Expenditure in	No.	Expenditure in
2006	14	12270120	0	0	14	12270120
2007	17	17415888	0	0	17	17415888
2008	24	18854626	0	0	24	19017548
2009	27	34788511	3	213340	30	35001851
2010	47	63300121	9	1073610	56	64373731
2011	45	25695354	8	1045233	53	26740587
2012	44	30266700	8	1574181	52	31840881
2013	44	33308376	8	1686332	52	34994708
2014	44	38526137	8	1707832	52	40233969
2015	41	33901499	8	1764553	49	35666052
2016	39	37070090	8	1717001	47	38787091

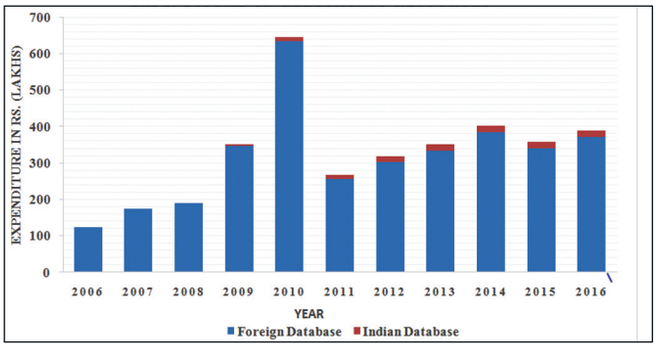

Figure 1. Expenditure on electronic resources.

The CAGR of expenditure incurred on the subscription of e-resources has been 9.60 since 2006.

4. SUBJECT-WISE EXPENDITURE ON E-RESOURCES

The expenditure on various subjects incurred on subscription of e-resources has also been analysed on the basis of their broad subjects and is presented (in %) as Table 2 and Fig. 2. Regarding expenditure on difference subjects an analysis reveals that database belonging to science subjects consume most of the financial allocation which vary from 57.91 % to 80.34 % of total expenditure on e-resources before INFLIBNET started giving access to important databases in 2010. In the current year, the library spent approx 40 % on sciences, 26 % on social sciences, and 1.55 % on arts or humanities databases.

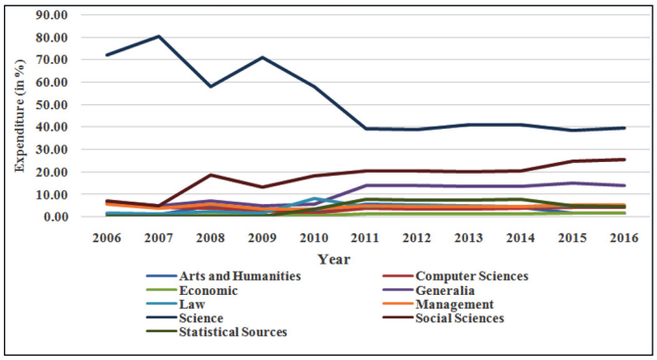

Figure 2. Subject-wise expenditure (per cent).

5. ANNUAL AVERAGE INCREASE IN FOREIGN DATABASES AND IMPACT OF EXCHANGE RATES

Fig. 3. shows the impact of exchange rates on subscription of electronic databases a study of fluctuation in exchange rates is also done in which reveals that exchange rates do impact the expenditure on electronic

Table 2. Subject-wise expenditure on e-resources (per cent)

Subject	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Arts and humanities	1.31	0.88	4.60	3.21	2.19	5.48	5.27	4.56	4.06	1.55	1.55
Computer sciences	5.86	4.13	3.77	2.40	1.48	3.60	3.48	3.37	3.61	4.04	4.07
Economics	0.00	0.00	0.60	0.42	0.31	1.11	1.19	1.19	1.19	1.44	1.43
Generalia	6.73	4.85	6.91	4.94	5.56	13.97	13.71	13.48	13.30	14.90	13.90
Law	1.76	1.33	2.21	1.62	7.95	4.30	5.02	4.74	4.32	4.93	4.39
Management	5.54	3.82	5.46	3.47	3.39	4.68	4.55	4.49	4.32	5.34	5.25
Sciences	71.88	80.34	57.91	71.05	57.98	38.99	38.87	40.90	40.99	38.35	39.44
Social sciences	6.92	4.65	18.53	12.89	17.94	20.09	20.40	19.96	20.40	24.53	25.35
Statistical sources	0.00	0.00	0.00	0.00	3.20	7.78	7.50	7.30	7.83	4.92	4.62

resources in Fig. 3. The exchange rates of $ have increased by 49.92 % followed by € 41.82 % and £ 16.74 % since 2006. Regarding comparative CAGR of three currencies, the $ has been increasing @ 3.99 %, € by 3.56 % and £ by 1.56 % per annum. Due to the fluctuation in exchange rates an overall increase in the last ten year subscription of foreign database has been 45.01 % in terms of original currency which rose to 112.6 % when into. The decreasing trends is emerging from the Table for the last three years as the average increase was 2.84 %, 3.22 and -0.5 for 2014, 2015 and 2016, respectively. This trends matches with the EBSCO projections for the same period.[3,4,5] Another reason for decreasing trends during the last three years could be intensive negotiation by the university of delhi.

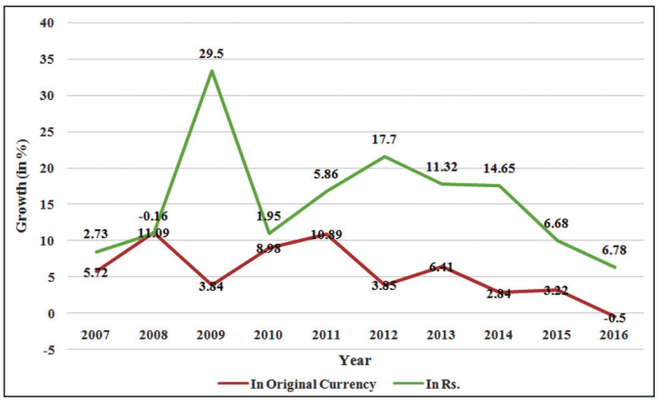

Figure 3. Annual average growth of foreign database.

6. SUBJECT-WISE INCREASE IN FOREIGN DATABASES AND IMPACT OF EXCHANGE RATES

Table 3 provides an analysis of percentage of budget for e-resources is being spend on various subjects. Further analysis of subscription prices of foreign databases (in their original currency) by subjects reveals that there has always been positive increase every year in case of databases belonging to science, management, and social science whereas in other subjects there has been a negative growth also in some years. Databases belong to sciences have shown highest increase (83.75 %) in subscription prices followed by economics (67.22 %), management (47.09 %), computer science (43.27 %), generalia (36.84 %), social sciences (29.41 %), law (23 %) and arts and humanities (8.84 %). Subscription prices of statistical sources have shown negative trends as their prices are reduced by 1.05 %.

On analyis of the impact of exchange rates, it is revealed that despite the negative growth (-1.05 %) in statistical databases in their original currency there has been a positive growth (25.26 %) when converted the into original currency. Subscription prices of science databases have enhanced by 179.54 % though the growth in original currency was 83.75 % and in arts and humanities prices have gone up by 64.83 % in although increase in original currency was only 8.84 %.

7. CUMULATIVE ANNUAL GROWTH RATE (CAGR)

The cumulative annual growth rate (CAGR) in various subjects and overall of the entire databases since 2006 being subscribed by University of Delhi is shown in Table 4. and Fig. 4. These show the CAGR of various databases according to their subjects. Table 4 reveals that in totality the CAGR is 9.60 % per annum.

The CAGR in case of databases originated from other countries is 3.80 % before currency impact. However,

Table 4. Cumulative annual growth rates (subject-wise)

Subject	Cumulative annual growth rate (□)
Arts and humanities	7.10
Computer sciences	7.63
Economics	10.28
Generalia	8.43
Law	7.59
Management	7.89
Sciences	12.64
Social sciences	9.37
Statistical sources	4.57
Indian databases	11.51
Total	9.60

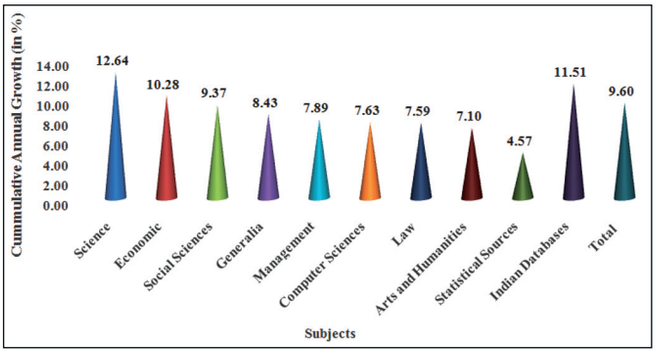

Figure 4. Cummulative annual growth rate (CAGR).

when the original currency is converted into Indian currency the CAGR climbs to 9.25 % per annum for foreign databases. The databases originated from India are also in fact having higher CAGR i.e., 11.51 % compared to foreign databases (9.25 %) in terms of as regards to the CAGR, in relation to various subjects (foreign databases only) it has been revealed that the subscription rate of science databases has the highest CAGR account for 12.64 % followed by economics (10.28 %), social sciences (9.37 %), generalia (8.43 %), management (7.89 %), computer science (7.63 %), law (7.59 %), and lowest is arts and humanities which is 7.10 %.

Table 3. Subject-wise increase in foreign databases

Subjects	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		Over All	
	OC	Rs.	OC	Rs.	OC	Rs.	OC	Rs.	OC	Rs.	OC	Rs.	OC	Rs.	OC	Rs.	OC	Rs.	OC	Rs.	OC	Rs.
Arts and Humanities	0.00	-4.68	0.00	-10.66	-6.01	30.65	4.02	-4.98	4.32	0.40	0.00	15.15	4.36	10.17	0.13	8.86	1.52	3.79	0.00	8.83	8.84	64.83
Computer Sciences	4.58	0.00	2.00	2.78	-5.19	13.81	22.33	15.11	2.02	-1.89	3.19	14.86	4.76	10.15	1.82	19.01	5.62	1.59	4.89	10.44	43.27	110.29
Economics					4.99	28.38	6.01	5.46	38.61	30.82	10.10	23.24	4.97	10.95	2.95	9.20	3.48	15.59	-16.75	-11.99	67.72	175.65
Generalia	12.77	10.22	4.17	-5.33	3.75	23.04	7.94	3.52	23.81	12.24	1.47	15.55	3.66	9.85	1.61	12.08	3.41	7.83	-4.18	2.39	36.84	92.35
Law	2.50	7.29	34.15	10.87	5.00	38.04	4.76	-7.35	15.67	12.22	0.19	20.28	3.74	5.36	-8.93	3.60	-0.93	1.10	-8.40	0.20	23.00	82.83
Management	1.08	-2.34	22.33	13.05	0.55	15.54	8.34	1.34	3.18	0.22	2.68	16.06	4.84	10.95	1.51	9.76	2.33	11.16	1.00	6.64	47.09	109.61
Sciences	9.30	6.38	16.41	4.53	9.74	39.58	10.15	2.63	8.01	5.49	6.77	20.62	10.56	16.00	3.39	16.80	4.45	8.71	4.82	13.04	83.75	179.54
Social Sciences	0.10	-4.68	0.00	15.02	5.33	35.75	4.66	-3.60	4.26	2.45	6.65	21.15	3.52	9.58	2.58	13.44	3.19	5.50	1.99	11.00	29.41	86.05
Statistical Sources									-16.86		0.00	8.66	13.90	9.59	19.28	37.61	1.25	-7.36	0.00	5.88	-1.05	25.26

8. REASONS FOR CHANGE IN PRICES IN DATABASES

Offer Price: Publishers/aggregators/vendors of electronic databases offer heavy discounted subscription prices of their databases in the beginning to promote their product(s) and enhance the price after getting popularity.

Change in Tier: In some cases if the usage go up and cross the certain level they increase the price and place the institution on a higher tier, hence, require to pay more to access the database.

Acquisition and Mergers of Publisher: Whenever there is change in the ownership of publishing house the pricing of e-databases get changed.

9. FUTURE PROJECTION BASED ON CAGR

Table 5. and Fig. 5 show EBSCO's projecting prices of the serials for many years[3-5]. They projected 6-8 % for 2014, 5-7 % for 2015 and 4-6 % for 2016 before currency impact. From the projections it has been notice that every year expected increase is dropping by one percent. On the basis of present study attempt has been made to project the increase for retaining the subscription of existing databases for the next ten years. The projection has been made on the basis of 2016 as base year.

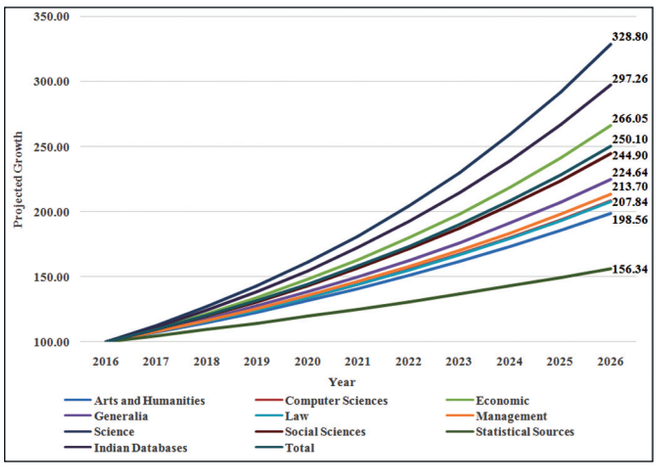

Figure 5. Future projection on the basis of CAGR.

As per CAGR in various subjects and in totality the multidisciplinary academic institutions libraries have to double its financial allocation in next 8 years to retain the subscription of the existing databases. Future is tenser for the libraries, like, CSIR, IITs, NIITs, Indian Institute of Science, etc., extensively subscribing science databases as they have to double their existing finance in the next six years. Doubling period of existing finance is 10 years for subjects, like, arts and humanities, computer science, law. In case of economics and social sciences the existing finance has to be doubled within 7 years.Management libraries should convert it financial allocations for retaining existing management databases within the period of 9 years.

Table 5. Future projection on the basis of CAGR

Subject	CAGR	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Arts and humanities	7.10	107.10	114.70	122.85	131.57	140.91	150.92	161.63	173.11	185.40	198.56
Computer sciences	7.63	107.63	115.84	124.68	134.19	144.43	155.45	167.31	180.08	193.82	208.61
Economics	10.28	110.28	121.62	134.12	147.91	163.11	179.88	198.37	218.76	241.25	266.05
Generalia	8.43	108.43	117.57	127.48	138.23	149.88	162.52	176.22	191.07	207.18	224.64
Law	7.59	107.59	115.76	124.54	133.99	144.16	155.11	166.88	179.55	193.17	207.84
Management	7.89	107.89	116.40	125.59	135.50	146.19	157.72	170.16	183.59	198.08	213.70
Sciences	12.64	112.64	126.88	142.92	160.98	181.33	204.25	230.06	259.14	291.90	328.80
Social sciences	9.37	109.37	119.62	130.83	143.08	156.49	171.15	187.19	204.73	223.92	244.90
Statistical sources	4.57	104.57	109.35	114.35	119.57	125.04	130.75	136.73	142.97	149.51	156.34
Indian databases	11.51	111.51	124.34	138.66	154.62	172.41	192.26	214.39	239.06	266.58	297.26
Total	9.60	109.60	120.12	131.65	144.29	158.14	173.33	189.97	208.20	228.19	250.10

10. SOLUTIONS OF PROBLEMS

Librarians are walking on the double-side edge weapon. One side they have to find the solution for rising cost of e-databases, especially, foreign databases and on other side ever increasing exchange rates. They have to strike a right balance between ever increasing information needs of the users and availability of resources in the library to satisfy those information needs.

Fortunately, the developments in information technology create new opportunities for librarians. The following are some suggestive solutions to meet these challenges.

10.1 National Consortia

Since information should be considered as national resource, there is an urgent need to set up a national consortium by the Government of India who would be responsible to provide any information/documents needed by any person/institution/libraries, etc., in India. National library consortia will have an advantage to have expert's knowledge not only for selecting the resources but also to negotiate the prices of e-resources.

10.2 Library Cooperation

During the print era, the libraries used to subscribe only core titles of periodicals which were useful to meet the objective of the institution. For auxiliary titles they used to depend on the other libraries. They received documents not available in their collection on ILL.

Instead of subscribing bundle collection and try to be self-sufficient, the libraries should scribe only core titles and for auxiliary titles they should get cooperation from other libraries.

10.3 Access Versus Ownership

Introduction of new pricing models by publishers such as licensing (rather than subscription) and access fees for e-information sources and relatively favourable offers for consortia agreements has made the economics of cooperation more visible.

10.4 Pay Per View Transactions

Users tend to download a single article number of times without realising the cost of download. Sometime they download articles after seeing the catchy titles of the articles though not related to their area of study. The libraries don't keep the record who is downloading what, why', and how many times and even for whom (for himself or for someone else). Even usages of many e-resources that are fully subscribed indicate low. Moreover, experts are raising questions on the usage statistics provided by the publishers. To tackle this problem the libraries may adopt the policy to pay for per view transaction. This will help libraries not only to lower the cost but also to maintain the records regarding who is using what and why.

10.5 Multiyear Price Cap Agreement

Another solution to the problem is to enter with publishers/aggregators/vendors multi-year agreements in which price cap is fixed if the library agrees to renew the subscription of the database for years. They agreed to keep the capped pricing as low as 3-5 % for libraries who agree to purchase the database for multiple years.

10.6 Return on Investment Study

It is a high time for libraries in India to do research on return on investment (ROI) which would help in identifying the impact of the usage of electronic journals on the activity of publishing articles by university-affiliated researchers. In particular, it analyses the impact of the usage of e-journals on the scientific production (publications, citations) by domain and type of institution. It develops indicators of causal relationships between usage, publications and citations, and analyses the evolution of the phenomena of causality in time[6].

10.7 Discontinuation of Print Journal

In India, some of the libraries are still maintaining the print run despite the availability of the same title in e-format. The libraries need to reformulate this policy

and discontinue the print run of the journal hence, save the expenditure of the library.

10.8 Just in Time Access

Libraries have been subscribing number of databases in anticipation of demand, i.e., 'Just-in-Case' users need any article the library doesn't to contact the publisher. In this, there are chances that there may not be enough demand for the database justifying its subscription. In 'Just in Time', the libraries acquire the document after receiving the demand from the user. 'Just in time' access satisfies information needs of scholars and keeps cost down as compared to 'Just-in-case'

10.9 Open Access Resources

Libraries must be upto date with the ever evolving information landscape and always on the hunt for reduced costs for accessing scholarly quality information. So far these free resources have been used to supplement and add value to the library's collection. The evaluation of the free internet resources that have been 'added' to the library's collection is ongoing, hopefully to allow for the cancellation of equivalent for-fee resources.

11. CONCLUSIONS

Expenditure on subscription of e-resources has been increasing at the rate of 9.60 % per annum since 2006. The University of Delhi spends most on science databases (58-80 %) and least on arts and humanities. Overall increase in the last 10 year subscription of foreign databases has been 45.01 % in terms of original currency which rises to 112.6 % in terms of the $ (increasing @ 3.99 %), € by 3.56 % and £ by 1.56 % per annum since 2006. Therefore libraries should add an additional 5-7 % to the estimated price increases while preparing a budget. Databases belong to sciences have shown highest increase (83.75 %) in subscription prices followed by economics (67.22 %), management (47.09 %), computer science (43.27 %), generalia (36.84 %), social sciences (29.41 %), law (23 %) and arts and humanities (8.84 %). Subscription prices of statistical sources have shown negative trends as their prices are reduced by 1.05 %.

The CAGR for databases originated from other countries is 3.80 % before currency impact but rose to 9.25 % per annum after converting. Regarding various subjects (foreign databases only), science databases have the highest CAGR (12.64 %) followed by economics (10.28 %), social sciences (9.37 %), generalia (8.43), management (7.89 %), computer science (7.63 %), law (7.59 %), and lowest is arts and humanities (7.10 %). Therefore, it is suggested that the libraries should add an additional 5-7 % to the estimated price increases while preparing a budget.

Information should be considered as national resource there is an urgent need to set up a national consortium. Instead of subscribing bundle collection and try to be self-sufficient the libraries should subscribe only core titles and for auxiliary titles, they should get cooperation from other libraries. The libraries may adopt the policy to pay-for-per view transaction to reduce the expenditure. Another solution to the problem is to enter with publishers/ aggregators/vendors multi-year agreements in which price cap is fixed if the library agreed to renew the subscription of the database for years. The libraries need to discontinue the print run of the journals whose e-access is available. Use 'Just'-in-time' policy instead of 'Just-in-Case' to arrest the increasing trend of expenditure on electronic resources. Libraries must keep up to date with the ever evolving information landscape always on the hunt for reduced costs for accessing scholarly quality information. So far these free resources have been used to supplement and add value to the library's collection.

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