Accessing Electronic Information

A Study of Pakistan's Digital Library

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Foreword

Providing affordable access to scientific and technical research information is recognized worldwide as being an essential element in promoting national development. The opportunities furnished by the electronic delivery of such information has placed this ambition within reach of the poorer countries of the world.

The Programme for the Enhancement of Research Information (PERI) was established by INASP during 1999/2000 to provide assistance to developing and transitional countries in information production, access and dissemination using information and communication technologies (ICTs). Its objectives include facilitating the acquisition of international information and knowledge, as well as training in the use of ICTs and improving the production and dissemination of national and regional research.

In 2004 a review of PERI was undertaken to examine its relevance, usage, management, sharing and sustainability. One of the conclusions was that some of the challenges reported could be resolved by sharing and archiving case studies, best practice, ideas, etc., relevant to PERI activities.

The Higher Education Commission (HEC) of Pakistan was therefore commissioned to prepare a case study of its Digital Library. Countries have chosen different ways of managing the transition from print to online information resources. Some have left it to individual universities to formulate their own policies. Pakistan's approach has been to centralize the process at national level. Having already established the vital telecommunications infrastructure connecting 54 universities, the HEC aimed to provide access to the content of scholarly journals, plus user training, technical support and marketing and promotion. It requested PERI to assist.

The case study shows what can be achieved through a well-planned and co-ordinated national approach. It covers the content, training, marketing, finance, monitoring and evaluation and impact of the Digital Library. The programme is considered economic, with the average cost of an article download in 2005 being US$2.30. Impact is also positive, with research output steadily increasing, as measured by the number of published journal articles and the number of institutions producing publications. The Digital Library is now moving forward to the establishment of an open-access online portal for journals published in Pakistan and a Pakistan Research Repository holding the full text of research articles by Pakistani authors.

The greatest challenge is identified as being spreading awareness and encouraging the use of the resources acquired. There is a big variation in use between different institutions. Although the Digital Library team at HEC are predominantly qualified in ICT, librarians are identified as the catalysts in spreading awareness of the Digital Library programme and bridging the gap between the team at HEC and the end users in participating institutions.

This volume is the first of PERI's Research and Education Case Studies to be published. We hope that its documentation of the national approach will be useful to other countries embarking on the process of accessing electronic information resources.

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1. Introduction

Affordable access to scientific and technological research information is widely recognized as critical in supporting the needs of the indigenous education and research sector. The Digital Library programme of the Higher Education Commission (HEC) is the cornerstone of its information and communication technology (ICT) strategy. Developed from an initial concept to provide access to international scientific publications for universities in Pakistan, the programme now provides a prolific national information service. It is anticipated that, through new collaborative partnerships and the systematic training of users within higher education institutions, the vast potential of the programme in enhancing scientific capacity will be manifest.

The vision of the Digital Library programme is to meet the information requirements of the higher education and research sector in Pakistan by providing access to high-quality scholarly information based on electronic delivery. The transition from conventional print resources to online resources has come about gradually, particularly in the context of developing countries such as Pakistan, where both access to the Internet and the subscriptions required for resources have historically been barriers to progress. Modern information and communication technologies are becoming an increasingly flexible medium for the purpose of delivering and retrieving information. This compendium of technologies, when combined with high-quality information resources, can provide benefits to the country by supporting the development of a 'knowledge based' economy.

It is important to address the knowledge gap or 'digital divide' between Pakistan and developed countries. This has been done by providing an infrastructure through which research activities are encouraged. The HEC has already taken many initiatives by executing major programmes and the Digital Library is one of the highest in priority. All these programmes seek to develop a culture that adapts the research process and seeks to advance it in priority areas. It is important to highlight, however, that behavioural changes occur over a longer period of time but are positively achievable, given the right amount of determination and perseverance. In order to reap the greatest benefits from this programme, it is clear that a mechanism needs to be set up which encourages the use of electronic resources. This may take the form of assignments given to students in which research must be conducted through the use of Digital Library resources in order to develop familiarity and quality content.

Objectives of the programme

Ensure users' knowledge and awareness of the Digital Library's resources

User groups are given a clear understanding of the Digital Library so that they appreciate the benefits of having access to its resources. They are familiarized with the various databases available to them and the wide spectrum of subject areas that these databases cover.

Ensure that users have the right training and skills to use the Digital Library

User groups are taught requisite skills to be able to use all Digital Library resources effectively. Training is being conducted in phases, first to introduce search methods, with follow-up to reinforce these skills and to influence improved usage.

Ensure that users of the Digital Library use the resources to maximum effect

The sustainability of the provision of these resources is significantly dependant on their usage. It is, therefore, an ongoing priority to provide participating institutions with seamless access to the databases and to encourage their use to maximum effect.

Build an institutional research community of Digital Library users and researchers

The long-term intention is to ensure that research is not being conducted in isolated groups but that there is 'knowledge-sharing' between communities. This will increase interaction and result in more research-led activities, facilitating a change in research culture at national level.

The Higher Education Commission and its role in building Pakistan's 'knowledge-based economy'

Mission: To build and strengthen research culture in Pakistan

In order for science and technology to contribute effectively to sustainable development, countries must have a basic scientific capacity. The sustained and enduring investments that the developed nations of the world have made in building their educational and technological capacity largely explain their economic success. The responsibility for building and maintaining this capacity lies squarely on the shoulders of national governments, but significantly enhanced partnerships between governments and the science and technology community are also necessary.

The terms 'information society' and 'knowledge-based economy' are used to describe contemporary economic society. In our global, networked economy and society, information is an essential resource for capacity-building and social and economic development. Knowledge societies are characterized by their ability to identify, produce, process, transform, disseminate and use information to build and apply knowledge for human development. Empirical evidence, particularly from South-East Asian countries, has shown knowledge-intensive and high-technology parts of economies to be the most dynamic in terms of output and employment growth. Changes in technology, and particularly the advent of information technologies, are making educated and skilled labour more valuable and unskilled labour less so.

Recent policies of the government of Pakistan, through the Higher Education Commission, have placed greater stress on upgrading the skills of the vast resources of human capital in Pakistan. This has been done through measures that promote access to education, with a focus on enhancing the capacity to learn, enhancing the knowledge-distribution power of the economy through collaborative networks and the diffusion of technology, and by providing the enabling conditions for change in the science system to maximize the benefits of technology for productivity.

The science system, essentially public research laboratories and institutes of higher education, carries out key functions in the knowledge-based economy, including knowledge production, transmission and transfer. Development programmes have been implemented to enhance the capacity of these institutions in their essential role in producing new knowledge through basic research and educating new generations of scientists and engineers. In addition, they have helped the science system to reconcile this traditional function with its

newer role of collaborating with industry in the transfer of knowledge and technology. The HEC is encouraging the formation of partnerships between research institutes and academia on the one side and industry on the other for both financial and innovative purposes, while at the same time supporting the science system in its essential role in more generic research, education and the production of knowledge.

The new global knowledge-based society has means embracing fresh development challenges and opportunities that the recent rapid evolution in information and communication technologies has brought about. A comprehensive ICT strategy plays an integral part in a broad development strategy, so that ICT is being effectively used to address the fundamental development challenges of poverty reduction and sustainable economic development.

The uneven availability of access to ICTs among the world's population has great importance for public policy and the well-being of nations and individuals worldwide. Of particular importance from a global public-welfare perspective is the unrealized potential in economic and human development that could be achieved through ICTs. At the micro-economic level this forgone development activity translates into higher rates of poverty, poorer health, lower literacy and poorer quality of life than is necessary.

As the increased deployment of ICTs leads to greater digital opportunities, they can be framed and applied as a potent tool in reducing poverty, extending health services, expanding educational opportunities and generally improving the quality of life for many of the world's disadvantaged.

These global knowledge-economies have transformed economic and social patterns in industrialized countries, and they are spreading rapidly throughout developing nations. ICTs are unquestionably a key factor facilitating the globalization of production systems and markets, and at the same time they are facilitating the transfer of power, in the form of information, to individuals and organized interest groups. In order to ensure the economic competitiveness of our nation, investments in building science and technology capacities, research and development, science education, and electronic networks for science and research are critical.

As the main feature of the ICT revolution is to accelerate the diffusion of knowledge and technological know-how and to provide a 'platform' for human interactions and a global marketplace, ICTs offer new potential for Pakistan to 'leapfrog' technological progress, further reduce poverty, and close the income gap with developing countries at a faster rate.

The leveraging of ICT to facilitate broader public goods, including improved health care, literacy, civic responsiveness and equitable access to

economic opportunity, creates the social capital essential for the full leveraging of economic development potential that is being achieved through the use of digital tools and telecommunications. A view that overlooks the critical, dynamic role of social capital formation substantially underestimates the potential economic development benefits of ICT.

The core function of the HEC, in its role of facilitating the transformation of Pakistan into a knowledge economy, is that of strengthening the science system and the institutions which it comprises, where the creation of knowledge takes place. The ICT strategy of the HEC has been developed to allow for the acceleration of this process, by providing the infrastructural backbone necessary for the conduct of research, and the delivery of high-quality information and distance-learning applications.

Since the establishment of the Higher Education Commission in September 2002, many programmes have been initiated to develop the IT infrastructure of universities in order to enable institutions in Pakistan to reap the benefits of the ICT revolution. The University Computerization and Networking programme has provided public-sector universities with funds to establish a computerized infrastructure to provide a modern and effective working environment. By installing Local and Wide Area Networking systems (LAN/WAN), the project is equipping universities with modern communications systems, supporting local intranet, Internet, and PERN accessibility. The revolutionary Pakistan Education and Research Network (PERN) programme, has established the vital telecommunications infrastructure, which is currently connecting 56 universities; participating institutions are provided with Internet bandwidth of up to four megabits. This educational network is allowing the real-time transfer of audio and video, multimedia-enabled lectures, remote research partnerships, and many other applications hitherto unknown. This solid foundation for the dissemination of information will allow the benefits of the ICT revolution in building indigenous scientific capacity to be exploited.

2. The Digital Library: A Progressive Step Forward

THE DIGITAL LIBRARY PROGRAMME was initially introduced as a collaborative project of the UK-based International Network for the Availability of Scientific Publications (INASP) as the implementation of their programme for the Enhancement of Research Information (PERI). With a specific remit to increase access to information and knowledge in developing and transitional countries, the activities of the PERI programme include initiatives to encourage the creation and production of information, to promote sustainable and equitable access to information, to foster collaboration and networking, and to strengthen local capacities to manage and use information and knowledge.

Implementation of the PERI programme in Pakistan has allowed the HEC to provide a vast quantity of scholarly publications to the broadest number of people, as eligibility for access to the programme covers not only universities in both the public and private sector but also indigenous institutions with a not-for-profit remit engaged in education and research. Inclusion in the programme enables each participating institution to access over 20,000 scholarly publications, including those from both general and highly subject-specific journal providers.[1]

Access to the resources is online, and has predominantly been set up through IP verification, allowing users within institutions to be authenticated automatically for easy access to full-text services from any terminal on their local area network. For content that is not available through these resources, the HEC has, through PERI, established an agreement with the British Library for document delivery of any article from any international journal directly to scientists in universities who submit requests for access.

The Digital Library programme can be categorized into four major components: Content Acquisition and Development, User Training, Technical Support, and the Marketing and Promotion of E-Resources, each of which is described in more detail in the following pages.

[1] A complete listing of the publishers involved in the programme can be found on the Digital Library Web site, accessible through <http://www.digitallibrary.edu.pk>.

Content Acquisition and Development

The most significant component of the programme, towards which over 75 per cent of the programme budget is allocated, is the acquisition of content and the development of the collection to meet the changing research requirements of institutions in Pakistan. Great efforts have been made in this area, with the typical university in Pakistan now having greater access to electronic journals than most universities in Europe or the United States.

Following an extensive exercise conducted by the HEC in 2004 to review the situation in institutions in Pakistan with respect to the supply and availability of scholarly literature, the resource requirements for the research sector were identified. A workshop was held at the Higher Education Commission in Islamabad in March 2004, to which were invited librarians and IT professionals from universities all over Pakistan. The workshop was conducted by the Project Co-ordinator of the Digital Library programme, Kamran Naim, supported by Martin Belcher from INASP. This event was essential to determine the demand for journals and to assess the current status of off-line research materials available to various libraries.

It was concluded that, because of the varying budgets available to libraries, it would be necessary for the Commission to use it's the consortium approach to acquire online resources. The HEC has therefore represented all public and private-sector universities and research and development organizations under one broad consortium in negotiations with publishers. Public university electronic resources are being funded solely through the HEC, whereas private universities share fifty per cent of the cost of acquiring specialist resources.

The expansion strategy of the Digital Library has looked at more particular research needs, with national development objectives driving the acquisition of content for the library. A consistent feedback mechanism from the universities has allowed for the HEC to remain aware of the current information requirements of institutions.

Through a joint Ministry of Science and Technology (Pakistan) and State Department (USA) 'Pak–US Co-operation in Science and Technology' fund (in 2004), the HEC has also entered into a collaborative programme with the National Academy of Sciences in Washington DC to acquire access to journal content from leading American scientific societies and US-based academic publishers. Negotiations were conducted by the project director of the programme over a ten-day period in Washington. As a result of these meetings, users in beneficiary institutions (where access was required) across Pakistan gained access to the publications of number of prestigious publishers.

The success of the negotiations has been so significant that less than half of the grant budget has been utilized in the first year. In 2005, the remaining

balance was used to expand access to some of these society databases to additional universities where access was required, as well as to subscribe to additional journal resources.

The e-databases currently available through the Digital Library programme are listed in Table I; some are on country-wide licences through PERI and others through institutional licenses with American society publishers:

Table I
E-databases Available through the Digital Library programme

American Association of Physics Teachers (AAPT)
American Chemical Society (ACS)
American Institute of Physics (AIP)
American Mathematical Society (AMS)
American Physical Society (APS)
American Society of Microbiology (ASM)
American Society of Agricultural Engineers (ASAE)
American Society of Civil Engineering (ASCE)
American Society of Mechanical Engineering (ASME)
Association of Computing Machinery (ACM)
Blackwell Synergy
Bentham Science
Cambridge University Press
Ebscohost
Elsevier (Science Direct)
Institute of Electrical and Electronics Engineers (IEEE)
Institute of Physics
ISI Web of Knowledge
Jstor
Mary Ann Liebert
Nature Publishing
Optical Society of America (OSA)
Oxford University Press (OUP)
Palgrave Macmillan
Royal Society of Chemistry (RSC)
Science Online
Scopus
Springerlink

For any material not presently available through the Digital Library, provision has been made to place individual orders for articles through the British Library Document Delivery Service. The cost of articles ordered is borne by the HEC, and orders are placed through a systematic and calculated procedure. Generally, the ordering policy allows for two articles to be ordered per individual (student/faculty member/researcher) per month from any institution. This is to ensure that budget requirements are met and that requests from a broader segment of researchers can be catered for.

User training

The Digital Library programme has encountered many challenges, the greatest of which have been spreading awareness and encouraging use of the resources acquired. This is because these resources have been introduced into an environment that is historically very limited in its understanding of digital libraries. It has been essential first to identify the user groups through which this change was to be introduced and then target them with specialized training modules to obtain the maximum impact.

Defining user groups

Identifying user groups has been an incremental first step for all future progress in training. It is important to consider what change is being sought and who the most effective people are to help bring about that change. Should the work be done with enablers of the desired change or with targets of the change? Should different people be targeted during different phases of change?

Our effort has been to ensure that users are provided with information and training on the range of content available to them, and are able to codify the knowledge that they acquire through their research and apply it in innovative ways to their own work. The promotion of this 'effective' usage is the focus of the Digital Library programme.

Highly qualified active researchers: Developing capacity

This group represents probably the most important users of the Digital Library's resources. They have an immediate need to conduct research and will use the Digital Library as a tool to enhance the quality of their research work. In essence, they will be the most 'effective' users. Building their searching skills has been a priority to improve their research capacity.

Subject specific: Refining capacity

This group consists of Ph.D. supervisors, Heads of Departments and Ph.D.

students all of whom are active researchers. They form another important group of users who must promote the use of resources and encourage students to benefit from the journal literature that is available.

General training: Building capacity

Currently, an option under consideration is the development of 'Information Literacy' courses to be incorporated into the curricula of Masters-level courses, which would involve training students in all the resources available that are relevant to their courses of study, and setting up compulsory assignments on the content available.

Training imparted

It was recognized from the outset that the vast resources available to universities in Pakistan through the Digital Library programme would have value only if they were to be used effectively by both faculty members and students; providing access alone is not enough to make an impact. For this reason the HEC devised a comprehensive training strategy whereby a core group of intensively trained Master Trainers conducted travelling workshops and seminars across Pakistan in 2005/6 to promote awareness and the usage of Digital Library resources. The training has been geographically spread through all the main regions of Pakistan, and teams of two or three members have actively conducted on-site promotion and training activities for users. All forty-three public-sector institutions in Pakistan have been provided with initial training, including selected private institutions.

Approximately 7,500 faculty members and students were trained at the various seminars conducted across the country in 2005. The training has been varied in its scope and content: General Awareness Training has been held at universities where knowledge about the use of electronic resources has been low. This has provided participants with general information on the programme, and has included presentations on the resources available to them (and how to use them) as well as skill-development components on effective online searching techniques and modules on copyright issues, intellectual property and the ethics of research.

For more sophisticated user groups from institutions where general awareness was satisfactory, a more focused approach has been taken. The HEC Master Trainers have developed subject-specific course modules in areas relating to the Chemical Sciences, Physical Sciences, Life Sciences and Engineering Sciences, and training has been arranged for Ph.D. supervisors in their respective fields, as well as for the students under their supervision. The tiered training approach has allowed the HEC to identify and train those

individuals who have the most pertinent information requirements and whose training is expected to have a more immediate impact on research productivity. Each group has been provided with comprehensive information on the range and depth of resources available to them in their subject area, as well as with the skills on how to utilize these resources effectively (including advanced searching techniques).

Table II
Number of People Trained between January 2003 and June 2006

Year	No. of people trained	Cumulative total
2003/4	150	150
2004/5	7,500	7,650
2005/6	1,200	8,850

Technical support

The organization of the programme entails establishing continuous communication with the publishers and institutions registered for access to Digital Library resources to ensure smooth operation. The management of the Digital Library is led by the Project Co-ordinator, who establishes long-term guidelines for the successful implementation of the programme and develops plans for diversification and expansion while keeping budgetary controls in place. The responsibility of the subordinates or Master Trainers is further subdivided geographically whereby each member is required to serve a number of roles to attend to the needs of his/her region.[2]

The team remains the first point of contact for technical queries from universities, and resolves these issues in a timely manner. For more complex technical issues, the team co-ordinates directly with the publishers to manage access at the universities. A central database is maintained of the IP addresses and contact details of each institute; if a university changes its IP address, they simply notify the Digital Library team and, through an automated system, access to resources is updated immediately. Specific tasks of the team include meeting the following objectives.

[2] Details of the Digital Library Team and their qualifications appear in Appendix VII.

Ensure the availability of resources

The country has been divided into five major regions, each being assigned to a regional co-ordinator. E-mails have been sent to all the institutional representatives to establish and ensure continued correspondence with their respective regional co-ordinators.

Through telephonic or e-mail correspondence between the co-ordinator and the representative, all issues pertaining to access to resources have been resolved. Variations usually arise for the following reasons:

- variation of the IP range
- a problem at the publisher's end
- a problem at the institution's end

New institutes are requested to provide static IP ranges for registration with the publishers and for the provision of the resources. Initially access was given to some institutes through a username and password but no new institution is now allowed access without a static IP.

Ensure secure and ethical use of resources

Access to the resources has been shifted from username/password to static IP range to facilitate systematic monitoring. The use of usernames and passwords means that the resources can be accessed from any location and in the case of illegal usage it is difficult to identify the individual or group responsible. Static IP range access is available only through the network of the respective institutes, thus holding the institute's management responsible for any unauthorized usage, such as excessive downloads with Web crawlers or other software. Should these occur, access is terminated at once and the vice-chancellors of the institutes concerned notified.

Monitor usage by participating institutions

The HEC has a mechanism in place to collect usage data of the databases provided to the various universities across the country and consistently monitors this usage. In this way, the team can identify technical issues, and also can adjust the collections provided to universities by removing those resources that are not used. The funds freed up by doing so are used to support institutions where usage is greater, or who have a requirement for a particular resource. The team also uses the usage data to monitor the impact of the training programmes, i.e. to map how the use of various resources changes at institutions following a training session, and to determine whether these changes are significant.

Institutional representatives at the university end comprise mainly librarians or networking professionals where there is an absence of librarian support. Their qualifications vary greatly. The librarians from top-performing universities are

individuals with high qualifications in library science. Other representatives may be individuals who are conversant with library systems and are able to disseminate electronic resource information effectively.

The librarians have indeed served as catalysts in spreading awareness of the Digital Library programme and bridged the gap between the team at HEC and the end users in participating institutions. As the responses to the questionnaires indicate, they have been responsible for conducting a number internal workshops of their own and have responsibly spread electronic resource awareness by displaying and distributing promotional material. They are responsible for receiving user requests for new journals and forwarding this information to the Digital Library Project Co-ordinator for processing, and correspond with the Digital Library team to submit article requests to be placed through the British Library.

Marketing and promotion of e-resources

In order to promote the indigenous research sector and improve the visibility of nationally conducted research, the Higher Education Commission has implemented major programmes that are based on the principles of promoting open access to research information. These programmes are elaborated on below.[3] With regard to the promotion of e-resources available through the Digital Library programme, a number of steps have been taken that are highlighted in this section.

Presently, over 20,000 journals are being provided through the programme, and a recent survey from Elsevier publishing claimed that the programme now covers almost 70 per cent of the world's peer-reviewed scientific content. Participating institutions include an estimate of over 150 organizations that include public-sector universities, private-sector universities and other research and development institutions. More institutions are being added on a regular basis, which portrays the ever-expanding sphere of researchers and academicians who can benefit from this programme.

The provision of access to databases is, however, not enough. As mentioned above, a major challenge has been spreading awareness of the resources acquired because they have been introduced into an environment that is historically very limited in its understanding of digital libraries. Librarians are traditional in their approach towards library management, given their experience of operating out of hybrid libraries, and find the electronic world slightly overwhelming.

[3] See section 5, page 27.

Various materials have been developed to promote awareness of the resources, including posters and pamphlets.[4] These have been dutifully distributed throughout the campuses of participating institutions. Institutions have ensured that this material is displayed in their libraries and that students can obtain this information readily. Bookmarks containing URLs of all the publishers' databases are also distributed so that students have promotional material at hand to refer to when conducting their searches.

A comprehensive Web site has been developed to support the promotion of the Digital Library and was launched in May 2005 in an effort to create awareness and provide users with a central point for information on the resources of the Digital Library. The Web site offers a user-friendly interface and gives detailed content information for Digital Library users – general users, librarians, researchers and students. Publisher information is readily available and subject strengths are outlined for easy reference. Each participating institution has its own page carrying information about registered resources and contact details of its representatives. Students and university staff can view a listing of the resources that are being provided to them and link directly to the publishers' databases to begin their search.[5]

The Web site also holds a number of useful links to open-access resources and various other scientific search engines to help users locate scientific information on the Web. A section containing frequently asked questions (FAQs) has been added, which responds to the basic queries of users wanting to learn about the concept and application of digital libraries. It also covers questions relating to membership and publisher participation information that are specific to this programme.

The Digital Library team has held a number of training sessions to create awareness of these resources and, at the same time, to impart the knowledge and skills required for their successful use. The training has been spread through all the main regions of Pakistan, with teams of two or three members having actively conducted on-site promotion and training activities for users.

A priority initiative of the Digital Library programme has been to introduce a one-window search interface known as the ELIN system. The Higher Education Commission and INASP have linked up with Lund Libraries, Sweden, to adapt and extend their existing Electronic Library Information Navigator (ELIN@) system so that it can be used by universities in Pakistan.[6]

The pilot project was launched in September 2005, initially at three major

[4] See Appendix IV.

[5] See Appendix V for a screenshot of the Web site.

[6] See <http://www.inasp.info/peri/elin>.

universities in Pakistan. ELIN provides users with a unified, user-friendly search interface, and allows the HEC to analyse and monitor usage within all participating institutions. Rigorous training activities were performed at these institutions in the early months of 2006, and personalized promotional material developed and distributed throughout the campuses. This included bookmarks and posters tailored to the names of the university, circulated generously to department heads and to users during training so that the URL for access to ELIN would be made available with ease.[7]

Following the biannual review of ELIN, access to this interface is being expanded to a further ten universities. Additional training activities are to be performed for the newly added institutions and have been planned for execution in the coming months.

Another recent initiative has been the development of a distance-learning module through which the programme is to be promoted. The programme involves the development of content to be supplied through the virtual university in the form of videotapes and broadcast via the education channels acquired by the HEC. The team has fleshed out an outline that covers not only the basic Digital Library information but also explores the resources in depth according to subject focus. Students will be able to learn the importance of the Digital Library and understand its effective application at their own pace from the comfort of their home or office. The television broadcast will ensure deeper geographical penetration to students in relatively remote areas.

Accomplishments include the final recording of the distance-learning module which will be supplied to students through the virtual university at the start of the academic year in September 2006.

[7] See Appendix VI.

3. Funding and Costs

As mentioned earlier in this study, the HEC has acquired electronic resources through a consortium-based model. Public-sector universities have been given access free of charge, the cost of access being borne completely by the Commission. Private-sector universities, however, must share 50 per cent of the cost as they generally have larger budget allocations.

The funding and costs of the programme may be categorized in to the same four major components discussed above:

- Content Acquisition and Development
- Training
- Technical Support
- Marketing and Promotion of E-Resources

The pie chart in Figure 1 shows how the total budget has been allocated under each component.

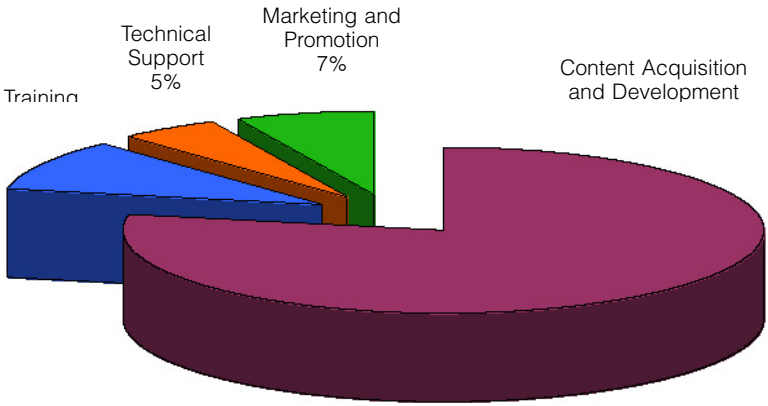


Fig. 1
Allocation of the Budget for Expenditure on the Digital Library programme

The budget allocation for the Digital Library programme has doubled each financial year, and the total amount for 2005/6 is Pak Rs200,000,000.[8] This includes approximately Rs65,000 that has been set aside for training, conferences, workshop expenditure and running expenses. This amount is expected to double in the year 2007 as the programme continues to expand its collections and broaden the scope of its coverage.

Table III
Budget Allocation for the Acquisition of E-content in the Digital Library programme, 2003 – June 2006

Year	Pak Rs	£	US$
2003/4	19,093,933	172,017	313,015
2004/5	73,590,025	662,973	1,206,394
2005/6 (to June)	135,198,690	1,218,006	2,216,372

[8] Approximately US$3,278,688 or £1,801,802.

4. Monitoring and Evaluation

SINCE ITS INCEPTION in 2003, the Digital Library programme of the Higher Education Commission has gone from strength to strength in terms of the content available and usage. The year 2005 has yielded a positive and enthusiastic response from researchers across the country, and a number of workshops have been conducted to facilitate the process of familiarizing users with the benefits and methods of using the electronic content available through the programme.

In order to assess the performance of educational institutions participating in the programme, usage statistics in terms of the number of article downloads have been collected. There has been a significant increase in the total number of full-text articles downloaded from the previous year. The statistics for 2004 show a total of approximately 100,000 full-text article downloads, while the total count for 2005 has exceeded 1 million. This clearly suggests that all the participating public, private and research and development institutions have woken up to the immense potential offered to their researchers through this programme who can benefit from being able to access scientific and technological content.

Table IV shows the number of full-text article downloads for all participating public-sector institutions. These institutions have been categorized in descending order, i.e. those with the highest usage first, with a total of 666,986 full-text downloads being recorded.

It is interesting to note that an increasing number of institutes are registering for access to the programme, with the total number of participant institutions exceeding 250. Not only is the number of users rising, but the depth and breadth of resources being provided through the programme are also growing. The usage statistics have been critical performance indicators in signifying which resources need to be trimmed from the portfolio and which might be expanded. Additional collections have been provided to the best-performing institutions to reward their usage. Resources that were being underutilized by some institutions have been removed and provided to other institutions based on their research requirements.

From the figures it becomes evident that there remains a great disparity between the use made of the resources by the different institutions. The HEC will be conducting exercises to help institutions with poor usage overcome any infrastructure constraints and to promote usage through focused user training. It

Table IV
Full-Text Article Downloads, January–December 2005, by Public-Sector Universities

Rank	Institution	Downloads
1	University of Karachi	91,989
2	Quaid e Azam University	83,426
3	University of Punjab	66,885
4	University of Agriculture, Faisalabad	55,410
5	University of Engineering and Technology, Lahore	55,225
6	Bahauddin Zakariya University	52,278
7	COMSATS Institute of IT	27,744
8	University of Peshawar	24,113
9	University of Sindh, Jamshoro	19,658
10	Pakistan Institute of Engineering and Applied Sciences	18,923
11	Institute of Business Administration, Karachi	17,414
12	NED University of Engineering and Technology	14,190
13	Government College University, Lahore	13,915
14	University of Arid Agriculture	12,616
15	Allama Iqbal Open University	10,762
16	University of Engineering and Technology, Taxila	10,451
17	National University of Science and Technology	8,978
18	Fatima Jinnah Women University	8,275
19	Liaqat University of Medical and Health Sciences	8,225
20	NWFP University of Engineering and Technology	5,880
21	International Islamic University	5,852
22	Mehran University of Engineering and Technology	5,727
23	National University of Modern Languages	5,615
24	Islamia University	5,556
25	University of Balochistan	4,911
26	Lahore College for Women University	4,404
27	Balochistan University of IT and Management Sciences	3,466
28	Air University	3,410
29	NWFP Agriculture University	3,076

30	Gomal University	2,552
31	University of Veterinary and Animal Sciences	2,187
32	Shah Abdul Latif University	2,138
33	University of Health Sciences	2,018
34	Bahria University	1,890
35	Quaid e Awam University of Engineering and Tech	1,818
36	Institute of Management Sciences, Peshawar	1,643
37	Federal Urdu University of Arts, Sciences and Technology	1,392
38	University of Aazad Jammu and Kashmir	1,114
39	Sindh Agriculture University	995
40	University of Malakand	313
41	University of Sargodha	184
41	Virtual University	158
42	DOW University of Health Sciences	117
43	Balochistan University of Engineering and Technology	65
44	Kohat University of Science and Technology	28

is in the interest of the participating institutions to ensure that faculty members and researchers attend these workshops and gain optimal benefit.

The usage statistics compiled for the year 2005 indicate that the cost per article for our Digital Library works out at less than $2.30.

The total number of full-text article downloads for private-sector universities came to 156,971 in 2005 (Table V). The three leading universities are Lahore University of Management Sciences, Isra University and Aga Khan University.

Total full-text article downloads for various research and development institutions came to 34,942 in 2005. The three leading research centres include the College of Physicians and Surgeons, Shaukat Khanam Memorial Cancer Hospital and the State Bank of Pakistan.

Table V
Full-Text Article Downloads, January–December 2005, by Private-Sector Universities

Rank	Institution	Downloads
1	Lahore University of Management Sciences	83,882
2	Isra University	15,974
3	Aga Khan University	12,050
4	Lahore School of Economics	11,602
5	University of Management and Technology	5,973
6	GIK Institute of Engineering and Technology	5,795
7	National College of Business Administration and Economics	4,002
8	Hamdard University	2,188
9	National University of Computer and Emerging Sciences	1,995
10	Muhammad Ali Jinnah University	1,929
11	SZABIST	1,794
12	Ripah International University	1,516
13	Ziauddin Medical University	1,407
14	University of Lahore	1,372
15	Iqra University	1,182
16	GIFT University	1,102
17	University of Central Punjab	839
18	Foundation University	617
19	Baqai Medical University	504
20	City University of Science and IT	323
21	Beaconhouse National University	234
22	Institute of Communication Technologies	201
23	Qurtuba University	149
24	Dadabhoy Institute of Higher Education	147
25	Pakistan Air Force Karachi Institute of Economics and Technology	100
26	Imperial College of Business Studies	28
27	Rana Liaqat Ali Khan Government College of Home Economics	12
28	Sarhad University of Science and IT	11
29	The University of Faisalabad	10
30	Gandhara University	10
31	Gandhara Institute of Science and Technology PGS Engineering	9

Table VI
Full-Text Article Downloads, January–December 2005, by Research and Development Institutions

Rank	Institution	Downloads
1	College of Physicians and Surgeons	8,129
2	Shaukat Khanam Memorial Cancer Hospital	3,463
3	State Bank of Pakistan	2,008
4	International Centre for Chemical Sciences	1,879
5	Pakistan Institute of Development Economics	1,757
6	Securities and Exchange Commission of Pakistan	1,640
7	Islamabad Policy Research Institute	1,551
8	Centre for Advanced Studies in Engineering	1,229
9	Global Change Imapct Studies Centre	1,157
10	National Centre of Excellence in Molecular Biology	1,057
11	Shifa College of Medicine	1,025
12	Institute of Communication Technologies	826
13	Fatima Jinnah Women University	763
14	Khyber Medical College, Peshawar	691
15	National Library of Biological Sciences	687
16	College of Excellence in Molecular Biology	551
17	National Tariff Commission	540
18	Ministry of Commerce	504
19	Centre of Biomedical Ethics and Culture	491
20	Pakistan Centre for Philanthropy	439
21	National Institute of Public Administration	420
22	Planning Commission	404
23	Pakistan Council of Scientific & Industrial Research	361
24	Pakistan Institute of Legislative Development and Transparency	302
25	Pakistan Naval Academy	302
26	FMH College of Medicine and Dentistry	261
27	Pakistan Museum of Natural History	237
28	National Agricultural Research Centre	229
29	Small and Medium Enterprise Development Authority SMEDA	203
30	Institute of Cost and Management Accountants	182
31	Sustainable Development Policy Institute	167

Table VI (continued)

32	National College of Arts	150
33	Institute of Bankers	145
34	Barani Agriculture Research Institute	132
35	NIIT Library	129
36	Institute of Regional Studies	126
37	A. Q. Khan Biomedical and Genetic Engineering Laboratory	125
38	Forman Christian College	124
39	Ministry of Foreign Affairs	120
40	Applied Economics Research Centre	118
41	Institute of Space Technology	65
42	Pakistan Administrative Staff College	64
43	National Library of Engineering Sciences	41
44	Pakistan Scientific and Technological Information Centre	36
45	Pakistan Space and Upper Atmosphere Research Commission	24
46	Women Institute of Science & Humanities	17
47	College of Medical Sciences	15
48	Government Gordon College	13
49	Mehbub ul Haq Human Development Centre	8
50	Lady Willingdon Hospital	6
51	Pakistan Institute of Legislative Development and Transparency	5
52	College of Electrical and Mechanical Engineering	5
53	Pakistan Poverty Alleviation Fund	5
54	QUEST Library	5
55	National Library of Physical Sciences	4
56	Pakistan institute of Legislative Development and Transparency	2
57	Information Technology Centre	2
58	Pakistan Engineering Council	1
59	Children Hospital and Institute of Child Health	0
60	Central Library	0
61	Belvedere Technical Teachers College	0
62	NIMS Library	0
63	Alvi Dental Hospital	0
64	AJK Council Library	0
65	Government Degree College Larkana	0

5. Impact

A NUMBER OF INDICATORS have been used to ascertain the impact of the Digital Library programme. The first indicator is the total volume of research being produced by public and private-sector universities between the years 2001 and 2004. Although there are many factors which make up these figures, they can be used as a crude estimate of the pattern of research output in Pakistan.

Table VII shows that research output has increased steadily over the past four years; the percentage of publications has doubled from 2003 to 2004. The Digital Library programme has been functioning in Pakistan since 2003, so it is likely to have played some part in the acceleration of research output. Users have greater access to electronic resources, there is more knowledge sharing, and better incentives are being provided by the HEC so these figures are expected to continue upwards over time.

Table VII
Research Output from Public and Private-Sector Universities, 2001–2004

Year	No. of research articles published	Percentage increase	Cumulative total
2001	513	—	513
2002	576	12	1,089
2003	639	10	1,728
2004	781	22	2,509

Tables VIII to XI provide details of how many articles have been published by each public and private university between 2001 and 2004. These figures have been calculated using the Thomson ISI Web of Knowledge, a powerful evaluation tool that enables highly focused analysis of over 7,500 science and social sciences journals, and measures performance to help in tracking trends.[9]

The top public-sector universities that have the highest number of publications are the University of Karachi and Quaid-e-Azam University. This is because they have active research centres and also have substantial budgets

[9] See <http://www.isiknowledge.com>.

Table VIII
Research Output from Public and Private-Sector Universities, 2001

Rank	Institution	Type	Articles published
1	University of Karachi	Public	101
2	Quaid-e-Azam University	Public	91
3	Aga Khan University	Private	70
4	University of Punjab	Public	34
5	University of Agriculture, Faisalababd	Public	30
6	University of Peshawar	Public	23
7	Government College University	Public	21
8	Pakistan Institute of Engineering and Applied Sciences	Public	12
9	University of Sindh	Public	10
10	Dow Medical University	Private	10
11	GIKI Institute of Engineering and Technology	Private	10
12	Bahauddin Zakariyah University	Public	8
13	University of Engineering and Technology, Lahore	Public	6
14	University of Balochistan	Public	6
15	NWFP University of Agriculture	Public	5
16	Islamia University Bahawalpur	Public	4
17	COMSATS	Public	3
18	Gomal University	Public	3
19	Hamdara University	Private	3
20	University of Azad Jammu & Kashmir	Public	2
21	Allama Iqbal Open University	Public	1
22	Baqai University	Private	1
23	NED University of Engineering and Technology	Public	1
24	Lahore University of Management Sciences	Private	1
25	Mehran University of Engineering and Technology Jamshoro	Public	1
26	Liaquat University of Medical and Health Sciences	Public	1
27	Sindh Agriculture University	Public	1
28	University of Arid Agriculture	Public	1

Table IX
Research Output from Public and Private-Sector Universities, 2002

Rank	Institution	Type	Articles published
1	University of Karachi	Public	144
2	Quaid-e-Azam University	Public	115
3	Aga Khan University	Private	89
4	University of Punjab	Public	33
5	University of Peshawar	Public	30
6	University of Agriculture, Faisalababd	Public	25
7	Government College University	Public	21
8	Islamia University Bahawalpur	Public	20
9	University of Sindh	Public	16
10	Dow Medical University	Public	15
11	Bahauddin Zakariyah University	Public	15
12	University of Balochistan	Public	9
13	GIKI	Private	7
14	Gomal University	Public	6
15	PIEAS	Public	6
16	University of Arid Agriculture	Public	5
17	NWFP Agriculture University	Public	5
18	University of Engineering and Technology, Lahore	Public	4
19	Baqai Medical University	Public	2
20	Lahore University of Management Sciences	Private	2
21	University of Azad Jammu and Kashmir	Public	2
22	Allama Iqbal Open University	Public	1
23	Mohammad Ali Jinnah University	Private	1
24	National University of Science and Technology	Public	1
25	NED University of Engineering and Technology	Public	1
26	Sindh Agriculture University	Public	1

Table X
Research Output from Public and Private-Sector Universities, 2003

Rank	Institution	Type	Articles published
1	University of Karachi	Public	145
2	Quaid-e-Azam University	Public	120
3	Aga Khan University	Private	85
4	University of Punjab	Public	42
5	University of Agriculture, Faisalababd	Public	41
6	University of Peshawar	Public	33
7	Government College University	Public	26
8	Bahauddin Zakariya University	Public	18
9	PIEAS	Public	12
10	University of Sindh	Public	12
11	Islamia University	Public	11
12	Lahore University of Management Sciences, Lahore	Private	10
13	NWFP Agriculture University, Peshawar	Public	10
14	University of Engineering and Technology, Lahore	Public	9
15	COMSATS	Public	8
16	Dow Medical University	Public	8
17	University of Balochistan	Public	8
18	Ghulam Ishaq Khan Institute of Engineering and Technology	Private	7
19	Baqai Medical University	Private	6
20	National University of Sciences and Technology	Public	6
21	Gomal University	Public	5
22	Hamdard	Private	5
23	Federal Urdu University of Arts, Sciences and Technology	Public	4
24	NED University of Engineering and Technology	Public	4
25	Allama Iqbal Open University	Public	1
26	Fatima Jinnah Women University	Public	1
27	International Islamic University	Public	1
28	Lahore College for Women University	Public	1

Table XI
Research Output from Public and Private-Sector Universities, 2004

Rank	Institution	Type	Articles published
1	University of Karachi	Public	176
2	Quaid-e-Azam University	Public	153
3	Aga Khan University	Private	86
4	University of Peshawar	Public	52
5	University of Punjab	Public	47
6	University of Agriculture, Faisalababd	Public	46
7	Government College University	Public	28
8	University of Sindh	Public	27
9	Bahauddin Zakariya University	Public	26
10	University of Balochistan	Public	13
11	Gomal University	Public	13
12	Ghulam Ishaq Khan Institute of Engineering and Technology	Private	13
13	PIEAS	Public	12
14	National University of Sciences and Technology	Public	12
15	NWFP Agriculture University, Peshawar	Public	11
16	COMSATS	Public	11
17	University of Engineering & Technology, Lahore	Public	9
18	Islamia University	Public	8
19	University of Azad Jammu and Kashmir	Public	7
20	Baqai Medical University	Private	4
21	Federal Urdu University of Arts, Sciences and Technology	Public	4
22	University of Health Sciences	Public	4
23	Liaquat University of Health Sciences	Public	4
24	Allama Iqbal Open University	Public	3
25	Hamdard	Private	3
26	Dow Medical University	Public	2
27	Sindh Agriculture University	Public	2
28	Shah Abdul Latif University	Public	2
29	Mehran University of Engineering and Technology	Public	2
30	ISRA	Private	1

Table XI (continued)

31	Lahore University of Management Sciences, Lahore	Private	0
32	University of Arid Agriculture	Public	0
33	NED University of Engineering and Technology	Public	0
34	Zia-ud-Din Medical University	Private	0
35	International Islamic University	Public	0
36	Lahore College for Women University	Public	0
37	Fatima Jinnah Women University	Public	0

to meet the needs of their researchers. For example, the survey conducted shows that Quaid-e-Azam has a budget of over Rs3 million to develop its library resources. In the private sector, Aga Khan University has the lead and continues to produce the most articles.

It becomes clear that over the years since the inception of the Digital Library programme in 2003, research output has generally increased. Not only has the total number of publications risen, but the number of institutions that are producing publications has also increased.

However, from a closer analysis of the first performance indicator, it becomes evident that there is still a significant gap between the output of research articles of the top three universities and that of those below them. This gap in performance can be attributed to many factors, including low incentives available to researchers, limited availability of resources (infrastructure) and restricted access to resources (both electronic and print). The Higher Education Commission has studied these factors in great depth and is providing assistance in the form of incentives for quality research and support through programmes such as the Digital Library.

The second indicator used in this case study to measure the impact of the Digital Library programme was a survey circulated to the top public and private institutions selected on the basis of their usage of the Digital Library resources.[10]

Responses from the survey produced the following information:

- The librarians employed are suitably qualified professionals who show enthusiasm and co-operation in disseminating Digital Library information.

[10] Details about the survey, a list of the institutions surveyed and a copy of the questionnaire used appear in Appendices I, II and III.

- The top performing libraries have provided their users with access to a considerable volume of print publications. For example, Lahore University for Management Sciences and Quaid-e-Azam University both have subscriptions for between 100 and 300 periodicals. This is in addition to the electronic resources being provided to them through the Digital Library programme.
- Libraries are now functioning on larger budget allocations than in previous years such that most libraries have budgets of over Rs1 million and bigger libraries have between Rs3 million and Rs6 million.[11]
- Successful implementation of the programme and awareness of electronic resources have been attributed to the amount of training sessions that have been conducted in the institutions. These include external training delivered by the Digital Library staff and internal training arranged locally by the librarians. Relatively smaller institutions – such as the Pakistan Institute of Engineering and Applied Sciences, Nilore – have held three internal training sessions to promote the use of their library over the period of one year. Their performance has been satisfactory and they have made it into the top ten public-sector institutions, even though their total student enrolment figure is just over 600. Larger public-sector universities with higher student enrolment figures have had difficulty in matching these figures, emphasizing again, the need to have proactive librarians. All institutions are encouraged to hold frequent workshops to build awareness about the resources for their users.
- Users' awareness of Digital Library resources in the sample libraries is high, and promotional material supplied through the HEC is systematically distributed to the relevant departments. Librarians report that many requests are generated daily by users regarding the Digital Library programme, which shows good interest levels and users' eagerness to learn.
- The educational impact outside the library can be measured by observing whether faculty members are setting assignments that require research to be conducted using Digital Library resources. Universities such as the Ghulam Ishaq Khan Institute of Engineering and Technology, Topi, and the University of Agriculture, Faisalabad, have taken measures to ensure that lecturers give assignments that involve downloading relevant material from the Digital Library and also require the use of this information in the preparation of final-year dissertations. All

[11] 1US$ = Rs61; £1 = Rs111.

universities are encouraged to do the same, as it will not only enhance the quality of their research but will help in processing requests for additional resources.

- Overall, the responses to the survey show that the libraries are benefiting from this programme and that librarians are optimistic that its implementation will enhance the quality of the research being produced in Pakistan.

6. Future Plans

A NUMBER OF PLANS to promote national research objectives are already in place and the Higher Education Commission is taking special interest in this area.

The first involves the creation of an open-access online portal where all journals published in Pakistan are made available for worldwide electronic access. This measure will allow international exposure of research conducted within Pakistan, and will assist in the international peer-review process of indigenous publications. The pilot project has involved the collection of back issues of ten leading Pakistani journals, which are being scanned and made available online. Once implemented, 'PJOL: Pakistani Journals Online' will have a fully searchable Web interface similar to that of any other international electronic journal database.

The second major programme has been the development of a national research archive, the Pakistan Research Repository. This national-level repository has the potential to bring significant benefits to educational and research institutions in Pakistan by improving the visibility and impact of indigenous research. Where allowed by publishers, this repository contains the full-text of research articles of Pakistani authors published in both international and local journals and, where full-text hosting is not allowed, article metadata (with abstracts) with links to the full text on the publisher's site is available. Research publications in this repository are being categorized by subject and by source institution (and further departmental categorization) to provide an overall view of research conducted in Pakistan at various strata.

This national-level repository serves as a mechanism for the long-term preservation and archiving of Ph.D. theses published in universities in Pakistan. Guided by the principle that they are public information, all Ph.D. theses are being systematically collected from institutions and entered into the repository. The repository provides a search mechanism to browse theses and dissertations by subject and source institution, and allows public viewing of any document through the hosting of PDF files of the full text. Until PDF versions are available for all the documents, the HEC is arranging document delivery of articles upon request.

The repository also intends to serve the second purpose of exposing research information published in Pakistan to the rest of the world. By making the repository open access, all articles, dissertations and Ph.D. theses will be

made freely available and be subject to review and scrutiny by the national and international academic community. Exposure on this platform will assist in the dissemination and improved citation of quality research output of Pakistani institutions, and will have the dual purpose of exposing plagiarism and duplication in published research.

The future of Pakistan's Digital Library holds great promise as the programme is being appreciated by users nationwide. The years to come will determine how effectively e-resources are integrated in the research process, and the sustainability of the programme will be dependent on researchers and professionals who must play an active role in managing the Library and optimizing the use of its resources.

Appendices

Appendix I
Scope, Purpose and Methodology of the Survey

Aims

In the context of the performance of the Digital Library Programme, the investigation aimed to:

- Establish an understanding of the importance of this Programme in Pakistan, a Third World country, while exploring the role of the Higher Education Commission in promoting it;
- Establish the progress that has been made in libraries by the introduction of electronic resources;
- Explore current priorities and strategic directives with respect to the expansion and diversification of the Programme;
- Ascertain which support interventions have worked best;
- Assess the impact of the Programme and monitor usage patterns of e-resources;
- Explore the future opportunities available for the sustainability of the Programme and its effective implementation.

Coverage

Data were collected from external as well as internal sources. The first set consists of data gathered in the form of questionnaires from ten librarians or institutional representatives of leading public and private-sector institutions in Pakistan.

Data collected from internal sources consist of the usage measured in terms of total article downloads in 2005 by public, private and research institutions, respectively.

Methodology

A questionnaire was designed and piloted for completion by libraries (see Appendix III). It covered the main aspects of digital librarianship, including the skill level of librarians, ICT facilities, local content, electronic resources, finances, management and training, user education and future plans.

Time scale

Data on usage were collected between January 2005 and June 2006. The questionnaires were distributed in early May 2006 and the analyses began later in the same month.

Data collection

The questionnaire was sent out to ten universities of which three were in the private sector and seven in the public sector. Out of these, two private universities and five public-sector universities responded. These institutions were selected on the basis of their high usage of the Digital Library in the year 2005. A complete list of the universities that were included in the survey appears as Appendix II.

The survey aimed to investigate the current status of the top performing institutions, so data were requested from the libraries of public and private-sector universities that showed high patterns of use. A further study may be conducted at a later date to provide a comparison between the best and worst performing institutions to assess why there is a difference in performance and to suggest methods of improving the use of electronic resources.

Appendix II
Institutions Selected for the Survey

Institution	Type	Representative's name and designation	Response received
Aga Khan University, Karachi	Private	Ayaz Somjee, Co-ordinator, IT Projects	No
Bahauddin Zakariya University, Multan	Public	Zubair Ahmed, Lecturer	No
COMSATS Institute of Information Technology	Public	Raja M. Ibrahim, Senior Librarian	Yes
Ghulam Ishaq Khan Institute of Engineering and Technology, Topi	Private	Salim Iqbal, Assistant Director Library	Yes
HEJ, University of Karachi	Public	Imran Hameed, Network Manager DL	Yes
Lahore University of Management Sciences, Lahore	Private	Haider Ali, Electronic Resources Librarian	Yes
Pakistan Institute of Engineering & Applied Sciences, Islamabad	Public	Shoaib Malik, Network Administrator	Yes
Quaid-i-Azam University, Islamabad	Public	Dr Abdul Hameed Toor, Head of Department	Yes
University of Agriculture, Faisalabad	Public	Nisar Ahmad Jamil, Head Librarian	Yes
University of Engineering and Technology, Taxila	Public	Shahbaz Pervez, Senior Network Engineer	No

Appendix III
Questionnaire

This survey is being undertaken to support the development of a Case Study which is to be prepared on the 'Digital Library of Pakistan', commissioned by the International Network for Availability of Scientific Publications. The opinion of Digital Library Subscribers, (mainly librarians of our top performing libraries) is sought on various attributes of the services provided through this Program. The objective is to analyze the Program's performance and estimate the success of its implementation in Pakistan. Your co-operation in completing this survey is highly appreciated.

Respondents Personal Information & Demographic Profile

Gender

- ❑ Male
- ❑ Female

Age

- ❑ Below 21 years
- ❑ Between 21 and 35 years
- ❑ Between 36 and 50 years
- ❑ Above 50 years

Educational Background

- ❑ Secondary Education (Metric/O' Levels)
- ❑ Higher Secondary Education (FA/ F.S.C / A' Levels)
- ❑ Bachelors
- ❑ Masters
- ❑ Ph.D

Professional Experience in the Capacity of a Librarian

- ❑ Less than 1 year
- ❑ 1 – 5 years
- ❑ 5-10 years
- ❑ More than 10 years

Current Status of Library

1. What is the total student enrollment at your Institution?

   _____

2. How long has it been since your Institution subscribed to the resources available through the Digital Library Program?
   - ❑ Over a year
   - ❑ Between 6 months and 1 year
   - ❑ Less than 6 months

3. What is your existing collection of off-line resources available, i.e. print journals that the Institution has subscribed to other than the DL Program?
   - ❑ Less than 100 journals / magazines
   - ❑ Between 100 – 300 journals / magazines
   - ❑ Between 300 – 600 journals / magazines
   - ❑ Above 600 journals / magazines
   - ❑ Other estimate _____

4. What is the approximate budget that has been dedicated towards the purchase of the printed journals?
   - ❑ Less than 1 Mn
   - ❑ Between 1 Mn – 3 Mn
   - ❑ Between 3 Mn – 6 Mn
   - ❑ More than 6 Mn

5. Are there any other resources that you have subscribed to apart from journals, such as conference proceedings, magazines, books, etc? And if so, in what quantities?

	Resource Name	**Resource Quantity**
❑	_____	_____
❑	_____	_____
❑	_____	_____

Library Use

6. Does your library contain computers for students and faculty members to access the DL content, and if so, how many work stations are available for this purpose?
    - ❑ No
    - ❑ Yes. Quantity _____

7. How many workstations are available outside the library premises for accessing the DL on campus?

    _____

8. What methods have been used by you to disseminate information to end-users (students / faculty members) to inform them of the resources available to them? Tick as many as appropriate.
    - ❑ Posters
    - ❑ Pamphlets
    - ❑ Library Website
    - ❑ E-mail alerts
    - ❑ Trainings
    - ❑ Other _____

9. When was the last training that was conducted in your Institution with the purpose of raising awareness of DL Resources?

    _____

10. How many internal trainings have been conducted on the Institutional end to promote the DL Program since its registration?
    - ❑ Less than 3
    - ❑ Between 3 and 6
    - ❑ More than 6

11. How many end users have been trained through:

    a. Internal Trainings? _____
    b. External Trainings? _____

User Needs

12. How would you rate the awareness level of your users about the DL Program?
    - ❑ Very aware
    - ❑ Reasonably aware
    - ❑ Not aware

13. How satisfied do you think are the users of your Institution in terms of the Program meeting their research expectations?
    - ❑ Very satisfied
    - ❑ Satisfied
    - ❑ Neutral/not sure
    - ❑ Dissatisfied
    - ❑ Very dissatisfied

14. How many requests on average are generated daily by users regarding the DL Program in a week?
    - ❑ Very Often
    - ❑ Often
    - ❑ Not very Often
    - ❑ Never

Educational Impact

15. To your knowledge, are faculty members incorporating the use of the DL resources in their teaching methodologies? For example, do they give assignments which require downloading relevant material from the DL?

    _____

16. How would you assess the impact of electronic journals being introduced to the academic community in Pakistan?

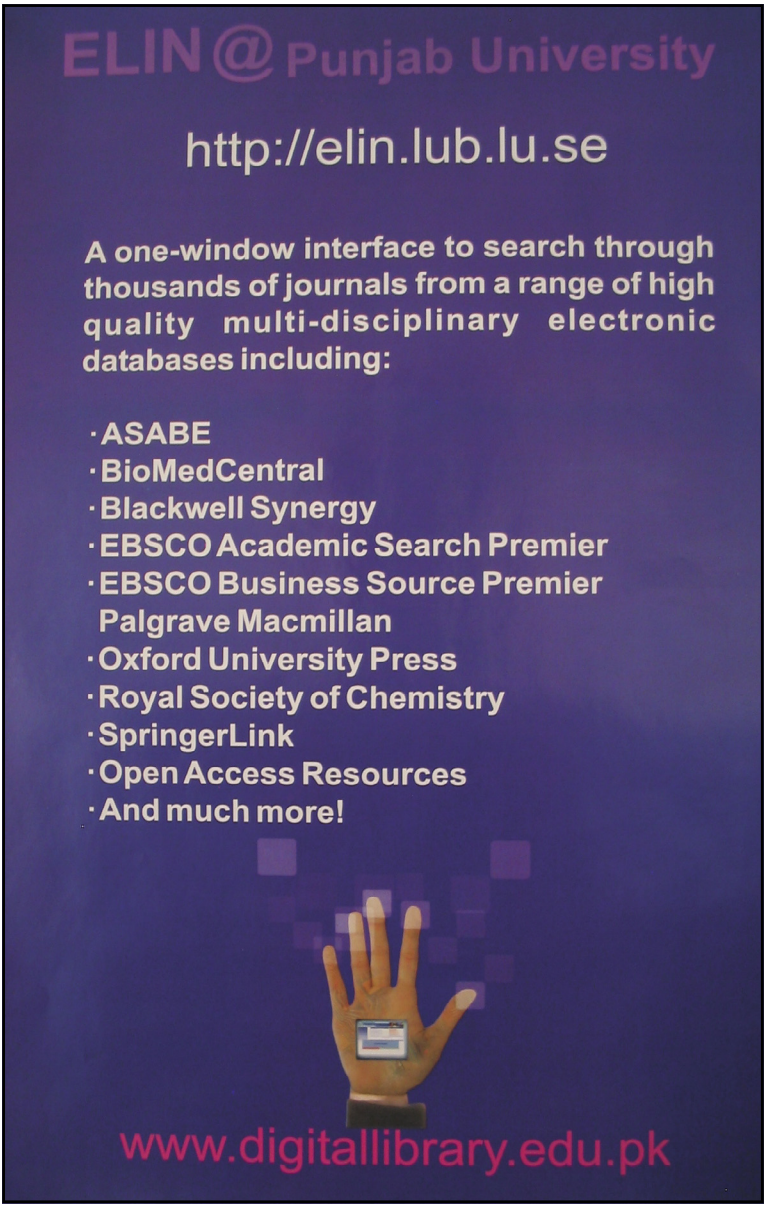
    _____

17. What do you feel is the future of the Digital Library program in Pakistan and what suggestions or recommendations do you have on the improvement of this Program?

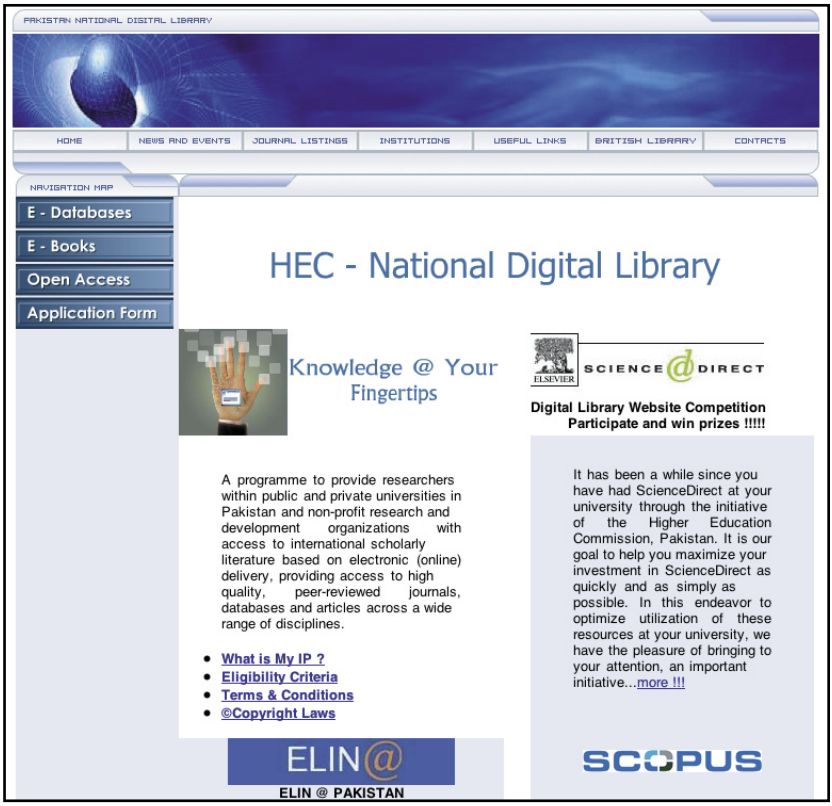
    _____

Thank you for your time and cooperation!

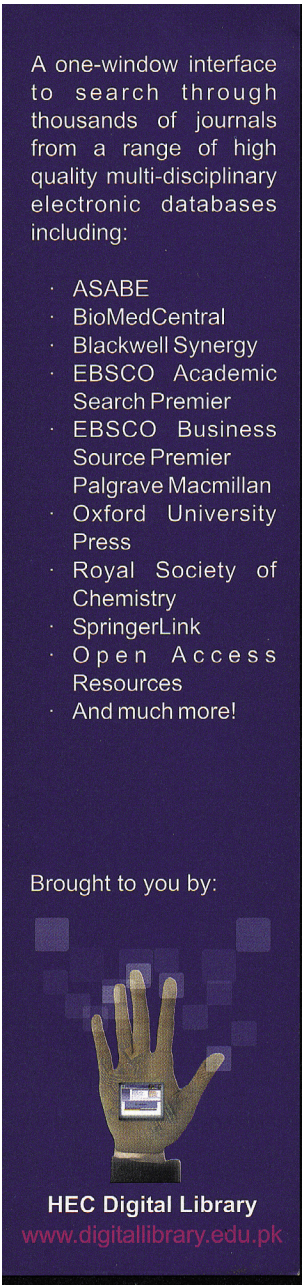
Appendix IV
Posters Used to Promote Awareness of the Digital Library


ELIN @ Punjab University
http://elin.lub.lu.se
A one-window interface to search through thousands of journals from a range of high quality multi-disciplinary electronic databases including:
· ASABE
· BioMedCentral
· Blackwell Synergy
· EBSCO Academic Search Premier
· EBSCO Business Source Premier
Palgrave Macmillan
· Oxford University Press
· Royal Society of Chemistry
· SpringerLink
· Open Access Resources
· And much more!
www.digitallibrary.edu.pk

Appendix V
A Screen Shot of the Home Page of the HEC Digital Library
<http://www.digitallibrary.edu.pk>



Appendix VI
Bookmarks



Appendix VII
The Digital Library Team and Their Qualifications

Regional Co-ordinator	Region	Professional Qualification	Years of Professional Experience
Amina Said	Federal Area	Masters in Information Technology Bahria University, Islamabad	2
Ali Said	Balochistan & AJK	M.Sc. International Economics and Public Policy Cardiff Business School, Cardiff University, Wales, UK	5
Furqan Sher	NWFP	MCS (Master of Computer Science) University of Management and Technology, Lahore	2.5
Shahida Younas	Punjab	MCS (Master of Computer Science) Qauid-e-Azam University, Islamabad	1.5
Urooj Fatima	Sindh	MCS (Master of Computer Science) University of Engineering and Technology, Taxila	3