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Awareness and Use of E-journals by the Scientists of CSIR-Institute of Genomics and Integrative Biology (IGIB), Delhi, and Indian Institute of Chemical Biology (IICB), Kolkata, India: A Comparative Study

Jamal Qasim
Integral University, Lucknow, India, jqasim2003@yahoo.com

Abdul Mannan Khan
Integral University, abdulk78612@gmail.com

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Abstract

The purpose of this paper is to compare the level of awareness and use of e-journals by the scientists of Institute of Genomics and Integrative Biology (IGIB), Delhi and Indian Institute of Chemical Biology (IICB), Kolkata, India- both centre of excellence in their field of research and premier Institutes of 39 laboratories of Council of Scientific and Industrial Research (CSIR) - India's largest research and development organization. The paper is based on the results of a well structured questionnaire administered to all the scientists of the two under study institutes for the purpose of data collection supplemented by interview and observation methods. The main findings are that 100% of scientists at CSIR-IGIB and CSIR-IICB are using e-journals for their research and development activities and for updating their knowledge from their campus cabin mostly. The study reveals that there are significant differences observed in frequency of visiting and using library, features liked most, and search strategies employed by the scientists at the under study libraries. But, similarity is found in use of open access e-journals, purpose of use, method of reading, and format of reading e-journals. CSIR-IGIB library has better infrastructure and its scientists are more satisfied with infrastructure in terms of highest computing facility, number of terminals, internet connections, printers, e-resources provided by the library for accessing e-journals. Scientists at CSIR-IICB, Kolkata face more hindrances in using e-journals. No facility is available for searching desired article from back volume at both under study libraries. A substantial portion of the scientists are not aware of specialized services like Selective Dissemination Services (SDI), Current Awareness Services (CAS) at both under study libraries. Least use of Boolean Operators at select libraries is common searching point that shows weakness in terms of technical knowledge on behalf of the users and necessitates user training program. The present study consists only of scientists of the two institutes i.e. CSIR-IGIB and CSIR-IICB and the geographical area is restricted to CSIR-IGIB, Delhi and CSIR-IICB, Kolkata. The scope of the paper can be extended to additional CSIR and R&D libraries. A comparative study can also be made amongst other biological research libraries of similar status at global level.

There are a number of studies on the use of e-journals by CSIR scientists, but this is the first of its kind which compares scientists of CSIR-IGIB that has the largest computing facility (4 Tflop/s) in Asia outside Japan and CSIR-IICB, a premiere institute in biomedical research with the biggest library on biomedical sciences in the eastern zone of India. As such, it should pave the way for research and lead a model role for other CSIR Institutes as well as other R&D institutes at global level.

Keywords- E-journals, Users' Study, Research Libraries, Scientists, CSIR-IGIB library, CSIR-IICB library.

Introduction

Institute of Genomics and Integrative Biology (IGIB), formerly known as Center for Biochemical Technology was established in 1977 with the objectives to translate concepts developed in basic biological research to commercially viable technologies. Principal areas of R&D include Allergy and Infectious Diseases, Functional Genomics, Molecular Medicine, Genome Informatics, Pharmacogenomics, Proteomics, Structural Biology, Comparative Genomics, Gene Expression, Recombinant DNA products, Nucleic Acids, peptide Chemistry, Environmental Biotechnology. It is an institute, where scientists, physicians and academicians can interact, complimenting each other, and generate new knowledge, develop technologies, and extend them for the benefit of society. CSIR-IGIB has made many significant contributions to the Indian Science, and is globally acknowledged, in certain areas of specialization. The long list of research publications of high average impact factor and the patent portfolio are testimony to the scientific caliber of the 60+ member scientists team of this institute. The research activities of the institute are business driven, in this new era of Biology, with significant industrial collaborations, and knowledge alliances, on the anvil.

CSIR - IGIB has the largest computing facility (4 Tflop/s) in Asia outside Japan (Ranked 158th among the World's Top 500 Super Computers). It is the first CSIR Institute to market bioinformatics software based on in-house R&D and a member of the consortium of leading global players engaged in research related to functional genomics, involved in the Pan-Asian Initiative: Study Genetic Similarities and Diversities in Asia. It has successful track record of public-private partnership (PPPs) and Business Models and sequencing the first Indian human genome. New vistas in offing includes setting up bio-incubator facility for scientist entrepreneur and start-up companies to nurture ideas, concepts and provide a platform for commercialization of products / processes and partnering with leading agencies to provide Virtual Training Programs in bioinformatics

CSIR-IGIB opens a new chapter with the inauguration of its new wing at South Campus. The lush green campus spread over 10 acres, boasts of a 200,000 sq. ft. laboratory building and a 100 seater student hostel of international standards

Library and Documentation Division: CSIR-IGIB library has a core collection of books and subscribes to core 50 scientific peer reviewed foreign print journals and 4,000 online journals through direct subscription as well as CSIR e-journal consortium, NKRC. E-journal packages subscribed includes world renowned databases like American Chemical Society, Annual Reviews, ASTM Standards, Derwent Innovation Index, IEEE, Nature Publishing Group, Oxford University Press, Questel-Q-PAT, Royal Society of Chemistry, Taylor and Francis, Web of Science and Wiley-Blackwell etc as well as recent databases and web servers like Spinocerebellar Ataxia (Locus Specific Variation Data), FishMap Zv8 (Zebra fish Genome Browser), MassWiz (analysis of mass spectrometry data for proteomics), miRacle, Gene Decipher (package for predicting genes), DNA VacS (tool for codon optimization), QuadFinder, QuadBase etc.

The total budget of CSIR-IGIB for periodicals for the year 2013 is Rs. 7,000,000 which is only ¼th of total amount of subscription spent by the institute. The rest is paid by National Knowledge Resource Consortium (funded by Government of India). The Library uses Libsys Automation Software Package for computerization of its activities. CSIR-IGIB is having J-gate Custom Content for Consortia (JCC) access whereby online document delivery is taken care of and provide Delhi Library Network (DELNET) which is actively used by students/scientists of CSIR-IGIB.

Indian Institute of Chemical Biology:

IICB is one of the a premier Institute of 39 laboratories of Council of Scientific and Industrial Research (CSIR) - India's largest Research and Development organization established in 1935 as the first non-official centre in India for biomedical research and was included within the aegis of CSIR in 1956. CSIR-IICB now holds seven major scientific divisions: Cell Biology and Physiology, Infectious Disease and Immunology, Cancer Biology and Inflammatory Disorder, Chemistry, Drug Development, Diagnostics and Biotechnology, Molecular and Human Genetics, and Structural Biology and Bio-informatics.

The CSIR-IGIB is equipped with I.T. facilities and new technologies like Radius Server, Google Mailing Application, Bandwidth Management, RFID Technology, NMS Open View etc. CSIR-IICB has become the part of CSIR-NKN project. The bandwidth of CSIR-IICB network has been upgraded to 100 Mbps from NIC. The LAN has been upgraded with 10G backbone support. The WIFI Technology has been introduced at CSIR-IICB Campus as well as at NIPER Office and NIPER Hostel with 5.8 GHz RF link. About 400 users are having the facility of using Wi-Fi technology. CSIR-IICB has also implemented ERP application to all labs. In connection to the application, 20 TB SAN storage and 5 IBM servers have been implemented. The division looks after about 700 Nodes and will give the support in Hardware, Software and Network problems. Intranet website has been introduced for internal use, which includes various types of official works, administrative matters, office memos, news etc. and it is designed and maintained by computer division.

Library and Documentation Division:

With the establishment of Indian Institute of Medical Research on January 01, 1935, the Library and Documentation Division started its Journey as one of the prestigious departments. This library is perhaps, the biggest one on biomedical sciences in the eastern zone of India. Library and documentation division has gone metamorphosed gradually. It is maintaining print collection as well as procures electronic versions. Thus it is becoming a hybrid type of library.

It has collection of 13,906 books, 3,000+ e-journals, 223 printed journals, 32906 bound volumes, ADONIS (CD-Rom Database of 743 journals covering full text from 1991-2002), 3895 Annual Reports and 140 Thesis etc.

3000+ e-journal packages subscribed through consortium includes world renowned databases like American Chemical Society, Annual Reviews, ASTM Standards, Cambridge University Press, Derwent Innovation Index, Emerald, IEEE, Nature Publishing Group, Oxford University Press, Questel-Q-PAT, Royal Society of Chemistry, Taylor and Francis, Web of Science and Wiley-Blackwell etc. The total budget of CSIR-IGIB for periodicals for the year 2013 is Rs. 11,000,000 which is ¼th of total subscription money contributed by the institute. The rest is paid by National Knowledge Resource Consortium (funded by Government of India).

Library functions and services are maintained in a computerized environment through library management software "LIBSYS" and Online Public Access Catalogue (OPAC) is also available. It provides Electronic Document Delivery Service, Literature Search Service, User' Awareness cum Training Programs. Besides, it has especial service that is Open Access Repository (IR) maintaining in E-prints for archiving peer reviewed journals articles, conference papers, theses and other research documents produced by CSIR-IICB researchers.

E-journals Consortium at CSIR: National Knowledge Resource Consortium

The National Knowledge Resources Consortium (NKRC) was started in 2001 with the objectives to provide access to the core high-ranked journals and databases in a more cost-effective manner; providing training and awareness on e-resources and build the institutional repository platform of all the 39 Council of Scientific and Industrial Research (CSIR) and 24 Department of Science and Technology (DST) laboratories of India based on a common standard using D-Space open source software.

Today, NKRC is one of the biggest national resource consortia in terms of investment and its nodal partners in the global map that give. The 63 CSIR and DST laboratories and the NKRC projected 12th Five Year Plan budget outlay of Rs 440 crores are enough to emphasize the importance of NKRC in the national and global perspective.

The extent of full-text access that NKRC is giving to all its nodal institute members is worth over Rs 120 crores per year as against the average part investment of individual laboratories within the range Rs 1.5–2.5 crores per year, which was beyond imagination and expectation 10–12 years ago.

In present time, NKRC facilitates access to 5,000+ e-journals of all major publishers, patents, standards, citation and bibliographic databases. NKRC provides open access resources also to its users. Resources subscribed include publishers like M/s Blackwell, M/s Springer, M/s AIP, M/s ASCE & others, Journals/Conference Proceedings, Patents, Standards, and Databases like Web of Science, JCCC, & SCI-Finder and many more e-resources.

The consortium has conducted many awareness and training programs and developed a web portal for promoting the use of e-journals among CSIR scientists. As a result the usage has been increased in terms of downloads from 11,000 to 385,000 full text articles in a span of 5 years (2002 to 2007).

Building the IR (institutional repository) platform of the all 63 research organizations based on a common standard using D-Space open source software is another major objective of NKRC. The IR will be accessible from the NKRC single national window and will include pre-prints, electronic theses and dissertations, technical reports, annual reports/progress reports, special lectures/special publications, patents and standards, in-house journals in institutional primary information resources on the IR platform.

Review of Literature: Investigator reviewed only those studies which were similar to the present study or indirectly related to the present study at international and national level.

Global Status:

   King *et at.* (2003) revealed through their study the patterns of journal use by faculty at three diverse universities i.e. the University of Tennessee, the University of Pittsburgh and Drexel University that the libraries were rapidly moving toward electronic journal collections. The likely increase in reading from library collections was due in part to a decline in personal subscriptions and increased online bibliographic searching coupled with increased availability of the library collections and enlarged electronic journal collections. Scientists appeared to be more advanced in their use of electronic journals than other faculty, but changes were taking place within all faculty disciplines. **Abdulla (2005)** sought to reflect upon the rapid development of e-journals at the United Arab Emirates University (UAEU) and described the scope of the journal migration project and its impact on library operations. He found that e-journals have added enormous resources to the collection, improved service, enhanced access to journal literature, increased its usage, and decreased the demand for document delivery of single articles. The author also indicated the challenges of offering e-journals as "bundled" packages and UAEU's concern about the library's inability to remove irrelevant titles,

control cost, and retain the freedom to make changes on its journal collection. **Bar-Ilan and Fink (2005)** explored that science library users at the Hebrew University had exposed to electronic journals; most of the scientific journals were accessible in electronic format while the print format was still available. More than 80 percent of the respondents frequently used and preferred an electronic format, irrespective of their rank or age. Users of all ages switched to the electronic format not only in terms of usage but of preference as well. **Nicholas and Huntington (2006)** quantified the usage of electronic journals and made a detailed analysis of the use of OHIOLink as well as the Blackwell Synergy, ScienceDirect, emeraldinsight, and OUP databases by CIBER at University College London and revealed that many more people were accessing electronic journals than was previously the case in a print environment. Users were searching more widely as linking became easier and abstracts were becoming increasingly popular. The aggregate, top-line, use and user figures for digital journal libraries were very impressive and significantly affecting the use of information by researchers. **Ansari and Zuberi (2010)** confirmed through their study on use of electronic resources among academics at the University of Karachi that despite of many hindrances like networking problems and lack of training, majority of academics were quite satisfied with them and regard them as less reliable. They consider electronic resources produced by an authentic organization or website to be authentic and reliable. **Duki (2010)** endeavored to establish how far teachers employed at the Josip Juraj Strossmayer University in Osijek (Croatian university) relied on online databases, and the way they perceived certain aspects of their usage. The survey indicates that the respondents highly value online academic database usefulness; however, they faced certain constraints in their usage. **Nicholas *et.al .*(2010)** explored usage and information seeking behavior of researchers in connection with the ScienceDirect and Oxford Journals databases at nine major research institutions in the UK sought to establish the impact of e-journals on the scholarly behavior and found high levels of gateway service use point to the re-intermediating of the broken chain between publisher and reader. **Veeramani, and Vinayagamoorthy (2010)** identified various methods used to locate articles within the journals, categorized the purpose of using e-journals, identified the preferred document format and analyze the level of awareness of electronic products at Dubai International Academic City and found that overwhelming majority of the respondents felt that e-learning has been an effective tool and they use e-journals. **Egberongbe (2011)** investigated the use and impact of electronic resources at the University of Lagos which showed that practical uses of e-resources were not up to the worth in comparison to investments made in acquiring these resources. The availability of e-resources on the campus was almost sufficient for all the existing disciplines but that the infrastructure to use the resources was in-adequate and hindering the ability to meet the requirements of users. **Hossam and Chowdhury (2012)** clearly revealed that the experience of IUB Library indicated that the electronic materials had incredible use if those could be made available for the users of Bangladesh, though in case of IUB most of the users were interested on business. Use of Emerald database in IUB found more rational comparing to JSTOR's and ProQuest that means that usage depends on class works given to students. The Emerald and ProQuest were heavily used by the undergraduate students of the School of Business. As JSTOR's used titles were again mostly on business. **Peiris and Peiris (2012)** revealed that the majority (77%) of postgraduate students of the University of Peradeniya had used Electronic Information Resources (EIR) for writing reports and users learned to use EIR by 'self learning' and by trial-and error. Users were not satisfied with the electronic information services offered by the libraries and they strongly believed that currently available EIR were not properly utilized due to certain difficulties/problems. **Anaraki and Babalhavaeji (2013)** compared three medical universities of Iran within the Integrated Digital Library in terms of awareness, use and research ability of students and found that awareness and utilization level were lower than the average and those who are not aware of the existence of the IDL portal used general search engines to meet their information needs. The respondents admitted that their lack of awareness about the IDL was their most significant problem. **Ivwighreghweta and Oyeniran (2013)** examined usage and awareness of e-resources by lecturers in

Federal University, Otuoke and the Western Delta University, Oghara, the two Nigerian Universities with a view to survey the exposure of lecturers to electronic information resources. It was discovered that the main purpose of using e-resources was for research work and the channel of access of these electronic information resources is through the search engines and the University e-library. **Mostofa (2013)** conducted a study on use and impact of e-resources at the students of Asian University, Uttara University, and North South University at Dhaka in Bangladesh and discovered that the use of e-resources was very common among the university and majority of the students were dependent on e-resources to get the desired and relevant information but infrastructure and training programs were needed also be revised as per requirements. **Erdamar and Demirel (2014)** examined the electronic source preferences with the finding of the study that the majority of staff members preferred electronic sources to print ones at the education faculties of Gazi University (Turkey). The most important reasons for the e-journal preference of faculty members who chose this format were easy and continuous access. Establishing the frequency with which faculty members use certain e-databases may guide libraries in choosing databases to subscribe to, and increased e-journal use may lead to the extension of e-collections. Users age and preference have inverse relationship as age increases (over 41), e-journal preference decreases; and as the number of publications increases, so does e-journal use. **Zha, Zhang and Yan (2014)** explored the effect of individual differences on users' perceptions of print and electronic resources in terms of ease of use, usefulness and usage in the hopes that a better understanding of these effects could help Chinese university libraries to meet the diversified information needs of their users more specifically and appropriately so that the second-level capability divide and third-level outcome divide of library information resources could be much reduced.

National Status:

Raza and Upadhay (2006) examined the usage and problems of e-journals and discussed need for print journals as well as electronic journals by the researchers at Aligarh Muslim University and revealed that all of them were aware of e-journals. Many research scholars were consulting e-journals from their departmental labs and computer centers, not only for research purposes but also to update their own knowledge. Among the problems, they faced include lack of training and slow downloading. **Golwal, Sonwane and Vaishnav (2008)** investigated usage of e-journal by the PG students and research scholars of the faculty of sciences of the Dr. Babasaheb Ambedkar Marathwada University, Aurangabad and found that the frequency of usage of e-journals was increasing day-by-day and a significant proportion of the users accessed e-journals from UGC-Infonet. A majority of the users (54.76 %) use electronic journals daily. In future major portion of respondents wants to access journals in electronic form. **Khan and Ahmad (2009)** sought to examine the comparative use of e-journals by research scholars of two Indian central universities, namely the AMU and the BHU and inferred that a majority of the researchers under survey kept abreast of the use of e-journals through scanning the printed journals available in their universities as well as through surfing the internet. Satisfaction level of the researchers of both the surveyed universities with regard to use of e-journals was largely very high. It was however found that lack of training was the major obstacle in proper and full utilization of e-journals. **Khan, Zaidi and Bharati (2009)** found out the level of use of on-line databases by faculty members and research scholars of the Jawaharlal Nehru University (JNU) and Jamia Millia Islamia (JMI), Delhi. All of the faculty members and research scholars are aware of the availability of online databases and largely use them for reference purposes in their research work and studies. The study reveals that the users of both universities are aware of the search options like field searching and Boolean operators for accessing on-line databases. **Natarajan *et al.* (2010)** revealed that despite the availability of wide range of e-resources the frequency of their use was low among the users of the Annamalai University. They identified the reasons for this lack of time, lack of awareness, lack of

subject coverage; and slow downloading. Some of the resources such as e-book, e-encyclopedias and e-dictionaries were less used. To further maximum use of the e-resources, wide publicity and imparting trainings are found to be necessary. **Siddique and Ali (2010)** assessed the uses and their problems of online journals at Jawaharlal Nehru University Library (New Delhi) by the students, research scholars and faculty members on various aspects of services pertaining accessible in the University. They discussed role of online journals and their utilization in higher education, focusing mainly on examining the status of the services available, their clientele, purpose and hurdles in retrieval. **Ali and Nisha (2011)** reported that more than half of users in the Central Science Library, University of Delhi were using e-journals weekly for the purpose of research. Printed journals were consulted by the majority of users compared with e-journals. Keyword was the most popular search method for searching e-journals among research scholars, whereas the date of publication carried the least percentage among all the options. Slow downloading of PDF files was the major problem that users faced in using e-journals. **Nisha and Ali (2012)** explored through their study that most of the users of IIT Delhi and Delhi University were aware of e-journals and they were using them for their study and research purposes, for retrieving information, publishing research papers and manuscripts, assignments, presentations, seminars, and largely to update their own knowledge as information can be acquired expeditiously through e-journals. However, this study also revealed several inherent problems like slow downloading, less number of e-journals, lack of training and limited access to terminals. **Roy, Kumar and Satija (2012)** investigated different challenges faced by the searchers of online database in eight central university libraries in India and found that easy and understandable content pages were the most desirable by the users; site feasibility was directly proportional to users interaction; and the retrieval techniques varied from subject to subject. They suggested that the databases should be selected on the basis of their retrieval aspects and the online features. **Elavazhagan and Udayakumar (2013)** examined the exposure and measure the extent use of e-resources by the faculty members and research scholars of BITS, Pilani - Hyderabad Campus and confirmed that there was a great amount of awareness among both faculty and research scholars on the e-resources and various types of e-Resources, e-Database, and e-Journals. They suggested subscription to more e-resources, practical training on selected e-Resources. **Khan and Khursheed (2013)** identified that most of the scientists of CSIR-CDRI were aware of the availability of digital resources and frequently use them for their research work and paper writing and improvement of quality of research work. It is also observed that majority of scientists of the CDRI keep themselves abreast of developments in digital resources and their proper utilization for their research projects. They found that slow downloading is the obstacle in proper and full utilization of digital resources. **Sahu (2013)** revealed that more than 70% researchers in both the universities were using e-resources weekly for the purpose of research. Majority of researchers were using e-resources at their departmental labs. Keyword was the most popular search method for searching e-journals among research scholars. Slow internet speed was the major problem to discourage users while using e-resources. The satisfactions of researchers towards the utilization of electronic resources in both the universities were found more significant. **Garg (2014)** conducted a comparative study to know and compare the use and awareness of e-resources via UGC InfoNet Digital Library Consortium among the users of Kurukshetra University and Maharishi Dayanand University and to identify and analyze the factors those promote or hinder the use of e-resources. It was notable that majority of the respondents of both the universities requires the printed version in addition to the e-journals and almost 3/4 respondents require more journals in UGC InfoNet in addition to the present journals. **Jotwani (2014)** studied the trends in acquisition of e-resources vis-a-vis their print counterparts, identifies the e-resources being subscribed by seven Indian Institute of Technology (IITs) libraries located in India, and analyzed the usage of these resources during 2004-11. There is a clear shift in the collection development policies of these libraries where e-resources have become a vital part of their core collections. E-resources in all IITs are being heavily used as the number of downloads have increased from 3233818 to 7617691 articles reflecting a growth of 135%

over a period of 8 years. **Khan and Shukla (2014)** inferred that most of the scientists of CSIR-Indian Institute of Toxicological Research, India preferred e-journals over print counterpart for research purposes owing to their multidimensional features like easy and faster access, easy availability, timeliness, convenience, currency of information, interactivity and remote access etc. **Merugu (2014)** demonstrated the electronic resources management and services for a new learning of Kakatiya University Library, Warangal, A.P. and revealed that actual use of e-resources was not up-to the mark because of no worth full e-resources there and physical requirements, infrastructure facilities and training programs according to new trends need to be revised. It highlighted the level of satisfactions with overall functions of electronic resources management and services. **Singh and Nagah (2014)** examined user approach towards e-resources that included awareness among the users about the availability of e-resource in the library; their usage; satisfaction with the availability of e-resources and infrastructure facility provided in using e-resources; and need of training to increase the utilization of e-resources at Indian Institute of Technology, Ropar and found that they were increasingly important to all aspects of teaching and learning but the users were not much aware about the availability of the e-resources in the library and they felt the need of training in using those e-resources.

Research Gap

From the foregoing comprehensive review of literature at global and local level on the awareness and use of e-journals, it becomes obvious to infer that despite the treasure of literature available in the realm of user studies, there is still a dearth of relevant and appropriate literature pertaining to the use of e-journals and search strategies employed by scientists in CSIR laboratories in India. This is the first of its kind which compares scientists of CSIR-IGIB that has the largest computing facility (4 Tflop/s) in Asia outside Japan and CSIR-IICB, a premiere institute in biomedical research with the biggest library on biomedical sciences in the eastern zone of India. Hence, this is a premier attempt and novel effort in this direction. The present study is intended to provide an in-depth analysis on the topic. As such, it should pave the way for the study of use of e-journals at CSIR Institutes as well as other similar R&D organizations at global level.

Objectives of the study
The following objectives have been pursued to examine the satisfaction level of CSIR-IGIB scientists pertaining to the use of e-journals to:
- ❖ study and compare the strength and weakness in use of periodicals by the scientists of CSIR-IGIB and CSIR-IICB;
- ❖ examine whether the periodicals subscribed by the library adequately meet the needs of the scientists of the under study libraries;
- ❖ study the level of awareness and extent of utilization of e-journals through National Knowledge Resource Consortium by the scientists;
- ❖ realize the constraints faced and features attracting most to the scientists while accessing e-journals;
- ❖ find the purpose behind using e-journals by the scientists of the institutes;
- ❖ determine priorities in search strategies and ascertain the most popular search technique among users in frequent access to e-journals;
- ❖ analyze access issues and suggest ways and means for the effective use of e-journals.

Methodology

The present study is based on primary data collected through a well structured questionnaire which was prepared keeping in view the objectives of the study and covering relevant aspects of the study. The Questionnaires were distributed personally to the whole population of the two under study institutes i.e. 66 scientists of CSIR-IGIB, Delhi and 66 scientists of CSIR-IICB, Kolkata in the month of July, 2014. Out of 66 distributed questionnaires, 44 were completed and returned by the respondents at old and new campus of CSIR-IGIB and 51 out of 66 questionnaires from CSIR-IICB, Kolkata, showing response rate of 73.33 percent and 77.27 percent respectively. The overall response rate was 75.30 percent. Besides the questionnaire method, interview and observation methods of survey study were also used to collect required information to supplement to questionnaire method and to bring more clarity to the data, which was essential. Few questionnaires were incomplete and which were not considered. The collected data were analyzed, classified and tabulated and presented in graphical form for drawing inferences by employing latest version of statistical software (MS Excel and SPSS) and methods.

Scope and Limitations of the study

Every CSIR institute has enormous E-journals collection in their libraries built through direct subscription as well as consortium but the present study is confined to the awareness and use of e-journals by the scientists working under the aegis of CSIR-IGIB, Delhi and CSIR-IICB, Kolkata. The investigator was able to identify some of the major limitations, such as (i) the present study consists only of print and e-journals users and (ii) the geographical area is restricted to CSIR-IGIB, Delhi and CSIR-IICB, Kolkata. The scope of the paper can be extended to additional libraries of biological institutes of CSIR.

Analysis and interpretation of research findings

The collected data were organized, analyzed, compared, consolidated, tabulated and interpreted using tables and percentages, Chi-Square and a simple method of calculation to compare and verify the validity of the results and presented in graphical form by employing latest version of MS Excel and SPSS.

Frequency of Visiting Library: This study found that small proportion of scientists reported visiting library for journals. Table I reveals that 20.45 percent of scientists at CSIR-IGIB but none of them at CSIR-IICB visit library daily, while 25.00 percent scientists at CSIR-IGIB and 9.80 percent at CSIR-IICB visit weekly, 18.18 percent scientists at CSIR-IGIB and 19.61 percent at CSIR-IICB visit fortnightly, while 22.73 percent scientists of CSIR-IGIB and 33.33 percent of CSIR-IICB visit library monthly. Only a small number (13.64 percent scientists of CSIR-IGIB and 22.53 percent of CSIR-IICB) use library rarely. It is observed that junior scientists visit library daily. It means senior scientists visit less frequently while junior scientists are more frequent. It may be owing to the fact that access of e-journals is available through LAN and login is based on IP throughout the institution's campus. This study is in conformity to that of Bayugo & Agbeko (2007) and Khan & Fatma (2013) who found that most users now prefer using electronic access to information.

Table I: Frequency of Visiting Library

Frequency	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Daily	9	20.45	0	0.00
Thrice Weekly	0	0.00	7	13.73
Weekly	11	25.00	5	9.80
Fortnightly	8	18.18	10	19.61
Monthly	10	22.73	17	33.33
Rarely	6	13.64	12	23.53

Notes: X^2 calculated value = 21.89 (df = 5); X^2 table value = 11.070 (at 5% level of significance).

Hypothesis: There is a no significant difference between the scientists at CSIR-IGIB Delhi and CSIR-IICB, Kolkata in terms of frequency of visiting library.

In order to prove the difference among the frequency of visiting library by the scientists of the select libraries (as per hypothesis), statistical tool like Chi-Square has been applied for this purpose to get the desired results.

Chi-Square test is a non-parametric test which describes the magnitude of difference between observed frequencies and the frequencies expected under certain assumptions. With the help of X^2 test, it is possible to find out whether such differences are significant or insignificant and could have arisen due to fluctuations of sampling.

The formula used for Chi-Square is:

$$\chi^2 \text{ Value} = \sum \left[\frac{(fo-fe)^2}{fe} \right]$$

Where,

fo = Observed frequency
fe = Expected frequency

Degree of Freedom refers to the number of independent constraints in the observed set of data and represented by df   which is calculated as follows:

df = (r -1) (c - 1)

r = no. of rows in the contingency table
c = no. of columns in the contingency table

Then value of X^2 computed is compared to the critical value of X^2 read from the table for the degrees of freedom at the predetermined level of significance-0.05 or 0.01.

As can be seen in Table I, the calculated X^2 value (21.89) is greater than its table value (11.070) at 5 percent level of significance. Hence, the null hypothesis is rejected and it reveals that significant difference exists in terms of frequency of visiting library between the scientists at CSIR-IGIB Delhi and CSIR-IICB, Kolkata.

Frequency of E-journals Usage
In order to assess the frequency of using e-journals, the scientists were asked to indicate any one of the six categories of time lag. It is found from the analysis that a whopping 100 percent of scientists of the CSIR-IGIB as well as the same 100 percent of CSIR-IICB were actively engaged in use of e-journals daily (see Table II). Thus it can be concluded that the scientists of the two under study CSIR institutes evince a good deal of interest in frequent use of e-journals realizing the value of e-journals because of their cost-effectiveness and multiple advantages for their research work with their respective field of study. These findings have already been supported by several previous studies that with increased use, users access the electronic format more frequently (Khan & Khursheed, 2013; Bar-Ilan et al., 2003; Dillon & Hahn, 2002; EJUSt, 2002).

Table II: Frequency of E-journals Usage

Frequency	IGIB (n=44)	Percentage	IICB (n=51)	Percentage2
Daily	44	100.00	51	100.00
Thrice Weekly	0	0.00	0	0.00
Weekly	0	0.00	0	0.00
Fortnightly	0	0.00	0	0.00
Monthly	0	0.00	0	0.00
Rarely	0	0.00	0	0.00

Features of e-journals scientists like most:

E-journals are used for their multi-faceted features. Eight reasons were listed, against which respondents were allowed to choose one or more than one features for using e-journals (see Table II). The intention here was to discover the preference of features for using e-journals.
Table III reveals that speed of access (93.18%), ease of searching and full text searching (88.64%) and updated information (63.64%) are the most appealing features of e-journals to the scientists of IGIB. Besides, 54.55% users like downloading possibilities, 47.73% users like environmental friendliness, 27.27% users like multimedia features, 11.36% users like reduced time in publishing, and 9.09% prefer hyperlinks feature of e-journals at CSIR-IGIB. But majority of scientists at IICB preferred e-journals for speed of access (94.12%), downloading possibilities (68.63%) and ease of searching/updated information (62.75%). Moreover full text searching (52.94%), reduced time in publishing (52.94%) and environmental friendliness (47.06%), multimedia features (9.80%), and hyperlinks feature of e-journals (5.88%) are also appealing features of e-journals to the scientists of IICB. These preferences are in line with other e-journals users working as core faculty/researcher at global level examined by previous scholars (e.g. Khan & Shukla, 2014; Khan & Khursheed, 2013;Bar-Ilan & Fink, 2005).

Table III: Features of e-journals scientists like most

Features	IGIB (n=44)	Percentage	Ranking	IICB (n=51)	Percentage	Ranking
Updated Information	28	63.64	3	32	62.75	3
Speed of Access	41	93.18	1	48	94.12	1
Ease of Searching / Full-text searching	39	88.64	2	27	52.94	4
Downloading Possibilities	24	54.55	4	35	68.63	2
Reduced Time in Publishing	5	11.36	7	26	50.98	5
Links to other resources	4	9.09	8	3	5.88	8
Environmental friendliness (saving paper...)	21	47.73	5	24	47.06	6
Multimedia Features	12	27.27	6	5	9.80	7

Notes: X^2 calculated value = 21.567 (df = 7); X^2 table value = 14.067 (at 5% level of significance); multiple answers were permitted.

Hypothesis: There is no significant difference between the scientists at CSIR-IGIB Delhi and CSIR-IICB, Kolkata in terms of features of e-journals they like most.

As can be seen in Table III, the calculated X^2 value (21.567) is greater than its table value (14.067) at the 5 percent level of significance, revealing a significant difference amongst features of e-journals scientists like most at the select institutions. Hence, the null hypothesis is rejected.

Figure 1: Features of e-journals scientists like most
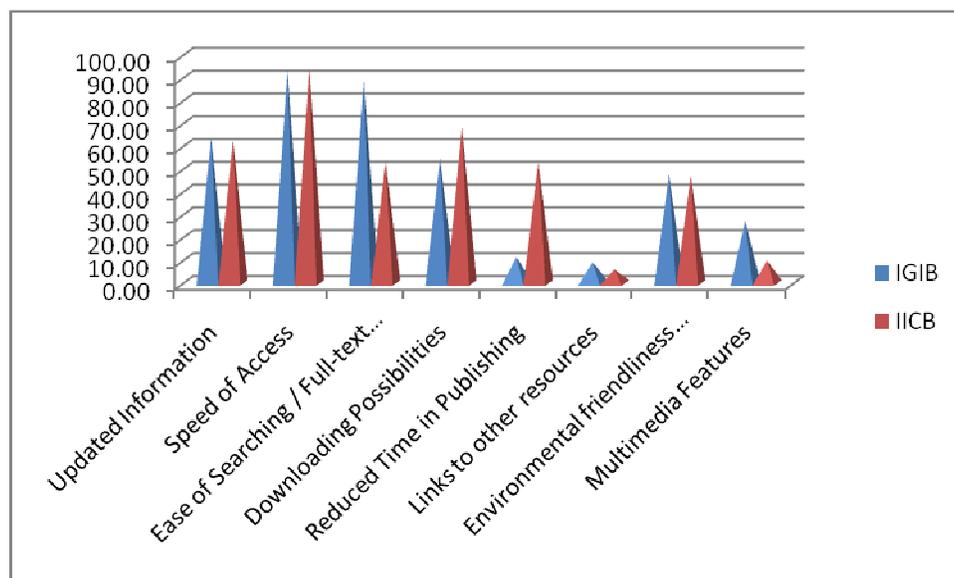
Use of Open Source Journals: The Table IV reveals that 100% of scientists of CSIR-IGIB and the same 100% of scientists of CSIR-IICB use open source journals as well for research purpose and gaining current information to keep them abreast of new changes taking place all around the world in their respective field of study. This also reflects that they need more journals for their research and the institutes should subscribe more e-journals to satisfy information thirst of their scientists.

Table IV: Use of Open Source Journals

Whether use Open Source Journals	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Yes	44	100.00	51	100.00
No	0	0.00	0	0.00

Place of Accessing E-journals:
It is discernible from Table V that 86.36 percent scientists of CSIR-IGIB and 82.35 percent of CSIR-IICB have access to e-journals from their Campus Cabin with the facility of LAN in the campus. At CSIR-IGIB, 13.64 percent of scientists and 66.67 percent scientists of CSIR-IICB use e-journals at the Central Library. While, none of them has accessed e-journals from home, hostel or computer centre at CSIR-IGIB because of access being restricted to campus only and departmental library does not exist. On the other hand, 25.49 percent and 19.61 percent of CSIR-IICB scientists accessed e-journals from computer centre and home respectively. Since journals access is restricted to campus only due to IP based login, it is necessary to state that they used open access e-journals from home. Thus we can conclude that the majority of the scientists from both the under survey institutes use their campus cabin for use of e-journals. These findings are against recent study of CSIR Institute conducted by Khan and Shukla (2014) where usage from library was shown 88.89% and in line with another study belonging to the same parent body of research institute conducted by Khan and Khursheed (2013).

Table V: Place of Accessing E-journals:

| Location of Access	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Campus Cabin	38	86.36	42	82.35
Central Library	6	13.64	34	66.67
Computer Centre	0	0.00	13	25.49
Hostel	0	0.00	0	0.00
Home	0	0.00	10	19.61

Note: Multiple answers were permitted

Method of Reading of e-journals: The Table V reflects the methods of using e-journals. On screen reading is most preferred by 61.36% of the scientists of CSIR-IGIB and 62.75% of the scientists of CSIR-IICB followed by hard copies which is preferred by 43.18% and 52.94% by the scientists of CSIR-IGIB and CSIR-IICB respectively. While only 36.36% of the scientists of CSIR-IGIB and 17.65% at CSIR-IICB read e-journals by downloading and saving in pen drive.

Table V: Method of Reading of e-journals

Method of Reading e-Journals	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
On Screen	27	61.36	32	62.75
Print on the Paper	19	43.18	27	52.94
Downloading in Pen Drive etc.	16	36.36	9	17.65

Note: Multiple answers were permitted

Figure 2: Method of Reading of e-journals

	On Screen	Print on the Paper	Downloading in Pen Drive etc.
IGIB	61.36	43.18	36.36
IICB	62.75	52.94	17.65
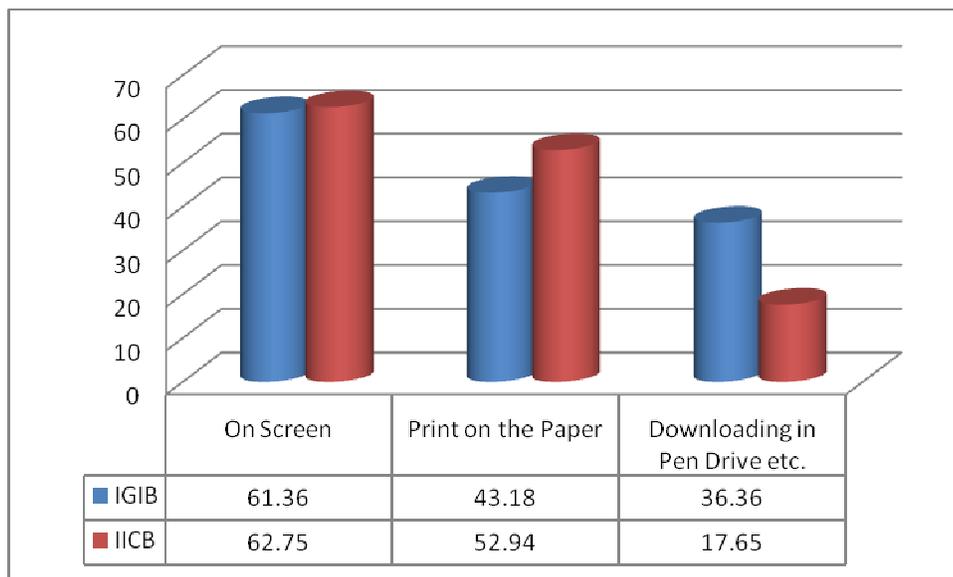
Awareness of E-journal Consortium: In response to the question "Are you aware of the availability of e-journals Consortium, NKRC?" 44 respondents (100 percent) from CSIR-IGIB Delhi and 51 respondents (100 percent) from CSIR-IICB, Kolkata responded positively and claimed that they were fully aware of electronic journals consortium. Responses on awareness of e-journals consortium show that scientists of both the institution are equally aware of its availability especially because of the fact that majority of e-journals are furnished by NKRC (NISCAIR).

Whether Aware with e-Journals Consortium	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Yes	44	100.00	51	100.00
No	0	0.00	0	0.00

Purpose of using e-journals:

It is discernible from the Table VI that the major reason for the scientists to use e-journals was to support research (100%) at both the institutions i.e. CSIR-IGIB and CSIR-IICB, followed by 'To update knowledge' 75% at CSIR-IGIB and 94.12% at CSIR-IICB. In addition, 47.73% and 41.18% of the them are using e-journals for publication work (writing manuscripts or research papers), 27.27% and 15.69% for preparing presentation activities (seminar etc.), while 36.36% and 25.49% of the scientists are using e-journals for project work at CSIR-IGIB and CSIR-IICB respectively.

The present study shows that the overall purpose of the use of e-journals is for research and development activities for scientists at both under study institutes because of the current and rich contents provided by e-journals' articles. This finding is supported by recent studies conducted by a number of scholars (e.g. Shukla & Khan, 2014; Khan & Khursheed, 2013; Okiki, 2012; Ali & Nisha, 2011; Madhusudhan, 2008).

Table VI: Purpose of using e-journals

Purpose	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
To Update Knowledge	33	75.00	48	94.12
For Research	44	100.00	51	100.00
For Publication	21	47.73	21	41.18
For Presentation	12	27.27	8	15.69
For Project	16	36.36	13	25.49

Notes: X^2 calculated value = 3.572 (df = 4); X^2 table value = 9.488 (at 5% level of significance); multiple answers were permitted

Hypothesis: There is a no significant difference between the scientists at CSIR-IGIB Delhi and CSIR-CSIR-IICB, Kolkata in terms of purpose of using e-journals.

Using X^2 test, it is found that calculated value (3.572) is less than its table value (9.488) at 5 percent level of significance. Hence, the null hypothesis is accepted. The analysis reveals that there is no significant difference observed in the purpose of using e-journals by the scientists of the two institutions. It may be due to fact that they are involved in the same activities.

Figure 3: Purpose of using e-journals
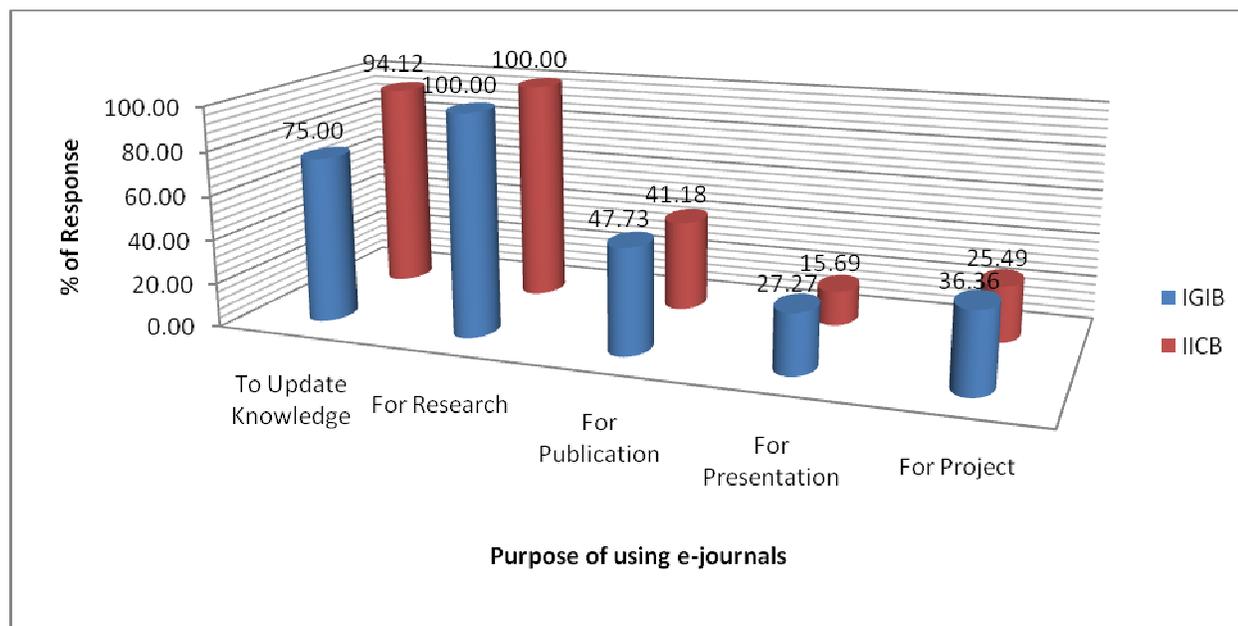
Use of Search Strategy:

The use of various search strategies to locate electronic information using e-journals is one of the vital aspects of the study. The scientists of the under study institutes were provided with five options to inquire their views about what extent they make use of various search strategies.
While accessing e-journals, the most popular search method is "Journal Title", "Author", and "Keyword" with 81.82%, 75% and 72.73% respectively at CSIR-IGIB. "Specific Article" and

"Boolean Operators" are least common methods used for information searching with only 25% and 2.27% users.

On the other hand, searching by "Keyword", "Specific Article" and "Author" are most preferable search strategy employed at CSIR-IICB with 92.16%, 80.39% and 62.75% users respectively. "Journal Title" and "Boolean Operators" are least preferred method (i.e. only 37.25% and 9.80%) for information searching at CSIR-IICB. Indifference towards Boolean Operators is common at both institutions showing lack of training/technical knowledge, while they can be used for efficient and fruitful information searching.

The overall discussion reveals that there is a good spread of the use of "keywords" among scientists at CSIR-IGIB, Delhi and CSIR-IICB, Kolkata as they obtain an increased amount of relevant information by searching by keywords. This strategy in searching corresponds with other studies that show that because of their increasing levels of searching competency, users are searching online journals more (Ali & Nisha, 2011; Madhusudhan, 2008, Stanford University, 2002).

Table VII: Use of Search Strategy

| Search Strategy	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Keyword	32	72.73	47	92.16
Author	33	75.00	32	62.75
Journal Title	36	81.82	19	37.25
Specific Article	11	25.00	41	80.39
Boolean Operators (AND, OR, NOT)	1	2.27	5	9.80

Notes: X^2 calculated value = 18.97 (df = 4); X^2 table value = 9.48 (at 5% level of significance) and 13.277 (at 1% level of significance); multiple answers were permitted.

Hypothesis: There is a no significant difference between the scientists at CSIR-IGIB Delhi and CSIR-CSIR-IICB, Kolkata in terms of use of search strategy.

Using a X^2 test, it is found that calculated value (18.97) is higher than its table value (9.48) at 5 percent level of significance (p, 0.05) which reveals that significant differences are observed in the usage of search strategy among users in under study libraries. Hence, the null hypothesis is rejected.

The above discussion shows a dire need for the scientists of both select institutes to be realized that searching by single keywords will consume lot of time yielding irrelevant results and low level of specificity. Besides use of subject alone may not fetch pinpointed and required information and searching by journal title will take much time and effort in finding a specific article. Rather, they should be taught about boons of complex searching techniques like Boolean searching and searching by wild card characters, truncation etc. would be hugely beneficial considering the degree to which they use e-journals,

Figure 4: Use of Search Strategy
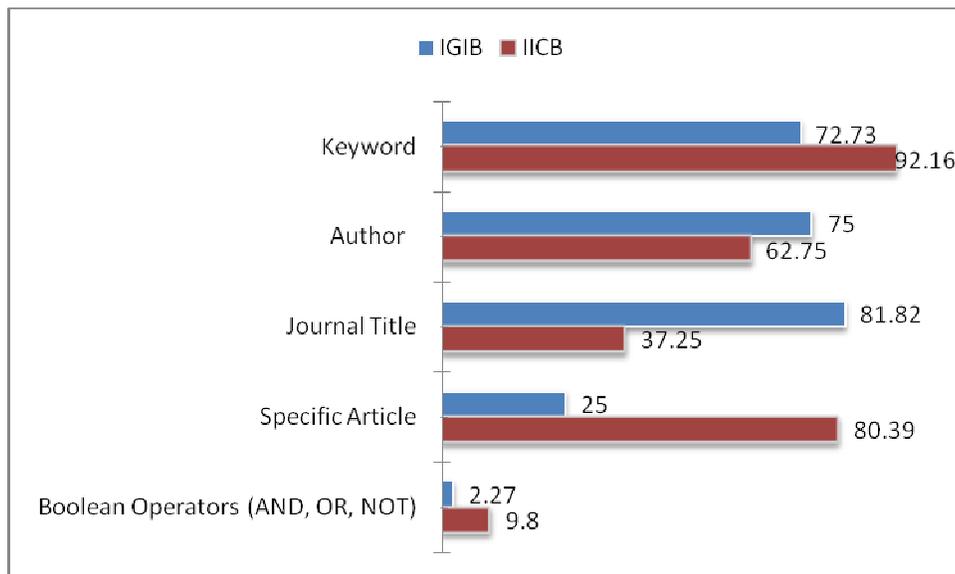
Preference of Format for Reading E-journals: Table VIII reveals that a whopping majority i.e. 97.73% scientists of CSIR-IGIB and 98.04% of CSIR-IICB use PDF format for reading e-journals. It is the best format to download, organize and study the required journals followed by HTML format which is less common format used for reading e-journals i.e. only 2.27% and 1.96% at CSIR-IGIB and CSIR-IICB respectively. Numerous previous studies have already established the present finding (e.g. Ali & Nisha (2011).

Table VIII: Most Preferred Online Format

Format Preferred for Reading e-Journals	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
PDF Format	43	97.73	50	98.04
HTML Format	1	2.27	1	1.96
Other	0	0.00	0	0.00

Figure 5: Most Preferred Online Format
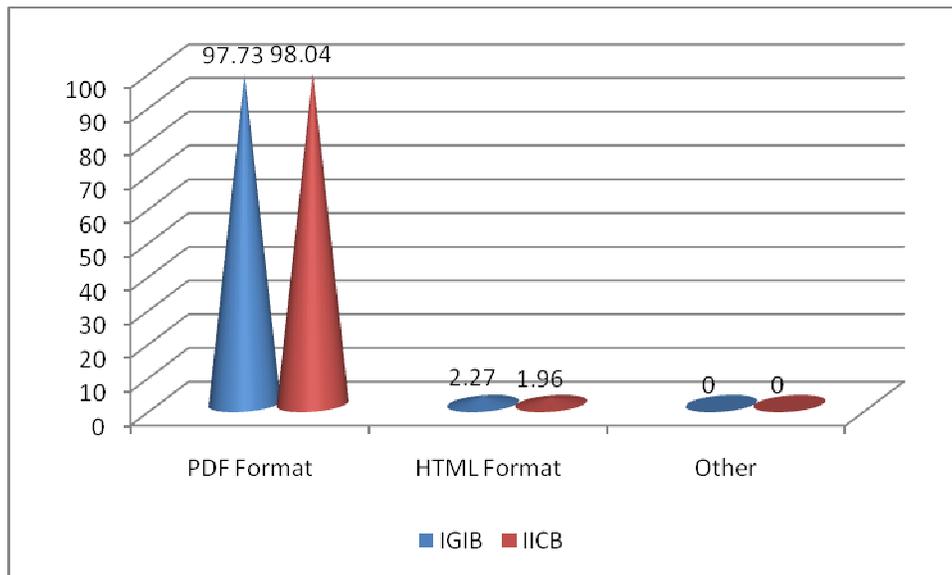
Problems in using e-journals: 100% of scientists at CSIR-IGIB found using e-journals very comfortable while 82% at CSIR-IICB agreed to this. 18% declines that using e-journals was very easy. They did not feel any problem. The data shows excellent use of e-journals at CSIR-IGIB because users faced no problem in using them. Answering the question regarding problems faced by the users, an absolute majority (100%) at CSIR-IGIB have accepted no difficulty in using e-journals. Actually the scientists are very sophisticated in their field of study and infrastructure provided by the institute is state-of-the-art in terms of technology and resources (especially in newly constructed South Campus). There is no lack of technical knowledge, lack of terminals, language problem, slow downloading speed, inadequate/insufficient availability of e-resources and problem in networking etc. On the other hand, 13.73 % scientists at CSIR-IICB faced problems of insufficient availability of e-journals and 9.80 % faced problem of slow downloading. This may be because of older technological infrastructure as compared to CSIR-IGIB Delhi.

This study is in conformity to the studies quoting various problems in using e-journals (e.g. Khan & Shukla, 2014; Khan & Fatma (2013); Okiki, 2012 ; Oduwole & Akpati, 2003).

Table IX: Barriers to Using e-journals

Barrier to Using e-journals	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Lack of Technical Knowledge	0	0.00	0	0.00
Lack of Terminals	0	0.00	0	0.00
Language Problem	0	0.00	0	0.00
Slow Downloading Speed	0	0.00	5	9.80
Insufficient Availability of e-resources	0	0.00	7	13.73
Problems in Networking	0	0.00	0	0.00
Unsuitable Library Timing	0	0.00	0	0.00
Non Co-operation from Library Staff	0	0.00	0	0.00

Need for Training:
It is, however, found that lack of training is not the obstacle in proper and full utilization of e-journals at CSIR-IGIB scientists as claimed by them. The huge number of the scientists i.e.100% at CSIR-IGIB were of the view that they need no training or orientation for using the e-journals. They claimed to be sound in technical knowledge about e-journals use, while 41.18 percent scientists at CSIR-IICB recognized the significance of orientation program for using journals effectively. They frankly admitted their weakness in terms of technical know-how.

Table X showing need of training

Whether Training is Needed	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Yes	0	0.00	21	41.18
No	44	100.00	30	58.82

Co-operation from Library Staff: when the question was asked if the library staff provide co-operation and assistance in accessing e-journals, 100 percent of scientists of CSIR-IICB responded positively, while 100% CSIR-IGIB scientists denied need of their assistance. It's amazing that even after weak search techniques used by them they are satisfied with the staff support. It shows mediocre quality of training and support from the supporting staff for the core members of the institute, the scientists who are obviously superior to them.

Satisfaction level of using e-journals
The purpose of this is to identify how much users are satisfied with library facilities. The Table XI shows the satisfaction level of the users about infrastructural facilities in terms of no. of terminals, internet connections, printers, e-resources provided by the library for accessing e-journals.

The table reveals that 90.91% users are fully satisfied with the facilities and only 9.09% of users are unsatisfied with the infrastructure provided by the institute for accessing e-journals at CSIR-IGIB, Delhi. On the other, satisfaction level at CSIR-IICB, Kolkata is at 68.63% and the rest 31.37% are not satisfied. In summary, it is deduced that the satisfaction level of the scientists of CSIR-IGIB, Delhi with regard to use of e-journals is largely higher than those of CSIR-IICB, Kolkata.

Table- XI showing satisfaction level of scientists with e-journals

Whether satisfied with e-Journals	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Yes	40	90.91	35	68.63
No	4	9.09	16	31.37

Note: Notes: X^2 calculated value = 7.055 (df = 1); X^2 table value = 3.841 (at 5% level of significance) and 6.635 (at 1% level of significance).

Hypothesis: There is a no significant difference between the scientists at CSIR-IGIB Delhi and CSIR-CSIR-IICB, Kolkata in terms of satisfaction level with e-journals.

Using X^2 test, it is found that calculated value (7.055) is higher than its table value (3.84) at 5 percent level of significance (p, 0.05). Hence, the null hypothesis is rejected which reveals that there is

a significant difference observed in the satisfaction level of the scientists of the two under study institution.

Awareness with CAS/SDI Services: Current Awareness Services and Selective Dissemination of Information Services are specialized services exclusively for special libraries like both the under study libraries. But when the scientists at CSIR-IGIB and CSIR-IICB were enquired about their awareness and use of these services, they got surprised and denied any such services. Users were enjoying the day to day normal services of library but even in these special libraries of CSIR, a majority of the users are not aware of these specialized services.

Table- XII showing awareness of scientists with CAS/SDI services

Whether Aware with CAS/SDI Services?	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
Yes	0	0.00	0	0.00
No	44	100.00	26	50.98
Don't Know	0	0.00	25	49.02

Usefulness of e-journals over printed counterparts

In spite of using e-journals for their multi-faceted features by 100% of CSIR-IGIB and CSIR-IICB scientists, 100% of scientists at CSIR-IGIB but only 58.82 % at CSIR-IICB feel e-journals more useful as compared to printed counterparts while none at CSIR-IGIB and 41.18% at CSIR-IICB spilled the beans saying printed journals were more useful and advocated their continuance and renewal in the library, while scientists at CSIR-IGIB support total transition and transformation from print to electronic journals. This finding is supported by many established studies conducted by a number of eminent scholars (e.g. Khan & Fatma, 2013; Khan & Khursheed, 2013; Bar-Ilan & Fink, 2005).

Table- XIII showing usefulness of e-journals over printed counterparts

	IGIB (n=44)	Percentage	IICB (n=51)	Percentage
E-journals	44	100.00	30	58.82
Print Journals	0	0.00	21	41.18

E-journals/database Used Most Frequently: Table XII shows that majority of scientists at CSIR-IGIB use ScienceDirect (72.73%), followed by PubMed (27.27%), HighWire (18.18%) and Wiley (20.45%) for catering to their information needs for research work etc. At CSIR-IICB, ScienceDirect (100%), Scopus (72.55%), PubMed (25.49%), Wiley (17.65%), HighWire (15.69%), and Web of Science (15.69%) are most frequently used databases. It reveals from the data that only well-known e-resources are preferably used by the research scholars of these two universities.

Table- XIV showing E-journals/database used most frequently at CSIR-IGIB and CSIR-IICB

E-journals Packages Preferred (IGIB)	No. of Responses	Percentage
ScienceDirect	32	72.73
HighWire	8	18.18
Wiley	9	20.45
PubMed	12	27.27

E-journals Packages Preferred (IICB)	No. of Responses	Percentage
ScienceDirect	51	100.00
HighWire	8	15.69
Wiley	9	17.65
PubMed	13	25.49
Web of Science	8	15.69
Scopus	37	72.55

Findings of the study

❖ Maximum percentage of scientists (25%) and minimum (0%) reported visiting library weekly and thrice weekly respectively for journals at CSIR-IGIB, Delhi while at CSIR-IICB, Kolkata maximum number of scientists (33.33%) visit library on monthly basis and minimum of them (0%) visit daily. Despite of being research libraries belonging to the same parent body, the study shows that there is a significant difference among the frequency of visiting library between the scientists at CSIR-IGIB Delhi and CSIR-IICB, Kolkata.

❖ The frequency of use shows an absolute acceptance and use of e-journals where a whopping 100 percent of scientists at CSIR-IGIB as well as the same 100 percent at CSIR-IICB were actively engaged in use of e-journals daily. Majority of them at both under survey institutes access e-journals from their campus cabin. Hence, focus should be made on the improved quality of information retrieved in less time and effort. Majority of them are supportive of moving to electronic only access.

❖ The most appealing features of e-journals to the scientists at CSIR-IGIB are speed of access (93.18%) and ease of searching full text information (88.64%). While majority of scientists at CSIR-IICB preferred e-journals for speed of access (94.12%), downloading possibilities (68.63%) which reveals a significant difference amongst features of e-journals scientists like most at the two select institutions.

❖ The study reveals that 100% of scientists at both the under study institutes use open source journals as well for research purpose and gaining current information to keep them abreast of new changes taking place all around the world in their respective field of study.

❖ There is no significant difference between the scientists of under survey libraries among the methods of reading e-journals i.e. reading on screen, on hard copies and by downloading and saving in pen drive etc.

- ❖ Many similarities were observed in the purpose of using e-journals by the scientists of the surveyed institutions that includes research related activities, updating knowledge, and publication work, preparing presentations and project works.
- ❖ The PDF format (97.73%) is found to be the most preferred online format for reading articles followed by HTML format (2.27%) at CSIR-IGIB while it is 98.04% and 1.96% at CSIR-IICB showing no significant difference in most preferred format for reading e-journals at the select institutes.
- ❖ The study reveals huge differences observed in the usage of search strategy among the scientists at select libraries. While accessing e-journals, the most popular search method is "Journal Title", "Author", and "Keyword" with 81.82%, 75% and 72.73% respectively at CSIR-IGIB. On the other hand, searching by "Journal Title" is the least preferred method (i.e. only 37.25%) for information searching at CSIR-IICB.
- ❖ Least use of Boolean Operators 2.27% at CSIR-IGIB and 9.80% at CSIR-IICB is common searching point that shows weakness in terms of technical knowledge on behalf of the scientists despite of their un-acceptance of the fact.
- ❖ 100% scientists at CSIR-IGIB faced no problem in using e-journals. On the other hand, 13.73 % scientists at CSIR-IICB faced problems of insufficient availability of e-journals and 9.80 % faced problem of slow downloading. This may be because of older technological infrastructure as compared to CSIR-IGIB Delhi.
- ❖ This finding clearly indicates that scientists at CSIR-IICB are not so comfortable in using e-journals as those at CSIR-IGIB.
- ❖ This study has wonderful finding i.e. Scientists at CSIR-IGIB, Delhi are more satisfied that those at CSIR-IICB, Kolkata in terms of technological infrastructure and resources.
- ❖ Despite of technical support, training, orientation etc. from library for making best utilization of available e-journals, scientists at CSIR-IGIB and CSIR-IICB were majorly using simple search technique. Besides, facing problems in using them by the scientists at CSIR-IICB shows mediocre quality of training and support from library.
- ❖ Another finding of the study is related with the preference with respect to document format. In both of the two surveyed CSIR libraries, e-journals are given preference over printed counterparts.
- ❖ Users are enjoying the day to day normal services of library but even in these special libraries of CSIR, a majority of the users are not aware of specialized services like Selective Dissemination Services (SDI), Current Awareness Services (CAS) etc.
- ❖ Surprisingly, no facility is available for searching required articles in back volumes of journals at CSIR-IGIB as well as CSIR-IICB libraries while they have a large collection of bound volume of printed journals.
- ❖ The rating of co-operation from library staff is also satisfactory as these scientists belonging to core members of the under survey institutes are superior to library staff.
- ❖ 100% scientists at CSIR-IGIB were not ready to accept any need of training or orientation program in order to utilize e-journals extensively and exhaustively while 41.18% of CSIR-IICB scientists were realistic and frank to accept the need of know-how. This shows technical strength of CSIR-IGIB scientists and weakness of CSIR-IICB scientists.

Recommendations and suggestions

Based on the findings of the study, and suggestions given by the respondents, the following recommendations are made to improve the quality and maximize the use of e-journals.

❖ Efficient and quality user training and technical support must be imparted for the proper exploitation of electronic journals since less use of Boolean Operators show less technical knowledge in information retrieval at both CSIR-IGIB, Delhi and CSIR-IICB, Kolkata even after routine training programs.

❖ The libraries of under study institutes should organize regular workshops to enhance usage of e-journals and access the required information effectively, efficiently and exhaustively.

❖ The scientists need to be ensured to participate in the training in order to solve the issue of low levels of visits to the library. They should be offered online tutorials as an option.

❖ The scientists of the select institutes should be realized that searching by single keywords will consume lot of time yielding irrelevant results and low level of specificity by fetching hundreds of results.

❖ They should be taught about boons of complex searching techniques like Boolean searching and searching by wild card characters, truncation etc. which would be hugely beneficial considering the degree to which they use e-journals.

❖ User' survey should be conducted periodically to assess and discover the electronic information needs of users, and problems they might face while accessing them.

❖ Bandwidths at CSIR-IICB, Kolkata should be sought so as to provide faster access that will save users' time and be a source of motivation to use e-journals.

❖ The number of e-journals available electronically should be added for the scientists in their area of specialization especially at CSIR-IICB since use of open access journals by the scientists at CSIR-IGIB as well as CSIR-IICB shows more hunger of e-resources.

❖ The library should create a gate-way of e-journals that they subscribe to in order to enable users to search full-text journal articles from various publishers by subject, keywords and topic from a single place.

❖ The under study libraries should appoint more trained and skilled IT staff, well aware of the functioning of both software and hardware, which can help the users in areas like accessing, downloading, and proper exploitation of the e-journal services.

❖ Proper feedback system should be introduced to know about various problems faced by the users and to solve them effectively.

❖ Library should insist for more grants in order to develop their collection both books as well as journals. Modules such as Article-Indexing of Libsys Software should begin for searching required articles in back volume of journals at both of the surveyed libraries for more efficient services.

❖ The scientists should be encouraged to use of Selective Dissemination of Information (SDI) and Current Awareness Services (CAS).

❖ E-mail alert service must be provided to make aware users about latest issues of e-journals and databases.

The study finds an absolute awareness, acceptance and use of e-journals as acknowledged by the scientists of both under study CSIR-IGIB and CSIR-IICB. The findings seem to be limited in scope i.e. to the scientists of the two under study CSIR Institutes of India. However, when examined as part of a set of case studies that were conducted over the years by various scholars of repute (e.g. Ali & Nisha, 2011; Anaraki & Babalhavaeji, 2013; Bar-Ilan & Fink; 2005, Bar-Ilan et al., 2003; Duki, 2010; Egberongbe, 2011; Erdamar & Demirel, 2014; Hossam & Chowdhury, 2012; Ivwighreghweta &

Oyeniran, 2013; Khan & Shukla, 2014; Khan & Khursheed, 2013; Mostofa, 2013, Nicholas *et.al.,* 2010; Nicholas & Huntington, 2006; Nisha & Ali, 2012; Peiris & Peiris, 2012 etc.) the inferences fit the trend of an increasing use of the electronic format of journals over time. Besides, it helps to understand how these studies assimilate/differ from users/institutions of similar kinds in India or elsewhere in the world. In addition, since the under study libraries provide access to all core scientific journals in the fields of Biology, Chemistry, Life Sciences and Biomedical Sciences from various world renowned databases/publishers, thus one may expect similar findings at other research and development institutes of similar status and accessibility to journals in the same areas.

References:

1. Ali P.M., Naushad & Nisha, Faizul. (2011). Use of e-journals among research scholars at Central Science Library, University of Delhi. *Collection Building*, 30(1), 53-60.
2. Anaraki, Leila Nemati & Babalhavaeji, Fahimeh (2013). Investigating the awareness and ability of medical students in using electronic resources of the integrated digital library portal of Iran. *The Electronic Library, 31*(1), 70 – 83. http://dx.doi.org/10.1108/02640471311299146.
3. Ansari, Munira Nasreen & Zuberi, Bushra Adeeb (2010). Use of electronic resources among academics at the University of Karachi. *Library Philosophy and Practice (e-journal).* Paper 385. http://digitalcommons. unl.edu/libphilprac/385.
4. Bar-Ilan & Fink, N. (2005). Preference for electronic format of scientific journals – a case study of the science library users at the Hebrew University. *Library & Information Science Research*, 27(3), 363-376.
5. Bonorino, Adina Gonza´lez & Molteni, Valeria E. (2007). Electronic journals collections in Argentine private academic libraries. *The Electronic Library*, 25(1), 65-79.
6. Danner, Richard A., Kolev, Kiril, & Most, Marguerite (2011). Print or Perish?: Authors' attitudes toward electronic-only publication of law journals. Harvard Law School Conference: The Future of Law Libraries? The Future is Now. Harvard Law School, Cambridge, Mass., June16, 2011.
7. Dasgupta, Abhijit. (2013). National Knowledge Resource Consortium – a national gateway of S&T on-line resources for CSIR and DST laboratories. *Current Science*, 105, 1-5.
8. Duki, Darko (2010). Online Academic Databases Use in Croatian Higher Education. 32nd International Conference on Information Technology Interfaces, June 21-24, 2010, Cavtat, Croatia.
9. Elavazhagan, K. & Udayakumar, M.S. (2013). Use of E-Resources in the BITS, Pilani – Hyderabad Campus: A Study. *International Research: Journal of Library & Information Science, 3* (3), 470-479.
10. Erdamar, Gürcü & Demirel, Hüsne. (2014). Electronic source preferences of education faculty staff: a case study of Gazi University. *European Journal of Research on Education, Special Issue: Educational Technology and Lifelong Learning*, 6-15.
11. Egberongbe, Halima Sadia (2011). The use and impact of electronic resources at the University of Lagos. *Library Philosophy and Practice (e-journal),* Paper 472. http://digitalcommons. unl.edu/libphilprac/472.
12. Gammon, Julia A. & O'Connor, Phillis. (1996). An analysis of the results of two periodicals use studies: how usage in the 1990s compares to usage in the 1970s. *Serials Review,* Winter;, 35-53.
13. Garg, N.K. (2014). Use of InfoNet digital library consortium at Kurukshetra University, Kurukshetra and Maharishi Dayanand University, Rohtak: A study. International Journal of Information Dissemination and Technology, 4(1), 79-84.
14. Golwal, Madan D, Sonwane, Shashank and Vaishnav, Ashwini (2008). Use of Electronic Journals in Dr. Babasaheb Ambedkar Marathwada University, Aurangabad: A case study.*6th International CALIBER-2008, University of Allahabad, Allahabad,* February 28-29 & March 1, 2008.
15. Hossam, Muhammad & Chowdhury, Haider (2012). E-Journals Usage Trend in IUB Library. *Bangladesh Journal of Library and Information Science .*2(1), 79-91.
16. Xxx, xxxx (2014). *Use of e-journals by the scientists of CSIR-IGIB, Delhi, India: A study.* Manuscript submitted for publication.

17. Ivwighreghweta, Oghenetega & Oyeniran, Kayode Gboyega (2013). Usage and Awareness of E-Resources by Lecturers in Two Selected Nigerian Universities. *International Research: Journal of Library & Information Science, 3* (4), 761-774.

18. Jotwani, Daulat (2014). Trends in acquisition and usage of electronic resources at Indian Institutes of

19. Technology libraries. *Annals of Library and Information Studies, 61*(1), 33-40.

20. Khan, Abdul Mannan & Fatma, Sadaf (2013). Role of E-journals and printed journals in research. Germany: LAP LAMBERT Academic Publishing.

21. Khan, Abdul Mannan & Naved Ahmad. (2009). Use of e-journals by research scholars at Aligarh Muslim University and Banaras Hindu University. *The Electronic Library*, *27*(4);, 708-717.

22. Khan, Abdul Mannan & Khursheed, Atika (2013). Use of digital resources by the scientists of Central Drug Research Institute (CDRI), India: a survey. *The International Information & Library Review,* 45, 77-82.

23. Khan, Abdul Mannan & Shukla, Prachi (2014). Scientists attitude towards use of e-journals in Indian Institute of Toxicological Research (IITR), India. *IASLIC Bulletin.* 59 (1), 30-40.

24. King, Donald W. *et.al…(*2003). Patterns of Journal Use by Faculty at Three Diverse Universities. *D-Lib Magazine,* 9 (10), available at <DOI: 10.1045/october2003-king>

25. Merugu, Ravi Kumar (2014). Electronic resource management and services for a new learning curve: a study on Kakatiya University Library, Warangal, A.P. *VSRD International Journal of Technical & Non-Technical Research*, 5 (3).

26. Mostofa, Sk. Mamun (2013). "Use and impact of e-resources at some selected private universities in Bangladesh". *Research Journal of Library Sciences, 1 (*1), 10-13.

27. Natarajan, K., Suresh, B., Sivaraman, P. & Sevukan, R. (2010). Use and user perception of electronic resources in Annamalai University: a case study. *Annals of Library and Information Studies, 57* (1), 59-64.

28. Nicholas, David & Huntington, Paul (2006). Electronic journals: are they really used?, *Interlending & Document Supply*, *34*(2), 48-50.

29. Nicholas, David, Williams, Peter, Rowlands, Ian & Jamali, H.R. (2010). Researchers' e-journal use and information seeking behavior. *Journal of Information Science, 36* (4), 494–516.

30. Nisha, Faizul & Ali P.M., Naushad. (2012). Awareness and use of e-journals by IIT Delhi and Delhi University library users. *Collection Building*, *32*(2), 57–64.

31. Peiris, N.D. & Peiris, B.L. (2012). Use of Electronic Information Resources by postgraduate students: a case study. *Journal of the University Librarians Association, Sri Lanka, 16*, (1), 46-69.

32. Raza, M. Masoom & Upadhyay, Ashok Kumar. (2006). Usage of e-journals by researchers in Aligarh Muslim University: a study. *The International Information & Library Review*, *38*, 170–179

33. Roy, Projes, Kumar, Shailendra & Satija, M.P. (2012). Problems in searching online databases: a case study of select Central University Libraries in India. *DESIDOC Journal of Library & Information Technology*, *32* (1), 59-63.

34. Sahu, Gopabandhu, Bijay Kumar Patra, B. & Mahapatra, Rabindra Kr. (2013). Use of e-resources by the research scholars of Utkal University and Sambalpur University, Odisha: a comparative study. *VSRD International Journal of Technical & Non-Technical Research*, *4* (1), 1-8.

35. Siddique, Mohammad Asad & Ali, Amjad (2010). Online Journals in the Jawaharlal Nehru University (JNU): a user survey. *TRIM, 6* (1), 41-50.

36. Singh, Gurpreet & Nagah, Pankaj Kumar (2014). User oriented approach towards e-resources: A case study of IIT Ropar. *International Research: Journal of Library & Information Science, 4* (1), 104-120.

37. Veeramani, M. & Vinayagamoorthy, P. (2010). Impact of online journals among management graduates at Dubai international academic city - A pragmatic study. *International Journal of Library and Information Science*, 2(2), 17-23.

38. Zha, Xianjin, Zhang, Jinchao & Yan, Yalan (2014). Exploring the effect of individual differences on user perceptions of print and electronic resources. *Library Hi Tech, 32* (2), 346 – 367. http://dx.doi.org/10.1108/LHT-07-2013-0099

39. http://admin.igib.res.in/aboutigib.html

40. http://www.niscair.res.in. (Accessed on June 15, 2014)

41. http://www.igib.res.in. (Accessed on June 20, 2014)

42. http://nkrc.niscair.res.in/indexpage.php (Accessed on June 20, 2014)

43. http://shodhganga.inflibnet.ac.in/bitstream/10603/13525/11/11_chapter%203.pdf. (Accessed on June 20, 2014)