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Digital Libraries and prospects of a programme on technology-enhanced learning in Africa

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The National Programme on Technology Enhanced Learning (NPTEL) in India is an illustrative project based on the concept of multimedia based courses with high potential for interactivity. It has become a popular and viable option for both developed and developing nations, though for different reasons. Offering multimedia courses in technology-assisted modes has not only become invaluable for the learner, but also an attractive and creative option for faculty. .

The broad aim of the project NPTEL in India is to facilitate the competitiveness of Indian industry in global markets through improving the quality and reach of engineering education. The operational objective of NPTEL is to make high quality learning material available to students of engineering institutions across the country by exploiting the advances in information and communication technology.

The present paper presents a prospect for such an initiative for African countries and institutions (as potential Associate Partner Institutions) to enhance the quality of human resources in technology and in the arena of the digital library itself.

Introduction

The National Programme on Technology Enhanced Learning (NPTEL) in India is an illustrative project based on the concept of multimedia based courses with high potential for interactivity. It has become a popular and a viable option for both developed and developing nations, though for different reasons. Offering multimedia courses in technology-assisted modes has not only become invaluable for the learner, but also an attractive and creative option for faculty. Such courses have the potential to enhance the on- and off-campus learning experience for students, and in a distance learning mode. Technology opens up several interesting avenues for innovation in design and delivery of courses and also for sharing expertise among faculty in different parts of the world. In India, where a large number of private institutions have entered the field of engineering education with inadequate faculty support and training, the project is aimed at providing a standard for academic content for both the teacher and the student.

The broad aim of the project NPTEL is to facilitate the competitiveness of Indian industry in global markets through improving the quality and reach of engineering education. The operational objective of NPTEL is to make high quality learning material available to students of engineering institutions across the country by exploiting the advances in information and communication technology. The target group for this project consists of students and faculty of institutions that offer undergraduate engineering programmes. NPTEL has developed curriculum-based video courses (110 new courses and 109 existing courses encapsulated in digital video format) and 129 web-based e-courses. This has been undertaken by Partner Institutions (PI) and other selected premier institutions, such as Associate Partner Institutions (API), in a collaborative effort.

The present paper presents a prospect for such an initiative for African countries and institutions (as potential Associate Partner Institutions), to enhance the quality of human resources in technology and in the arena of the digital library itself.

NPTEL: conceptual framework

The main objective of the NPTEL programme is to enhance the quality of engineering education in the country by developing curriculum-based video and web courses. This is being carried out by seven Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc), Bangalore, as a collaborative project. In the first phase of the project, supplementary content for 129 web courses in engineering/science and humanities have been developed. Each course contains materials that can be covered in depth in 40 or more lecture hours. In addition, 110 courses have been developed in video format, with each course comprising approximately 40 or more one-hour lectures. In the next phase other premier institutions are also likely to participate in content creation.

In 1998, a delegation of Directors of IITs and Indian Institutes of Management (IIMs), together with faculty, visited several American universities to explore technology-enhanced learning (TEL) and distance education prospects for Indian institutions. This was followed in May 1999 by a workshop organized jointly by the Indian Institute of Technology, Madras and the Carnegie Mellon University (CMU) Pittsburgh, USA, in which four major projects were identified: content creation for core science and engineering courses; setting up digital library; an online and interactive programme for doctoral education in the IIMs; and the creation of a virtual university for open and distance learning.

After several rounds of discussions over the following three years, the NPTEL was launched. This created contents for 100 courses as web-based supplements; 100 self-contained video lecture courses would be developed by all of the eight partner institutions. Five engineering branches (Civil, Computer Science, Electrical, Electronics and Communication and Mechanical Engineering) and core science courses, that all engineering students are required to take in their undergraduate engineering programme in India, were chosen.

The basic objective of science and engineering education is to devise and guide reforms that will transform a country into a strong and vibrant knowledge economy. In this context, the focus areas for NPTEL project have been i) higher education, ii) professional education, iii) distance education and iv) continuous and open learning, roughly in that order of preference. In India approximately half a million students have been joining the engineering programme annually for the last few years. Industry estimates that fewer than 10% are employable soon after their graduation, although workforce requirements are much higher than this figure. There are more than 1500 private engineering colleges which have been started in the last 20 years, a substantial number of them in the last ten years. The majority do not have the minimum required number of well qualified teaching faculty in each discipline. Despite this, many colleges offer technological programmes such as information technology, biotechnology, nanotechnology and similar programmes, which are highly interdisciplinary, but continue to neglect traditional science and engineering disciplines which are fundamental constituents of such interdisciplinary programmes.

There is an alarming level of neglect of the sound pedagogical principles which are fundamental to discovering such super technologies. The number of teachers trained every year is less than 2% of what we actually need. The teacher-to-student ratio for a good learning ambience in educational institutions is roughly between 1:10 and 1:16. India needs approximately 160,000 teachers in engineering education for a student population of about twenty lakhs (two million), but institutions of higher learning in India are able to train barely more than 4000 teachers every year and offer them jobs. Over

and above this, a teaching career is also among the least attractive alternatives in the current socio-economic setup.

Technology for learning and teaching is already available and the cost per computer power and performance level of technology tools will only become less with time. Students are much more comfortable with cellphones, computers and Internet-based communication such as e-mail, chat and similar technologies. Creating a technology-based learning medium and content delivery through the Internet is thus a natural method for faculty to impart to young minds the concepts of science and engineering which have shaped human lives for the last 200 years or more.

Today's students are ready to plunge in and learn through media-rich, learning-by-doing and learning-by-participation environments. Teachers therefore have to become facilitators and designers of learning experiences, processes and environments. They have to use intelligent software agents which browse the network through search engines to provide information seamlessly. They have to seek out students and equip them in a short period of time in order to make India a developed nation. India therefore has no choice but to offer massive online education, to sustain the current levels of student influx. It is an emerging market and it is also a major business opportunity.

The NPTEL, in terms of its goals, is conceived along the same lines as the Open Courseware (OCW) of Massachusetts Institute of Technology (MIT) in the USA, but the processes are different. The OCW project at the MIT (as seen through its website <http://ocw.mit.edu>) was a brilliant and painstaking effort by its former President, Dr Charles M. Vest, to make freely available to the rest of the world the course materials developed by professors at MIT. There was a phenomenal degree of skepticism among MIT professors about the project when he made the announcement. Since then, the transformation of many of them has been remarkable indeed.

The philosophy of this project has been, and is, to promote the creation of open resource material from some of the best faculty in the world and to encourage teachers and educators in the rest of the world to use these as resource materials without violating basic intellectual property rights. OCW also encourages self-learners. It is a laudable exercise and has recorded millions of visits by students and teachers all over the world. NPTEL also has proposed to provide free open course materials for engineering and science students and teachers. The similarities between OCW and NPTEL start and end here.

NPTEL is a curriculum development exercise and is directed towards providing learning

materials in science and engineering by adhering to the variations in the curricula at different universities. Faculty have modularized their courses into core concepts, which every one of these institutions may teach, and topics which are add-ons to the course. The courses are well structured and are elaborated with details wherever the faculty members have felt the need. Institutions are encouraged to build their own versions of NPTEL courses based on their curriculum design, using the NPTEL materials and collective experience of all IITs and IISc in TEL. They are meant to fill the large gap that exists between the current expertise level of faculty in IITs/IISc and those in private and other government-aided engineering institutions in India.

The initiative is furthermore a joint exercise between eight competing top teaching and research institutions in India, and there is very little duplication of contents among them in the first phase. It is a difficult exercise indeed to come out with a coherent philosophy towards teaching and learning but teams work better than individuals. Although in future phases duplication of course materials between different IITs and IISc will happen (as with the existence of many excellent text books on the same subject), the focus is on building at least one version of each course offered in all of the science and engineering programmes.

The third major difference between MIT OCW and NPTEL is that NPTEL courses will be taken to the teachers through many workshops that are being conducted at present for them, and which will be continued in the future for every course, it is hoped. The interaction between teachers in various colleges and the course developers in IITs/IISc is a mandatory requirement for NPTEL. These workshops are aimed at inviting and gathering suggestions and feedback from teachers and users, to incorporate as many of them as possible in courses.

The fourth aspect is to build in the immediate future a course-specific web space for each course where students, teachers and other users anywhere in the world would be encouraged to create threaded discussions. In this area, direct interaction between students all over the world and teachers would be encouraged through a bulletin-board approach and threaded discussions, with the help of moderators who would be appointed for this purpose. The purpose is to eventually build a digital library for each subject. It would be difficult to maintain such an activity using the faculty of IITs/IISc alone as moderators and several possible avenues are therefore being explored for supporting such sites with faculty outside of IITs/IISc.

The last important difference between NPTEL and OCW is that there are 110 video lecture courses (approximately 4,500 hours) from Phase I and there will be about 400 video lecture courses (with about 16,000 hours of lectures) at the end of Phase II. In addition,

IITs have large repositories of video lectures prepared already, from their own efforts outside of NPTEL, and these are also being made available as free and open educational resources for all. When this is completed, it will be the largest single repository, in the streaming video format, of technical courses in the world and will be helpful to everyone who is interested in enhancing his or her learning.

Despite these differences between MIT OCW and NPTEL, it is important to recognize that the goals of these two programmes are absolutely the same: to educate, get educated with technology and prosper. In India, the means have to be different, given the complexity of the problem of education. In the future OCW and NPTEL will in likelihood work together through a consortium of open education, and it is hoped that IITs and IISc will see this as an opportunity to foster relations among the giants in teaching and research and enable the whole world to prosper.

Implementation strategy

Implementation is supervised at the national level by the Ministry of Education and all the regulatory as well as content-developer institutions. Two national coordinators (one for web courses and another for video courses) are also members of this National Programme Committee (NPC), which oversees policy matters and financial sanctions. There is a Programme Implementation Committee (PIC) which oversees implementation of the programme and has members from all IITs and IISc, who are NPTEL Coordinators in each IIT and IISc, and members from representative user institutions; some of the NPC members are also members of the PIC.

In each IIT and IISc one or two faculty members in each discipline were identified as subject coordinators. They identified faculty volunteers from their departments to develop content for specific courses and to coordinate the content development component for all such courses. In addition, for each discipline, one or two faculty members were nominated as Principal Discipline Coordinators (PDC) to coordinate content creation in their discipline across all seven IITs and IISc. There are six disciplines and six subject level committees. The discipline coordinators met with the PDC and examined the curriculum for that discipline, identified all courses that needed to be developed and ensured distribution of courses across all the Institutes. There are many courses in which more than one faculty member in IITs and IISc agreed to develop contents, and thus there are teams of faculty members for these.

The organizational exercise was initially much more massive than was first anticipated, but it has led to a set-up which can sustain TEL activities in each institute for a longer period than that of Phase I. In addition, this exercise created much-needed software, hardware

and human infrastructure as well as support for faculty members in developing web-based and video-based courses.

Another important issue is the content organization itself and the non-uniformity in styles, teaching pedagogies and experiences of the more than 300 faculty members involved across eight institutions. All seven IITs compete against each other fiercely in the field of undergraduate education, among other things. Criteria were evolved as to what would constitute a minimum web or video course and all faculty members were requested to use these criteria as guidelines. There is thus a team of 350 or more faculty members, with Professor M. S. Ananth as the overall coordinator, and they agreed to disagree on details but at the same time to create course contents for a national cause.

Industry looks for all-round well educated, conceptually sound graduates rather than people with specific skill sets. Even in the latter case NPTEL has something to offer for each skill set. Much more work however needs to be done with the industry's support for the next two or three years; with the development of courses under NPTEL, what follows may be considered to be emerging as opportunities for industry.

IT industries have such strong growth possibilities in India and offer pay scales commensurate with that growth, so that the Indian student population is no doubt attracted to them. If we add to this the management skills that many finance and human resource enterprises are looking for, it is easy to realize that much of the engineering admission and the hype associated with it, including IITs, is a myth. After four years so many graduates cross over to other professions that industries in the area of manufacturing, design and infrastructure development have been taking a beating with regard to the number of well qualified undergraduates they can hire.

A majority of NPTEL courses are however in the "hard", traditional subjects and these industries need people trained on these subjects. Therefore, it is very much in the own interests of industries, for sustenance and growth, to adapt these courses to train a student population and offer them better financial rewards and career opportunities. The courses are well structured and their organization of fundamental concepts can be supplemented by industrial experts with case studies and techniques relevant to the industry.

It has been observed that the subject-level training, comprehension and analytic skills of the majority of graduates that are hired from private colleges are quite inadequate and fall far short of expectations. Engineering institutions must design and offer programmes which are both need-based (as, for example, in the IT and Management industries today)

and which impart sound education in core areas of engineering and science at all levels. IITs have been excelling in this for so many years that their graduates are able to adapt themselves for the choice of their employers in a short period of time. Through NPTEL, part of the IIT training, and the flavour and the rigour with which courses are given, is made available to teachers and student community at large.

Security and privacy issues in digital library and archives

Issues relating to privacy and data protection are crucial factors for any technology-enhanced learning applications, including digital libraries and archives. Security and privacy concerns in education are not new. However, novel technologies and learning environments for mobile, pervasive and ubiquitous systems or Web 2.0-based personal learning environments, especially in the context of developing countries of Africa, have introduced new challenges in prevailing security and privacy problems. In a relaxed regulatory or legal environment (what we called "data heaven") there is a difficult situation when the security and privacy provided are a major concern.

Globally, security and identity management are the most important IT-related issues that need to be resolved.¹ Security and privacy problems concern all the stakeholders: developers, content providers, archives, system administrators and end users. The main concern is unauthorized use and modification of learning content.² Secure storage of both content and learner data is matter of great concern where both protection of personal data as well data related to the learning contents are important.

Security and privacy requirements also differ in different learning settings or learning environments. In a shared learning scenario, through a central digital library or archive, a content provider can ask for a higher security set-up to protect both his personal data as well his "intellectual property". To address the security and privacy issues in technology-based libraries and archives, it is necessary to educate end-users about the potential threats and make them ready to face those threats. On the other side, digital technology and online library service providers should also be aware of the security and privacy issues in data processing, storing and sharing across borders. One of the foremost issues concerning digital libraries and archives storing "knowledge resources" is data security and copyright that could initially create a challenge.

The digital library and technology-enhanced learning

Creation of a digital library of learning resources or a consortium of digital libraries across Africa will facilitate the competitiveness of the region's industry in global markets, through improving the quality and reach of higher education. The operational objective of such a consortium will be to make high quality learning material available to students of

institutions across the continent by exploiting the advances in information and communication technology.

The target group for such a project would consist of students and faculty of institutions offering undergraduate engineering programmes. The educational goals are:

- a. Make video lectures in a format appropriate for broadcasting, which would provide quality content through a dedicated technology channel;
- b. Create web-based (e-learning) material and make it available in the form of a portal or DVDs which would be tailored to meet the needs of engineering students across the country;
- c. Create a common web portal for digital library activity;
- d. Make e-learning material available on the web for video lectures to supplement class room teaching;
- e. Advise target institutions with regard to the software and hardware requirements for benefiting from the national project.

NPTEL in India has so far developed curriculum-based video courses (110 new courses and 109 existing courses encapsulated in digital video format) and 129 web-based e-courses. This has been undertaken by seven IITs and IISc Bangalore as Partner Institutions (PI) and other selected premier institutions as Associate Partner Institutions (API) through a collaborative effort. Taking a cue from the Delhi Declaration of the India-Africa Forum Summit in April 2008, which proposed extensive cooperation in the areas of education, the NPTEL experiments can be taken forward by African institutions as an international "Associate Partner Institution". In fact the Delhi Declaration specifically mentions that Africa and India will collaborate "...in the development and production of teaching and learning materials, including equipment for teaching science and technology and textbooks, especially for universities". It further states that there will be "Collaboration in designing and implementation of Open and Distance Education/Learning Programmes with attendant capacity building for personnel required, such as teachers and ICT technicians"

Action Plan

If we draw up a tentative Action Plan for a Digital Library consortium for technology-enhanced learning in Africa, along the lines of the NPTEL of India, we must first and foremost have a joint platform of African Institutions or Libraries. This may be created under the auspices of the host organizations of this conference.³ This platform, a committee of representatives from the institutions, may carry the initiative forward, taking overall responsibility for policy decisions under this programme. The committee would also ensure inter-institutional coordination at the regional level. The actual work of the Digital Libraries consortium for higher education learning resources would then be to choose faculty from different institutions, departments and centres. The committee would then need technical assistance to develop expertise in multimedia production using digital formats and in developing courseware for the Internet; and would develop a support system of essential hardware and software, with the support of a software programmer,

communication designer and instructional editor, to help faculty in the design, implementation, and assessment of effective learning systems and trained technical staff for support in programming, designing, editing, documentation and maintenance and in conducting training programmes for the faculty.

All courses developed under the NPTEL project in India have been thoroughly reviewed by experts in the area nominated by the subject coordinators' group. The review has been incremental and has provided sufficient mid-course correction strategy to faculty who are involved in the content development. To adopt these materials for African learners, workshops for faculty on web design and choice of appropriate software would be conducted in the initial stages. In addition, workshops would be conducted for librarians, archivists, and teachers from other institutions who would like to use the contents. The course development team would interact closely with teachers and make relevant changes in the content to enable the use of learning materials by the largest spectrum of faculty inside Africa.

In moving towards the successful launch of a Digital Library consortium for technology enhanced learning in Africa, existing facilities for video recording in the partner institutions should be revisited and, if necessary, these should be upgraded to the required level. A uniform format is always emphasized for video courses, so that they can be delivered as capsules for the TV channels and for streaming the content through a video server for access outside specific broadcast schedules. The video archives of lectures are currently available in all partner institutions of NPTEL in India. Similar facilities would also be created in Africa.

The primary target group is students and faculty of institutions offering undergraduate engineering or any other higher learning programmes. In the context of NPTEL-based collaboration, it is particularly geared towards engineering & technology courses. Five branches of engineering (civil, electrical, electronics and communication, computer science and engineering, and mechanical) were addressed in the first phase. Each Institute identified the courses in which it would like to participate as a video (V) or Web (W) based content contributor. The core courses common to all these disciplines, including basic science and engineering, were addressed by a core courses group also formed of members from all partner institutions.

As the colleges are affiliated to a university, and different universities have different curricula and syllabi, one set of learning material would not meet the needs of all engineering colleges. Even when the topics are the same in a learning unit, the scope of the topic may differ from one university to the other.

Students would accept and use the learning material only if it is according to their syllabi, and the conventions followed are the same as in the prescribed textbooks. Hence, even if the topics are the same, the content would need customization with regard to each university. This constitutes a significant amount of work. Faculty from African institutions would be encouraged to interact with NPTEL content creators in this area, to create the necessary variations on the model modular content.

The quality of learning is dictated by evaluation. In most universities evaluation is through public examination and students are expected to write "standard" answers. The design of

support material has taken this factor into consideration while concentrating on student learning. Good international textbooks are prescribed and available at low cost. Nevertheless, students in many colleges often find the methodology used in them quite difficult. Both teachers and students in these colleges would like to have support materials in the web in this regard.

Web supplement materials

In the NPTEL system, the e-learning materials have been created in such a form that they can be expanded and updated continuously. Currently they consist of one or more of the following:

- Localization of examples;
- Elaboration of key concepts and theorems to facilitate clearer understanding;
- Case studies to provide more comprehensive design experience than that offered by simple numerical examples;
- Examples that require the use of different categories of engineering knowledge under different sets of assumptions;
- Question banks to assist instructors to design good tests and examinations;
- Additional reading material for underperforming students, especially those with difficulties with English ;
- Additional reading material for overachievers;
- Historical information and anecdotes related to specific topics;
- Creation of the e-learning material in those formats which ensure that the content creation and course management platforms are decoupled.

The programme for video lectures has courses that consist of about 40 video lectures. Each video lecture is of one hour duration. To enhance the longevity of the video lectures, it was suggested that they should not be too specific to syllabi but should be confined to core concepts. It was suggested that the contents should be distinct from textbook and web support material. The video lectures utilize a multitude of facilities of the video medium such as chalk-and-talk, tablet writing, PowerPoint, two and three dimensional animations, interactive codes and similar features. The lectures were intended to motivate the student by emphasizing why he/she must study a topic in a subject, and often was related to industrial practice as appropriate. Creation of video lecture units was not tied necessarily with the scheduling of regular courses in the Institution.

Follow-up Services

The following actions have been taken towards the deployment of the web and video courses for the benefit of students, teachers and professionals. The programme hosts the e-content on a web site that students have free access to. E-content can be made available in the form of CDs/DVDs. Participating institutions will be encouraged to host these materials on one of their servers and allow students to access. Further e-content can be converted into print form and then distributed at a low cost, but this format will not allow the flexibility of e-material where one can navigate from one point to the other in a module, and when the courses contain animations or interactive templates or both. Some or all of the following simple course management features are available:

- Keeping track of the extent of usage of the material (feedback for the project);
- Collecting feedback, from both students and faculty, on the content;
- Answering specific queries on the subject.

This would require creation of an elaborate structure and network that can be sustained beyond the initial piloting phase. Engineering institutions all over Africa would be encouraged to obtain NPTEL contents and make them available to their faculty and students through their campus intranet. All video courses would also be provided to them in a format ready for streaming in campus networks as videos-on-demand. The hardware configuration needed for this purpose is minimal and as such would not be a difficult proposition for most of the African institutions.

Content Quality

Quality of content is a very crucial issue and it is more complex when materials developed across continents are open to a diverse range of end-users as in the case of digital learning platforms. Content developers as well content processors, faculty and students recognize that quality content is a key element in the success of an online, web-based programme. Digital libraries will perhaps face the same dilemma in respect of selection and storage of resources, often within a limited storage capacity. Of course the overall success of the programmes would not only need content quality but also good delivery support functions for instructors, administrators and students, including those with vision and hearing impairments; pedagogically driven instructional design with well-defined objectives, website usability factors, and technological factors.⁴ Quality assurance benchmarks for distance education⁵ call for a comprehensive and continuous process of analysis, synthesis and evaluation activities as part of the content development requirements.

Challenges for Africa

African countries will need a number of public policies and priorities that must be established to help African institutions develop a system of technology-enhanced learning, and for growth to encourage growth and development of new learning resources including Digital Libraries as Archives. The National Information and Communication Infrastructure (NICI) Policies developed under the auspices of UNECA, Addis Ababa, are geared towards harnessing information and communication technologies for the education sector in some countries and these can be an illustrative example. The greatest challenge however remains that the quality of education in learning through technology must be built on solid research and evaluation.

Developing and sharing subject content and expertise across continents can be both time consuming and expensive. Saving on financial resources through a viable collaboration (say with India and even within African countries) can be achieved by sharing knowledge and best practices. Moreover, the development of new content in the university community is best encouraged through peer review and interaction. National initiatives are

needed which will encourage such sharing and exchange of advances in content development among all African institutions of higher education.

The infrastructure for learning technologies in African higher education institutions is weak in many respects. Faculty members do not generally have access to adequate computers. Many libraries and classrooms do not have sufficient computer resources, the required Internet access or the multimedia capabilities to fully exploit the potential of technology-enhanced learning. Few institutions have the technical facilities and professional staff to develop quality technology-based products. Innovative partnerships with private sector providers are one avenue that holds promise for acquiring the necessary investments. Even with increased private sector investment, however, there is little question that substantial public investment from both federal and provincial levels of government will be crucial on an ongoing basis. Dedicated funds, tax policy changes, and opening up existing programmes to include university infrastructure are all options that need to be explored at both the national and regional levels.

Intellectual property policies that balance the needs of users and creators will be critical to the ongoing development of technology-enhanced learning in Africa. National copyright laws must

- assure that fair dealing and other statutory exceptions for educational and library uses apply in the digital environment;
- expand the scope of the fair dealing exception and include new exceptions to facilitate technology enhanced learning;
- establish an efficient copyright clearance mechanism for works created by third parties in any format, especially multimedia works and digital works on the Internet; and
- ensure the widest possible access to digital resources.

Conclusion

Preparing African institutions for the future will require new knowledge, new skills, new approaches and new attitudes. Information and communication technologies will be a fundamental cornerstone of how we learn, and of the teaching and research at African universities and other institutions of higher learning. Technology-enhanced learning has tremendous potential to improve the overall quality of the higher education experience for all African people.

Course contents created so far by the Indian initiative NPTEL will be useful for teacher training and through this will improve the quality of instruction in Africa. In addition the course materials (both web and video) are freely accessible by everyone independent of their geographic location. These courses can be used by professionals for updating their own academic backgrounds. Open and distance education using NPTEL contents are long-term prospects for IITs.

It is hoped that the contents will help to evolve criteria for focused learning and a common set of standards for professional education in India and elsewhere, through participation by everyone concerned under this platform. Universities in Africa may

recommend NPTEL material to students and do something more , namely, set examination questions from them. This ensures adoption, and African industry will recognize that this is a unique programme and must be supported, because of the potential for improving the quality of their intake. A similar initiative in Africa will incorporate feedback and evaluation by users and continuously update the course contents for the next several years, in the same manner that they have been doing for their own teaching. All of this must happen simultaneously, otherwise the process will become another one for creating a digital content repository without qualitative and quantitative assessment on usefulness and improvement through continuous feedback.



About the Speaker : Dr Baharul Islam has been working in the area of Information Technology policy and legal issues, Rural Development, Poverty Reduction, teaching and researching information society and emerging knowledge economy for more than a decade. His areas of legal specializations are Information Technology Law, Cyber Crimes, and Intellectual Property Rights of software and Liability in Information Society. Presently Dr Islam is on diplomatic assignment with South Asian Regional Development Gateway as its Chairman and CEO. He was earlier working as a consultant on ICT policy and e-Government with the UN Commission for Africa (UNECA) and UN Economic Commission for Asia (ESCAP). He has been involved in various UN projects in Asia and Africa and developed national and regional ICT policies and e-Government Strategies for many countries. He has written a chapter of the first Encyclopaedia of Digital Governance being published this year.

Dr Islam has MA, LLB, B.ED, PhD, Post-Doctoral degrees. He also did his LLM (IT & Telecom Law) from the University of Strathclyde (UK). He taught for more than 12 years in various universities in Asia and Africa and last held a position of an Associate Professor at the University of Addis Ababa (Ethiopia). He has recently taken over as the Chairman and CEO of the South Asia Development Gateway (www.sardeg.org). He may be contacted at islamb@un.org

Endnotes:

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² Weipl E.R. (2005) *Security in E-Learning* in Series: Advances in Information Security, Vol. 16, Springer.

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