

E-Resources: Trends and its Use in the Libraries of Tata Institute of Fundamental Research

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Abstract - During the early 21st century, the developments in library automation and the internet have made its impact on library operations and information access in majority of the libraries across the globe. The technology has profound effect on academic institutions and has enabled users to access library resources from any location. It has enabled and led the libraries in transformation of its services from traditional to new services and also delivery models, incorporating various electronic resources. User demands are major driving force in collection development. Information users are no longer solely reliant upon physical storehouses of information and therefore, libraries must look into subscribing to e-resources such as e-journals, e-books and databases. In order to meet the changing needs of the users, libraries continue to use new technologies and offer services in innovative ways. Hence, an attempt has been made in this paper to explore some of these new and emerging technological and service paradigms in the use of electronic resources in TIFR Libraries.

Keywords: Electronic Information Resources, E-Resources, TIFR, Digital Library

I. INTRODUCTION

With the advent of information and communication technology during the turn of 21st century, the library automation and the internet have made its impact on library operations and information access. The library functions and services have changed with the applications and usage of computers. Consequently, libraries have seen a major shift in their collection development and services during last couple of decades. As technology gets more and more sophisticated and affordable, the range of services provided

to its users have increased accordingly. For example, these recent technological developments and its applications in the libraries have brought many changes in terms of format and mode of access to the library resources and services. With the transition from print resources to electronic form of information, users have been provided with new tools and applications for information seeking and retrieval. During the past decade, many libraries have witnessed a steady increase in the usage of electronic resources.

The digital revolution is an impacting process and generates products throughout. The ability to transfer data rapidly to multiple locations, in multiple formats, has provided an unprecedented opportunity for the transmission of information and they are valuable resources for the users. An increase in electronic information has resulted in libraries and other information centers to embrace the digital collections to provide related services to library users (Tenopir, 2003).

The libraries are becoming more engaged in the creation, dissemination and use of information and they are essentially collaborating with the other institutes in these activities. The technological developments in libraries facilitated the sharing of resources and engage in new cooperative activities. However, the availability of networked information resources encouraged libraries to setup library consortia to provide more and varied electronic resources. So, the emergence of various consortia's has really contributed to the usage of e-resources in a network environment.

A. E-Resources in TIFR Libraries

The Tata Institute of Fundamental Research is a National Centre of the Government of India, under the umbrella of the Department of Atomic Energy, as well as a deemed University awarding degrees for master's and doctoral programs. Tata Institute of Fundamental research was established in 1945. TIFR is a premier research institute for basic sciences. Immediately after its founding in 1945, the institute began with a small library to facilitate the needs of researchers. TIFR gradually started its expansion in various research areas like astronomy & astrophysics, molecular biology and computer sciences. Along with its growth, the library also started growing in the pace of its expansion in research activities. TIFR - an institution of national and international repute has subscribed large content of e-resources and as a benchmark, it becomes essential to understand and evaluate the usage of e-resources among scientists and students of TIFR and various centers of TIFR namely - National Centre for Biological Sciences, Bangalore, National Centre for Radio Astrophysics, Pune, Homi Bhabah Centre for Science Education, Mumbai and Centre for Applicable Mathematics, Bangalore.

Along with the developments in modern information technology, the libraries of TIFR started using them in its activities and services to provide resources electronically. The libraries have positively responded to major changes in the nature of their collections and user demands. The number of electronic journals and full-text databases held by these libraries has grown rapidly. And there is a gradual growth in e-book collections. Managing these electronic resources involves providing the library users with convenient and simple ways to find and access them. Libraries subscribe to electronic content in a number of different ways like package subscriptions that include many electronic journals and individual title subscriptions independently to their centers. Also, there have been a large number of e-resources provided under the consortium subscriptions such as DAE Consortium, FORSA consortium, TIFR Libraries' consortium and UGC-Infonet Digital Library consortium.

II. REVIEW OF LITERATURE

The importance and wide ranging scope of electronic resources in research activities in academic institutions is highlighted majorly. The literature review shows that, number of relevant studies have been carried out on the use of electronic resources by the scientists and research scholars. Overall, the opinion towards the use of electronic resources has been positive and users are comfortable using these resources.

Hawkins (2000) emphasizes that the library of the future will have mission of helping users discover what relevant information exists anywhere in the world and in variety of formats and media. Singh (2009), states that information and communication technologies have brought tremendous change in nature, boundaries and structure of information.

Madhusudan (2008) carried out a study on use of electronic resources by the teachers and students of universities. The findings were majority of the respondents felt that the use of UGC-Infonet e-journals have created high dependency value on their research activities and they need more services of on e-medium.

Growing number of users are accessing library collections online, librarians are working to develop an integrated approach to providing access to e-resources that facilitates retrieval of required information. A library website can function as an information gateway and an entry point to a range of online resources (Johnson, 2008).

User's reliance on the web and online resources continues to rise at a rapid pace. Recent studies confirm that usage patterns among the users are shifting and preference of using online resources is becoming more predominant (PIALP, 2002). The e-resource has gradually become a major resource in every academic library. The emergence of e-resources has tremendously transformed information handling and management in academic environment (Shuling & Wu, 2007). Through the use of e-resources, users now have access to global information resources (Ellis & Oldman, 2005).

In EPIC Faculty Survey (2003), the finding revealed that the most faculty members do not have an overwhelming preference for print or electronic resources. Rather, their preference varies on a case by case basis depending on the type of information they are looking for and the way they are going to use the resources, Print resources are preferred when the material is a book or long article, it is something they need to read in-depth. Electronic resources are preferred when using materials that are short in length, searching or browsing for information, for current materials, and when using data or graphics that can be downloaded and manipulated. The respondents in this survey who prefer print, the main reasons were the ease of handling and reading print. Other reasons included the ability to write on print, ability to browse, ease of saving print for future use, and ease of evaluating the reliability of print resources. Another set of respondents who prefer electronic resources, the main reasons were the ease of access and use, saving time and space, and the ability to access information from anywhere. The study also, shows that the senior professors were statistically more likely to prefer print resources than their junior colleagues. This may be due to their history of using print resources whereas junior faculty may be more familiar with electronic resources.

Another study by Tenopir (2003) revealed that both faculty and students use and like e-resources and most readily adopt them if they are perceived to be convenient, relevant and time saving to their usual workflow. She further recommends that academic and research institutions should take advantage of these resources so that they can benefit from such a fortune that improves and facilitates the access to good quality and reliable information resources.

A study conducted by Baruchson-Arbib and Bronstein (2007) on the use of resources by 136 Jewish scholars in Israel. These scholars have adopted and integrated into their work practices new information technologies that can advance and facilitate their research along with the available print resources. Electronic information sources and newly developed information technologies have great potential to further research; it would be a profitable approach for libraries to design information services and sources that support the research practices and the information retrieval habits of scholars.

Toms and O'Brien (2008) observed a significant change among the users to use electronic sources. It was found that web search engines were used as regularly as library catalogs and finding aids for locating both secondary and primary resources.

Natarajan (2012) describes about e-resources and their different types. The information seeking behavior of students, researchers and faculty in the e-environment is discussed. The role of library professionals in making the e-resources available to different types of user community is discussed in detail. It has been concluded that e-resources helps for anytime availability and easy to access, which helps for the researchers to carry out the research on time.

The study by Rupp-Serrano and Robbins (2013) explores the information-seeking behavior of academic education faculty from twenty large public research universities. The investigation includes an examination of how frequently education faculty seeks or access information, how they stay up-to-date on current developments in the field. The study highlights about electronic sources. The faculty emphasizes the importance of electronic access to scholarly journals and library databases and the continuing value of books, both print and electronic, for meeting the information and research needs.

In the opinion of Dai *et al* (2000), there is need for library consortium that will ensure collective acquisition of e-resources. The consortium arrangements made it possible for users to access and download required resources without even going through the process of inter-library lending.

III. PURPOSE OF THE STUDY

The purpose of the study is to:

- a. Examine the use of e-resources by the users.
- b. Identify the purposes of using e-resources by the academics.
- c. Find out the preferred medium of accessing e-resources.
- d. Identify factors that hinder usage of e-resources by the academics.
- e. Ascertain their level of satisfaction with e-resources.
- f. Determine the perceived impact of e-resources on teaching and research.

IV. METHODOLOGY

The purpose of the study was to analyze the use of e-resource, purposes of using e-resource, medium of accessing e-resources, impact of e-resources on academic and research activities, level of satisfaction and problems while using e-resource by the members of the Tata Institute of Fundamental Research (TIFR), Mumbai and the National Centre for Biological Sciences (NCBS), Bangalore where the major developments in the use of e-resource have taken place.

The study used academic members viz, faculties, research scholars and staff members of the institutes viz, scientific/technical & administrative of these two institutes as a sample population for the study. In this connection, survey was conducted to collect the information regarding the use of e-resources. A questionnaire pertaining to the awareness and use of e-resources was distributed among 200 members of faculty, research scholars and staff of these two institutes. Personal observation and interview were considered in addition to questionnaire to collect the required information.

V. ANALYSIS AND FINDINGS

The study targeted 200 members to fill the self administered questionnaire. However, as targeted 200 respondents responded, 100 % feedback was obtained. The data received from these responses were analyzed to understand the use of e-resources.

TABLE I POPULATION/DEMOGRAPHIC STUDY

Gender	Respondents
Male	138
Female	62
Age Group	
18-29	87
30-39	45
40-49	36
50 and above	32

N=200

This is a personal profile section of the respondents. The distribution of gender-wise and age wise respondents is shown in this table. Out of the 200 respondents 69% (138) of respondents are males and 31% (62) of respondents are females. The data indicates that majority of the respondents i.e. 43.5% (87) belong to the age group of 18-29 years, who

are mostly the research scholars. 22.5% (45) are between the age group of 30-39 years, 18% (36) are in the age group of 40-49 years and the age of 50 years and above are 16% (32).

TABLE II DISTRIBUTION OF RESPONDENTS BY USER CATEGORY

User Category	No. of Respondents	Percentage
Faculty	50	100%
Research Scholars	100	100%
Staff (Scientific/Technical/Admin)	50	100%

N=200

The study divided the users in to three categories as shown in the Table II. This table show that out of total 200 respondents, 100 respondents are from the user category of research scholars which includes senior & junior research students and 50 of the respondents belonged to the faculty comprising senior professors, associate professors, assistant professors and readers. Staff members include scientific, technical and administrative accounting to 50 respondents.

TABLE III AWARENESS OF E-RESOURCES

User category	Aware	Not aware
Faculty	50 (100%)	-
Research Scholars	100 (100%)	-
Staff	48 (96%)	2 (4%)
Total	200 (99%)	2 (1%)

N=200

Table III shows the awareness of e-resources among the various categories of respondents. All the respondents in the categories of faculty (100%) and research scholars (100%) are aware of e-resources. These two categories of respondents are the major set of users of e-resources. It is very interesting to note that only 2 respondents from the category of staff are not aware of e-resources which is 1% of respondents form all the categories. The results in this table clearly show the positive sign that the e-resources are widely known to many respondents.

TABLE IV PREFERRED MEDIUM OF RESOURCES

Medium of Resource	Faculty	Research Scholars	Staff	Total
E-Resource	35 (70%)	58 (58%)	2 (4%)	95 (47.5%)
Print Resources	12 (24%)	12 (12%)	43 (86%)	67 (33.5%)
Both	3 (6%)	30 (30%)	5 (10%)	38 (19%)
Total	50 (100%)	100 (100%)	50(100%)	200 (100%)

N=200

The analysis of data in Table IV shows that e-resources are preferred by majority of the faculty, i.e. 70%, followed by Research Scholars (58%). It is also seen that 30% of research scholars prefer both the media. While, among the staff, 86% prefer only print media. Since the institutes offer large number of their resources in the field of basic sciences and technology to fulfill the research mandate, the resources in general reading and reference are very minimal. Therefore responses from staff category indicates that they prefer print resources such as general magazines, general collection of books, reference sources, news papers, etc. than to e-resources for their general use. But as shown in previous table, these categories of respondents are very much aware of e-resources.

TABLE V FREQUENCY OF USE OF E-RESOURCES

Frequency	Faculty	Research Scholars	Staff
Regularly	35 (70%)	79 (79%)	1(2%)
Frequently	8 (16%)	12 (12%)	3 (6%)
Often	6 (12%)	7 (7%)	17 (34%)
Rarely	1 (2%)	2 (2%)	26 (52%)
Never	0	0	3 (6%)

N=200

It may be observed from the Table V that the majority of the faculty (70%) and research scholars (79%) use e-resources regularly for their research and study. It is also observed from the table that around one-third of the staff and half of the same use the e-resources often (34%) and rarely (52%). As has been stated earlier, the reason behind this less usage is the non-availability of the information in that they are interested on electronic medium.

TABLE VI LOCATION OF ACCESSING E-RESOURCES

Location	Faculty	Research Scholars	Staff	Total
Laboratory/Office	50 (100%)	93 (93%)	50 (100%)	193 (96.5%)
Library	20 (40%)	59 (59%)	15 (30%)	94 (47%)
Home	41 (82%)	30 (30%)	9 (18%)	80 (40%)
Other	-	3 (6%)	-	3 (1.5%)

N=200; Respondents allowed selecting multiple options.

This Table VI depicts the responses related to location of access to e-resources usage is influenced more by the location of access i.e. if the access can be obtained from home or office, users can access the e-resources at their leisure. Justifying this fact, it is seen from the table that all the respondents from the category of faculty and staff access e-resources from their office or laboratory and 93% of research scholars also access e-resources from the laboratory. Respondents using the library for accessing e-resources are less, compared to office

or laboratory. This is due to the availability of e-resources on campus network which is IP authenticated and users have feasibility and flexibility to access e-resources from their convenient location and time.

With the advancement of information and communication technology and network, majority of the libraries provide uninterrupted, 24/7 and round the year access to e-resources to its users. Users have privileges to access the e-resources at their convenience. Personal visit to the library has significantly reduced after the emergence of electronic information resources. The users feel that technologies have made access to information very much easier. Only a very small number of respondents (3) access the e-resources from other location such as browsing centre.

TABLE VII PREFERRED SEARCH AND RETRIEVAL FIELDS

Search Fields	Faculty	Research Scholars	Staff	Total
Keywords	39 (78%)	75 (75%)	40 (80%)	154 (77%)
Title	32 (64%)	65 (65%)	25 (50%)	122 (61%)
Author	36 (72%)	70 (70%)	3 (6%)	109 (54.5%)
Any other (eg. Phrase)	22 (44%)	72 (72%)	3 (6%)	92 (48.5%)

N=200; Respondents allowed selecting multiple options

On analyzing the preferred field majority of all the categories of the respondents use keywords for search, followed by author field in case of faculty (72%) and any other amongst the research scholar (72%). While half of the respondents from the staff category also search using the title (50%).

TABLE VIII TYPES OF E-RESOURCE MOST FREQUENTLY USED

E-Resources	Faculty	Research Scholars	Staff	Total
Abstracting & Indexing	40 (80%)	86 (86%)	3 (6%)	129 (64.5%)
Full text databases	46 (92%)	96 (96%)	4 (8%)	146 (73%)
Electronic journals	48 (96%)	97 (97%)	3 (6%)	148 (74%)
Electronic books	47 (94%)	96 (96%)	4 (8%)	147 (73.5%)
Online catalog	30 (60%)	79 (79%)	10 (20%)	119 (59.5%)
Online reference works	41(82%)	65 (65%)	35 (70%)	141 (70.5%)
Internet browsing	46 (92%)	95 (95%)	48 (96%)	189 (94.5%)
Electronic mails	48 (96%)	85 (85%)	49 (98%)	182 (91%)
Websites/Home Pages	39 (78%)	59 (59%)	40 (80%)	138 (69%)
Blogs	16 (32%)	45 (45%)	39 (78%)	100 (50%)
Portals	20 (40%)	53 (53%)	18 (36%)	91 (45.5%)

N=200; Respondents allowed selecting multiple options

It is observed from the table that amongst the faculty, although all the e-resources are used, more than 90% of the faculty uses Electronic journals (96%), Electronic Mail (96%), Electronic Books (94%), Full Text database (92%) and Internet (92%). As regards the research scholars, it is seen that the same e-resources, except the electronic mail are used by more than 95%. Majority of the third category,

i.e. Staff, who do not need technical information, use E-Mail (98%), Internet (96%), Websites/Homepages (80%) and Blogs (78%).

Analysis of all the consolidated responses on frequently used e-resources reveal that almost all types of resources are most widely used by the respondents on day-today basis based on their need of information and availability of information from a particular or various types of resources.

However, the impact of e-resources has changed the trend in research and academic activities. The availability of wider range and various types' information has enabled the scientist in maximum exploitation of e-resources along with number of advantages such as easy accessibility, time saving and instant access.

TABLE IX PROBLEMS ASSOCIATED WITH THE EFFECTIVE USE OF E-RESOURCES

Issues	Faculty	Research Scholars	Staff	Total
Pay & Access	47 (94%)	82 (82%)	3 (6%)	132 (66%)
Username password	24 (48%)	35 (35%)	4 (8%)	63 (31.5%)
Network speed	18 (36%)	8 (8%)	11 (22%)	37 (18.5%)
Information overloaded	5 (10%)	3 (3%)	-	8 (4%)
Storage	6 (12%)	2 (2%)	-	8 (4%)
Format of the file	2 (4%)	6 (6%)	-	8 (4%)

N=200: Respondents allowed selecting multiple options.

Table IX depicts the data regarding the problems in the effective use of e-resources of all the problems, the one which ranks high amongst faculty (94%) and research scholars (82%) pay and access, followed by user name and password (Faculty 48%); (Research Scholars 35%). Network Speed has also been identified as a problem by nearly one-third of the faculty (36%), nearly one-fourth of the staff (22%) and very meager percentage of the Research Scholars (8%).

TABLE X SATISFACTORY LEVEL OF USE OF E-RESOURCES

Satisfactory level	Faculty	Research Scholars	Staff	Total
Highly satisfied	35 (70%)	57 (57%)	-	92 (46%)
Satisfied	13 (26%)	17 (17%)	13 (26%)	43 (21.5%)
Neutral	2 (4%)	26 (26%)	37 (74%)	65 (32.5%)
Dissatisfied	-	-	-	-
Highly dissatisfied	-	-	-	-

N=200

To determine the satisfactory level of use of e-resources, the respondents were asked to rate their opinion. It is observed from the Table X that majority of the respondents from the category of Faculty (70%) and Research Scholars

(26%) are highly satisfied and satisfied (Faculty 26%) and (Research Scholar 8.5%) with e-resources. At the same time, it is also observed that nearly three-fourth of the staff (74%) and one-fourth of the Research Scholars (26%) are neutral with neither satisfaction nor dissatisfaction with e-resources. At the same time, none of the respondents have expressed dissatisfaction with e-resources.

It is obvious that an appreciable number of e-resources are made available to the users, yet it is required to make available more e-resources to meet the needs of users in particular research scholars. In case of respondents from staff category, the use of e-resources in particular is minimum and rarely.

TABLE XI IMPACT OF ELECTRONIC ACCESS TO INFORMATION ON STUDY/ RESEARCH ACTIVITIES

Impact	Faculty	Research Scholars	Staff	Total
Strongly agree	23 (46%)	26 (26%)	-	49 (24.5%)
Agree	19 (38%)	38 (38%)	9 (18%)	66 (33%)
Neutral	6 (12%)	36 (36%)	41 (82%)	83 (41.5%)
Disagree	2 (4%)	-	-	2 (1%)
Strongly disagree	-	-	-	-

N=200

The data regarding the impact of electronic access to information on study and research activities have been presented in this table XI. It can be seen that majority of faculty (46%) strongly agree and 38% agree; research scholars 26% strongly agree and 38% agree that e-resources have led an impact on their research activities. While majority of the staff (82%) are neutral to the impact of e-resources on their activities.

VI. DISCUSSION OF FINDINGS

The results of the study on the trend and use of e-resource by members of TIFR and NCBS offer significant information. Majority of the respondents regularly use the internet and they are aware of e-resources. However, the preference of e-resources over print is concerned, the study results shows that the respondents in the category of faculty and research scholars prefer e-resources. Respondents' frequency of use of e-resources is high among the faculty and research scholars. Significantly, the respondents of other category prefer to use print resources and they often use e-resources.

Personal visit to the library has significantly reduced after the emergence of electronic information resources. As this

study revealed, majority of the respondents access e-resources from their laboratories & office and at home. This shows that the location is not an issue while accessing various electronic information resources and the facility of information and communication technology has made it possible. The internet browsing, full-text databases, electronic journals, electronic books, emails and online reference materials are most frequently used e-resources. Although, the respondents, some extent depend on print resources for their research and study activities.

One of the notable findings from the study is that the respondents are highly satisfied with the e-resources. But still libraries need to provide and make available more number of e-resources to meet the growing needs of users. The problems which are faced by the respondents while retrieving and accessing e-resources such as pay & use, and requirement of username password are most common issues in accessing the e-resources.

However, the impact of e-resources has changed the trend in research and study. The availability of wide range electronic information resources enabled the respondents to work better in the field of their study and research. Therefore, e-resources provide many advantages such as easy access, from any location, time saving, convenience of format, etc.

VII. CONCLUSION AND RECOMMENDATIONS

With the advancement in information and communication technology, the internet and emergence of electronic resources have made its impact on information access and retrieval. During last couple of decades, libraries have seen a major shift in their collection development and services. These recent technological developments and its applications in the libraries have brought many changes in terms of format and mode of access to the library resources. The transition from print resources to electronic form of information, users have been provided with new tools and applications for information seeking and retrieval. To retrieve relevant information, users need to make use of various electronic information sources for their study and research.

The results of this study revealed that the use of e-resources has made a significant impact upon members of these institutes in their research and study. E-resources offer every convenience to access up to date and current information. Members use these resources and they are best utilized by the faculty and research scholars as indicated from

the above results from this study. Majority of the respondents are very satisfied with electronic resources also they would like to prefer using print resources some extent. However, the preference for the e-resources is related to the discipline and age of the respondents and is higher among faculty and research scholars also, among the younger generation of users. E-resources have significantly impacted respondents in their academic activities. The study also reveals, all the respondents are aware of existence and availability of various e-resources like abstracting & indexing databases, full-text databases, e-journals, e-books, online reference works, internet, e-mail, etc. Respondents face not many issues while accessing these resources. To conclude this, the e-resources and the technology have changed the method of research, access and retrieval of information, its storage, format, and most importantly communication of scholarly information.

Based on the findings of this study, the following recommendations are put forwarded.

1. There is clear indication from this study that both the institute libraries should increase the number of full text e-resources by procurement and subscriptions in all the subject areas and in particular, include substantial number of e-resource for the general category users like staff members.
2. Studies should be conducted more frequently to find out the changes in use pattern as the technology is becoming more and more sophisticated and the e-resources are increasing day-by- day in every discipline.
3. The libraries need to frequently update their list of e-resources, provide link from the library website so the users can make use of library website more frequently.
4. Conduct user orientations on use of e-resources and databases regularly so that every category of user can make use of e-resources.

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