Challenges And Strategies For Online Multimedia Content Delivery in SEAMEO Member Countries

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Synopsis

The world has been taken by storm over the advent of new technologies and software in the information communication technology sector. Southeast Asia, without exception should brace itself to meet the proliferation of this new technology and learn from the world to maintain its global competitiveness in all sectors including education. Many Internet software applications have emerged to support the education sector and these applications purportedly try to imitate real-life teaching learning scenarios using multimedia as its core presentation strategy. To date, there are many examples of the use of such applications in education in countries such as the United States and Canada. In education, these new technologies and applications are clustered into those supporting asynchronous and synchronous subject content delivery over Internet or Internet like connectivity such as the Intranet.

Southeast Asia is still lagging behind in the use of such applications and educators should be made aware of the opportunity that the applications could offer over the existing Internet infrastructure available in the Southeast Asian Region. Irrespective of the level of Internet infrastructure in the Southeast Asian countries, these available applications are still useful, if applied in the right way over the institution's existing computer networking infrastructure. The existing low level of Internet connectivity available in the Southeast Asian countries will pose challenges to the use of these new innovative applications but if a suitable strategy is applied, the implementation of such applications may be made possible. The existing level of Internet connectivity between Southeast Asian countries is studied and the countries with almost equivalent Internet connectivity are grouped together to simplify the deployment of suitable strategies for the use of the new applications. An application suitable for asynchronous delivery of multimedia content, WebCT, is introduced and discussed when suitable strategies could be identified to implement such application within the limitations of the country’s Internet connectivity. Where there is a perception of good Internet connectivity, a free available computer software for rich media communication is introduced revolving round the use of NetMeeting as a tool to support synchronous multimedia content delivery over an Internet or an Intranet connection. Strategies on the effective use of these tools are laid out to guide would be implementers to ensure that they are effectively deployed for education.
Introduction

The world has been taken by storm over the advent of new technologies and software in the information communication technology (ICT) sector. Southeast Asia, without exception is seeing the proliferation of this new technology in a number of sectors affecting the retraining of human resources in the various sectors to meet up to the challenges of this trend. The core technology that is seen dominating the ICT applications is multimedia and a number of centers around the world has mushroomed to take up the challenge of preparing the labour force to be equipped to deal with this technology. This is especially important as new domestic devices today are changing in shape and features to include an interface that has multimedia capabilities. In the telecommunication sector especially, the devices are now able to have multimedia capabilities with an added advantage of being able to be connected to the Internet. All these progress is charting a new landscape to the arena of content delivery over the telecommunication media. Internet is seen to be the powerful agent in providing cheap multimedia educational resource delivery over wide geographical locations. Many Internet software applications have emerged to support the education sector and these applications purportedly try to imitate real-life teaching learning scenarios using multimedia as its core presentation strategy.

To date, there are many examples of the use of software applications in education in countries such as the United States and Canada. This software application could be commercially available software adapted for use in teaching or special custom made software that was specifically developed to address some educational needs solicited from the education community. In education, these applications are clustered into those supporting asynchronous and synchronous subject content delivery over Internet or Internet like connectivity such as the Intranet. This paper however, does not intend to contest or discuss the suitability, effectiveness or the unsuitability and ineffectiveness of distance education as a course delivery system as this require a more in depth research and an independent paper on its own. This paper only aims to explore the suitable modes of content delivery on the existing internet platforms available in SEAMEO member countries giving suitable recommendations where it is required.

Strategy of Multimedia delivery on the Internet.

There are a number of ways that multimedia content can be delivered on the Internet. All the ways or approaches however could be classified into either the Synchronous mode of delivery or the Asynchronous mode of delivery. These modes are the same modes identified in Distance Education. Since Internet is now becoming more and more preferred as the medium for distance education delivery for countries with reasonable Internet connectivity, several applications that fall into these two categories are rapidly taking over much older and traditional methods of distance delivery through mail correspondence.
**Asynchronous Delivery**

Asynchronous delivery of course content occurs when the recipient or student of the course is receiving or interacting with the course content at his or her own time in a formal venue such as the library or at home. Its meaning is sometimes simplified to be learning at any time, at any place and at your own pace.

Several approaches using Information Technology tools could be used to support this mode of delivery and this is described below:

*Interactive CD-ROM.*

Contents with interactivity could be designed and prepared on CD-ROMs. The Interactive CD-ROM’s could include digitized textbooks, video, animation, photos, figures and charts. The CD-ROM could also integrate a self-assessment mechanism to provide checks for the student to conduct their own self-assessment. In this format, the CD-ROM could be posted to students and if there is a need, students may access their supervisors or lecturers through the telephone or arrange a meeting to discuss the progress of the content delivery.

*Integrated Internet Solutions*

Internet contents with interactivity could now be produced with ease for the World Wide Web and these content could be hosted on the provider’s site to serve all students wishing to gain access to the subject content. The format of these content varies but almost all formats are now easily accessible with any Web browser. Certain formats however do need a little understanding of add-on application to the browsers called plug-ins. The formats that could easily allow rich lesson content to be delivered on the Internet are as follows:

1) Normal text and graphics, which may include amongst others pictures, illustrations and graphs.
2) Plain animation that illustrates processes as well as interactive animated movies that could be used for educational illustrations. Plug-ins may be needed for this type of movies.
3) Streaming audio, streaming video or streaming video and audio. The streaming could also be synchronized with text and graphics presentation thus improving on the delivery mode. Plug-in application might also be needed for this type of format.

The amount of media richness used in the content delivery based on the formats above depends on the Internet bandwidth available for serving the contents. For low bandwidth, that is slow Internet connection for the server, only the format described in point (1) should be used. With this format, even servers serving users with dial-in access with 33.6 kbps modems should be able to allow reasonable speed of access to its students. Serving formats richer than that, requires at least a leased line connection to the server.
This type of delivery is less costly for a bigger group of students but this is only viable in areas with reasonable Internet connectivity. Several other services will also be used to support this delivery such as Email, file transfers using FTP and even telephone when the need arise. This is to ensure that students have a means of access to help and assistance from their lecturers. Students need to access the content at their own time and may use the email for communication with their supervisors, lecturers or their peers.

At this moment in time, the conventional web applications described above have even be expanded to include special course management software that integrates all the services mentioned into one application such as WebCT, Blackboard, LearningSpace and others. The presence of this software also allows lecturers to monitor student accesses to their content and could track their progress at the same time.

SEAMEO VOCTECH is currently using WebCT as one of the Web course tools to deliver asynchronous multimedia content on the Internet allowing students access through the internet and through dial-in connectivity to institutions in Brunei. The features of WebCT that was found useful is its ability to allow multimedia content to be hosted in web page format and the student tracking and evaluating feature. The email and bulletin board feature allows students and lecturers discuss content issues asynchronously. There are also features in WebCT that allows real-time discussions between students and lecturer using the Whiteboard and Chat Rooms. All the available features in WebCT illustrates that integrated Internet solutions is now available on a single software.

Hybrid CD-ROM and Internet Web Solutions.

When internet connectivity is not as favourable and the bandwidth available is small, a good method of asynchronous content delivery could be done having part delivery using the internet and having the web content on the Internet interacting with richer multimedia files stored on CD-ROM. Rich media intensive files such as video, audio, animated illustrations and others could be stored on CD-ROM and this CD-ROM could be posted to the recipient first before the students are given access to the course content on the Web.

Synchronous delivery mode

Synchronous delivery takes place when all the learners or students are receiving the delivery of contents from their lecturer at the same time. This however does not mean that they are at the same venue. The students could be located anywhere as long as they have access to the contents at the same time it is being delivered. The format of the content delivery could vary from just simple text messages from the lecturer to a group of students on-line to actual video and voice transmission with graphics and text delivery at the same time.

Several approaches using Information Technology devices could be used to support this mode of delivery. The devices available for this mode may be those that use the normal telecommunication channel such as the telephone for connectivity or the Internet and this is described in the proceeding paragraphs.
Video conferencing is the delivery of content through the delivery of video and voice transmissions. The video transmission may also include graphic presentation and illustrations besides the view of the lecturer. Conventional video conferencing today uses the telecommunication channel to establish a wide bandwidth digital connection between two nodes, the node where the delivery is being recorded and transmitted and the node of the recipient. Usually an Integrated Digital Services Network (ISDN) service is used for this type of communication. Video Conferencing of this kind, using point-to-point communication is efficient and usually offers good quality image. A number of devices may be needed to make such connection successful. Usually, a TV-top device with a camera that allows connectivity through the ISDN Telephone and a TV on both nodes are required. PictureTel Corporation is one of the companies that provide solutions for Video conferencing and their solutions offers a wide range of features that allows rich media integration features over the video conference call. Some of this features would match the kind of data richness available on computer systems.

With the availability of broadband connection today for the Internet, this type of solutions is also being made available through the desktop conferencing software.

Desktop conferencing

Desktop conferencing systems are software applications that allow a conference to be initiated between two or more parties over the Internet using standard desktop computer systems such as the Windows based PC, Apple Macintosh, or Unix workstation. The features that can be used in the conference depend on the conference software that is being used. The simplest and most common conference software are those that support Internet Chats, allowing a number of people to log on to a chat server and permitting them to do real time chat across wide internet locations. This started off as a social communication tool but could now be used innovatively for peer-to-peer discussions for distance learning support.

A more sophisticated and elaborate conference software will allow communication that is not limited to the following features:

1) Voice communication
2) Video communication
3) Text communication similar to Internet chats.
4) File transfers between the lecturer node and the students node.

The American Society for Training and Development (ASTD) published a paper by Tom Barron looking at several available Desktop Conferencing Software that are able to be used on small bandwidth such as a connection through a 33.6 kbps modem and found that the Internet conference initiated in three of the software he used, proved workable although there were a number of weakness in the quality of video and voice. The conferencing software that he used was Centra 99 from Global Knowledge Network, NetPodium from Intervu and the learningSpace from Lotus. Among the common features provided by the software are voice transmission, video to a limited
extent and rich media presentation capability through the use of presentation tools to
deliver textual and graphical content to the learners when the voice are being
transmitted.

In the Institution where the author works, SEAMEO VOCTECH, desktop
conferencing using a free tool from Microsoft, NetMeeting is being used frequently
for transmitting and receiving synchronous content delivery. NetMeeting allows
voice, video, whiteboard, chat box, file transfers and application sharing to support
the synchronous communication. It was found that, with some innovative
configuration on the transmission node and the recipient node, content delivery
through the Internet could be conducted efficiently. In SEAMEO VOCTECH’s
experience it is best to have all the learners located in one venue during the conduct of
the lesson conducted by a presenter located thousand of kilometers across the world.
However, the quality of delivery sometimes fluctuates depending on the time of the
day. This is due to high Internet traffic, which is anticipated to be higher in the middle
of the working day. Diagram A below shows the equipment configuration at
SEAMEO VOCTECH.

Diagram A

Internet Infrastructure in Southeast Asia.

The existing level of Internet connectivity available in the Southeast Asian countries
is rather disparate and different between country to country in Southeast Asia. It
extends from the most connected nation that is Singapore to possibly the least
connected nation in Southeast Asia that is the Indo-China countries. It is rather
sensitive to say which Indo-China country in Southeast Asia is the least connected as
the data available today is not strong enough to formulate such conclusions. However,
what is clear is that this will pose challenges to the use of new innovative applications
in delivering content online in countries in Southeast Asia.
Most literatures and references available, including those in the internet indicate that the Internet linkage world wide is still transmitted through North America and there is little inter-regional connectivity between the countries of Southeast Asia. Internet messages from countries such as Thailand and the Philippines will traverse through the United States first before being able to get to the other nations in Southeast Asia. This pose delays and redundant routing of signals from these Asian countries in their communication to one another.

To ensure that multimedia delivery options are possible between countries in Southeast Asia, the inter-regional connectivity in SEAMEO countries should be improved and this is only possible if the Internet Service Providers in the respective SEAMEO countries work together. The major Internet Service Providers in a few of the SEAMEO countries is discussed in the proceeding paragraphs.

**Internet Service Providers in Southeast Asia**

There are a number of major Internet Service Providers (ISP) that provide the Internet Backbone in the Asian countries that they are operating. The list of ISP’s are as follows:

1. Singapore SingNet – Singapore Telecoms StarHub Internet
2. Malaysia JARING TMNet – Telecom Malaysia
3. Brunei BRUNET – Brunei Telecoms SimpurNet
4. Thailand INET-TH –Thailand Internet Services
5. Indonesia Indo-Net
6. Philippines PHNET

Little information was available for the Service Providers in Indo-China countries such as Vietnam, Cambodia, Laos and Myanmar.

A paper presented by the SEAMEO Secretariat in the SEAMEO 23rd High Officials Meeting in November 2000 indicated that among the Asian countries, Singapore has the best Internet followed by Malaysia, Thailand, Philippines an Indonesia. The other SEAMEO member countries in Indo-China that is Myanmar, Laos, Cambodia and Vietnam has inadequate connectivity to the Internet. There was no mention of the status of Brunei in the paper as the paper focuses on countries that have direct international connectivity to the United States. At the time of writing, Brunei is not connected directly to the United States but goes through Singapore for its international linkage to the world. However judging from the unit of measurement used in the paper that is bandwidth per 10,000 inhabitants, Brunei could be the second best connected country after Singapore as the 8 Mbps International connectivity to Singapore from Brunei is shared by only about 330,000 people which is roughly the whole population of Brunei. This makes the Internet bandwidth availability in Brunei to be about 242 Kbps per 10000 inhabitants compared to Singapore that is having
approximately 1.2 Mbps per 10000 inhabitants and Malaysia with 51.8 Kbps per 10000 inhabitants.

This type of measurement however does not mean that the Internet connectivity for countries with less bandwidth per 10000 inhabitants would have slow internet connectivity as the actual number of people having internet connection in that country may be smaller thus giving them better bandwidth. The measurement was based on gross population without isolating the population that is actually using the Internet. The results only give a general guide as to the connectivity standing of the countries in SEAMEO.

**Inter-Asia Internet Connectivity**

Most of the ISP discussed above has their own International Links to the United States and there is very little formal Inter-Asia connectivity between them except for Malaysia, Singapore and Brunei. At the time of writing, checks on the signal routing (using trace route) between Indonesia and Singapore indicate a direct connection between Indonesia and Singapore thus allowing Indonesia to have direct interconnectivity with the three interconnected Asian countries. The availability of this direct interconnectivity between Malaysia, Singapore, Brunei and Indonesia allows better Internet accesses between servers located in these countries but connection to other SEAMEO countries are still through the United States.

Efforts are underway to try to have an inter-Asia connectivity with connections that do not have to traverse through the United States. Several major Internet Service Providers (ISP) in Asia such as Singapore Telecom, Asian Internet Holdings, Internet Initiative Japan (IIJ) and others does these efforts. As this paper is written, the landscape of Internet connectivity in Asia is changing rapidly and very few literatures or reports will be able to report correctly on the changes that are happening. However, with whatever resources available, a general idea of the connectivity can be perceived and this is illustrated in the few diagrams below:

![Singapore Telecoms Internet Exchange Network Coverage](http://www.stix.net/network.html)
The Diagram above indicates that there would be Internet network coverage from Singapore to the various SEAMEO countries and the world. The literature however does not indicate when the connectivity will become fully operational. To date, in terms of connectivity in Asia, available literatures indicate that there is a direct connection between Singapore to Hong Kong and Singapore to Japan. The Diagram below shows another Internet Network company Asia Internet Holdings that is also working towards providing Inter-Asia regional connectivity.

Atlas of the Asian Internet Holdings (AIH) A-Bone Infrastructure for Inter-Asia connectivity to the world. (Source: http://www.aih.com/)

Schematic of the same A-Bone network managed by AIH. (Source: http://www.aih.com/networkcov/netcov.htm)
Modes of Internet connectivity in SEAMEO countries.

A survey done by SEAMEO VOCTECH to assess the IT infrastructure in SEAMEO centers in year 2000 indicates that there are generally four modes of connectivity to the internet for centers and institutions in SEAMEO countries. These modes are as follows:

1) Leased line connection
2) Asymmetrical Digital Subscribers Line (ADSL) connection.
3) Dial-up Integrated Services Digital Network (ISDN) connection.
4) Dial-up analog modem connectivity.

In the countries that have good Internet connectivity such as Singapore, Malaysia, Brunei, Thailand, Philippines and Indonesia, a number of SEAMEO centers have Leased Line connection while countries in SEAMEO that has minimal connectivity such as Laos, Vietnam and Cambodia are mainly using dial-up analog modem for Internet connectivity.

SEAMEO Countries Internet Connectivity Categorized.

From the discussions above, a way of categorizing the Internet connectivity could be formulated based on the level of Internet connections between one another or the connections of the SEAMEO countries to the United States. Based on the connectivity to the United States, SEAMEO countries could be just be categorized either as good connectivity or weak connectivity. However, if the criteria is extended to include also inter-regional Internet connectivity, the author suggest three categories of Internet connectivity. The following table suggests the three category of Internet connectivity that could reflect the Internet connections of SEAMEO countries to the world.

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
<th>SEAMEO Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category A</td>
<td>Countries that have direct connections between one another and also to the United States.</td>
<td>Singapore, Malaysia, Indonesia, Brunei</td>
</tr>
<tr>
<td>Category B</td>
<td>Countries that have connections to the United States for all Internet connectivity</td>
<td>Thailand, Philippines</td>
</tr>
<tr>
<td>Category C</td>
<td>Limited Internet connectivity to the United States or between SEAMEO members.</td>
<td>Vietnam, Cambodia, Laos, Myanmar</td>
</tr>
</tbody>
</table>
Challenges and Strategies For Multimedia Content Delivery

The three categories identified enables similar kind of strategy to be formulated for multimedia delivery via Internet between the countries in SEAMEO that belongs to the same group. Several research done by centers such as the American Society for Training and Development also indicate that no matter how low or small the internet connectivity level is, there is always a way round to provide content delivery. The only constrain would be to limit the richness of multimedia to the bandwidth available. A number of challenges will need to be addressed if efficient multimedia delivery lessons is to take place in the SEAMEO countries with limited Internet connectivity. The following list down some of the challenges that will need to be addressed.

1) How do we plan a good lesson with minimal multimedia content but enough to reflect the actual content?
2) If a multimedia lesson content is already developed, is the bandwidth enough for the planned multimedia delivery? If not, how do you modify the presentation or delivery strategy?
3) How do we balance between the deliveries of the same content to SEAMEO member countries that have different Internet connectivity levels?
4) What if, only a small number of institutions in a SEAMEO country have computers and Internet connectivity?

In addressing the challenges, considerations need to be placed, not just in the multimedia component to be planned and delivered, but also on the possible connectivity profile that could be used to efficiently deliver the content. If only internet connectivity through the ISP’s are relied on, then countries located in weak connectivity areas such as Indo-China would not have the means of delivering successful multimedia content between institutions in their country.

If reasonable telecommunication services are already installed in these countries, which they usually are, then the options of delivering multimedia content could be channeled to the use of Internet like connectivity between centers using the concept of Intranet. Intranet is actually a private Wide Area Network that uses protocols and interfaces common to the Internet. Diagram B illustrates two organizations connected via the telephone service to form an Intranet. When two Local Area Networks are connected together through the public telecommunications service provider, such as that shown in the diagram, then the bigger network is called a Wide Area Network. This would be one of the ways in which centers could connect to their institutions to offer access to their multimedia content for countries that falls in category C. With this kind of connectivity, the multimedia content delivery options are expanded depending on the channel bandwidth offered by the Public Service Provider and all strategies identified in the asynchronous delivery mode is possible.
When good Internet connectivity is available, such as those countries in category A, then the big question posed would be more on the bandwidth requirement for the intended multimedia content delivery. The richer the multimedia content to be served, the bigger is the bandwidth requirement and this implies to higher cost of connectivity. So, the multimedia needs must be addressed carefully so as not to stress the financial expenses of the organization. In the pursuing paragraphs, discussion on the possible solutions that could be implemented for multimedia delivery in SEAMEO countries are discussed beginning with the category of least connectivity, that is category C.

**Multimedia delivery solutions for Category C**

Countries in category C are the least connected, so the type of strategy to be selected to deliver multimedia content have to be more conservative. Even so, if a dedicated dial-up connectivity could be established between Institutions in a particular SEAMEO country, then the multimedia delivery solution could be expanded. If that is possible, then even synchronous delivery between institutions in that country is possible. One possible scenario would be as shown in diagram below:
In this setup, the individual dial-in connections are quite dedicated and can guarantee a stable and consistent connection to the main server. This allows any of the strategies discussed in the asynchronous delivery mode to be used as well as to a certain extent, the use of synchronous delivery that does not use video. So WebCT could be used to host asynchronous lessons and NetMeeting could be used to deliver synchronous delivery using voice and application sharing with PowerPoint to deliver text and graphics content. However, a classroom setting on the receiver’s side similar to the one illustrated at SEAMEO VOCTECH should be implemented to minimize the bandwidth, but still allowing many learners to access the multimedia content.

If the dial-in solution is not possible, but there are possible accesses via the Internet, then asynchronous delivery using tools such as WebCT is possible. The richness of multimedia content however should be properly designed so as not to stress the connection bandwidth. If, there is no connectivity at all, which is often true in many centers in these countries, then the first multimedia delivery strategy, that is using asynchronous delivery should be used. The best mode in this strategy would be preparing CD-ROM’s to be used on stand-alone computers in the centers.

Interaction between SEAMEO countries in this category, such as between Cambodia and Laos, however, is very limited and if common multimedia resources are to used in teaching in each of these countries, then it is suggested that they only use CD-ROM multimedia courseware to do so. Using this strategy is totally independent from any connection requirements.
Multimedia delivery solutions for Category B

In this category, the SEAMEO country would have direct connectivity with United States but with only indirect connectivity to the other SEAMEO countries. The bandwidth available for international connection too is not that big based on the reference made in the SEAMEO paper HOM-23/WP/17 and other references available. The national connectivity in these countries though is quite good and would allow a number of strategies to be implemented if good strategies are adopted.

In the case of Thailand, for instance, the national connectivity between institutions is good and can reach high bandwidths. It is thus possible to apply all the asynchronous or synchronous delivery strategy for multimedia delivery if the access to these deliveries is restricted to recipients in Thailand only. If access is to be provided to countries outside Thailand, then only asynchronous delivery options should be considered and the richness of multimedia content should be minimized to those that would suffice the lesson delivery only.

It is not advisable to implement synchronous delivery to another SEAMEO country unless a direct dial-up between two nodes in the two SEAMEO countries is considered. This is possible using the strategy involving video conferencing with ISDN phone connections, which is available in the countries of this category. The cost of implementing such strategy, however, might be expensive outweighing its advantage.

Multimedia delivery solutions for Category A

Category A SEAMEO countries have the best Internet connections and their connectivity also extends to their inter-country connection. In this category, almost all the approaches identified in the strategies for multimedia delivery that falls into the Asynchronous and Synchronous mode are viable. The strategies laid out for category C and category B are also possible for implementation in countries falling in this category. Therefore, for the countries in this category, the education delivery needs would really be dictated by the amount of multimedia content delivery required.

Multimedia content delivery between centers located in one of these countries could in effect initiate multimedia delivery sessions with centers located in another SEAMEO countries in the same category using any of the strategy laid out for asynchronous and synchronous delivery. This would mean that it is possible to use WebCT for asynchronous delivery of content and perhaps using any desktop video software for synchronous delivery.

In this category, the synchronous delivery possibility could be extended to multi-point user connectivity, which is having many users connected to a content presenter using individual computers and not in a classroom setting. One such software that supports this is the Centra 99. This product allows more than one client computer (node) to be connected to the hosting site and voice-over-IP (VOIP) is used for content delivery. The software allows two-way audio communication, document sharing, and various instructor-student interaction options suitable for a virtual classroom setting. The two-way audio communication however only allows one student to speak at a time, when prompted but the voice is transmitted to all receiving nodes. This is similar to having
students spread across a wide geographical locations using tools that allows them to receive the lecturers content simultaneously at the same time. In this scenario, a timetabling and proper scheduling system that is informed in advance is needed.

**Conclusion**

Even though there is a wide difference in the connectivity levels of SEAMEO countries, there exists, however a cluster of these countries that has sufficient connectivity to be the pivotal countries in the implementation of new technologies to deliver education. The paper identified these countries as those that belong to category A SEAMEO countries in terms of Internet connectivity. They will act as trendsetters and the test bed for researching multimedia delivery techniques on the Internet for the other SEAMEO countries to consider or follow. The presence of regular training programmes conducted between the SEAMEO centers for the members of SEAMEO countries allows SEAMEO countries to stay abreast with the advancement of these new technologies for education.

The paper also provide some possible ways around the limitation posed by the SEAMEO country’s Internet connectivity by introducing possible network connection strategies through the use of dial-in services and Wide Area Network connectivity within the particular SEAMEO country to allow multimedia content delivery. It is thus possible to use these alternatives as a strategy to enhance the delivery of multimedia content to institutions within the country.

It is also possible to deliver multimedia content even if the Internet bandwidth available is small. The only constrain is to limit the multimedia richness to conform to the bandwidth constrain. At this point of time, when developed countries are progressing rapidly ahead with the use of multimedia enabled devices to conduct communication, training and education, SEAMEO countries must not be left behind by reflecting on our limited connectivity, but SEAMEO countries should strategize, by working together with SEAMEO countries that have good and even sometimes excellent internet connectivity to stay at par with these countries.
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