C.R.E.D.I.T

This paper seeks to report on the structure, methodology and outcomes of a series of ongoing experiments between two of the Scottish Schools of Architecture. The experiments are directed at establishing the best use of video conferencing as a means of sharing resources through collaboration in design teaching.

Key Words: networks, video conference, design teaching, remote access.

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1. Introduction

Recent investment in the communications infrastructure within Scotland has led to the establishment of an optical fibre, ATM, backbone for communications between the higher educational institutes. This facility is built around several interlinked Metropolitan Area Networks, the MANs. In order to capitalise on this investment a series of projects have been initiated by the educational funding bodies. One such project is C.R.E.D.I.T. (Collaborative Research in Education for Designers using IT) a collaboration between the two Glasgow Schools of Architecture, namely, the Department of Architecture and Building Science at the University of Strathclyde and the Mackintosh School of Architecture within the Glasgow School of Art.

The purpose of this collaboration is to undertake a series of experiments in order to determine the suitability of video conferencing, as enabled by the new communications infrastructure, in relation to key pedagogical activities within architectural education.
2. Video Conferencing

Although the technology for video conferencing has been in place for a number of years, it has yet to become accepted as a mainstream activity. This is mainly due to the constraints of current network technology. Even traffic over ISDN which represents the highest quality of video conferencing technology in general use today, is fraught with difficulties caused by lack of network bandwidth. This results in degradation of image and audio quality to the extent that communication is often disrupted. While some forms of conferencing are less susceptible to network limitations it becomes obvious that the quality of the underlying technology is the common denominator in most of the problems experienced while trying to communicate at higher levels of fidelity.

These problems are outlined below:

- Lack of network bandwidth inevitably causes degradation of image and audio quality, often to the extent of masking the message being put forward.
- Lack of familiarity with the medium results in the user focus centring on the technology itself, rather than its application. This, coupled with misuse of the format, is cited as a major drawback to the current use of the technology.
- Lack of comprehensive hardware/software tools to aid presenters bring together material thus causing a shortage of quality presentation material and resulting in a disproportionate amount of preparation time.

3. Experimental Objectives

In approaching the collaboration between the two Schools of Architecture, the hope was that in basing the experiments on the MAN infrastructure we would be spared the common technical problems, as discussed above, and would be free to concentrate on the issues of content and session management. In essence, the basis of the experiment was to take the two key architectural teaching methodologies and evaluate their performance when integrated with the new technology. It was agreed that the
two key scenarios would be represented by a lecture situation and a design review. The experiments themselves would concentrate on whether it was better to use "traditional media coupled with traditional methodology" or to look to "new media and a new methodology". By contrasting the traditional with the new the objective was to assess what factors of current teaching methodologies would survive the transition to the new medium without modification and what aspects would have to be modified or reconsidered.

Considering these aims, five types of session were designed to explore various forms of communication related to the teaching of architecture and design, namely:

- Lecture - traditional presentation format using traditional media.
- Lecture - computer oriented presentation format using digital media.
- Design review - traditional presentation using traditional media
- Design review - computer oriented presentation using interactive, Multimedia presentation tools.
- Remote Access - broadcast from off site locations.

Each of the experiments was structured to allow a different model of presentation technique. In some instances the participating audience would only be present at the remote site, in others the audience would be at both. The variation of delivery media was intended to test the problems incurred by both the traditional and the new technologies and the "off site" experiments would stress the flexibility of the equipment and the methodologies employed.

5. Discussion

With regard to the traditional lecture format it was always apparent that it would be unlikely that the average member of staff, or a visiting lecturer, could be expected to translate the format of their visual material just to suit a video medium for a lecture broadcast. Most lecturers would be expecting to deliver their visual material as 35mm slides. Given this it was important to ascertain what quality trade offs were involved in filming a projected image from the screen. In the event it turned out that the reproduction quality was higher than expected and even attracted
positive comment on the visual quality of the material. Having said this, it was apparent that certain slides came over better than others but this was largely due to the quality of the originals. A three camera set up was used in most situations and here it allowed one camera to be trained on the visuals, another for the presenter and the third for the audience. A video mixer, under the control of the director, cut between cameras at the appropriate times. One aspect that became apparent was that the directed multi camera production was more effective in that it was more interesting and engaging to watch. However this positive outcome had to be weighed against the additional staffing and equipment overheads.

Lecture delivery using computer based visual aids did not provide any problems as long as the usual conventions regarding the transfer between digital and video media were observed. These include abiding by the rules for safe screen areas, avoidance of saturated colours and single pixel graphics, and the use of sans serif type faces.

In the traditional design review, the key problem was expected be the legibility of the standard architectural media, as a TV image at video resolution could not be expected to provide optimal viewing conditions. However, with careful consideration to the uniformity of the lighting this did not materialise as a problem, if fact the ability of the camera to zoom in provided, in some instances, greater detail and better viewing conditions than were available to the local jury. This was especially evident when physical models were the focus of attention and even the local viewers found that watching the monitors providing a better viewpoint. It was also apparent that since the remote jurors only get to see what the camera shows them it was important that the presenter took care to guide the camera to each specific piece of media rather that just refer to generalities.

The outcomes of that part of the experiment dealing with aspects of a computer based design review proved to run contrary to expectations. It had been expected that the introduction of a remote jury / audience into a traditional architectural design presentation scenario, which was rich in information types and communication paradigms, would push both the technology and the managerial aspects of conferencing to its limits and hence the more technologically focused and formalised computer based multimedia presentation would be more adaptable to the video conferencing situation. In practice the reverse was true. Both the traditional and new formats suffered the same drawbacks in that the remote viewer was limited to a very narrowly focused view of the available media which limited the extent by which a juror could cross reference information. However it was evident that the remedy for this was more easily achieved via the traditional format. When the multi
media format was applied it was apparent that features which were considered to be its main strength, such as interactivity and non linear navigation, became weaknesses. This format seemed to exacerbate the problems of the limited channel for information and it proved to be difficult to maintain the context of the information being presented. These faults were largely related to the design of the presentations but did prove that special consideration must be given to the shortcomings listed above.

This virtual tour of an exhibition was a test of the system's ability to provide a measure of "telepresence" for the remote audience. A presenter at Strathclyde University who was familiar with the architectural exhibition, introduced the exhibition to a remote audience at the Mackintosh School, describing the content and highlighting some of the more interesting aspects. Questions from the remote site were then answered by the presenter. This involved revisiting some of the parts of the exhibition in more detail by talking the remote camera person through a route. In this manner the remote audience had interactive control over the visuals that they were receiving. The only limitation proved be the proximity of the network to the exhibition area, as obviously cabling considerations would impose physical limitations.

In order to extend this concept a further off site visit was arranged to a remote location at the site of a prestigious development in Glasgow. A microwave link was set up between this location and the School at Strathclyde, allowing a three way discussion between the architect presenting his scheme and the Strathclyde and Mackintosh audiences.

6. Conclusions

The network is configured for bi-directional video and audio transmission and provides full screen, full resolution, s-vhs quality data. The quality of this communications infrastructure undoubtedly liberates the users from the problems incumbent in previous video conferencing hardware. In the past it has been suggested (Schnurr & Smith, 1995) that the negative aspects of struggling with a limited technology base may outweigh the cognitive benefits of having visual communication. The experience of this project would suggest that the technology now exists to support high quality communication.

To date the relatively poor resolution delivered through video conferencing has resulted in constraints in the form and content of conferencing sessions. Now that the video
quality is high enough to transmit even line drawings with acceptable clarity it will be possible to envisage more diverse forms of interactive communication.

Mapping teaching activities onto the new technologies requires a minimal paradigm shift and it is quite easy to see that most "head to head" delivery mechanisms would be accommodated in this manner. With the infrastructure employed in this set of experiments, communication was limited to a video and audio stream, there currently being no parallel channel for data communications. This does limit the nature of the interactivity as it does not allow for a shared workspace or whiteboard. However, in time this issue will be addressed.

There are potentially three problem areas inherent within a video conference situation. Firstly, there is the usability and reliability of the communications infrastructure. In our experience this has been the least problematic part of the operation and has proved to be easy to configure and, to date, 100% reliable. Next there is the on site technology, cameras, sound systems, mixers and the whole paraphernalia associated with video production. With these experiments a top-down approach was taken in that Scottish Television provided technical equipment and support for each event. This meant that the participants were insulated from technical problems and were free to concentrate on evaluating the sessions from their own perspective. The final problem area concerns the ability of the participants themselves to manage the sessions and ensure that the methodologies adopted prove suitable for the concepts under investigation. As these are early days for this class of experiment, familiarity with the system and a knowledge of it's limitations will undoubtedly bring benefits.

As more academics gain first hand experience of the system then the remaining conceptual barriers which exists towards video conferencing will be broken down and the new technology can be fully exploited in increasingly innovative and useful ways.

This leads us to conclude that the technology is now capable of supporting a wide range of teaching activities, given this, both schools plan to continue the collaboration and investigate how the technology can be further integrated within the teaching curriculum.
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