

EVALUATION OF DIFFERENT TECHNIQUES FOR VIDEO STREAMED SEMINARS FOR MEDICAL EDUCATION IN BANGLADESH

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The project was coordinated by the research centre CRATOS (Centre for Research on the Applications of Telematics to Organisations and Society, <http://cratos.pc.unicatt.it>) from “Università Cattolica del Sacro Cuore” (UCSC, Italy) in collaboration with the University of Birmingham (UoB, UK), the Bangladesh University of Engineering and Technology (BUET, BD), the Bangladesh Institute of Development Studies (BIDS, BD) and the Sustainable Development Networking Programme (SDNP, BD).

The area on which this project was focused is: Education of medical practitioners from a Hospital and a Clinic located in Bangladesh.

The core of the project was the following:

“Health operators from public and private institutions (national and international), from Bangladesh will attend a series of seminars delivered via different streaming typologies from different sites in Europe (University and Hospitals). These seminars will be especially addressed in areas which are among the most central issues in health care today in Asian Countries.”

The E-Health & Learning Project aimed at supporting the creation of a Medical Network; participants from Asia and Europe were invited to join it through a Medical Portal and to attend a set of seminars. The project was focused on the following activities:

- Development of a joint European and Asian Network dedicated to Telemedicine;
- Organization and diffusion of a set of seminars aimed at training the participants in different areas of medicine;
- Support the development of a Medical Portal;
- Promote easy access to medical libraries around the world through the Internet;
- Study the level of satisfaction for long distance medical training;

- Select the best way to stream medical seminars through the public network with poor bandwidth;
- Study how EBM (Evidence Based Medicine) approach can influence the day to day work of medical practitioners. The EBM is the systematic acquisition, appraisal and application of current best evidence. Practising EBM requires a attitude to use of Information and Communication Technology (ICT) to access relevant guidelines, reviews and literature, etc.

The project started with the attempt to identify the different solutions to deliver the seminars via the Internet; the output of this analysis was the choice of the more appropriate technology framework that was to be adopted.

Meanwhile, an initial survey to the medical operators was submitted in order to understand their familiarity with ICT: their poor knowledge in this field represented one of the major constraints during the project implementation.

The other constraints (mainly technological), that we had to face were:

- Budget restriction, that forced us to discard expensive technologies. This means that we did not take into consideration technology solutions like VSAT, videoconference via IP or ISDN, dedicated bandwidth and so on;
- Utilization of public network to connect Europe to Asia;
- Lack of bandwidth and very low quality of service from public network;
- Need to connect several networks (public and private) to reach the final users in Bangladesh;
- Necessity to avoid any type of e-learning platform due to the poor client site hardware found;
- The software adopted had to be standard, easy to use and cheap or free.

The situation in Bangladesh is that in many areas of the country it is really hard, if not impossible, to obtain medical information and assistance because of the poor economic conditions and telecommunication

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infrastructures. In fact, there is a strong difficulty in retaining specialists in non-urban areas.

In developing countries like Bangladesh, rapidity and an easy access to medical information are essential conditions for the quality of the help assistance to patients, for medical research and for checking the developments in the health service.

During the e-HL project we started, as a first stage, by building the missing infrastructure: we built two-network segments, both on radio link with transmitter and receiver in bi-directional way, with a bandwidth of 2Mbps. The first network is in Dhaka and connects the SDNP node with the Comfort Nursing Home Ltd., covering a distance of about 8Km. The second network established is from SDNP node in Dhaka to Community Hospital in Mymensingh, 120Km away.

The whole network exploited by the project was composed by:

- Janet University Network in UK connecting UoB to London node;
- HDSL Telecom Network in Italy connecting UCSC to Cilea node in Milan;
- Public network connecting London and Milan nodes to Singapore;
- V-sat connection from Singapore to SDNP node in Dhaka;
- Radio link connection from SDNP node to Comfort Nursing Home in Dhaka;
- Radio link connection from SDNP node to Community Hospital in Mymensingh.

The second phase was to make a comparison between the different technologies available for delivering content on a public network. In particular, we selected and analysed the following ones:

- Specific e-learning platforms;
- Videoconference over ISDN;
- Videoconference over IP;
- Downloading media content;
- Streaming media content;
- Microsoft Live Meeting.

After various analyses, comparisons and tests, we selected as best technology to deliver content (bearing in mind our hypotheses and constraints), the streaming technology.

Thus, we chose four streaming solutions to be tested and validated through a feedback questionnaire from final users and statistic tests. The seminar typologies chosen (corresponding to different streaming solutions) were:

- Real-time streaming;
- Recorded media streaming over a public network;
- Recorded media streaming over a Local Area Network;
- Web embedded streaming content.

“Real-time streaming” is when a medical expert is filmed while taking a seminar. The captured audio and video file is the output from an encoder machine (hardware or software), and it’s used as input for a Streaming Server. The Streaming Server streams the live audio and video content (e.g ASF file) using ‘http’ or ‘mms’ protocols. In this case the publishing point is “broadcast”, delivered as “unicast” over the network, i.e. one to one connection between the client to the server. For better result, it’s better take the encoding process and streaming process on two different machines on the same high speed LAN. A streaming media player (the client) for each Hospital in Bangladesh is directly connected to the server and the seminar is displayed with a projector to the doctors in a common room. After the seminar, the doctors can ask questions to the experts using an instant messaging (IM) software.

During the “recorded media streaming”, a medical expert is filmed and recorded while taking a seminar, and the audio/video are stored in a file in uncompressed format (e.g. AVI). Then a media file is made after a post production phase; several compressed file can be produced to fit different bandwidth requirements. This file is published on a Streaming Server located in Europe for the streaming experience on a public network (“Recorded media streaming over a public network”), or at SDNP node in Dhaka for the streaming experience over a LAN (“Recorded media streaming over a Local Area Network”). In this case the publishing point is “on-demand”, delivered as “unicast” over the network. At the time scheduled for the seminar, a computer from each Hospital / Health Centre in Bangladesh involved in the project is connected to the Streaming Server with a streaming media player.

The seminar is displayed with a projector to the doctors in a common room or watched directly from the doctor’s personal computer in his/her office. At the end of the seminar, the doctors and the expert can interact in a synchronous way simply using an IM software.

In the “Web embedded streaming content” way, the media file from the seminar is published on a ‘streaming server’ that feeds its content to a ‘web server’ containing some specific web pages written during the post production phase. The web pages show the video linked and synchronized with the slides used by the “teacher” during the seminar. These files are made available on the e-HL Medical Portal. Having a web page it’s possible to create several links connected to streaming files created with different bit rate for dissimilar target audience. People from each Hospital / Health Centre in Bangladesh involved in the project can connect to the Web Portal and access the seminar on their own personal computer whenever they need. The only requirement in terms of software is to have a web browser installed on the machine. The doctors can then ask any questions to the

expert by e-mail thus starting an asynchronous communication.

After an initial stage during which each streaming methodology was tested in terms of bitrate, appropriate time of the day, user feedback, bandwidth consumption, and quality of service, we proceeded with the statistical part of our analysis. This work was conducted in three sub-phases:

- Collecting information about Bangladeshi clinicians through a needs analysis focusing on EBM attitude and ICT skills;
- Delivering the medical seminars to different selected subset of clinicians using for each group a different technology among the four mentioned above. After each seminar, for each group of people, a feedback was collected;
- Data and statically analysis, tests, outcomes and results. Several indexes were built to show and describe both the level of satisfaction for each seminar/methodology and the quality of the learning experience for the final user.

The main outcomes from the project show how the technology used to deliver the seminar can strongly affect the overall level of satisfaction of the final user.

The first two streaming methods (real-time streaming and recorded media streaming over a public network) were evaluated as poor in terms of quality of service by the final users. Our first conclusion was that these technologies are not suitable for medical distance learning in a context of poor bandwidth and lack of financial resources to adopt more sophisticated technological solutions.

The most significant results came from the comparison between web embedded mode and the seminar delivered over a local network. We noticed that any improvements in favour of the web embedded mode were found when the seminar's quality level and seminar available resources are compared. This is a notable result if we consider that in the "web embedded" mode the users were free to access the Web searching for additional resources, whereas in the "streaming over a LAN" mode they had not been given the access to the Internet.

This result can be justified by the lack of skills on ICT of our target groups: our initial survey showed that 49% of medical practitioners have never accessed the Internet. This data explains how the web access has not been understood as an added value by our target group.

During our analysis we also realized that the lack of skills in ICT is a strong factor that can introduce a bias in our seminars evaluation.

The additional goals achieved by the project are (By the way, we are not going to describe in depth these results since they do not fit the purposes of this article):

- To explore whether a more or less 'structured' way of integrating the EBM approach is appropriate between different modes of delivering lectures, within a distance-learning context;
- Analysis of the Question and Answer session.