

Use of Information and Communication Technology (ICT) for Effective Open and Distant Learning (ODL)

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Abstract—Allama Iqbal Open University (AIOU), Pakistan is one of the sixteen mega-open universities in the world, providing education opportunities to about one million students in Pakistan and the Middle East, from elementary level to doctoral level. The University has been facing quality issues in Open and Distance Learning (ODL) education, mainly due to the poor interaction between tutors and students, outdated course content, a biased assessment system, and lack of trained Human Resource. A major project to improve the quality of education at AIOU has been developed for the technological transformation of this unique national institution with the assistance of the Higher Education Commission of Pakistan. This paper discusses the technological and E-learning Model being implemented for the effective, responsive and target oriented Open and Distant Learning (ODL) at the University.

Index Terms—Mega, education, ODL, Middle East, Open and Distance Learning.

I. INTRODUCTION

Communication technologies have a manipulative power and effect on the field of education in general. These technologies have been increasingly used in education and training for many years to meet different needs [1]

Distance education programs worldwide use a variety of technologies that include print materials, audio and videocassettes, audio and video teleconferencing, one-way and two-way television, computer-mediated communication (e.g., electronic mail, computer conferencing), and more recently, the Internet. Technologies that deliver instruction to distance learners are often classified as two-way interactive or one-way non-interactive [2]

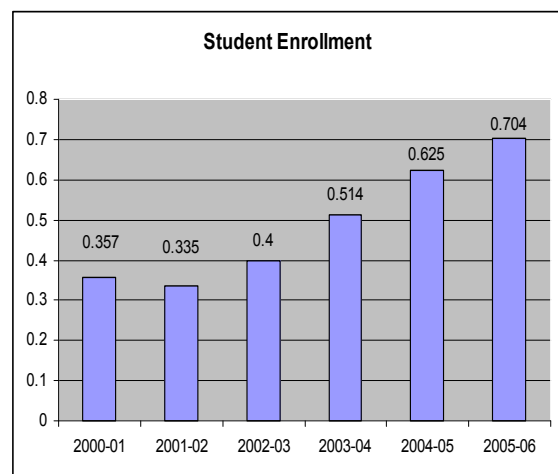
The basic problem with the students of the ODL is poor interaction and affiliation as the non-formal distance learning education provides little chances of interaction and they are isolated from the main stream of education [3]. The need for affiliation is critical for distance learners in general [4].

The specific cultural ethos of a country has direct bearing on the quality of distance learning, hence the research in distance learning in developing countries require understanding the contextual framework of the area[5].

Open and Distance Learning (ODL) provides a unique opportunity to those who cannot afford formal University education due to their socio-economic, socio-cultural and

demographic conditions. Pakistan is a developing country with per capita income less than US\$1000. The majority of the 160 million populations belong to the lower-middle and poor classes [6]

A great majority of these people live in rural areas where access to the formal education system is not possible. Allama Iqbal Open University was thus established in 1974 on the model of UK Open University. During last 30 years AIOU has been recognized as a major national institution providing education to 800,000 students in science, social science and humanities. Presently the University offers about 1000 courses and 120 programs from elementary to doctoral levels. Student enrolment growth trends and basic data about the University in 2005 are shown in Figure 1 [7].



Faculties	4
Departments (Academic)	35
Research Centres & Institutes	3
Programs Offered	135
Courses produced & Offered	1200
Students Undergraduate	221621
Students (Bachelors & Masters)	363854
Students (M. Phil & Ph. D)	896
Others (Diploma & Certificates)	118331
Total Students Enrolment	704702

Figure 1. Size of the University, 2006 [ref.7]

The average growth rate in enrolment is 15% per annum and the University is meeting all of its operating expenses from revenues mainly generated from student fees [6].

II. CHALLENGES FACED BY AIOU

1. Poor interaction of the students with University and tutors.
2. Non reliable networks (LAN and WAN) and inconsistent information bandwidth.
3. Traditional students and management information system depending mostly on manual operations.
4. Due to limited multimedia course ware and E-learning facility, the benefits of ODL cannot be extended to most students.
5. Shortage of trained human resources. The majority of senior and middle level managers lack modern management and leadership skills and knowledge of ICT.
6. Enormous student drop-out ratio to the tune of at 50%.
7. Significant quality concerns and questions in the minds of policy makers about the standards of education at AIOU.
8. Relatively poor quality of student intake.

III. OBJECTIVES OF THE TECHNOLOGICAL DEVELOPMENT OF THE AIOU

Technology can be a big catalyst for change to help AIOU face the challenges of twenty-first century education. For this purpose a major Information and Communication (ICT) system has been conceived and being executed under Higher Education Commission of Pakistan at a total cost of US\$70 millions and is to be implemented in next two years [8].

The objectives of the ICT transformation projects are as follows;

1. Develop the infrastructure for a modern technology based distance education university including interactive satellite based TV channels.
2. Create digital course content and deliver it through multicast, satellite based broadcast network from studios to study centers, schools and colleges.
3. Establish a WAN to connect the regional centers study centers, and selected schools and colleges where AIOU student do practical work with the main campus and interact with a group of faculty members available online over the network.
4. Improve the quality of teachers of English, science, mathematics, and IT by using the network for pre-service and in-service training opportunities for teachers and educational administrators.
5. To assist the Ministry of Education in implementing the new scheme of studies and curricula in English, Science, and Mathematics.
6. Improve the quality of assessment of students and reform the examination system using online assessment methods and tools.
7. Acquire open source international materials through international linkages with reputable ODL universities/organizations and deliver them through DVB IP, Internet streaming media and/or teleconferencing.

IV. APPROACH FOR THE TECHNOLOGICAL TRANSFORMATION MODEL AT AIOU

Four major sub-systems have been devised for the implementation of the proposed projects is given in Figure2;

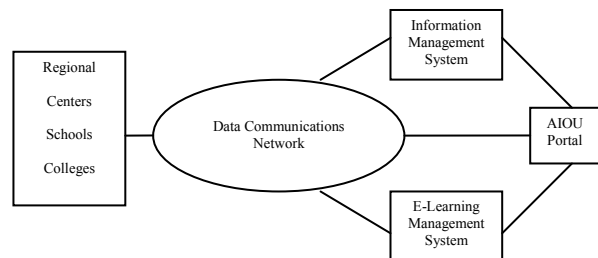


Figure 2. A conceptual diagram of the four sub systems.

A. University Information Management System

University Information Management System (UIMS) is aimed at providing timely and accurate information to the university's internal and external users. Its functions are to collect, store, and process, manage, distribute, utilize, and secure the information pertaining to AIOU establishment, and its students (from admission to graduation). Major components of UIMS are:

- Data Centre (Data Warehouse)
- Data applications for human resource, material resource, financial resource, and other traditional and non-traditional management functions including students' record management.
- Web services providing AIOU Portal
- Email services for AIOU employees

B. E-Learning Management System

The purpose of this system is to create, archive, deliver, and distribute on-line course material including interactive live telecast of lectures. Online admission, registration, study, assessment, and evaluation of students is important ingredient of this system. It shall also facilitate collaborative learning and teaching.

C. Data Communications System

This system is required to interconnect the various hardware/software components of the above two systems at the main campus as well as with all regional centers, schools and colleges associated with AIOU. This includes satellite-based WAN connectivity for E-learning and teaching and any other wireless/wired connectivity. The existing LAN is required to be integrated with the VSAT network. Remote AIOU locations, schools and colleges will also enjoy Internet access through the VSAT network. DVB-S2 supporting full range of applications will be the main protocol for E-learning activities.

D. Human Resource Training and Development

This project segment aims to provide training to the tutors and teachers in E-Learning. Course development, on-line course conduct, assessment and evaluation of participants are the areas in which number teachers and tutors will be trained. Creative activity for course development and delivery is a hall mark of this project.

V. COMPONENTS OF THE ICT PROJECT

The scope of the project is summarized in Table 2.

TABLE II
SCOPE OF THE PROPOSED PROJECT.

#	Component	Quantity
1	DVB Satellite Channel Uplink Main Campus AIOU	1
2	Two TV Channels through Virtual University Connectivity	1
3	DVB Satellite Channel Main Regions	
	Model A: AIOU Buildings + Large Colleges + Main Computer Study centers of AIOU outreach	10
	Model B: AIOU Regional Centers/Regional Campuses/medium Study Centers/Medium Teacher Training Colleges	30
	Model C: City Schools/Small Colleges/ Community Learning Centres/Internet Café	40
	Model D: Very Small Set ups/Shared Single Connection	40
4	Remote area Govt. Schools.	
5	Equipment For Main Campus	5
	Tutor and Staff Training Labs	
	MIS Centre Servers	
	S/W Systems, Applications and customization	
6	Video Conferencing facilities	6
7	Wifi Mesh System	7
8	ICT Building	8
9	Electrical Power Equipment	9

A. Proposed communication Network

Three major communication media have been proposed in the network:

- AIOU DVB-S2 Satellite Network for remote connectivity.
- AIOU-TV channel: Initially to benefit from the virtual University VU uplink facility.
- Higher Education Commission (HEC) Pakistan intranet PERN fiber network

The basic architecture of the network is shown in Figure 3.

Theses models have been elucidated in the Figure 3 thru Figure 7. Three communication models A, B, C & D have been proposed under the project.

Four communication models A, B, C & D have been proposed under the project for the interaction with the ODL students and teachers across the country.

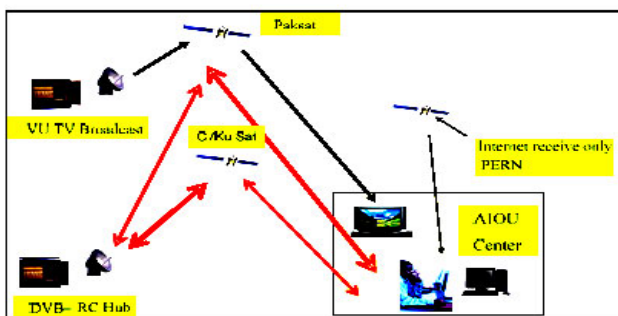


Figure 3. Basic Architecture of the communication network.

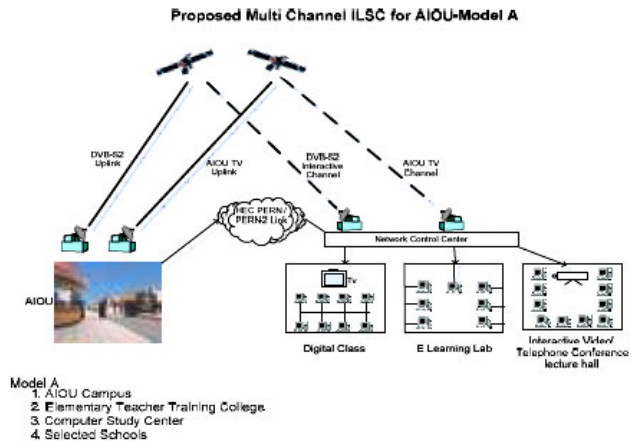


Figure 4. Model A. Interactive Learning Students Centre (ILSC) model with the Regional Campuses.

B. AIOU premises Interactive Learning Students Centers (ILSC) -Model A

In addition to main campus at Islamabad-Pakistan, AIOU has nine purpose buildings for its regional campuses. At these nine locations, AIOU will provide multiple connectivity on 15 hours a day and 7 days a week basis.

Three interaction components have been proposed;

- Digital teaching labs
- Open E-learning Labs
- Video-Teleconferencing class rooms

These labs will be used for those students, who don't have the computing facilities at their premises, offices, schools and communities. These ILSC will also be connected with the Higher Education Commission (HEC) mega intranet (HEC-PERN) and AIOU-DVB S2, network and AIOU TV channels. The details of Model A are illustrated in Figure.4

C. Rural/Remote Regions- (ILSC-Model-B)

This model will be established at the 22 regions of AIOU, presently functioning in the rented buildings across the country. This model will have DVB-S2 connectivity for internet and AIOU TV channel. Students will attend Moodle(or any other suitable alternative) based live class room presentation, vice based lectures and Q& A sessions. The Government Elementary Teachers Training Colleges (ETTC) can also be connected to this model at later stage. The details of model-B are given in figure 5.

D. Small School Community Learning Centers and Model-C:

For rural schools and local internet café, Tele-centres of Model-C shall be adopted, with average 5-10 computer terminals. This can be done through public private partnership. The details of model-C are given in figure 6

E. Rural and Remote Connectivity Model-D

For the areas lacking communication infrastructure, model-D has been adopted, in which one way communication through TV broadcasts, use of multimedia flash and content along with moodle online interactive class rooms and tele-class rooms with DVB S2 vice channel has been adopted. The details of model-D are shown in Figure 7.

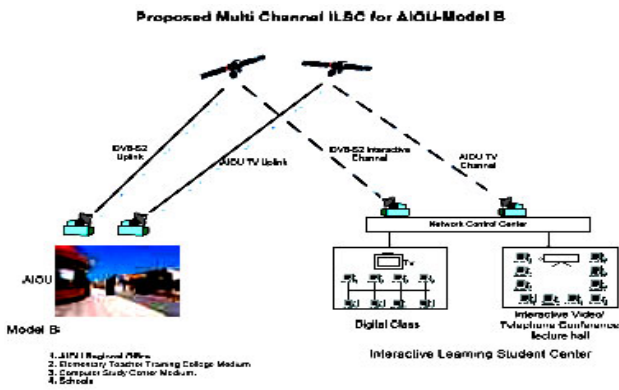


Figure 5. Model :B : Proposed ILSC model with small regions.

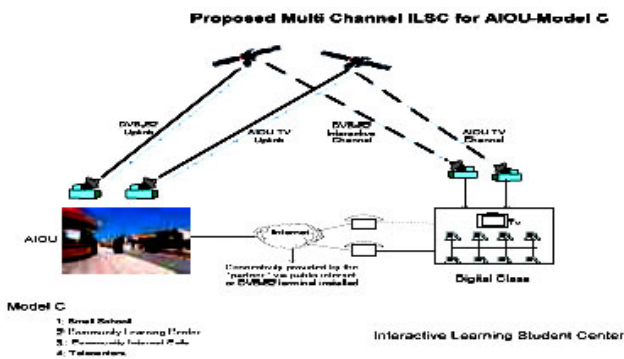


Figure 6. Model :C: Proposed ILSC model for Community centers and schools

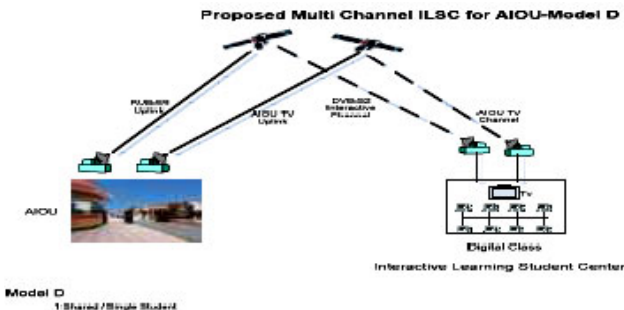


Figure 7. Proposed ILSC Model D for small Schools and remote rural centers

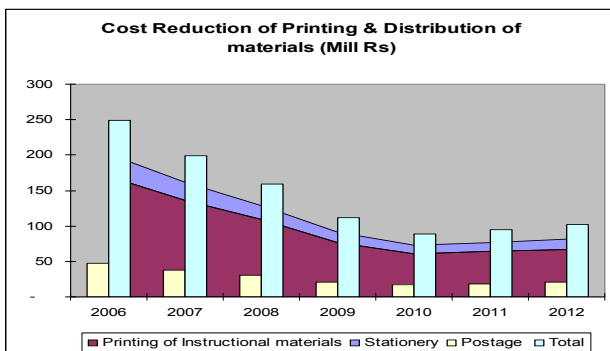


Figure 8. Cost reduction Model after implementation of the project

The main hub of the communication network shall be installed at AIOU main campus at Islamabad with capacity of 500 ILSC's.

VI. COST REDUCTION AND RATIONALIZATION

- Reduction in a block budget of over Rs. 170 Million (see Figure 8).
- The increase in costs in later years arises because there is expected to be an increase in activity, and also because not all learning will be electronic in nature.

VII. RISK ANALYSIS

The possible areas of risk and their proposed mitigation include:

1. Funding issues encompass funding shortfalls, over expenditure, a funding cycle that fails to match the incidence of expenditure, failure to implement in time, cost overruns etc.
 - Reduced Funding: In case of reduced funding, the project can be scaled down suitably with no major change in the main architecture.
 - Cost Overrun: The Project Management process will ensure that there is a timely cut off point to take corrective action
2. Lack of capacity and skills to manage the key processes:
 - The communications expert team will be established very early in the project. Analysts and staff for the MIS process will also be inducted as a priority.
 - User training and the development of the old and new IT-enabled employees in the Services departments (especially in MIS, Exams, Admissions, Registrar, Finance etc) will be strengthened, and the ICT infrastructure will be opened for use by all.
 - Staff training will be done simultaneously to ensure the utilization of the new systems.
 - The process from staff recruitment to having someone actually in place takes a long time (sometime up to 12 to 18 months). This will be reduced to build capacity in a shorter timeframe.
 - The current lack of emphasis on training and continuing education for internal staff will be changed drastically, and budgets and internal training staff coordinators with specific targets are going to be put in place.
 - In order to meet the key vulnerability of the lack of capacity in terms of acquiring and retaining personnel with the high level of skills needed for the IT and Telecommunications infrastructure, it is proposed to outsource these two elements.
 - For the above, the Campus and ERP will be contracted on a transaction based fee and the bidding for these will be based on a small upfront charge, while the ongoing implementation, management and support would be paid on a per student basis. This cost will be recovered from the student base via a small increase in students' monthly fee.
 - For the Satellite and ICT infrastructure the contract for the initial procurement will additionally be based on a fixed monthly maintenance and support fee for the Satellite Hub as well as the Remote sites.

3. Falling short of targets in the hiring and training of requisite staff is a very real danger and it is for this purpose that special training and other professional incentives are being designed in the system. This aspect will also be addressed by the above mentioned strategy.
4. Inability to transform the plans to a practical shape and lack of acceptance by the end user is an issue and will be covered by adequate publicity and support from stake holders
5. Lack of transparency and monitoring of the project is another issue. Key Performance Indicators (KPIs) and Critical success factors will be defined. For this purpose an external Project Management and Monitoring team will be put in place to report to the Vice-Chancellor. The team will track in real time all KPIs and monitor slack and as well as provide a recourse for settling grievances. It is planned to put the progress on a Website with all possible details so that the process can be transparently monitored by all stake holders.
6. All outsourced items (Project Management, ICT infrastructure, software for Campus and education ERP, etc) will be covered by comprehensive SLAs (Service Level Agreements). Such SLAs are the norm in the outsourced IT and Telecommunications industries and are also being used in Pakistan.
7. Improper conceptualization and planning and flaws in Process and systems design need to be considered. It is expected that with the Advisory Council and external consultants will cover this aspect.
8. Lack of acceptance of key external stake holders viz. HEC (Higher Education Commission), the Ministry of Education, and other government departments is being taken care of by continuous sharing of information and seeking guidance from the key entities involved.
9. Issues with Internal Change management and implementation: Lack of internal buy-in and HR issues: This is an issue being dealt with by a comprehensive Change Management program
10. Poor quality content and inadequate delivery resulting in a failure:
 - There needs to be an overall review of the way in which academic content is updated, adopted and acquired, even in text format.
 - AIOU is slow in producing audio/video content. It is not geared to acquiring/using common content.
 - The student and tutor base is not fully IT literate and not acquainted with e-content (text). TV may not be accessible since there are many viewers with differing requirements.
 - Parallel efforts will be undertaken for content development and utilization:
 - i. Faculty training and repositioning and getting lead faculty members in each faculty or department.
 - ii. Content search and adaptation/localization effort is going to be a component in project PC-1

iii. Training of tutors and students in order to make them IT enabled and be able to utilize e-content

- Availability of PCs at home is a critical issue. There are parallel plans to involve microfinance banking to build in an additional fee for enabling each student to own their own PCs.
- 11. Poor image and support. The budget for routine advertisement of 2006-7 of Rs. 17M will be tripled over the next two years to address the issue of articulation of the growth and new processes, ‘products’ and methods and their impact on the educational landscape

VIII. RESULT OF TRANSFORMATION AND CONCLUSIONS

The project has been initialized and the consultancy services have been hired. The successful completion of the project will enhance the quality of ODL of AIOU, while increasing student strength and diversity of activity:

- 10-12
- University
- Continuing Education
- Vocational Training
- Specialized Corporate Training.

Information and Communication Technology can play a dynamic role in the effectiveness and strengthening of Open and Distant Learning (ODL)/

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