

## A Hybrid Distance Education Model for Pakistan

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**Abstract** <sup>3/4</sup> In this paper we will be reporting on a Distance Learning project currently underway in Pakistan. Firstly, it will be analysing how the Ministry of Science and Technology's (MOST) venture of Virtual University (VU) is likely to address the issue of the wide dissemination of quality education through this distance learning initiative. Secondly, the role Lahore University of Management Sciences (LUMS) s' research team played in testing and refining the model of instruction for VU. There are many problems and hindrances in providing quality education to remote areas. Coupled with an acute shortage of teachers are lack of resources, such as Internet connections fast enough to provide video-conferencing, availability of state of the art PCs and infrastructures. A hybrid model evolved where the lecture would be broadcast on Television and Internet will be used for on-line question answers, quizzes, and assignments. The TV satellite quasi-synchronous model was chosen to overcome high bandwidth requirement, which is essential for effective on line instruction. The linkage between VU and private institutions like LUMS is also unique a response to a national need of bridging the digital divide.

**Index Terms** <sup>3/4</sup> Distance Education, Virtual University, Hybrid Model, Remote Education, Instructional Television, Online Instructional Design.

### INTRODUCTION

Distance Education (DE) has gained much significance in the last decades of the twentieth century and every university is desirous of an on line presence. Competition in the higher education market is likely to grow with high-tech businesses increasing their sphere of influence by offering e-learning courses to people looking to improve their qualifications. It is a business worth \$25 billion a year world wide and growing. Universities will lose their students to these smart competitors if they do not figure out how to ride this wave of on line learning. Over 80% of US universities and many of the world's best universities are offering online degree programmes or courses. "Most prevalent is the overall trend of institutions to move from single mode delivery to multi mode with a major interactive component" [1].

The School of Arts & Sciences (SoAS) at the Lahore University of Management Sciences (LUMS) is a well-established traditional university and now wants an online presence. Web based and online instruction can be used as an adjunct to regular classes or as stand-alone courses, which the students can opt for. So when the opportunity

presented itself of starting research and work in the area of Online /E-learning in collaboration with the Ministry of Science & Technology (MOST)'s venture Virtual University, it was received with some enthusiasm. LUMS objectives would include building capacity in the following:

- Administration of online courses
- Supplemental and stand alone on line materials
- Develop instructional design capacity
- Use of multi media in instructional design

We in the project team were very interested in researching implications and impact of Multimedia Computer Applications in Instructional Design for online and regular university courses. Since it is a new area, of particular importance to technical and professional schools, the administration perhaps was more interested in how LUMS can operationalise this growing knowledge base. The exciting possibilities of incorporating distance learning with individualised need-based learning were worth looking into and further exploration of this nexus was a worthwhile goal.

Many supporters of distance education remark that distance education is cheaper and is as effective as traditional university education. But Distance Education is gaining momentum in third world countries for some other reasons. There are many unsolvable problems and hindrances to providing quality education to remote areas in the third world. Some of the main problems include absolute shortage of teachers, especially in the field of computer science. Other factors include lack of resources, availability of state of the art PCs and infrastructures. These circumstances have made traditional education very inefficient and overpriced [3]. Distance Education of the type discussed in this paper may help in providing good quality education to some remote cities and villages.

The Ministry of Science and Technology, anticipating growing worldwide interest in Distance Education and realizing its advantages, initiated setting up of the "Virtual University of Pakistan" (VU) with a starting budget of 1.0 Billion Rupees (\$16 million).

LUMS in collaboration with the VU team came up with a proposal, which would help in providing quality web and TV based distance education. Otto Peters the leading European scholar of distance education comments that the enthusiasm for virtual universities is not shared by all, "educationist are tortured of *how* it will in fact be used in reality"[2]. The pilot study at LUMS helped to

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operationalise the idealism behind the virtual university concept. However, as a corollary to this research LUMS was able to offer its first online course. The research data collected from this first experiment will help not only LUMS but also VU to refine their course offerings. Both these models will be discussed in depth later.

The Virtual University started recording its lectures in January 2002 and broadcasted its first lecture on 23 March 2002. It was a great achievement for the team working under Dr. Naveed Malik, the Rector of the Virtual University. However, insufficient lead-time for the preparation and delivery of lectures was a serious constraint, and must be addressed in the recording of next semester's lectures. One very important aspect of this project is the training and learning curve emerging for instructors prepared to act as e-moderators for distance learning courses. Most of the instructors were new to the concept and took a while getting used to TV recordings and initializing web discussions. Other quality issues will also have to be ironed out. Hopefully as capacity develops in instructional design and the broadcast mode of lecture delivery, the course offerings would improve. Teething troubles faced by all such set ups have not been able to dampen the enthusiasm of VU supporters. They still believe in the idealistic goals of the venture and feedback of students enrolled in the remote centers justifies an expensive venture like the VU. Instructors of the first semester continue to receive grateful mails from students from remote parts of the country showing appreciation for such high quality education.

**A BLUEPRINT FOR VIRTUAL UNIVERSITY**

After a thorough review of the literature on Distance Education and many discussions with the stakeholders of the Virtual University, we proposed the following model and made these suggestions. We suggested a hybrid model that uses television and low-speed Internet. The Instructional Television will show course programming and Internet will be used for on-line question answers, quizzes, assignments. Other features include remote classrooms with PCs and mentors. Students' attendance will be mandatory at the time of TV broadcast, ensuring synchronous mode of delivery. The students will be able to see course videos on monitors using TV cards. Their attendance will be automatically registered at the time of login. They will be able to ask questions from the mentor or directly from the instructor using chat or e-mail.

**The Project's Physical Set-up**

The set-up uses a hybrid model, which is new to this part of the world. Following are the components of the proposed physical set-up:

- There will be remote class-rooms arranged/setup by the project.

- Each classroom will have state of the art computers with Internet.
- All computer will have video cards for TV signal reception.
- All remote classrooms will have satellite downlink.
- The project will have either its own satellite uplink or it can buy air-time from one of the commercial television companies as shown graphically in Figure 1.

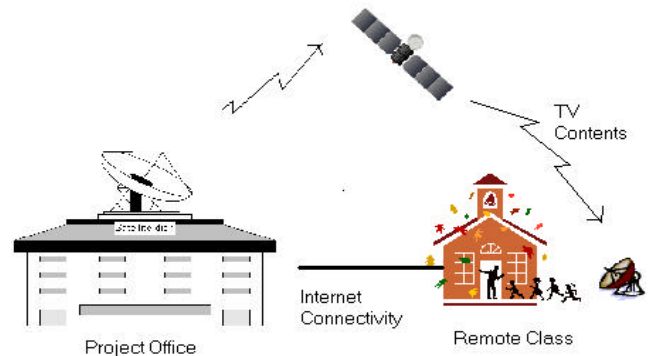


FIGURE 1  
A PHYSICAL PLAN OF THE PROJECT.

We have suggested that for each courses, there should be a live broadcast on the televisions at fixed times. The courses will be offered on nation-wide basis.

**The 3-element Course Video**

In the 3-element video, we suggested that a live video of the lecture should be one element. The course slides on PowerPoint will be the second element; the overall lecture breakup will be added as third element. This is shown in Figure 2 below.



FIGURE.2  
THE PROPOSED 3-ELEMENT MODEL FOR VU

The role of the main/side window can change as per demand of the course. This may include some animations or computer graphics to emphasize some concepts of the lecture.

### Role of Faculty

In distance learning, it is important that the student's first learning experience is an encouraging one for him, or he may not come back for another DE program for several years [4]. Lately, the role of the teacher in Distance Education is changing from 'sage on the stage' to a 'guide on the side' [3],[5]. In a country like Pakistan where students are used to traditional classroom, it was thought that the teacher's new role as 'guide on the side' might not be acceptable to the students. Hence, it was decided that a live video of the teacher would be one element of the three-element video. This has many advantages. American Federation for Teachers (AFT) suggests that all Virtual Universities must have full time teachers [9]. This is important if the course is to be reiterated, or else a new video has to be made. Modern Distance Learning courses have adopted 'standardization' or 'massification' of courses leading to little freedom for the faculty. For example, University of Phoenix, which is world's largest university has 15 minutes modules and all courses have the same look and feel [6], [7]. This kind of standardization has worked well for course designing team but has left little freedom for the faculty. Many educators have strongly criticized course standardization as it causes disaggregation of the faculty, [6], [8]. A typical on-line course designing team includes [6]; Content Expert, Learning Process Design Expert, Process Implementation Manager, Advisors, Assessors of Effectiveness, Examination Experts.

A typical online course design usually costs in excess of \$1 Million [7], which, of course, is difficult to afford for a country like Pakistan. In our project, we have suggested a simple video of the teacher. Other consideration include that the faculty should not only be a 'curriculum expert' but also a teaching a research faculty, so that the courses are updated well in-time for changing environments. It is further suggested that the teacher must meet students at least once during course, as required by AFT recommendations. [9] This is another reason for keeping a permanent faculty.

### The Role of Students

Many backend and front-end studies have shown that students have a liking for DE [3], [10], [11], however, this is yet to be tested in Pakistan. The following proposals were made in order to make DE practical and also an interesting experience for the students.

**Lectures on CDs:** Although courses will be delivered through television broadcasts, students will also be provided with a CD containing an integrated package containing the 3-element model shown in figure 2. This way, if any student misses the actual lecture/broadcast, he/she would have the opportunity of reviewing it at a later date or time. Similarly, by providing the entire lecture material in the form of API (Application Program Interface) based contents on CD, the full power of hyperlinks will be utilized to further enhance

the learning process. Students would be able to review the course material and repeat exercises and practice problems as many times as needed for a proper comprehension of the material. This strategy was, in fact, later adopted for LUMS pilot project where easy to use graphics user interface (GUI) was developed for slow-speeding, rewinding and forwarding the lecture video and other contents. The lecture video was synchronized with the related contents on a time-line. On students' demand, a facility was provided to turn off the video (keeping the audio still on) for them to focus on the slides and other elements of the window.

**Student Conferencing/Chatting:** Discussion Boards would be a standard feature of this model. Students sitting in the remote Internet cafes which will act as classrooms will be able to discuss course related issues with other students in different cities of Pakistan. Similarly message boards will also be set up for asynchronous interaction. This "pedagogic connection" is very important to reduce the anonymity and the "I-it relationship (i.e subject object relationship)" of distance education, which alienates students from DE [2]. Moreover, "a dialogue forces people to contact each other directly... an irreplaceable activity... important for the existence of mankind"[2].

**Email Link with the Professor:** Learning from research at MIT, and Professor Larson's strong views on students having access to what he calls "high touch", it is proposed that students have access to first TAs and then the Professor himself.

**Proctored Examination:** Instead of resorting to hitech online testing and grading system incorporation, we have suggested that proctored examination will be a low cost and effective way of testing students.

**Course Synchronicity:** The course video broadcast in a class will ensure the concept of 'same-time same-place' and will help in developing a classroom environment and student interaction among them, thus creating a healthy competition environment.

**Clear Course Outlines and Details:** In DE, students take on more of a customer role than a traditional 'chalk and blackboard' classroom. Hence it is important that the students are given clear course outlines and details of each and every event and dates and times of each instrument well before the start of the course.

**Advance Training:** An advance training is suggested for those who do not know how to use computers, how to email, etc. As described by [5], 'cyberspace courses may not match many students' taste, particularly those who like traditional and verbal atmosphere'. It is important that they become friendly with the equipment before start of the course. This will help them not feeling secluded during the course.

**Meeting with the Faculty:** As suggested by the AFT, it is important that the student have meetings with the course

instructor. The frequency may once in the middle of the course, as much as once a month.

### **The Role of Remote Classroom**

Remote classrooms have an important role to play. They are not only the meeting place for the students, but also resources provider of many resources such as library facilities, Internet and computers for doing assignments and projects. The administration of the remote classroom must make every effort for Internet to be ready at the live course program broadcast, so that students can login to register their presence and also join in on line question answer sessions and other Internet activities.

### **The Role of Facilitator/Mentor**

The professor teaching the course cannot be expected to be available for the large number of students enrolled for the course, therefore V-tutors and Facilitators would be guiding the students. Perhaps there could be a facilitator and a tutor for each remote center at the administrative hub to give proper attention to course related and administrative issues.

## **VIRTUAL UNIVERSITY OF PAKISTAN**

The pressure to produce qualified IT professionals is unrelenting in Pakistan because of a global shortage of IT manpower. The gap between supply and demand, despite the current recession, is expected to further widen over the next few years. The Government of Pakistan and MOST decided to address this problem by producing quality human resource to fill this vacuum by establishing the Virtual University.

There is also a severe shortage of quality faculty in the country. The academe has lost a large number of qualified individuals to the software industry. What little faculty is left in institutes of higher learning is spread out in various universities without forming a critical mass at any single point. The motivation behind the Virtual University is to utilize the services of quality individuals wherever they may be without relocating them. This may even involve faculty members located outside the geographical limits of Pakistan.

The Virtual University aims to provide quality education to a very large number of students. Considering only the Bachelor's level, it is estimated that annually, at least 30,000 students would want to pursue a career in Information Technology after qualifying their Intermediate examinations (12 years of study). The existing colleges and universities can only cater for a small fraction of these. The Virtual University would be able to provide large-scale educational facilities for these students nation-wide and by eliminating the need for qualified faculty at each Virtual University campus, would be able to provide this environment nationwide, even to remote areas.

The Virtual University will establish one administrative centre, which will act as the hub coordinating all activities of

the University. This Administrative Centre will house the management as well as the basic electronic infrastructure for enabling the activities of the Virtual University. This will include, but not be limited to, Servers, communications equipment, content development workstations, CD-Writers and print media duplication facilities.

### **Virtual Campuses**

The Virtual University will establish five "Virtual Campuses" countrywide over the next four years. Each Virtual Campus would have an intake capacity of at least 200 students, thereby developing a total capacity for 1,000 students nationwide in the five Virtual Campuses. The Virtual Campuses will be equipped with state-of-the-art multimedia projectors and screens, multimedia personal computers and video conferencing equipment. All equipment in the Virtual Campus will be networked internally and also interfaced to a high bandwidth Wide Area Network thereby allowing it to connect to all other Virtual Campuses as well as the Internet. Video equipment to receive television broadcasts and display via the multimedia projectors will also be provided.

### **Courseware Management and Delivery System**

A comprehensive Courseware Management and Delivery system would be provided by the Virtual University. Courses will be delivered through television broadcasts, on-line web-casts, video on demand and web-based content. This way, if any student misses the actual lecture/broadcast, he/she would have the opportunity of reviewing it at a later date or time. Similarly, by providing the entire lecture material in the form of web-enabled content, the full power of hyperlinks will be utilized to further enhance the learning process. Students would be able to review the course material and repeat exercises and practice problems as many times as needed for a proper comprehension of the material.

The Courseware Management and Delivery system will involve television studio facilities, as well as multimedia content development facilities. The multimedia content development will be done at the Administrative Centre or outsourced to experts wherever they may be, in line with the concept of the Virtual University.

### **Content Delivery Mechanism**

The content provided by VU would be in the form of multimedia content and rich web-based content. Multimedia content would include conventional audio-video content, which could be a simple introduction of a course by a Professor; a video clip explaining some point; or even a full-motion video of a Professor delivering a lecture, live or recorded. Other multimedia content could be streaming video and hypermedia processed video clips.

Rich web-based content would be HTML based with graphics, hyperlinks and animations, sometimes with

embedded video clips. The VU Web server would also maintain Frequently Asked Questions (FAQ's) as well as exercises, reading material and other reference material.

The content delivery channels can be broadly classified into two main areas: Internet Protocol (IP) based delivery and interaction, and Television based delivery with Internet based interaction. IP based delivery and interaction can take place over fiber terrestrial networks or via two-way satellite communications. TV delivery can be via satellite using analog or digital broadcast, with a modest bandwidth requirement for reverse interaction over normal dial-up or dedicated lines.

**Faculty**

The Virtual University's faculty will comprise a core group based at the Administrative Centre. Members of this core group will be selected based on their expertise in various subjects and their awareness of the "Virtual University" concept. This group would either have, or be willing to develop skills in the use of distance learning and multimedia technologies.

Member of the core group would be required to teach courses as and when required, and also devote their time to curriculum development and improvement. They would also be required to host on-line discussions (chats) and respond to student questions submitted via e-mail. A process of continuous improvement of distance learning instructional techniques and technologies would be introduced and would form part of the responsibilities of this core group of qualified individuals.

The learning experience will not be complete unless adequately backed up by an interactive support environment. With this view, a tutor network is planned for the Virtual University. Tutors will be required to host on-line tutoring sessions at specified schedules, respond to student questions via e-mails, prepare and grade assignments, administer examinations and evaluate student performance.

The Virtual University in collaboration with other national/provincial bodies, will launch staff development schemes to develop the tutor network. These schemes would include incentives for human resource retention by the Virtual University. Faculty members will be trained and updated on a regular basis in methodologies and strategies of using advanced technologies in the instructional and learning process.

**Examinations**

Quality assurance of the overall education imparted to the students is an important component of the Virtual University plan. In this regard, VU will conduct proctored final examinations as well as use external calibration tests. The National Testing Service is an important component of the IT Policy. The NTS will conduct calibration tests for all

computer science and IT graduates in the country. VU will use the NTS tests as a further quality assurance mechanism.

**THE FIRST ONLINE COURSE AT LUMS**

The LUMS on line / e-learning research project started as a pilot for VU. However, this afforded us the opportunity to address the issue of "teaching excellence being marginalised in tertiary education" and to establish LUMS as a "learning organisation" with a faculty ready to supplement its teaching with multi media and web based instruction[12]. 'Contemporary innovative thinking about tertiary education is embedded in models of learning that destroy the notion of knowledge as a commodity and promote knowledge as a critical and collaborative interactive process of meaning making'[12]. The project team improved on the model suggested to the VU and designed a four window graphic interface for LAN/CD based delivery as shown in Figure 3. To emulate the ecstatic environment of a good class and additionally to make it as exciting as a discussion classroom. To introduce the vibrancy and dynamism of classrooms the presence of an instructor was considered a must. Therefore, the video of the instructor became a necessity for our model. To adapt the medium to our teaching and learning culture it was felt that students would like to get something extra out of such a course. Therefore the lecture slides, and additional materials such as animated explanations of difficult concepts, web references were included. The additional material was to enhance and enrich the learning experience of the students.

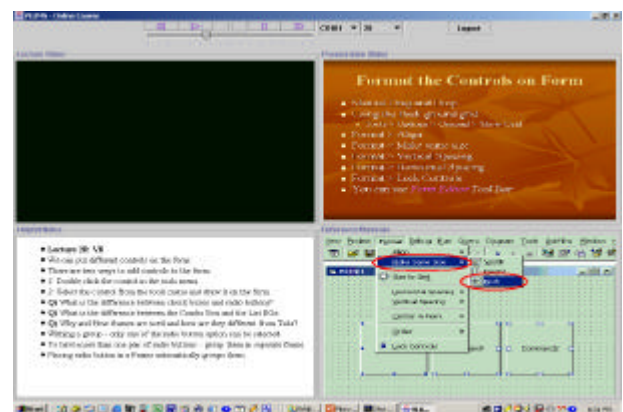


FIGURE 3.

THE LUMS DESIGN PROTOTYPE SHOWING VIDEO WINDOW (VIDEO CURRENTLY OFF), SLIDES WINDOW, REFERENCE WINDOW, AND NOTES WINDOW (CURRENTLY ANIMATING MENUS IN VISUAL BASIC). NOTE LECTURE CONTROL BUTTONS ON THE TOP.

The Graphical User Interface (GUI) was based on a 4-element window as shown in Figure 3. The 4 elements were: the *video window*, which students could turn off on their will (as a feedback from students) to concentrate on

other elements of the window, the *slides* window (a fixed element), a *reference window* showing general break up of the whole lecture and highlighting what issue is currently in focus and *notes window* reserved for showing possible web links, FAQs, class notes, at times animation.

- Additional controls were provided to rewind/forward the lecture video and other contents synchronised on a timeline.
- Lecture Notes and Frequently Asked questions will be added at times in one of the 4-element window. It will be interesting to note that the lectures notes and FAQs were based on some collected material from the previous class when the same course was offered in traditional way. These notes will be in power point format and will pop up at appropriate times as the lecture progresses.
- Online testing and evaluation would not be part of the project but later this functionality could be added.
- On line discussion boards and message boards would provide the interactivity. the students were encouraged to use it actively for all course related issues.
- Lecture slides are power point format files of the slides that the instructor shows during class. These slides will change as the instructor changes them in the video.
- Reference Window: Reference material is additional material that is connected to the lecture such as animated gifs, java applets, and web links which will be helpful in understanding the concepts. There is no content restriction on this window. It may even have interesting images, short anecdotes etc. to keep the students interested.

Of the core courses, we selected Introduction to Computing CS101, as it had the highest enrollments every autumn quarter and is foundation pre requisite for all CS courses. We developed three different prototypes initially, selecting the four-window model of the interface. Alongside refining the prototype, we worked on filming the first course, which was CS 101. As soon as a lesson was filmed our team started developing the additional instructional materials and adapting/ converting the video of the class for the on line version. Completing one lesson took considerable time and we faced quite a few snags related to conversion and compression of the video-recorded lessons.

We launched the first on line course at LUMS with the on line offering of CS101 in the spring quarter 2002. There were 27 students enrolled for the course, who were given their log-ins and had priority access to these PCs in the lab. Two teaching assistants were appointed for the course to assist the Instructor who was also new to the concept of E-moderating. The instruction model was as follows:

- The course lectures for the week were made available on Mondays. The students can study / view these lectures at any time at their convenience during the week,

- Course moderators/TAs conducted help sessions once a week on a designated time on Fridays and took a quiz based on the week's three lessons. The instructor was involved throughout the process, except responding to E-mails, thus giving this course a true On-Line outlook.

### Results and Unresolved Design Aspects

This LUMS project was floated at the Lahore University of Management Sciences as an independent experimental project to determine the applicability of online /distance learning within the LUMS environment. The purpose of the experiment was to see whether a software system that emulates the basic elements of the classroom is worthy of being an additional learning supplement or even a replacement depending on the results of the experiment. We are happy to report that student's have evaluated the LUMS model as a much more effective mode of learning then just class lectures. Figure 4 below shows the student preferences excluding the viewing of the video [13]. This data is based on the evaluation questionnaire given to them and the login roster.

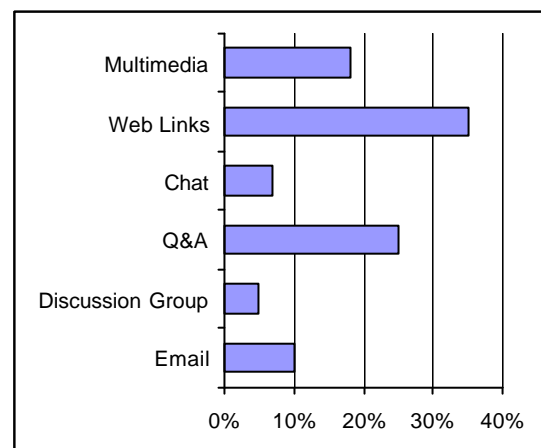


FIGURE. 4

A LOG OF STUDENTS' ACTIVITY IN DIFFERENT INSTRUMENTS

While the online course offered a lot of flexibility to the students allowing them to view the lecture videos any time during the week, it was very easy for them to fall into the trap of thinking that it was all too easy and would pass without any hard work. Lecture videos, the software and other technical issues aside, one of the major challenges from a v-tutor's perspective was to maintain instructor-type interaction with the students in some form and at some level, in order to keep a check on their progress.

Motivation was a serious issue throughout the administration of the course. Students routinely skipped the lecture videos. Consequently they lacked initiative during the review session, if they were not prompted for questions, they would not ask on their own.

Having lecture videos instead of in-class lectures also meant that the students would not be quizzed during the

lecture. Instead, announced weekly quizzes were taken in the regular class sessions, which gave the students an opportunity to be well-prepared, and every quiz was preceded by a review session. The students performed well on the quizzes despite the fact that many viewed all the lectures only the night before. In the first couple of weeks the students were provided with too much help. Lecture videos alone make up for what they would normally gain from the class lectures, in addition they were provided with references and help-notes. At times it was very difficult to come up with a quiz whose answers were not already captured concisely by the help-notes (which they had all memorized). It would have been best if it was left up to the students to prepare their own notes.

Finally, the question of having a cell at the university which would assist students taking online courses. A “help desk” that can “walk” users through a problem resolution and having a “problem tracking system” [14]. The students need to have someone who can play the role of a semi-instructor, in addition to a quiz-grader, website-manager, assignment-preparer and tutorial-deliverer. All these tasks combined are too heavy for just one or two persons and require the support of a full-time team of instructional designers and course administrators.

### CONCLUSION

The LUMS On line /E-learning project has completed its first phase of experimentation. Considering the positive response of the students in studying through this hybrid model of online and class based instruction, we have started recording two more Computer Science Courses to be offered on line in future. However, learning from our past experience of the amount of work involved in adapting and conversion to the on line medium of instruction, only one would be adapted and offered next year as an on line option.

Working on the premise that “the virtual university has to develop its own pedagogical profile and must not imitate either the traditional university or the distance teaching university”[2], the virtual university is functioning according to plan. The hitches, glitches and teething troubles aside the response has been very encouraging. An evaluation questionnaire has been designed and posted through the VU hub, but the data has not been collected till the writing of this paper.

We hope that both LUMS and VU are universities of the future and are “flexible and variable above all and use digitalized teaching alongside traditional means” [2]. The Research Associates at LUMS continue working on improving the current application and switching the platform to the web so that the programme has a wider reach. It is hoped that LUMS will also be able to realise its vision of bridging the ‘digital divide’ and bringing quality education to all, not just a handful of the elite of the country.

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