

Usage, Cost Analysis and ROI of E-Resources: A Case Study of Banaras Hindu University Library System

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Abstract

E-resources are very useful to all institutions and individuals to get instant, relevant, comprehensive information at doorsteps. Realizing the importance of the electronic resources, academic and research libraries provides services to access the e-content. The decision to acquire a particular product or service involves an examination of its costs and benefits to library customers. To assess the increasing prices of the electronic journals, it is obvious to compare journals with different amounts and quality of content, publishers, and subject matter. Since academic libraries are the nonprofit organizations, measuring the cost and benefit and performing the cost-benefit analysis in a not-for-profit environment can be even more difficult. The aim of this article is to perform the analytical study of usage, cost analysis and return on investment (ROI) in the digital environment of the Science Direct online database with special reference to the Banaras Hindu University Library System.

Keywords: Usage, Cost Analysis, Return on Investment (ROI), E-Resources

1. Introduction

E-resources are very useful to all institutions and individuals to get instant, relevant, comprehensive information at doorsteps. Realizing the importance of the electronic resources, academic and research libraries provides services to access the e-content. The growth of electronic journals and databases has both complicated and transformed the acquisition and servicing of library materials. The key issues for the management of electronic resources are evaluation, selection, acquisition, access, work procedure, pricing models, content management, user orientation programme, IPR issues, preservation and archiving etc. Librarians have to play their role effectively in selecting, evaluating and providing intelligent access to electronic information available on the web. Costs of providing the access to electronic

resources, services and products include direct monetary costs and indirect costs e.g. time. Svenningsen stated as electronic publishing affects not only the ways in which scholars conduct their research but also the selection process librarians utilize in acquiring these products. This impact creates new scenarios when examining budgetary considerations for selecting print or electronic media or in some cases several versions of the same resource.

Direct monetary costs and the indirect costs such as time are the associated costs of the library services and products. The decision to acquire a particular product or service involves an examination of its costs and benefits to library customers. To assess the increasing prices of the electronic journals, it is obvious to compare journals with different quantity and quality of content, publishers, and subject matter. Indirect costs includes the time, intangible costs i.e. paper, ink or cartridge, hardware, costs for training and materials, or any other factors which can be added to the cost of providing a service or product.



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Since academic libraries are the nonprofit organizations, measuring the cost and benefit and performing the cost-benefit analysis in a not-for-profit environment can be even more difficult. As a part of the study, it is decided to examine the three years science direct online database downloads and subject wise downloads of the articles are used for the study. This article describes the analytical study of usage, cost analysis and return on investment (RIO) in the digital environment of the Science Direct online database in the Banaras Hindu University Library System.

1.1 Concept of Cost Analysis

Wikihow defined cost analysis (also called cost-benefit analysis or CBA) as a detailed outline of the potential risks and gains of a projected venture. Many factors are involved, including some abstract considerations, making the creation of a CBA more of an art than a science, though a quantitative mindset is still a must-have. A CBA is useful for making many types of business and personal decisions, especially ones with a potential for profit^[3]. Cost analysis constitutes analysis of benefits or potential benefits, of offering a product or service and comparing them to the costs of offering that product or service. Encyclopedic Dictionary of Accounting & Finance defines cost-benefit analysis as an analysis to determine whether the favorable results of an alternative are sufficient to justify the cost of taking the alternative. Cost-benefit analysis attempts to decide whether the result justifies the expense. Benefits are typically defined in terms of an organization being better off and, ideally, cost should be measured in the same terms.

Cost analysis (CA) can be simply defined as the methodology in which all potential gains and losses from a proposal are identified, converted into monetary units, and compared on the basis of decision rules to determine if the proposal is desirable. The

results of the studies of cost analysis can be used to justify budgets and acquisition and to provide insight into the true costs of providing library services. It means that cost analysis can be used as a measure that helps to determine how the benefits of a product or service compare to its costs.

Cost analysis of electronic resources is important to consider users and their demand for a particular e-resource. The advantages of the cost analysis of e-resources includes assessment of quality, benchmarking, strategic planning, expenditure on e-content, savings as a result of consortium purchase, reasons for asking additional budget, status of the downloads, and for reporting purpose to compare with others, etc.

1.2 Concept of ROI

White and Crawford (1998) defined ROI, i.e. Return on Investment as the amount of profit, or return, a product or service provides and compares this figure to its cost. ROI can be defined as a quantitative measure represented as a ratio of the value returned to the institution for each monetary unit invested in the library, i.e. for every 'spent on the library, the institution received' in return. According to Investopedia, ROI can be defined as a performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. ROI can be calculated as the benefit (return) of an investment is divided by the cost of the investment; the result is expressed as a percentage or a ratio. The return on investment formula:

$$\text{ROI} = (\text{Gain from Investment} - \text{Cost of Investment}) / \text{Cost of Investment}$$

In the above formula "gains from investment", refers to the proceeds obtained from selling the investment of interest. Return on investment is a very popular metric because of its versatility and simplic-

ity. That is, if an investment does not have a positive ROI, or if there are other opportunities with a higher ROI, then the investment should not be undertaken.

2. Objective of the Study

The investigation was carried out with following objectives:

1. To assess the Science Direct Database and its services
2. To assess the usefulness of the Science Direct Database subscribed by BHU
3. To Evaluate the Subject wise usage of the Database.
4. To measure the usability of the database against the subscription fee paid by BHU.
5. To analyse the cost per download and return on investment

3. Methodology:

While adopting a statistical method effort was made to realize the objective by collecting the usage data from Elsevier to analyse the subject collection wise distribution of usage, subject wise distribution of the usage, cost and return on investment for the last five years. Statistical Tabulation and graphical representation of the usage are applied for the analysis of the data.

4. Limitations

This study is limited to the analysis of services offered and usage of the e-resources provided through Science Direct database by the BHU Library System to the students, research scholars and faculties of the university. The data for usage analysis of the database from 2010 to 2014 (5 Years) is requested and collected from the Elsevier. Analysis of cost and ROI is done only for the 13 subject's collections subscribed through Elsevier-BHU Science Direct Agreement from 2012 to 2014.

5. Literature Review

Griffiths and King (1983) discussed CBA as Cost and benefits should be described in terms of the unfavorable (i.e. costs) and favorable (i.e. benefits) outcomes of input and output and consequences such as effectiveness. Thus, cost and benefits are expressed in terms of input expenditures and other resources, and output results in terms of performance attributes, and effectiveness where benefits includes a component, activity, service or product, function of the library. While Cummins, 1989 correlated the CBA to decision making process and stated that cost-benefit analysis is not an attempt to convert decision making into a formula, but it does provide a framework for decision making. This analysis creates a method of listing and quantifying the pros and cons of a problem or opportunity in order to weigh the importance of each. As a tool for better fiscal control, it supplements but does not replace judgment or political acumen. Mick (1979) while studying Cost Analysis of Information Systems and Services" described four types of the cost analysis which are:

1. Study a function or service,
2. Study that look at the organization,
3. Study that examine the structure within which the library is located (university, town, or corporation), and
4. Study that compare costs across similar types of libraries .

White and Crawford (1998) discussed three models for the calculation of cost benefit analysis which are return on investment (ROI), present value analysis, or payback period. ROI models can be used to determine the amount of profit, or return, a product or service provides and compares this figure to its cost. Present value analysis models can be used to

compare the cost of the product or service to its future estimated annual rate of return while pay-back period models look at how long it will take before the profit or return pays for the cost of the product or service, and compares this time period to the estimated life of the product or service. Coyle (2006) described that there are many different things that ROI can measure, mainly because you can define "investment" and "return" to suit your situation. White, L. N. (2007) discussed ROI (as an assessment or valuation tool) is a valuable asset for the library to possess in addressing customer accountability inquiries. Applying ROI in potentially new applications within the library organization would provide library administrators with a wider scope and effectiveness to report their organization's activities in terms of performance/value/impact and a strategic competitive advantage in the knowledge economy.

Several studies have been done for the calculation of the ROI of the academic libraries in which the data for ROI calculations have been gathered through the user's response against the usability of the library services, viz. White and Crawford (1998), Griffiths and King (1983), Coyle (2006), Mezick (2007), Sidorko (2010), Tenopir and King (2000), Aabø (2009), etc. Few studies have also been made by gathering the data of no. of downloads per year and its usage analysis, viz. White and Crawford (1998), Mick, Colin (1979), Coyle (2006), Holmström (2004). It is quite difficult to measure the return on investment on the electronic environment of the non-for-profit organizations like academic libraries in Indian perspective due to lack of the tool to measure the tangible costs and hidden costs. Holmström (2004) proposed that the number of article downloaded from e-journals can be considered for the return of the investment in case of the electronic resources while according to Vij and Soni (2011), The ROI (Return on Investment) of a institution is mea-

sured in terms of the increased usage, usability of the costly information products which is ultimately reflected in the scientific productivity of the host institute. The present study is analysis of return of investment on the basis of usage and cost analysis of the usage via cost per downloads.

6. Science Direct Database

Elsevier Science Direct is the world's largest full text database in the field of scientific, technical and medical (STM) information. It covers more than 12 million journal articles and book chapters from nearly 2,500 peer-reviewed journals and more than 30,000 authoritative books including reference works, handbooks, book series and e-books of 24 subjects in 4 major subject categories, viz. Physical Sciences, Life Sciences, Health Sciences, and Social Sciences. It provides more than 1900 open access articles from more than 290 open access journals for everyone to access immediately upon publication in four major subject categories of Physical sciences and engineering, life sciences, health sciences, and Social sciences and humanities.

The special features of the Science Direct Database are as follows:

- ▶▶ Unlimited Access
- ▶▶ Free Access to abstracts
- ▶▶ 3 formats of articles (e.g. Summary Plus, HTML, and PDF)
- ▶▶ Personalized access option
- ▶▶ Powerful Search and Browse functionality
- ▶▶ E-mail Alert
- ▶▶ Cross linking
- ▶▶ Article in Press

6.1 Access of Science Direct Database at BHU Library System

Before 2012, Banaras Hindu University Library System subscribed the Science Direct Freedom

Table1. Science Direct Subject Collections in BHU (2014)

Science Direct Subject Collections in Banaras Hindu University (2014)

S. No.	Access through 2014 Elsevier-BHU Science Direct Agreement	Access through 2014 Elsevier- UGC-INFLIBNET Science Direct Agreement
1.	Business, Management and Accounting	Agricultural and Biological Sciences
2.	Chemical Engineering	Biochemistry, Genetics and Molecular Biology
3.	Decision Sciences	Chemistry
4.	Earth and Planetary Sciences	Computer Science
5.	Energy	Economics, Econometrics and Finance
6.	Engineering	Immunology and Microbiology
7.	Environmental Science	Mathematics
8.	Materials Science	Physics and Astronomy
9.	Medicine and Dentistry	Psychology
10.	Neuroscience	Social Sciences
11.	Nursing and Health Professions	
12.	Pharmacology, Toxicology and Pharmaceutical Science	
13.	Veterinary Science and Veterinary Medicine	

Collection which covers 23 subjects. After 2012, 10 subjects database is provided to BHU Library system by the Elsevier and UGC-INFLIBNET Science Direct Agreement, while BHU Library System subscribed and paid to access other 13 subjects collection database as per special pricing negotiated between Elsevier and BHU Science Direct Agreement. Above table shows that Elsevier Science Direct offers total of 23 Subjects collection to the BHU users. 10 subject's collections subscribed through 2014 under Elsevier -UGC-INFLIBNET Science Direct Agreement while 13 subject's collections subscribed

through 2014 Elsevier-BHU Science Direct Agreement.

7. Usage Analysis

Science Direct Database provides the 24 subjects database under 4 major subject categories of physical sciences and engineering, life sciences, health sciences and social sciences. Out of 24 subjects, 13 subject's collection is subscribed by BHU under Elsevier-BHU Science Direct Agreement. The usage data for full text downloads of 5 years (2010-2014) is collected by the Science Direct for the study.

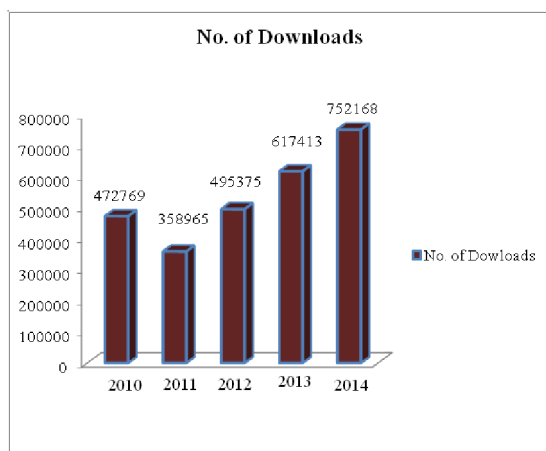


Figure 1: Year Wise Usage of the Science Direct Database

The above figure 1 clearly shows the graphical representation the year wise distribution of usage of full text Science Direct articles. It is clear from the figure that the highest utilization of the database is done in the year 2014 followed by 2013 while the lowest utilization of the database is done in 2011 followed by 2010.

Table 2: Year wise % growth in Usage

Year	No. of Downloads	% Growth
2010	472769	—
2011	358965	-24.07%
2012	495375	38.00%
2013	617413	24.63%
2014	752168	21.82%

Table 2 reveals the year wise successive growth within consecutive years in the usage of Science Direct database. Due to interruption in the service during the year 2011, the low usage is clearly seen while the enhancement in the facilities and services leads an average growth of 28.15 % during 2012 to 2014. The

average growth in last five years in the usage of Science Direct database is 15%. It shows that the whole 23 subject collections of science Direct is very useful to the users of the BHU.

Table 3: Subject Vs Year Wise Usage of Science Direct

S. No.	Subjects Accessed through Elsevier-BHU Science Direct Agreement	2012	2013	2014
1.	Business Management, etc.	2,068	2,776	3,545
2.	Chemical Engineering	31,022	42,155	57,305
3.	Decision Sciences	7,932	4,666	7,439
4.	Earth and Planetary Sciences	14,142	24,024	25,802
5.	Energy	16,019	23,214	34,887
6.	Engineering	32,895	37,651	48,857
7.	Environmental Science	30,536	46,453	57,896
8.	Materials Science	56,611	62,825	78,645
9.	Medicine and Dentistry	32,821	37,443	45,464
10.	Neuroscience	11,785	16,538	18,643
11.	Nursing and Health Professions	1,306	1,223	1,812
12.	Pharmacology, toxicology, etc.	30,900	33,968	40,842
13.	Veterinary Science	3,693	4,609	4,167
Total		271,730	337,545	425,304

Table 3 represents the subject wise distribution of the number of downloads in the year 2012-2014.

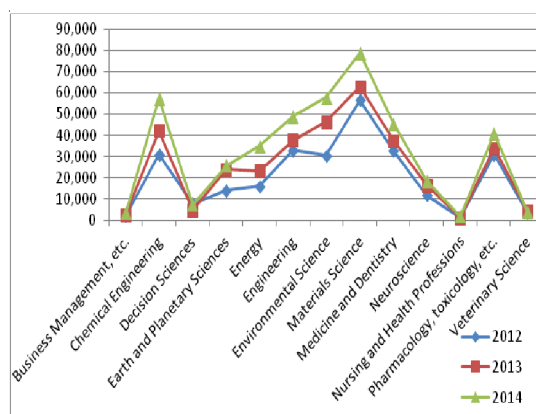


Figure 2: Graphical Representation of Subject Wise Downloads

Figure 2 is the graphical representation of the subject wise distribution of usage of the Science Direct Database in the year 2012 to 2014. It reveals the growth in the usage of the database in all subjects in every year. Material Science is the subject area in which remarkable growth in the usage of the database is found while Nursing and Health Science have the least usage. The year wise comparison reveals that there is an increasing tendency in the usage of the database in every subject in all consecutive years. It is clearly revealed that there is continuous increase in usage of the Science Direct Database of the 13 subject collection which is subscribed through *Elsevier-BHU Science Direct Agreement*.

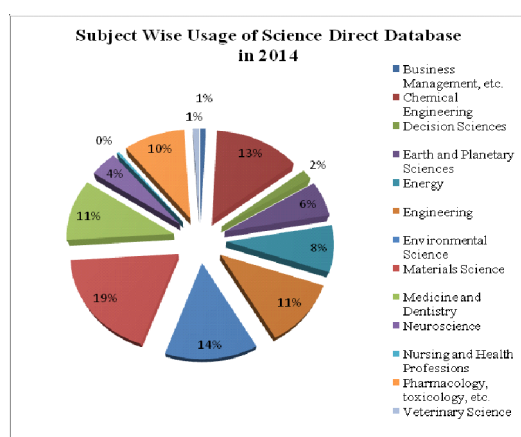


Figure 3: Subject Wise Usage of Science Direct Database in 2014

The Figure 3 states that subject wise full text articles download in 2014. It reveals that Material Science, Environmental Science, Chemical Engineering, Engineering, and Medicine are the subject area of Science Direct literature which is mostly used by the users of BHU library system.

Table 4: Contribution of usage of subject collection subscribed by BHU

Year	No. of Downloads in 24 Subjects	No. of Downloads on 13 Subjects Collection Subscribed by BHU	(%)
2012	495375	271730	54.85%
2013	617413	337,545	54.67%
2014	752168	425,304	56.54%

Table 4 shows the usage break-down by 13 subject collections subscribed by BHU. It is evident that a significant contribution (55% in average) of the total usage of Science Direct was derived from 13 subject collections subscribed by BHU in every year. This usage statistics is an indicator of high preference of the Elsevier journals through Science Direct by the researchers of Banaras Hindu University.

8. Cost and ROI Analysis

The usage data for full text downloads of 5 years (2009-2014) is collected by the requests from the Science Direct for the study, out of which the usage data of 3 years including 2012, 2013 and 2014 is used for the cost analysis and return on investment analysis of downloads.

Table 5: Year Wise Cost Per Download

Access Period	Usage	Subscription Fee		Cost Per Download	
		USD	INR	USD	INR
2012	271730	91875.00	45,58,387.00	0.338	16.77
2013	337,545	115762.51	61,99,082.41	0.342	18.365
2014	425,304	122708.25	76,81,536.00	0.288	18.061

Table 5 shows the year wise cost per download in both USD and INR. This reveals that regardless of the continuous increase in the number of downloads in the successive years the cost per download varies according to the hike in the subscription fee. The lowest cost per download in INR is found in the year 2012 while it is highest in the year 2013. There is

slight decrease in the cost per download in USD in the successive years. This difference is found due to the increasing value of USD over INR. The decreasing cost per download in USD explores the increase in the return on investment because whether there is increase in the number of downloads, the cost of download will decrease and the return on the investment increases. This shows that the return on investment (ROI) on the e-resources of Science Direct is positive in the case BHU Library System. The 13 subject collection of Science Direct subscribed by BHU under *Elsevier-BHU Agreement* is quite useful and significant for the users and can be continued in future.

9. Conclusion

The significance of the quantitative metrics, i.e. transaction log data generated from publishers/aggregators servers, lies in interpreting what the user actually does, and how they do. This factual data reflects the real use of the database as per page views, table of contents, abstracts, articles and related articles, etc. though it does not reveal the utilization of content in their academic work or purpose^[19]. The usage data can be appropriately analyzed in all aspects to establish the usefulness of the databases and also to know the users approach to information in university environment. Since libraries are not for profit organization and used in similar ways worldwide for study and research, the analysis of library values, products, and the services may be useful to the decision makers.

Results of the study suggest that Science Direct e-journals have a significant degree of usage by the users of BHU Library System. However, the calculation of the cost per download and return on investment on this basis may be effective in assessing the subscription of electronic information resources

while more discrete analysis will provide the locally useful information for collection development and research output of the subject. In order to accurately assessing of e-journals, however, our cost model should provide some visibility for annual "administrative", "access", or "platform" fees charged by vendors like Science Direct.

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