An Exploratory Study on the Implication of Virtual University Concept in the Developing Countries

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Abstract

Information and Communication Technologies [ICTs] are having a profound impact on learning and teaching in almost all countries, and in all models of education. The impact of these technologies is likely to continue unabated and, therefore, educators find it important to keep themselves abreast of the latest thinking. In this line of thinking, the concept of virtual university [VU] came into existence as the result of the modern ICTs. The main target of this paper is to deal with the relevant issues of VU which are emerging all over the world. Six VU Models from different continents have been brought under study to formulate a suitable VU model for a developing country. This paper has provided a brief description of how the VU models are being implemented in real life and how effectively they are fulfilling the work processes. Theoretically, this paper has come up with a new extended model of a VU with prior identification of the common factors among all the existing models including some essential cost factors. For the empirical analysis, the study has chosen a leading private university of a developing country [Bangladesh], namely, American International University – Bangladesh [AIUB], where the process of virtualizing the physical university activities has been already started. Finally, the study finds the proposed VU model suitable for AIUB where physical- as well as virtual-university may coexist.

1.0 INTRODUCTION

Education is an art to live a life to its fullest extent, it is a science to learn the intricacies of the laws of nature and it is the technology which glues them together by making use of whatever science discover and providing

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1.0 INTRODUCTION

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it to the mankind so as to learn the art of living. In the post Rio Earth Summit era, a new international consensus emerged concerning the critical role of education in achieving sustainable development. Principles 36, one of the forty Principles of the Agenda 21, state "Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues." At the heart of the new international consensus is a fresh vision of education and public awareness as the essential underpinning for sustainable development, a linchpin to support advances in other spheres, such as science, technology, legislation and production. Education is being redesigned in terms of how to prepare people for life: Job security and employability, the demands of the rapidly changing society, technological changes that now directly or indirectly affect every part of life; and ultimately, the quest for happiness, well being and quality of life. Education is therefore redefined as a life long process that needs to be not merely readjusted, but restructured and reformed according to new requirements.

These powerful driving forces linking education and sustainability are being matched by the emergence of new information society technologies that are transforming the traditional character of the higher educational institutions such as the lecture theatre, library, conference hall and so on. Probably therefore, when discussing educational innovations for the development of society and its economy in the 21st century, it is recognized that they are hardly achievable without effective utilization of new information and communication technologies. State-of-the-art information technologies enable their successful application in education and allow the creative potential of the student to be tapped into. It is these new information technologies that will help us develop an open educational system. The open educational system will bring about dramatic change in the activities. These changes are effected through the use of computers and their very important didactic characteristic of individualizing the classroom work, without disrupting its entirety, via programmed and adaptable curricula. The shift to the virtual mode of education is, thus, creating new potential for innovative curriculum development as well as links between the intellectual resources of institutions across the world.

Through application of new information technologies in education humankind seeks to effectively resolve some long-term problems, and thus respond to the challenges of the 21st century by achieving:
1] Greater effectiveness and higher quality of the educational process;
2] Intensification of research at educational facilities;
3] Reduction of time and improvement of conditions for additional education and adult education;
4] Extension of operational abilities and effectiveness of management at specific educational facilities and the educational system in general;
5] Integration of national educational systems into the world network that will considerably facilitate access to international information resources in the sphere of education, science and culture.

Field research and practice demonstrates that substantial educational success is possible with a Virtual University learning technology and approach, but it is related to pedagogical factors [appropriate instructional design, a learner-centered approach, and peer learning] [Harasim et al., 1995], administrative investment and support [see Oakley II, 1998], and strong marketing [see Massey and Curry, 1999].

In the developing economies, the concept of VU has been gaining popularity day by day with the emergence of computer and flourishment of computer-based activities. To cope up with the job market demand, educational institutions are noticed to be increasing at a high pace in private sector with facilities of computer-oriented learning. Due to lack of physical infrastructure and faculty support in comparison to the education-seeking population, developing countries such as Pakistan, Mexico, Kenya, have reached in a stage to think of virtualizing the mode of higher education. Since the growth of computer-oriented activities has been seemingly high in Bangladesh too, it has become necessary for the country to provide a deep thought on VU modeling. In this respect, this research paper is about how the idea of virtual university emerged through the evolution of information technology and how this virtual university is fulfilling the educational need all over the world like the traditional university. In this connection, the main objective of the study is to examine the essential factors of establishing a virtual university in a developing country context. In order to verify the major objective, this paper will attain the following specific objectives:
1] To conceptualize virtual university [VU].
2] To identify the inherent factors of establishing a VU.

3] To make an outline of a new model of VU which can be applied in an LDC.
4] To figure out the applicability of VU concept in the Context of Bangladesh with the use of one sample University, namely, American International University – Bangladesh, where the process of virtualizing academic activities has been already under operation.

This research paper collected both primary and secondary data. Both qualitative and quantitative data have been collected. For primary data survey, Group Discussion and Personal Interview methods are used. Semi structured questionnaires are used to collect information because questionnaire method is more acceptable than any other method. The questionnaire has been developed considering the list of information required to achieve the objectives. Open-ended, close-ended and multiple-choice questions are used to design the questionnaire. Secondary data has been collected from the Internet and different journals.

2.0 SURVEY OF VIRTUAL UNIVERSITY MODELS

Historically, the first initiative of establishing e-learning has been taken by the United Nations University, through the help of Institute of Advanced Studies. At present, a virtual university is commonly believed to be one that delivers courses [typically credit but also non-credit] primarily online, that is, by networks such as the Internet or Intranets, using asynchronous technologies, such as computer conferencing [First Class, Lotus Notes, Convene, etc.] or web-based technologies especially customized for education [LearningSpace, WebCT, Virtual-U, etc.] These learning technologies enable and support active, collaborative learning approaches and the software provides tools for:
1] Designing courses and developing an interactive course syllabus,
2] Conducting individual and group learning activities,
3] Recording and accessing evaluations and grades. Varieties of VU models have been found in internet as well as in published articles which present the process of setting up and successful operation of VUs all over the world. Some major resemblances are noticed in all the models although some possess striking differences in operation. For the purpose of modeling a new version of VU in the context of an LDC, this section has adopted six VU models which represent all continents of the world other than Australia.

2.1 UK VIRTUAL UNIVERSITY MODELS

In UK, the virtual university [VU] is a term used to describe a growing range of projects and enterprises, ranging from *clearing houses* listing a range of distance courses offered by more than one institution to the full scale *new institution* delivering its own fully accredited degree courses. Therefore, in developing any virtual university in UK, high importance is laid on clarifying differences between organizational structure, technical infrastructure and content. According to the UK Model, there should be three layers to establish a VU. Each layer of the model has associated with it, a number of issues, which will have to be addressed by any VU.

Table 1: The Virtual University Model

Organizational Layer	Infrastructure Layer	Content Layer
Structure Copyright Quality assurance	"Virtual Campus"-look and feel Registration and payment Student support services Assessment mechanism Discussion mechanisms Content delivery systems Student tracking	Static HTML On the fly HTML Learning environments Formative assessments Summative assessments

2.1.1 THE ORGANIZATION LAYER

Structure:

A growing number of "virtual universities" have emerged since web technology began to be used extensively for education in 1995. These can be broadly classified under three categories: *virtual front ends* for single existing institutions such as Michigan State University [http://vu.msu.edu/][1]; *collaborative ventures* involving genuine collaboration between existing universities such as Clyde Virtual University [http://cvu.strath.ac.uk/] in Western Scotland, and entirely *new institutions* created for the delivery of online education such as The

[1] Universities such as the University of Phoenix [http://www.uophx.edu/] in the USA, and Britain's Open University [http://www.uophx.edu/] already delivering courses primarily by distance are likely to find a transition where main web sites and *virtual front ends* will likely to blur.

International University [http://www.international.edu/] based in Denver, Colorado. In addition there are two further types of website which call themselves virtual universities. Online *clearinghouses* bring together the distance courses offered by a range of institutions[1]. There are also various *commercial enterprises* that do not deliver accredited university courses[2].

Copyright Issues:
Virtual Universities possess clear policies on copyright and ownership of materials. The answer to "who holds the copyright to the final product?" is that each party may have some claim to the copyright but that this depends on contracts of employment and the terms of the agreements, which is made before content is built.

Quality Assurance:
Rigorous and regular testing and evaluation of materials and methodologies are found necessary to assure the quality of Internet-based courses. For example, California Virtual University [http://www.virtualu.ca.gov/Faculty/AcademicPlan/acplan-full.html] has produced an extensive academic plan outlining the roles and responsibilities of each institution and detailing how quality will be assured in virtually delivered courses.

2.1.2 THE INFRASTRUCTURE LAYER

This is the layer which is often most visible when visiting a site. All large Web sites need a consistent and distinctive look and feel. VUs are no exception and many use the campus metaphor for at least the top level of navigation. The infrastructure of a VU must also include extensions to the basic Web server. The extensions can be implemented as CGI programs, servlets or any other technology.

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[1] One *clearinghouse* not linked to any particular region is the Globe wide Network Academy [http://www.gnacademy.org/], which lists over 15,000 courses and programs Worldwide.

[2] Some *commercial enterprises* such as Price Waterhouse Virtual University [http://www.vu.pw.com/], have built their own websites to meet the training needs of a single company.

The Virtual Campus:
A number of excellent examples of virtual campus front ends exist such as Clyde Virtual University [CVU], Howard Community College [HCC] [http://www.howardcc.edu/] and Fern Universität [http://vu.fernuni-hagen.de/]. Image maps are the usual way to implement these top-level menus where the number of choices offered varies widely[4].

Registration and Payment:
All VUs need to "identify" their students in one way or another and this implies the requirement for some form of registration. The management of the large amount of registration details that can be generated by just a small VU can be a major problem if not properly planned.

Student Support Services:
The student accommodation office may be redundant in the VU but counseling and advisory services may well be more important to the student who studies at a VU. These services must not be overlooked in the haste to capitalize on the economies of scale that a VU offers.

Assessment Mechanisms:
Assessments, both formative and summative, are crucial to any educational experience. VUs have to offer a mechanism for testing student achievement. Formative assessments will almost certainly be integrated into the content of the courses. This might make the content less portable than it would otherwise be but the advantages of tight integration of content and formative assessment are many. Summative assessments can also be delivered from a VU but problems of user authentication and plagiarism become very important. It would be possible to deliver a traditional exam via the Web only if the students were in a room of computers under traditional exam conditions. A move toward innovative methods of summative assessment is, in some respects, desirable so long as academic quality is not compromised.

Student Tracking:
Monitoring students' progress is important in any university VUs are no exception. Results from formative and summative assessments will

[4] At the time of writing, CVU offers a choice of five "buildings" in its virtual campus while HCC offers fifteen "buildings" along with other clickable street furniture such as a mailbox, a phone box & road signs.

provide vital data but tracking students' progress through the content may also provide useful information. Most Web servers will log access information. Analyzing the server's log file to provide useful information regarding individual students remains a challenge.

Discussion Mechanisms:
Student-student, staff-student and also staff-staff contact has to be supported in some way. In an online environment the simplest discussion mechanism might be email, but this is not very sophisticated. Basic email systems can be improved dramatically by adding mailing list managers and mail archives. Systems such as WWWBoard [http://worldwidemart.com/scripts/wwwboard.shtml] and HyperNews [http://www.hypernews.org/] provide a Web-based alternative to email lists for asynchronous discussions. Sophisticated, non-Web-based [but, more recently, Web accessible] systems such as Lotus Notes [http://www.hypernews.org/] and First-Class [http://www.softarc.com/] are widely used for asynchronous discussions. Synchronous or "real time" discussions can be supported by Internet Relay Chat, EWGIE [http://www.eit.com/ewgie/] and various other systems.

Content Delivery Systems:
If the course material, which will be discussed in the content layer, is stored as something other than HTML then some mechanism for generating Web pages on-the-fly is required.

Integrated Systems[5]:
Many systems are now available, which integrate a number of the functions of the infrastructure layer [http://www.whitsystems.com/, http://homebrew.cs.ubc.ca/webct/]. Basic systems help automate the authoring and delivery of Web-based content and might include assessment and discussion mechanisms. More advanced systems take care of student registration and payment, user tracking and content organization and offer an attractive front end to the courses.

[5] Comparative analyses and critical reviews of integrated learning packages are available on the Web [http://mide.sm.ca/tfl/integrated/eye/].

2.1.3 THE CONTENT LAYER

Web-based courses are the reason why VUs exist. As the range and number of courses increase, the need to impose some sort of structure becomes ever more pressing. The organization of the content will depend largely on the type of institution. The way the content is authored, stored and delivered to the student could be any of a number of options available.

Static HTML:
Web-based courses will probably have started life as a collection of HTML pages, perhaps with a few inline images. For the author this is relatively easy to produce [http://www.softquad.com/products/], but, although simple and straightforward, static HTML does have problems of great quality variation. Maintaining a site's consistent look and feel can be very difficult when authors create their own HTML. The rigorous use of an HTML validator is recommended. Use of discussion areas and formative assessments within the course requires the careful integration of pages generated by CGI programs.

On The Fly HTML:
Given the need for some of the CGI generated pages within the content it is worth considering the "on the fly" generation of all the content. Control over the look and feel is taken away from the author and consistency is guaranteed. Linking in discussion areas and formative assessments becomes trivial. However, authors are now forced to use a particular authoring tool such as Toolbook II [http://www.asymetrix.com/products/] and the portability [and reusability] of the material is lost. Authors are also constrained by the limitations of the chosen delivery system, while innovative use of technologies such as Java and VRML might be difficult if not impossible.

Learning Environments:
Organizing information into sequences of Web pages with added discussion areas and formative assessments produces adequate but not particularly engaging Web-based courses. A more imaginative approach that can be usefully mixed with the basic approach is to challenge students with a task, which has to be accomplished within a virtual environment. These environments could make use of VRML and

simulation engines to provide truly interactive learning environments in which groups of students could hone their skills.

Formative Assessments:
The design of well-graded formative assessments can provide vital feedback to students who may be isolated from any human feedback. The design and delivery of multi-choice and multi-response questions is well documented [http://www.qmark.com/]. Integrating Java Applets with an assessment mechanism allows for a much wider variety of question types including drag and drop and questions which encourage critical self-assessment [http://cvu.strath.ac.uk/admin/cvudocs/caa2lboro/].

2.2 CANADIAN VIRTUAL UNIVERSITY

The interest and concerns regarding VU initiatives that have characterized the past few years as the potential yields to concrete plans and implementations need to be considered in building a powerful and successful strategy. The Canadian context is especially critical given the unique opportunities and resources as well as the challenges and must be seriously taken into account in setting forth models for a Canadian VU. This paper emphasizes models that are based on prestige as well as access. The Canadian VU should not be developed as "second class" or "last resort" learning opportunities, a condition that plagues most distance education providers -- what is essential is the importance of real and perceived quality of learning. The five models which are analyzed in this paper are: Prestigious Virtual University: Group/Semester Model, Prestigious Traditional and Virtual University Combo, Professional Virtual University: Group/Cohort, Best of Breed Virtual University [Networked], Niche U [i.e., Virtual Government University].

2.2.1 PRESTIGIOUS VU : GROUP/SEMESTER MODEL

A Virtual University is not unlike a Physical University in its mission or educational processes. A Virtual University offers a wide variety of credit courses that lead to a particular area of specialization and degree or diploma. Course credits are based on demonstration of mastery of the course objectives. Typically participation in activities such as group discussions, seminars, debates, simulations, and individual and/or group projects, all of which mediated through the online learning environment, would characterize a virtual course. Hence, to a remarkable degree, the

activities are similar to those in a physical university course, although they are mediated differently. Students in a Virtual University typically interact with faculty, peers, and curricula through a computer conferencing system, using tools and software in the virtual learning environment and resources, which may be online [readings, video clips, animations, graphs, spreadsheets, etc.] in the Virtual Learning environment or in a CD-ROM or simulation software or offline, such as a course textbook. In Canada, such an independent, national, totally Virtual University would likely be very difficult to create, given the provincial control of university accreditation. Nonetheless, consideration of the above model has value because it can be viewed as a component of a traditional university, which thus leads to Model 2 below.

2.2.2 PRESTIGIOUS TRADITIONAL UNIV. AND VU COMBO

The Combined Traditional [TU] and Virtual University[VU] model occurs when a traditional university invests in (several) integrated degree and diploma programs offered entirely online. Students can take their degree entirely face-to-face or entirely online or through some combination. Several Canadian universities offer some courses online such as online Post-Baccalaureate Diploma in Business Administration by Simon Fraser University and an entirely online advanced diploma in psychiatric nursing by Douglas College [http://www.douglas.bc.ca/psychnur/advdip.html].

The University of Illinois Online [UI-Online] offers a valuable exemplar for the Combo model. In the Combo model, the faculties of the Virtual University are typically the same and teach similar course loads whether the courses are offered online or face-to-face. UI-Online, however, provides special grants to campus departments to cover one-time costs of converting existing campus-based programs to an online format. "These costs include faculty release time and summer salaries, employment of graduate and undergraduate assistants, compensation of programmers and technical support staff during the development phase, and purchase of hardware and software" [Oakley II, 1998; Manning, Oakley, & Ward, 1998].

This is a powerful model, and variations on the TU-VU can be expected to become increasingly prevalent as universities seek to respond to demands for increased and flexible student access, to global market

opportunities, and to local and global needs for knowledge workers. The VU component would not compete with but rather complement on-campus offerings.

2.2.3 PROFESSIONAL VU : GROUP COHORT MODEL.

The Professional VU is based on group learning. This is a key tenet of adult education and online it is expressed in asynchronous group learning activity. In this way, it is very similar to the VU programming described in models 1 and 2 above. However, it is distinct and innovative in scheduling. Rather than being organized in the typical three semesters, the offerings follow a continuous learning cycle. As soon as the requisite number of students registers, in the words of the UK Open University Online MBA program, the "bus" leaves the station, and the next "bus" pulls in. There are other differences in the organization of the Professional [working adult oriented] University, in both distance education and virtual mode [Open U, OLA, Athabasca, UofPhoenix Online, etc.]. They tend to employ part-time professional faculty and offer a centralized curriculum. Their working professional adult students seem to agree that the curriculum is as good as if not better than in traditional universities.

2.2.4 BEST OF BREED VU : NETWORK/CONSORTIUM MODEL

This is a model in which selected universities and education providers collaborate to provide courses and/or programs for the lifelong learning market. A critical issue is whether "name brand" universities would choose to collaborate with "B" level universities, which they might consider a dilution of the overall brand and perception of high quality? It is likely that top international, particularly American, universities will employ Models 1 and 2; that is, they will provide their own Prestigious Virtual University offering. They will [try to] go it alone!

However, there seem to be major benefits in terms of leveraging of scarce resources for technological infrastructure, faculty training, and support, curricular integration, and so on, especially in a country like Canada whose academic institutions and populations are a fraction of the numbers south of the border. Canadian universities on their own simply do not have the muscle power of their southern competitors or of Europe.

Therefore, the "Best of Breed [BOB]" approach which encourages a collaborative rather than competitive model is considered suitable for a country like Canada for which the country can enjoy several advantages. Canadian universities have far fewer resources and faculty than top or even middle level US universities. Networking and leveraging is requisite for most Canadian universities, in order to participate effectively in online offerings. There are significant cost savings in linking the best in specified fields, and undertaking common marketing, training, and other initiatives. Students appreciate the ability to select minors from a variety of programs and faculty can share experiences, leverage successes and resources, etc. in BOB model. The opportunity exists to build on the extensive knowledge and technology base already established with the VU field trials, and customization based on these results and market analysis can provide highly visible value-added in case of a BOB approach.

2.2.5 NICHE VIRTUAL UNIVERSITY [GOVERNMENT VU]

The Niche Virtual University is a variant of models 1 to 4. It is distinguished by the focus on discipline/market distinction and need. A Niche VU targets specific areas of high demand, for example, public service education, information technology areas, continuing medical [and/or health] education, telecommunications engineering, business administration, computer science, and so forth.

In Canada, the key question is how to create such a university? One option, perhaps, is to copy the Western Governors model in the US. It is an umbrella administrative structure that brokers academic courses from public and private institutions but awards the degrees itself. Such an umbrella model works to empower smaller universities and colleges, allowing the whole to be greater than the sum of the parts. This specific model is not found to be feasible in Canada given accreditation issues.

A second variant is a partnering among institutions offering differing learning approaches, thereby providing students with increased flexibility in learning approach and perhaps curricula [*Chronicle of Higher Education*, 27 November 1998]. A third variant is a Modular University, an entirely new organization that builds upon advanced 21st century technology. The model is technology mediated, based on short modules: "Just the subject that you want, just when you want it." This is an

emergent model, with no large academic players of presence as yet.[6] Again, issues of accreditation in Canada are serious and would need to be considered.

Throughout the description of the Canadian models above, this paper has identified several factors which work behind the successful establishment as well as operation of the Canadian VU Model. The factors are described in a table given below[7]:

Table 2: Canadian VU Models

Input	Traditional University[8]	Prestigious VU	Professional VU	Niche VU
Philosophy	Students comes to campus	Campus goes to students	Campus goes to students	Campus goes to students
Mission	Defined by level of instruction	Defined by level of instruction	Degree-centered, workforce focused	Workplace, professional focused
Curricula	Relatively stable & comprehensive	Relatively stable and comprehensive	More flexible, adult oriented, focused on workplace	More flexible, focused on workplace
Instruction	Most courses are lecture based	Most courses are based on group learning & seminars	Courses based on group learning, use of student experiences	Greater variety of methods & use of student experience
Faculty	Primarily full-time academics	Primarily full-time academics	Usually part-time faculty with professional experience	Usually part-time faculty with professional experience

[6] One minor example is the for-profit corporation, Magellan University. Some major computer and telecommunication corporations are targeting the potential, at least in terms of providing some primitive infrastructure and bandwidth: these include Microsoft's Online Learning Institute, the IBM's Global Campus, and Deutsche TeleKom's Global Learning network.

[7] The Combo and BoB inputs are the same as the Prestigious VU.

[8] Traditional [Physical] University is group oriented, synchronous [time dependent], place dependent, and multimedia [although the core communication channel is audio] whereas Virtual University is group oriented, asynchronous [time independent], place independent, computer mediated, and multimedia [although the core communication channel is text-based].

Table 2.1 continued ...

Learning Technology	Didactic lecture oriented instruction	Support group learning and extended access	Support group learning & extended access	Most support open individualized as well as group learning
Physical Facilities	Extensive physical plant	Minor physical plant (for non-academic staff)	Minor physical plant (for non-academics staff)	Minor physical plant (for non-academics staff)
Productivity Outcomes	Student credit hours and degrees	Student credit hours and degrees	Student credit hours and degrees	Student credit hours & degrees

2.3 THE AFRICAN VIRTUAL UNIVERSITY [AVU]

The AVU is training world-class scientists, technicians, engineers, business managers, health care providers, and other professionals to support economic and social development in Africa. AVU supplements existing university programs with high-quality courses, while introducing new cost-efficient programs. From an initial summer course at Kenyatta University [Kenya] in July 1997, AVU now offers undergraduate and remedial courses as non-credit programs to twenty-five universities in Sub-Saharan Africa. AVU's curriculum includes foundation courses in calculus, differential equations, physics, chemistry, and statistics as well as courses in computers and engineering. Universities are developing French-language seminars in business management, environment, teacher training, and computer and Internet literacy.

To implement AVU, the World Bank has established a small core team supported by international consultants experienced in academia, distance learning, library systems, networking systems, and network operational management. Partner institutions in Africa provide academic, administrative, technical, and student support services as well as the infrastructure needed for AVU operations at the country level. These institutions receive all training and support needed to implement AVU. The World Bank has already donated 950 computers to the universities in the AVU network. In addition, Benin, Mauritania, and Niger have just received shipment of satellite terminal equipment; INTELSAT has provided full satellite capacity since AVU's beginning. The online library became operative in June 1998.

In African Model, some partner institutions[9] provide the support services[10] and infrastructure needed for AVU [African Virtual University] operations. In course of time, AVU's will move forward to gain recognition beyond the university through targeted non-credit programs and reach out to the private sector. Accordingly, it is going to develop a plan that outlines its mission, social responsibilities, and business goals soon.

2.4 ITESM'S VU : A LATIN AMERICAN MODEL

Space technology, like communications satellites, can be used to broadcast educational programs simultaneously in many classrooms whereas; comparatively speaking, terrestrial communications might be considerably more expensive. Many universities have started branches that offer virtual education programs with a specific model for learning. In Mexico, the Virtual University of the ITESM [Monterrey Institute of Technology] system -- a private educational vanguard -- brings together a system of educational teaching - learning processes, which operates utilizing the most advanced technologies in telecommunications, electronic networks, and multimedia. It extends educational services [high school, undergraduate, and graduate levels, as well as continuing education programs] to Latin America, USA, and Canada. This paper presents the space and terrestrial technology used in reaching its' educational commitment to become a "global university".

2.4.1 System Description

The Virtual University [VU] of the ITESM system is an educational system parallel to the traditional ITESM educational system. The VU uses telecommunications systems with the final objective of taking advantage of ITESM's best professors and outstanding professors from other universities to provide the highest quality education to the most

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[9] As for instances, the Africa Region International Development Fund [IDF], the Canadian trust fund [CND], the Irish trust fund, the European Commission and the World Bank Development Grant Facility.

[10] Such as Academic-, Administrative-, Technical-, and Student- Support Services, Library Systems, Networking Systems, Physical & Computer Equipment Facilities.

remote places throughout Latin - America. It was founded 8 years ago and, it uses 5 Solidaridad satellite channels, 30 videoconferencing channels, 19 international channels, and 11 pertaining to the ITESM Campus system. In addition it has 15,000 computers connected to the Internet; it links more than 11 countries. Some 150 courses are taught via this system every semester, 200 lectures of which are life transmissions. Altogether and approximately 20,000 course hours are taught to over 30,000 students annually. The VU transmits from so many different sites of Latin America. Some 692 different sites receive course transmissions; among these are the 27 campi of the ITESM system, 5 graduate associations, 16 educational institutions in México, as well as diverse companies in México and Latin America, Honduras, Colombia, Ecuador, Perú, Venezuela, Argentina, Costa Rica and Chile. The 19 international videoconference systems are linked to many academias of América including MIT, Stanford University, University of British Columbia, UT Austin, Wisconsin, Queens, Universidad de Chile, and Simon Fraser. Three satellite channels are destined to almost all the regions of América.

2.4.2 Educational Models

The VU of the ITESM system utilizes any models of learning and technology as long as it contributes to a harmonious environment. The models that the VU of the ITESM system currently use are the following:

Professor Centered Model:
The professor is the central transmitter of information, knowledge, skills, values and attitudes. There are three roles of a professor:

1] The classroom professor, who supports the work of the satellite instructor by assisting and guiding students at the receiving sites;
2] The satellite professor, who acts as a lecturer from the transmitting site and is physically separate from the students; or
3] The videolink professor, who lectures on the course, conference or discussion-group content via a videolink transmission from a space physically separate from the students.

Student Centered Model:
Students, under the guidance of their professor learn through performing individual activities. Supporting technologies include textbooks, class

notes, CDs with tutorials, videos, and Internet pages for researching and analyzing information relevant to the course content.

Group Centered Model:
Students not only learn the course content but also develop attitudes of teamwork, tolerance and collaboration by participating with group members, who are physically distant and from different cultures, in electronic discussion groups moderated by a professor. These activities are carried out using a variety of Internet applications such as Net News, First Class, Lotus Notes and Lecturer.

2.4.3 Educational Programs

The ITESM-VU offer High School, Undergraduate, Master's Degree, Doctoral Degree, Program for Enhancing Teaching Skills, Program for Training Professors, Program for Teaching Update, and Continuous Educational Program on a regular basis. In addition, the VU offers continuing educational programs[11] directed at different sectors of the countries of the American Continent.

The Mexican Model highlights four factors to set up a VU model which are as follows:

1] Schedule: It contains the specifications of course requirements, activities, homework, exams, and surveys. [Academic Support Services]
2] Media Center: It contains the support materials related to the course, which can appear in text, graphic or video form. [Technical Support Services]
3] Course room: It contains the database for interactive collaboration, moderated or private discussion among class members and between students and professors. [Student Support Services]
4] Profiles: Consist of all of the relevant data of class members and of professors. [Administrative Support Services]

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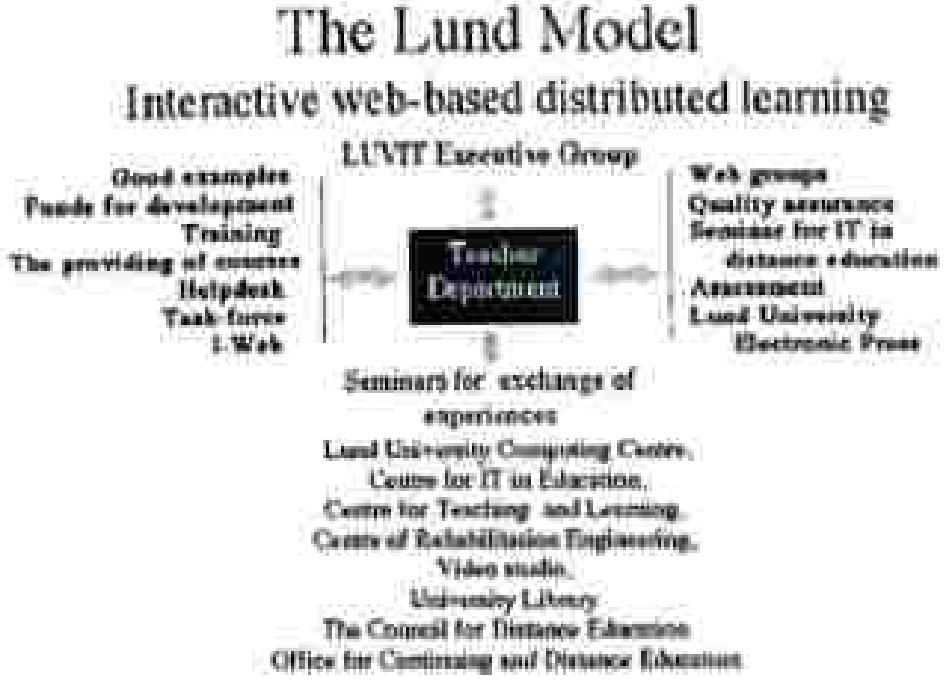
[11] These programs include: Entrepreneurial Programs, Virtual Business Classroom, Conferences [6000 people-conference], National Program for Enhancement of Teaching Skills and National Program for Science Training; these with the national Educational Public Secretary and sponsored by the Interamerican Bank for the Development [BID] use the DirecTV satellite system.

2.5 LUND VU : A SCANDINEVIAN MODEL

Universities of today have to be involved more directly than before in the development of the surrounding society. Important parts of this involvement are continuing education and industrial and business training. One of the objectives is to make courses more flexible and available both for campus students, and for other than traditional students. Another objective is to offer tailor-made industrial and business training, i.e. learning on demand. In achieving these aims Lund University [LU] has decided to enter directly the 'fourth generation' of distance education, which means establishing Internet-based open and distance learning [ODL] with access to WWW resources [and based on interactive multimedia and computer mediated communication].

LU has also decided to establish a support system for both individual teachers and for different departments; a dual mode system named "the Lund Model" for distributed learning [see below]. Furthermore, LU has developed an interactive distance-learning tool – Lund University Interactive Tool [LUVIT], now in version 2.3. LUVIT is the environment and the toolbox for web-based courses, distance education courses and continuing education, as well as for on-campus courses. LUVIT is also planned to be the carrier in various projects around the world.



Internet based ODL with access to WWW resources creates a new role for the teacher and calls for a renewal of pedagogic thinking. Six support groups, called Web Groups, are therefore established to work in the fields of humanities, social science, medicine, science, technology and languages. These groups develop the "web-thinking" in the different fields and they are the driving force in the standing seminar for IT in distance education, and in developing the next version of LUVIT. They also support departments with regard to quality assurance and assessment. Finally, a Lund University [LU] Electronic Press is established handling the problems concerning electronic publishing.

During the spring of 1999, guest professors from USA and England had been cooperating in developing web education and Lund Virtual University. Cooperation was also started with several industrial companies, e.g. Ericsson and Telia, to develop web education and ODL. LU started a project with Teracom [the national broadcasting network operator of Sweden] concerning computer broadcasting integrated with the LUVIT system. LU also discussed with new broadcasting companies, e.g. the Knowledge Network, to combine digital television and radio with web resources. Financial resources are appropriated by the Vice-Chancellor and channeled through the OCDE for development and support of ODL in close cooperation with the groups mentioned above and listed in the diagram. The next step, for which preparations were carried out, had been an information campaign concerning the potential of Lund University for supporting, by way of WWW, competence development of professionals in business, industry and society. In addition to this experiments with local study centers will continue [Internet-based courses in combination with video] for students without access to computers and those who are in need of pedagogic support. Finally, during 1999, the Lund Virtual University [LVU] was launched. LVU not only works as the interface and portal for distance courses for continuing education, but also handles web-based courses like basic computer-courses, skills-for-life-courses, core curriculum-courses which are kept free and accessible also for the public.

2.6 THE PAKISTAN VIRTUAL UNIVERSITY

As per government of Pakistan 2010 program, the private sector is being encouraged to establish universities and graduate schools in the newly

emerging field and applied sciences. PLANWEL[11], therefore, believes that the following should be the concept of a good education program:

1] Education should be economical and affordable to all.
2] Education shall be comprehensive and uniform for all through out the country meeting the International standards.
3] Education shall be spread all over and shall reach the masses.

The above policy and program has been found only possible through adopting modern technology; i.e. distance learning – deciding the syllabus first and disseminate to the masses through the use of IT. In this case lesser number of trained teachers as well as good educational buildings are needed, the educational program becomes economical in cost and the mass people receive a uniform type of education. All these educational incentives are realized in practice through adoption of the Virtual University concept.

Coming to the question of implementing VU concept in a developing country like Pakistan, it has been found that the underprivileged masses are still living under miserable conditions. Even if the structure is put in place still individuals would not be able to afford computers or the line rents. PLANWEL, therefore, believes that in order to make the VU a reality, it is essential to open up delivery POPs [distance learning center] for the VUs in each and every community of underdeveloped nation with the help of local private sector. These POPs act as catalyst for development and diffusing disparity. In reality, the VUs host researchers and Professors from around the world; whereas the POPs act their classrooms all over the developing world. These researchers / professors can be part of the Panel from around the world so it will be a true virtual forum, disseminating their knowledge through the POPs around the GLOBE. This is what PLANWEL'S goal is "taking technology to the people". Finally, once certain about the quality and reliability of transmission and receiving at the customers' end, it can be replicated all over the city, the country and in the region.

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[11] PLANWEL is the acronym for Association of Planning Professionals for Social Welfare Work. This was created in 1990 by a group of like-minded professionals in the fields of Planning and Development.

2.6.1 The Project

Under phase 1 of the project, PLANWEL wishes to collaborate with organizations, initially for R&D; to prepare, plan, design, implement and run distance learning center [POP] in Pakistan. This would include conducting such graduate courses, which are ready for delivery in areas such as computer science, engineering, management, environmental town planning, health care, and library sciences etc. The phase 2 of the project would entail setting up a distance learning center [POP] based on the results of R&D conducted in phase 1 of the project following the concepts of Internet; making it possible to truly act as The Virtual University POP site. The concept will be to deliver collaborating university courses through different media to this center, which on the other hand will be equipped with receiving equipment and state of the art Information technology. This eventually would cater for research on the Internet Program in the underdeveloped region. Once this system has been tested then this could be replicated in the region in health care and various other sectors.

2.6.2 Implementation Plan

Mr. Shahab A. Khan Director, PLANWEL and his staff under the guidance of PLANWEL board of Directors will work along with the Director of the Institute in the developed country and will provide the following:

1] Preparation of a joint proposal for appropriate funding, initially to establish a Model Distance Learning Center/Virtual University POP, test it, perfect it and enlarge and replicate this system on other sites in the country and the region.

2] Establishment of a Model Distance Learning Center/Virtual University POP for 20 to 30 students to be able to receive the teaching material through computer mediated communications Internet or any other suitable delivery mode.

3] Arrangement of suitable resource persons, instructors, technicians, faculty and staff to receive, exhibit and present the materials to students at PLANWEL Virtual University POP and carry on research to perfect this system, so that it could be enlarged and expanded over different sites in Pakistan and the region.

4] Expand this model to other sectors as health care etc.

2.6.3 Outline Proposal for Funding as Conceived By PLANWEL

An outline proposal for funding the operations in both the developed and developing countries needs to be prepared for implementing the following activities:

1] Development of appropriate teaching methodologies for distance learning.

2] Identification and testing of appropriate software tools for distance learning.

3] Training of trainers and experts in the field of Informatics.

4] Advise PLANWEL on furnishing and equipping the lab suitable for receiving educational instruction and its transmission to other POPs in the developing country and the region.

5] To advise on the estimates of all expenses required in this process of distance learning both in the developed and developing country.

3.0 CRITICAL ANALYSIS OF THE VU MODELS

The preceding description of the worldwide VU models highlight several factors that work behind formulating a virtual university project. Some of these factors are observed common in most of the models although some are found seemingly different in nature. The following sub-sections present a brief idea of the VU factors under two headings of 'pedagogy' and 'cost':

3.1 PEDAGOGY OF VU MODELS

Accreditation

An Independent VU model involves the creation of an independent institution by a province, a state, or a country. Such a university would offer all of its courses and programs online to meet the needs of the lifelong learner. For example, accreditation of a national Canadian VU would seem to be difficult, if not impossible, to achieve.

Academic Credentials

A VU needs academic credentials and acceptance in relation to the public demand for access to first-rate learning opportunities. Therefore, a decision to woo and maintain highly qualified faculty members needs to be taken where faculty members would be able to relate themselves with academic meetings, research and publications so that they would be treated like other tenured senior world-class faculty. In this connection,

an appropriate consideration of teaching and scholarly activities related to electronically offered programs can be made for effective faculty evaluation.

Faculty Training and Support

The key to quality programming is faculty training and support in VU Learning Approaches. Teachers must know how to design and develop online courses, how to deliver them, and how to engage learners in knowledge work activities. Investment in significant and systematic training is currently almost non-existent which is perhaps the single weakest link in the investment chain for success.

Pedagogies and Instructional Design

Powerful, innovative, and proven pedagogies are critical for academic success, for contributing to user satisfaction, and for developing the knowledge worker mind set. Pedagogies based on advanced learning models such as collaborative learning and knowledge buildings are key.

Number of Courses

About 20 different majors [400 unique course] or degrees seem to be average at successful institutions, although the number of majors in a given area will vary greatly. The critical factor is having enough students in a given degree so that the students can form a community and undertake various activities as a collaborative group.

Class Size

Collaborative learning involves a class size of 25 or fewer in an undergraduate degree course [for one semester] or possibly 8 to 10 students in a smaller timeline. Working teams of students should be in the three to seven ranges, and group assignments may involve at least three to five teams in a class. In addition, a class of twenty to twenty-five students is likely to generate a reasonably active discussion. As students progress to upper division and to graduate courses, the critical mass for good discussion goes down as each student becomes more of an expert in the subject matter and has more inherent incentive to participate. Courses offered on a shorter time frame [6 to 8 weeks, rather than 13 + weeks] would likely benefit from small class size [8 to 12 students].

Program Support

The program provides faculty support services specifically related to teaching via an electronic system. The program provides training for faculty who teach via the use of the technology. Even for faculty who buy or use their own equipment, online course and program delivery require specialized peripheral equipment to handle graphics, drawings, digitization, and multimedia [video and audio recordings] that need to be provided in a multimedia lab environment where faculty can process their own materials.

Communications

The program provides for appropriate real-time or delayed interaction between teachers and students and among students. This policy statement calls for technology that is appropriate to supporting essential educational communication and seems to recognize that the group communication and peer interaction requirements of virtual university courses are similar to the physical university counterparts.

Service Integration

Enrolled students have reasonable and adequate access to the range of student services to support their learning. Access to services such as tutoring, counseling, librarians, and so forth would need to be provided to the VU student.

Evaluation

A VU needs to evaluate the program's educational effectiveness, including assessments of student learning outcomes, student retention, and student and faculty satisfaction. Students may have access to such program evaluation data. The institution provides for assessment and document of student achievement in each course and at completion of the program. In Canadian universities, such program evaluation data is not typically made public whereas in US, for-profit universities generally make it available as a form of consumer information.

Literally speaking, all the inherent factors which are observed through the above discussion look nearly same but with some differences in some cases. As the common factors, Physical & Computer Equipment Facilities, Technical Facilities, Academic Support Services, Student Support Services, Administrative Support Services and Networking Systems seem necessary to initiate a VU project.

3.2 COST FACTORS

To establish a virtual university proper infrastructure, and support services are needed. But prior to this, the factor which comes as an important prerequisite is the 'cost' of setting up a VU. In this regard, the cost factors related to VU can be highlighted below:

Computer Equipment Cost:
A fairly powerful network server is needed to provide the database and conferencing capabilities for the students and faculty. Initially it will be serving approximately 2500 users. Some video equipment will be needed to reproduce and to create CD ROMS of course materials produced by the faculty for the students.

Physical Costs [Campus & Equipment]:
Physical campus is not huge but then again to establish a virtual university with a traditional university physical campus cost is not that small also. An attractive space to house administrative and technical support staff would be essential. In physical equipment cost, the cost of the number of computers needed in the labs are included.

Software Cost:
A software cost is needed. It includes the cost of licensing a Virtual Learning Environment software and multimedia authoring tools.

Faculty Cost:
Faculty costs include the salary and benefits of the faculties. It can be assumed that a faculty will be taking at most 4 courses and the ratio of faculty and student will be 1:40.

Non Faculty Personnel:
A good business manager will be needed to head the administrative side of the operation. He will be in charge of monitoring the performance of the faculties based upon a regular evaluation by a full time social scientist who will conduct a regular analysis of feedback from the students. Four full time administrative staff will be needed to handle record-keeping, reports, distribution of student material and so on. Furthermore four full time technical people will be needed

approximately not only to keep up the system but to be on call for the students to aid in any technical problems they will have.

4.0 MODEL BUILDING OF VU

Different VU follows different types of models. This section of the paper prepares an extended model of a VU [see table 3] mostly features Canadian and UK Model:

Philosophy:
The extended model is the combination of both Traditional University [TU] and VU. This occurs when a TU invests in [several] integrated degree and diploma programs offered entirely online. Students can take their degree face-to-face or entirely online or through some combination.

Faculty: Full-time academics.

Registration and Payment:
In traditional and virtual university combo, students can either do their registration and payment in the university campus manually or completely online staying at home/office or completely online sitting in the VU-combo computer labs.

Student Support Services:
In traditional university student course counseling is not a problem as it is done face-to-face. But counseling and advisory is more important to the students who studies in VU. In the combo model, the counseling can be provisioned in either or in both of the ways.

Assessment Mechanism:
Like any other educational experiences, VUs have to offer a mechanism for testing student achievement. Formative assessments will almost certainly be integrated into the content of the courses besides the provision of summative approach.

Discussion Mechanism:
Student-student, staff-student and also staff-staff contact has to be supported in some way in online education. There are other sophisticated ways of discussion mechanism but in an online environment the simplest discussion mechanism is email.

Table 3: Extended VU Model

Input	Traditional University	Prestigious Virtual University	Traditional & Virtual University Combo
Philosophy	Students comes to campus	Campus goes to students	Students comes to campus
Mission	Defined by level of instruction	Defined by level of instruction	Defined by level of instruction
Curricula	Relatively stable & comprehensive	Relatively stable and comprehensive	Relatively stable & comprehensive
Instruction	Most courses are lecture based	Most courses are based on group learning & seminars	Most courses are lecture based
Faculty	Primarily full-time academics	Primarily full-time academics	Full-time academics
Learning Technology	Enhance lecture oriented instruction	Support group learning and extended access	Enhance lecture oriented instruction
Registration & Payment	Manual registration & payment	Completely online registration & payment	Both manual and online registration & payment
Student Support Services	Physical counseling & advisory	Counseling & advisory through email/chat	Both physical & virtual counseling & advisory
Assessment Mechanisms	Summative	Formative	Both summative and formative
Discussion Mechanisms	Face-to-face	Email/chat	Both face-to-face and email/chat
Content Delivery Systems	Books, class notes, photocopies	HTML, C#, ASP.NET	Both
Student Tracking	Class attendance & grade sheets	Result from formative assessments	Results from formative and summative assessments
Faculty Tracking	Manual Teachers Behavioral Inventory	Virtual Teachers Behavioral Inventory Software	Virtual Teachers Behavioral Inventory Software
Course Tracking	Manual	Web-based	Both
Physical Facilities	Extensive physical plant	Minor physical plant (for non-academic staff)	Extensive physical plant
Productivity Outcomes	Student credit hours and degrees	Student credit hours and degrees	Student credit hours and degrees

Content Delivery System:
Content can be delivered to the students through class notes, photocopies or online. Student can choose in whatever way they feel comfortable to collect the class materials.

Student Tracking:
Teachers can easily track the student through their ID number or partial name. Results from formative and summative assessments will provide vital data but tracking students' progress through the content may also provide useful information.

Faculty Tacking:
The administration department can easily judge the teacher's performance through manual procedures or by online mechanism using customized software.

Course Tracking:
In VU, the frequency of course-offers and the magnitude of student-enrollments in courses can be recorded by management for future projection of likely course-intakes.

5.0 EMPIRICAL IMPLICATION OF THE BUILT MODEL

5.1 Why AIUB is taken as a sample?

To set up a virtual university lots of background factors are needed. Before selecting a sample university this paper had to conduct a research on identifying the required components for setting up a VU which are 1] Technology for VU [ie, logistics], 2] Faculty Members, 3] Students and 4] Academic programs or courses, among others. After going through with all the infrastructure and support services of almost all the private universities, this paper found American International University-Bangladesh [AIUB] as a suitable place to setup a virtual university. The university possesses many of the components needed to establish a VU. The inherent AIUB features for which this paper has chosen AIUB as the field of study can be highlighted as follows:

1] AIUB has the state-of-art technology. They are powered by latest IBM servers. They have state-of-art computer labs also. The computers have "Pentium – 4" micro-processor. And of course they have Internet. They

have their own database administrators, system engineers, and programmers.

2] AIUB has a very good pool of qualified teachers with proper trained to work in VU environment. The teachers are research oriented and educated in reputed international universities of the world.

3] At present, AIUB possesses a number of 2500 students [approx.] with a remarkable growth rate of intakes per semester.

4] AIUB offers five world standard academic degree programs based on extensive use of IT facilities such as Bachelor of Science in Computer Science; Bachelor of Science in Computer Engineering; Bachelor of Science in Electrical and Electronic Engineering; Bachelor in Business Administration [BBA] with major in MIS, Economics, Finance, Marketing, Management, and HRM; MBA with major in Management Science, Finance, Marketing, and HRM

5] Most importantly, AIUB has the financial ability to support the VU project and, at the moment, AIUB is the only university which has come up with the concept of VU in Bangladesh.

5.2 Presence of VU Factors in AIUB

Technology has not been able to flourish that much in Bangladesh like the developed countries. It becomes a very tuff job to search for a university in Bangladesh – no matter public or private -- which accommodates all kinds of new technologies. Still now, even people of the country have remained unaware of the concept of VU. In such a crisis, the only university which this paper has identified as a potential place to groom a VU model is "American International University-Bangladesh" [AIUB] – the first private university in Bangladesh which has initiated the process of modeling a VU facilitating required infrastructure and technical support to establish a virtual university. That is why, the study has chosen AIUB as the sample university to conduct the empirical study.

Table 4: Empirical Implication of the Extended Model in AIUB

Input	Traditional & Virtual University Combo	AIUB
Philosophy	Students come to campus	Students come to campus
Mission	Defined by level of instruction	Center for Excellence in computer-based learning & research worth international standard
Curricula	Relatively stable & comprehensive	Relatively stable & comprehensive
Instruction	Most courses are lecture based	Most courses are lecture based with Virtual mode back-up
Faculty	Full-time academics	Full-time academics
Learning Technology	Enhance lecture oriented instruction	Lecture oriented instruction with audio visual projection
Registration & Payment	Both manual and online registration & payment	Mainly online registration & payment with manual back-up
Student Support Services	Both physical & virtual counseling or advisory	Physical & counseling or advisory only
Assessment Mechanisms	Both summative and formative	
Discussion Mechanisms	Both face-to-face and email/chat	Face-to-face facilitating light discussion opportunity through email [teacher-student]
Content Delivery Systems	Both books, class notes, photocopies and HTML, C#, ASP.NET	Books, class notes, photocopies and online lecture notes
Student Tracking	Results from formative and summative assessments	Written exams, Quizzes, Assignments, Presentations, Seminars, Counseling, Extra-curricular activities
Faculty Tracking	Virtual Teachers Behavioral Inventory Software	Manual Teachers Behavioral Inventory [TBI] System
Course Tracking	Manual and Virtual	Manual and Virtual [includes pre-advising survery among students regarding choice of courses]
Physical Facilities	Extensive physical plant	Extensive physical plant
Productivity Outcomes	Student credit hours and degrees	Credit hours and Degrees

AIUB has developed its online University Solution by the use of its own internal resources. The name of this online University is "AIUB-Virtual

University and Expert System" [VUES] -- the first achievement of AIUB's research on Web based Learning, Teaching and University Management. This is being called an expert system because it will help the university administration department in decision-making too.

VU software operates on both private networks and the Internet, utilizing World Wide Web [WWW] technology to support multimedia presentation and centralized management. There would be a proper combination of powerful server, network communication, hardware & software support to establish this VU. AIUB has all these supports of a VU. The software that AIUB has prepared is fully VU software but as people of the country are not fully aware of the concept and there are other obligations, the university is not going for the implementation of a typical VU as in the UK. At present, the university is using the software as an extended aid to the physical university activities -- students have to be present in the university physically and will take the help of the VUES-software in case of necessities like downloading class lectures uploaded by the teachers in the site, appearing make-up online quizzes, enquiring exam/quiz grades, status of fees paid, etc. Also, teachers can monitor the class performance of the students, their attendance, quizzes, and assignments [for details, see Appendix I]. VUES has the option of student-student, student-teacher, and administration-teacher emailing system. In this way all the participants can easily communicate with each other. Other VU has the option of chatting among the students for discussion but VUES doesn't support this at present. In this connection, this paper finds the extended model of VU suitable in AIUB.

6.0 CONCLUDING COMMENTS

Looking back and assessing the achievements of the present century, we should venture to single out one very important thing: the concept of relativity laid down by Albert Einstein, Sigmund Freud and Karl Marx in the material, emotional and social worlds. Their brilliant insights gave humankind the possibility of realizing that the world is not what it appears to be, that we cannot trust the empirical perception of concepts of space and time, of good and evil, law and justice, and the nature of human behavior in society. They gave back to people awareness of the fact that concepts and laws reflect not only the objective reality of the material world but also the social world. Unfortunately, the past year has given us many examples of how these fundamental truths have been

overlooked, causing irreparable harm to nature, the world of living things and humankind. At the dawn of the third millennium humanity is striving to avoid previous mistakes and errors, and learning via education, science and culture to ensure the necessary conditions for sustainable development in the coming 21st century.

When discussing educational innovations for the development of society and its economy in the 21st century, we should recognize that they are hardly achievable without effective utilization of new information and communication technologies [ICTs]. State-of-the-art information technologies [ITs] enable their successful application in education and allow the creative potential of the student to be tapped into. It is these new ITs that help us to develop an open educational system virtually although the age of new ICTs does not eliminate the most difficult problems, which the world of education faces now, and which have to be solved irrespective of whether the new technologies are adopted or rejected. One of them, for example, is reconstruction and reorganization of school space and school time, the management of this space and time, the reorganization of teacher training, curricula, the content of education and so on. Nevertheless, training and development, social and professional requirements, globalization of communication economy, and political projects of building a new society heavily rely on the introduction of ICTs into education.

Education is currently confronted with the issue of choice among many readily available technologies, and the challenge of solving different kind of problems that may follow in the wake of the technologies' education. The alternative, however, is to chronically lag behind these developments and, in effect, fail to meet the challenges of the 21st century. In this juncture, the endeavors of countries in developing virtual modes of higher education may show some light of optimism. Even though confronted with various shortcomings the comparatively higher gains from virtual learning process has led countries to adopt the internet-based interactive education. In rhythm with the advanced world's progress, the developing world has also started realizing the need of widening the scope of education through virtual university system. Many developing countries initiated this process with open university mode of education due to lack of sufficient technological infrastructure. Pakistan has been pursuing this strategy to launch virtual mode of learning in near future by the time the open university projects become

well-flourished with proper structure. In this respect, Bangladesh Open University project can also be considered as the first step of virtualizing education in Bangladesh.

Since the industrialized countries are well-equipped with latest technology facilitating people with access to the upgraded technology and technological know-hows, the virtual university project highlights a different picture in these countries. In countries like UK and USA, universities maintain separate web sites for virtual educational services whereas, scandinevian countries like Finland chose to enter directly to the "fourth generation" of distant learning. In Canada, successful VUs function in collaboration with the physical university infrastructure. Africa endeavors its level best to structure a VU model with fruitful results which aided them to receive huge technical and financial support from International Organizations and reputed Institutions like Stanford and MIT. But like other developing nations, Africa still has to develop their technological infrastructure as well as to enhance usage of computer and IT-related activities in the continent. In this light, this paper finds it suitable for the beginners to start with modeling Physical-Virtual combo until they gain proper infrastructural support as well as required strength to run a full-fledged virtual university.

In order to verify the proposed extended model of VU [ie, Physical-Virtual combo], this paper has successfully conducted the empirical examination in AIUB [see Table 4] where the infrastructure to operate a VU has been observed satisfactory. It is also understood that if the ongoing pace of development of AIUB continues as a pioneering computer-based academia in Bangladesh, it will be able to emerge as a professional VU in Bangladesh in near future. The initial successes of AIUB in operating its Virtual University Expert System [VUES] may penetrate an outline of framing a VU model for a developing country like Bangladesh where future educational systems are going to place a special premium on the study of the latest development in the area of ITs and computer sciences, as well as issues of the practical application of such developments and prospects of further research.

The rapid development of the informational sphere of society which is dramatically altering the structure of work and employment, and producing new occupations and jobs will force educational institutions in a developing country to plan for VU projects. In this regard, the major

role which is required to be played mostly in arranging for VU modeling is the government. It is government who has to build awareness among the people about virtual university and the benefits of e-learning and has to be sincere in taking initiatives for ICT industry to convert a traditional society into an "information society" as a prerequisite of planning for a VU. In complementary to this, the private sector educational institutions have to expand their technology-oriented academic services in such a way that government finds no other alternative than thinking of arranging for proper infrastructural support. In this connection, the AIUB-VUES success story may work as a source of inspiration for the entire private university community in Bangladesh to commence their endeavors in optimizing [mostly via introduction of computer aided-systems] various information processes that have gained importance in various areas of society's life in the recent years.

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APPENDIX I

Virtual Facilities for Students in AIUB:

1] Students can browse the university website and get the class routine and timing of his/her classes everyday.

2] If any of the students have missed his or her class he/she can collect the course material, submit assignments from their home.

3] They can sit for any quizzes or exams online. It also reminds the students about the upcoming quizzes and notifies about missed assignments.

4] They can also check out their quiz marks, assignments marks and grades easily from the website.

5] If the students face any problem they can easily communicate with their respective teachers using its instant messaging feature. They can make appointment with the teachers and request for advice from anywhere in the world.

Virtual Facilities for Teachers in AIUB:

The ongoing virtual expert system not only makes the life easier for the students but also makes the life easier for the teachers in the following ways:

1] Teachers can take quizzes online

2] They can save their valuable time through automatic calculation and publishing of grades.

3] They can also Upload Lectures/Class notes and other important materials for the class.

4] They can also monitor the class performance, Print Customized Reports and Communicate with the students as well as the Administration.

Virtual Facilities for AIUB Administration:

The AIUB-VUES supports the following functionalities and helps better management and decision-making by the University Administration:

1] Preparing class schedule

2] Assigning classes to teachers

3] Managing teachers and students and communication with them.