An integrated approach to technology within Lecture Room Services

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Summary

Heriot-Watt University has a strong history in the use, development and implementation of learning technology but has only recently been able to address the provision of suitable facilities in its lecture theatres. This places the University in a good position to report on its recent experiences and the plans it has for the future. At the core of this report is a case study on the refurbishment of a lecture theatre for electronic delivery. A survey was carried out of lecturers who used the refurbished room and lessons have been drawn from that survey and changes in approach identified. Overall there is a move to integration of lecture rooms with its computing, audio-visual and learning technology units.

The report recommends

The inclusion of a consultation process when planning changes in teaching facilities

New technology is introduced with training and support

That an integrated approach is taken to include technology alongside basic facilities and timetabling

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1 Background

1.1 Introduction

Heriot-Watt University is a medium size institution with a relatively small number of lecture rooms serving a high proportion of technical subjects. Since 1989 it has adopted a strategic direction looking at new forms of teaching and learning, focusing on new educational technologies. These can support non-traditional forms of education and encourage a move towards more flexible access to the resources of learning, but they also need to support the lecturers and students working within the conventional framework of the lecture theatre. As part of this process the University has made a start on the integration of the latest technology (multimedia, projection, video-conferencing) in lecture rooms. Alongside this there is a recognition of the need to manage the process of change by bringing together the various aspects of room provision, management, timetabling, and technology with those who use the rooms for teaching.

For this report we look at the refurbishment of a lecture theatre giving detailed information about the planning of the facilities and the specification that resulted. The room discussed is particularly interesting, as it was one of the first lecture theatres designated for video-conferencing use as part of the Scottish Metropolitan Area Networks Video Conferencing Network (SMVCN). The additional criteria and changes that this imposed on the room are discussed together with the new training that had to be provided both by the University and from the TALiSMAN (Teaching and Learning in Scottish Metropolitan Area Networks) project. TALiSMAN offers training for new ways to use the facilities provided by the Scottish MANs.

Following the description of the design and implementation, results are presented from a survey of the lecturers who used the refurbished lecture theatre. This study looks at how the room was used for conventional lecturing – this remains its main use – and brings out some recommendations for immediate improvements as well as indications for longer term changes. The lessons learnt from this process are examined in the context of the approach now taken in specifying new teaching rooms. Changes include more detailed specification, the formation of a group bringing together those with interests in the provision of lecture room services, and a wider consultation process with end-users.

1.2 The Learning Technology Centre

The Learning Technology Centre at Heriot-Watt University was formed in 1995 bringing together its Institute for Computer Based Learning (ICBL) with its former TV Centre and Audio-Visual Services. The new structure continues to support external activity through ICBL while providing a combined Media Services based on media production and audio-visual support, and forming a new function by offering an internal Learning Technology Service. The Learning Technology Centre exists to provide a strong academic support service underpinned by its externally funded work.

Media Services includes the provision of audio-visual support to the University. This has meant a new look at how this support can integrate with other activities and the possibility of supporting changes in teaching and learning with new technologies. Particular changes noted in its approach are to try to increase the overall provision of equipment and, where possible, to offer these on a permanent basis within rooms. The unit has also had to address new areas such as video-conferencing and extended operating hours.

1.3 Lecture rooms

Heriot-Watt University has a relatively small provision of centrally allocated rooms backed up with rooms within each departmental area. Its room stock consists of:

1	Conference centre main auditorium	600 seats
4	Lecture Theatres	350, 250, 200, 100 seats
35	Seminar rooms	20-100 seats

With the exception of the main auditorium, which is not normally used for teaching, the lecture theatres were built during the 1970's and are equipped with chalk boards, OHP and 35mm projection.

The case study presented in the next section of this report, the 100-seat lecture theatre 2, incorporates examples of both the upgrading that is necessary and the use of video-conferencing and the effect that has on the design and use of facilities. A new role has also appeared with the need to offer training and ongoing support when staff use the new facilities.

That lecture theatre was conventionally equipped with:

- Chalk boards – 2 rolling boards
- OHP to separate offset portable screen
- 35mm projection from projection room

An agreed plan was in place to develop this room to include computer connectivity and data projection on a permanent basis. This would be accompanied by some general refurbishment and removal of chalkboards. This plan was augmented following the announcement by SHEFC of a programme under the Use of Metropolitan Area Networks initiative to provide video-conferencing into all Scottish Higher Education Institutes. Heriot-Watt University decided to implement their initial video-conferencing within the lecture theatre. This was the only installation within a lecture theatre planned for the first phase of video-conferencing in Scotland and meant some compromises had to be made to satisfy acceptance criteria.

A further change in plans occurred towards the end of the refurbishment to allow some writing surfaces to be included. Thus the new facilities includes:

- Data and video projection mounted from the ceiling
- Networked multimedia computer
- Visualiser (horizontally mounted video camera for projecting papers, slides and objects)
- Over head projectors
- 35mm slide project retained in projection room
- Low mounted whiteboards
- Video-conferencing linked to three switchable and zoomable cameras
- Room control system (AMX touch panel)

2 Lecture Theatre 2

2.1 Planning

At the time the Lecture Theatre 2 (LT2) project was initially being considered (late 1995), none of the centrally allocated teaching space on the Riccarton campus of Heriot-Watt University was equipped with any form of data display system on a permanent basis. The delivery of data display and video replay facilities into teaching rooms was achieved solely by means of portable equipment moved around the campus by audio-visual staff. Furthermore, what portable equipment there was consisted primarily of monitors (on wheeled stands) for video and O.H.P. pallets for data.

This lack of display technology was considerably at odds with the University's strategy of encouraging the use of technology in teaching and learning and was widely held to be a serious anomaly that required urgent attention. A number of options were considered but the outcome of this deliberation resulted in a strategic decision to upgrade the smallest traditionally tiered lecture theatre on the campus and re-equip it in order that it might fully support technology based teaching.

Subsequent use of the lecture theatre would be evaluated and that the results of this evaluation would be fully analysed. This evaluation is presented in the next section. Recommendations for the future technological upgrade of other teaching spaces would be developed.

An initial outline was drawn up for the refurbished room and was the basis for a limited consultation document. This consultation was limited in nature and concerned primarily the agencies within the University that would be involved in the refurbishment. Very limited consultation took place with academic staff at this time.

2.2 Implementation

In this section, the implementation of the refurbishment will be detailed including discussion of the facilities required and the methodology used to choose both contractor and equipment.

Original Room Condition

The original space was built in 1974 and comprised a steeply tiered lecture theatre seating 100. Writing surfaces in the form of three large roller chalkboards dominated the front of the room. The main projection screen was mounted in a very high position and was of a landscape aspect. Due to it's resulting unsuitability for use with an overhead projector, a separate portable 6' square screen had been provided for this purpose. 35 m/m slides were available via a Carousel projector in a projection room.

In addition to the basic audio-visual capability, this room also had a fixed lecturer's bench taking up much of the floor space at the front of the room. This contained gas, a fully plumbed sink and a three phase electrical supply. Originally this facility had been provided to enable demonstrations in science and engineering to take place, however, after considerable investigation it appeared that these facilities had never been used and that demonstrations had always been confined to laboratories.

Ventilation was as originally built with forced air supply and extract via remote plant. Lighting also dated from 1974 and consisted of fluorescent main room lights augmented by dimmable tungsten lighting. Control of this lighting was from push buttons mounted on the lecturer's bench.

The Refurbishment Specification.

The initial objectives set for the refurbished room were:

- Electronic Lecturing
  - Video Projection
  - Networked Computer
  - Visualiser
  - Video Tape Replay
- Support for Existing Teaching Methods
  - Overhead Projector
  - 35 m/m Slides
  - Minimal Fixed dry wipe boards

It should be noted that at this stage it had not been felt necessary to replace the existing roller chalkboards as it was assumed (wrongly in retrospect) that the vast majority of lectures had been using O.H.P. instead.

The initial outline provided at the time of specification for the refurbished room is detailed below:

Projector (and Mounting)

The proposed projector (Liesegang dv800) can be supplied with a ceiling mount bracket (preliminary information provided). This is normally attached to a ceiling by means of a flange. In the case of Lecture Theatre Two the ceiling flange would be attached to a steel plate supported by the structural metalwork. The plate would be mounted horizontally with the alignment of the projector being dealt with by means of the mounting bracket.

The Projector siting should be such that the lens is five metres from the projection screen at a height so that the base-plate of the projector is approximately level with the top of the projected image.

Connection cables for power and video would be run across the ceiling space and clipped to the suspension.

Trunking

Three-compartment steel trunking should be installed in a chase, the entire width of the room, cut in the concrete floor at a distance of two meters from the front wall. There should be further trunking provision connecting this to the projection room.

Floor boxes containing twin 13 amp sockets to be provided at two metre intervals from the left hand wall.

Projection Surface

The existing chalkboards to be removed and the wall restored and finished. 12-foot square projection screen to be attached to the wall centred at the position of the existing centre and right hand chalkboards. The screen will be manual but may provide for keystone correction of OHP.

Writing Surface

Writing wall panels should be fixed to the wall at a height of approximately one-foot from the ground. Three four-foot panels will be required and the surface should be centred as per the projection screen.

Electrical Services

The existing electrical services should be removed from the current benching and safely terminated so that they can be connected to new switchgear. The existing switches will be replaced by optically isolated, low voltage controlled switches, which will in turn be controlled by an AMX Accent room control system. The existing dimmer for the tungsten lighting will have to be replaced by one controllable by the AMX system.

Drapes

The area of rear wall currently covered by the left hand chalk board and an equal area of the left hand wall will have curved theatrical curtain track provided in order to suspend drapes providing a suitable backdrop to the lecturing area. This will be a five metre 50% full drape with a 4.7 Metre drop chain weighted.

Lecture Bench

It is proposed to construct a custom lectern, which will also enclose all of the equipment necessary within 19" rack mounting. This will be designed by the AV contractor. The lectern will also house the computer system, and a VHS video recorder.

This outline had been agreed by March 1996, however, a potential new requirement immediately became evident. The Scottish Higher Education Funding Council (SHEFC) had funded the development of four Metropolitan Area Networks (MANs), one for each of the major population centres in Scotland. These provided a very high bandwidth communications channel and one of the projects which was developed to exploit this bandwidth was the creation of the Scottish MAN Video Conferencing Network (SMVCN). This used a proprietary implementation of the M-JPEG picture compression algorithm, which resulted in very high quality video-conferencing but with a correspondingly high bandwidth requirement.

A pivotal concept involved in the creation of the SMVCN was that there should be dedicated studios at each participating site. These would be equipped to a very high standard and would be directly funded by SHEFC. Along side these dedicated studios, it was also proposed that each institution should equip a lecture theatre for MAN-based video-conferencing. The lecture theatre installation should be to the same high audio-visual standard as the dedicated studio and the video-conferencing component would again be funded directly by SHEFC.

It was therefore decided to revise the specification for the upgrade to meet this demand.

The Revised Specification

In addition to the requirements outlined above the video conferencing requirement brought new demands which had to be met. These were:

- Interactive Video Conferencing
  - Incoming Video
  - Outgoing Video (Cameras)
  - Incoming Audio
  - Outgoing Audio
  - Video-conferencing lighting
  - Conference system Control

It was concluded that it would now probably be necessary to enlist the services of a specialist contractor to design the system. Although considerable in-house experience existed, the time-scale was becoming increasingly difficult and it was felt that a contractor who had experience of designing similar systems would enable the time required to be considerably reduced.

The Design Brief

A description of the project and an outline of its objectives were drawn up. It was specifically kept as generic as possible to maximise the exploitation of a contractors experience. Certain items of equipment were specified to maintain compatibility with other installation, but it was left to contractors themselves to design the system.

Four potential contractors were chosen based on our perception of their abilities to carry out the work. This was largely based on visits to other installations and discussions with the users. Each

short-listed contractor was sent an invitation to tender accompanied by the following brief during June 1996.

Audio-Visual refurbishment and conversion to Teleconferencing Theatre.

Project Aim.

To convert an existing lecture theatre into a high technology computer based presentation theatre with a teleconferencing capability.

Existing Room.

The existing room is a steeply tiered small lecture theatre seating approximately 100.

The existing chalkboards, lecturer's bench, projection screens, and bench mounted electrical connections for lighting will be removed in a separate contract. The electrical connections for lighting will be terminated and will be available for connection to a new room control system. The walls will be decorated fair finished block work. The existing asbestos ceiling will be removed and replaced to allow ceiling mounting of a video projector. A structural support for the projector will be provided in the ceiling void by the main contractor in consultation with the A/V contractor.

Three-compartment steel trunking will be provided to allow interconnection between the new lecturing position, the rear control room, wall mounted camera positions and provision will be made for overhead cable access to the video projector.

Specification of Required Equipment

1. Teleconferencing Cameras.

Two 3-chip high quality television cameras should be provided. These cameras should be fully genlocked. They will be wall mounted and be provided with remote pan, tilt and zoom capability controlled from the room control system. A further camera connection position should be provided adjacent to the seating area allowing a genlocked studio camera to be used in addition.

2. Audio Capability.

The audio system should provide for a fixed microphone position at the lecturing console. There should be provision for connection of a radio microphone. There should also be provision for a microphone position at a point easily accessible from the seating area. An auxiliary line input should be provided for tape replay etc. Audio connections at line level should be available both to and from the teleconferencing codec. All sound levels should be automatically controlled. A suitable amplifier and speaker system should be provided for the auditorium.

3. Video Projection.

To maintain compatibility with other rooms in the University, the video projector should be a Leisegang dv800 TFT projector with long drop ceiling mounting kit.

The projector should be controllable via the room control system.

4. Projection Screen.

A twelve-foot square wall mounted adjustable projection screen should be provided.

5. Writing Surface.

White board panels with seamless joints should be attached to the front wall. These panels should provide a surface of approx. 12 feet width by 7 feet high.

6. Lecture Console.

A custom built presentation module should be provided which will provide a housing capability for rack mounted distribution and switching equipment, a presentation computer, room control system, a multisysnc monitor with preview capability for the conferencing system, provision for the control panel for the control system capability for the connection of an external lap-top computer.

7. Lighting

The existing fluorescent lighting and dimmable tungsten lighting in theroom should be controlled by the room control system. Special lighting should be provided for the presentation area.

8. Document Camera.

A genlocked document camera (Visualiser) should be provided. This should be capable of both top lighting for printed material and bottom lighting for acetates. An easily accessible zoom function should be provided.

9. Drapes

Drapes should be provided as a backdrop to the presentation area. A run at 50% fullness of five meters round the room corner at a drop of Approx. 4.7 meters is required. The drapes should be flame retardant and weighted.

10. Room Control System.

This should be capable of controlling all aspects of the presentation and teleconferencing capability of the room. It will provide remote camera control, switching of video and audio systems, lighting control, projector control (video and 35mm). Contractors should be able to demonstrate considerable experience in this area and should be able to provide a skeleton of the system program before coming on site. It is highly desirable that the contractor provides the programming on an in-house basis to ensure continuity of system development.

11. Interconnection to Conferencing Codec.

The teleconferencing codec employs proprietary technology and will present audio and video inputs and outputs on phono-plugs. It is vital that the switching capability of the room allows the video projector to display either the input to the system from a remote site or to display the source being sent to a remote site. Once again this switching should be provided by means of the room control system.

Contractors were allowed a period of four weeks to develop a suitable system outline and to reply to the initial invitation to tender.

Tender Acceptance

The returned tender documents were opened following the University's formal procedure. The successful contractor was chosen based on his clear understanding of our requirements and on cost.

Detailed Design Process

A series of discussions were held with the contractor and it was concluded that a variation of his well proven standard lecture theatre presentation system should be used but that this should have the necessary video-conferencing functionality 'grafted' on to it in a seamless way. In particular, it was stressed that the system would have be used by individuals with minimal training and that the layout of the control screens should be both simple and as intuitive as possible.

Because the design process had to be completed in less than three weeks, there was a very intensive period of dialogue between the contractor and ourselves. During this period the operational methodology of the control system evolved, whilst simultaneously, the equipment to be used was ordered and construction of the physical system was begun at the contractor's premises. It was felt that due to the rapidly approaching deadline, the majority of the system would have to be built and tested off site leaving only final installation to take place at Riccarton. The time available for installation was now only going to be one week due to the discovery of further asbestos within the room.

The System Configuration

The system was to be based on the AMX room control system. This would be used to control all of the AV equipment in the room along with control of the video-conferencing cameras, additionally it would interface with the existing room lighting.

The AV equipment to be controlled now included

- Video Projector
- Visualiser
- Video Tape Recorder
- Computer Data Display
- 35 m/m slide projection
- Auxiliary video input

The video conferencing camera control included:

- Pan, Tilt and zoom
- Focus
- Scene memory set
- Scene memory Recall

Audio facilities included:

- 4 x Microphone Inputs (controlled by 'smart mixer')
- Video Tape Recorder Sound
- Computer Sound
- Incoming audio (from remote video-conferencing site)
- Auxiliary sound

Note. Although all *local* sounds are combined and sent to the video-conferencing codec, two separate sound systems are used in the lecture theatre, one for voice reinforcement only and one for all other sound.

Audio/Video switching capability comprised:

- All video sources to be sent to main projector, preview monitor and video-conferencing codec
- RGB (computer) sources to be sent to main projector and preview monitor
- All destinations to be separately selectable
- Audio switching to follow video

Note. All video switching to be synchronous (genlocked)

Power switching comprised

- Main fluorescent room lights
- Tungsten room lights (dimmable)
- Video-conferencing spotlights (dimmable)
- Stage down-lights (dimmable)
- Video projector power
- 35 m/m projector power

Note. All lighting control tied to system operation i.e. pre-set lighting states are recalled to match the operation being performed. Lighting control also available from push-button panel at room exit/entry door.

Essentially the system was that which would be used in a normal non video-conferenced room with the additions to take account of the far-end sources and destination. All functionality is available through a hierarchy or screens and the interface is adaptive, bringing up new functional sub-screens for specific operations.

Each screen was designed to mimic, wherever possible, the type of control that might previously have existed on control panels/remote controls for individual devices. The functionality on any single screen is limited in order to firstly make screens as uncomplicated as possible and secondly to allow for large buttons easily identifiable in a lecturing situation.

2.3 Video-conferencing.

The specialised needs of video-conferencing had to be addressed specifically. There are several areas that require particular attention.

- Cameras had to be provided in fixed locations. They had to be of high quality and they had to be fully controllable by the room control system.
- Close attention has to be paid to sound because of potential problems with feed-back within the SMVCN
- Lighting will involve a compromise due to the conflicting requirements of cameras and video projectors.
- Control of what sources should be sent to which destinations must be flexible and intuitive.

It was decided that the only practical position to permanently mount cameras was on the side wall of the lecture theatre. These positions would allow reasonable coverage of the front of the room including the lectern, but it would also be possible to pan the cameras round to give acceptable coverage of the audience seating area. Three-Chip cameras were specified in order to give high quality pictures in the less that ideal lighting conditions.

Sound is often difficult to manage in a video-conferencing environment. In ISDN based conferencing, there is a delay involved in processing the video and the sound is correspondingly delayed. This can give rise to an echo as the far-end sound is picked up by the local microphone and returned again to the far end. Normally this problem is dealt with by sophisticated echo-cancellation hardware either within the video-conferencing codec, or within a separate 'black-box'. In the case of the proprietary system used in the SMVCN, there is no such delay. Instead, the problem of far end sound being picked up and set back to its source can give rise to audio feedback. To eliminate this problem, very stringent acoustic performance criteria are laid down for SMVCN studios. Very detailed empirical trials were necessary to achieve these criteria in the lecture theatre environment.

High quality lighting is hard to achieve in this environment unless a very high powered projector is used. As budgets precluded this, a lower output device had to be used but this required that the room lighting be dimmed to achieve satisfactory results. As a result, in order to provide enough light for the cameras, the main speaker's area had to be lit with a pool of light which would not spill onto the projection screen. This entailed the use of focused spotlights and careful attention had to be given to the overall lighting balance to avoid discomfort to the presenter. Additionally, there are considerable problems associated with sending a satisfactory shot of the audience to the remote site. The room lighting must be brought up to enable an acceptable picture. However, this prevents high quality projection. One possible option is to automatically bring up the room lights for the duration of the audience shot. The can be achieved by linking a camera pre-set scene to a pre-set lighting state using the room control system.

Finally, very flexible control of the video-and audio switching must be achievable. It must be possible to send one source to the far-end, preview any source on the preview monitor and display any other source on the main screen. This switching must all be achieved synchronously, and its operation must be straightforward enough not to baffle users.

Although it would be possible to separate the normal lecture theatre room control functions from those of the video-conferencing functionality, it was decided to try to 'graft on' the video-conferencing functionality as seamlessly as possible. In this way, users would not have to learn two separate systems.

A final consideration is that of overall quality. In many ISDN based video-conferencing systems, there is extensive use of low-quality (cheap) audio-visual components. This is done on the basis that the limitations of the low-bandwidth conferencing medium will mask any aberrations. This is not so in the SMVCN. The quality of the video is much higher than that achieved in ISDN systems and the sound is of CD quality. As a result, it is important that all aspects of the signal path, from cameras and microphones to the distribution amplifiers and switching components, are carefully considered.

There is of course no reason why these higher quality components should not be used in an ISDN system. Their use will certainly not be detrimental and will allow a great degree of flexibility to change the type of codec in use as the technical quality of video-conferencing equipment continues to improve.

2.4 Training and support

It was envisioned from the outset that there would be a considerable effort required to achieve even the most basic level of training required to use the new facilities. Even before the room design was complete, a statement committing to the level of support which would be provided had been circulated.

> Extensive technical support will be available for academics using the theatre. In particular, staff using the room for the first time, will have access to a hands on training session where they will be taken through each section of the control system.
>
> Initially, it is intended to provide a technician on site to deal with any problems which might occur and an on-call support system will operate whenever the room is in use. For teleconferencing it is anticipated that a technician will always be present at the start of each session.

It was felt, at all levels, that the level of support provided would have to be sufficient to prevent any lecturer being unable to complete a class. Failure to achieve this would result in academic staff deserting the room in droves. It was also thought that the earlier staff could be exposed to the system and be made comfortable with it, the more likely individuals were to consider changing their course materials to exploit the enhanced facilities.

Prior to the start of the academic term all staff members were invited to one of a series of demonstrations of the new facilities. These sessions took the form of a formal demonstration of each function available followed by a question and answer session. Staff were invited to remain behind at the end of each session and were encouraged to try the facilities out for themselves. Members of staff who were about to use the theatre for the first time were also invited to book individual hands on sessions in which they would be able to try their own material on the system. Each of these sessions was supervised by a member of AV staff.

It was thought that the majority of video-conferencing applications would require technician support in a lecture theatre environment. Because of this, specific video-conferencing training for this room was not originally offered. However, parallel training in general video conferencing methodology was available along with advice on facilitating a video-conference.

This was generated as part of the TALiSMAN project and example material included below. This comes from *You and your video-conference (February 1998)* produced by the SHEFC funded TALiSMAN project based at Heriot-Watt University. The full version of this training material is used in the context of a series of workshops, roadshows, and supported on-line training. This training has been made available equally to all Higher Education Institutes in Scotland. Further information about TALiSMAN and its activity can be found through its web site at http://www.talisman.hw.ac.uk/.

Section from TALiSMAN video-conference training material.

Introduction

A video-conference is a meeting of people, who are remote, by means of video, data and audio transmission. It is a mixture of Television, Telephone and Computer technologies.

Video-conferences can follow a strict schedule, as with a television programme, or they can be free flowing and interactive. Participants of the conference can communicate by telephone, fax, data-sharing or e-mail. In these ways, participants can submit questions or comments to the main conference site and receive feedback during the on-air conference.

This section assumes that in your video-conference you will be playing a role which is a mixture of facilitator (one who catalyses an outcome) and presenter (one who orchestrates presentations). As a facilitator, you will also need to devise a structure for your video-conference that works. To help in this stage, terminology from broadcast television will help you see your conference in terms of ideas and concepts, production and follow-up.

The role of the facilitator.

The facilitator is the person who requires the video-conference, has a vision for the conference, and who designs the activity of the conference so that the results as are required. Facilitation is critical to the success of any video-conference. As facilitator of a video-conference you will be responsible for:

Arranging the event

- Contacting participants and keeping them informed before the event
- preparing the environment for participants
- Introducing the conference
- Co-ordinating the interactive portions
- Closing the conference
- Ensuring that follow-up is done

What you will not have to do is to arrange equipment and make sure that it works. Video-conferencing (particularly multipoint video conferencing) requires that it is both a supported and a managed activity. This is true not only of the support infrastructure provided for the use of students with disabilities, but also of the Scottish MAN Video Conferencing Network (SMVCN). You do not need specialist skills to facilitate a video-conference, but preparation is essential.

The facilitator must take the responsibility for the production and distribution of any required materials. The facilitator should be sufficiently familiar with the operation of the equipment at a site to operate it without constant technical backup. The facilitator may be expected to provide flip-charts, writing instruments, refreshments and directional signs to the site of the conference.

Essentially, the facilitator is the link between material and participants. The success or failure of a video-conference depends a great deal on how well the facilitator performs the above duties.

Who is involved in a video conference?

A typical multi-site video-conference involves:

- Multipoint conference controllers (Either at the host site for the MCU involved or at Edinburgh Regional Computing Centre (ERCC) in the case of the SMVCN)
- The local site co-ordinator
- Facilitator(s)
- Participants

The conference controller will accept bookings for the multi-point switching component of the conference. The facilitator should ensure that the location and equipment at each site is also booked. In the case of conferences on the Scottish Man Video-Conferencing Network, the second step is not necessary as all studios on the network are dedicated conferencing studios and are booked along side the conference connection.

The local-site co-ordinator, in liaison with the conference facilitator, is responsible for arranging with the conference controller the dates and times for the video-conference. The local site co-ordinator is usually the person at each site who manages the video-conferencing facilities. In the case of an ISDN connected conference. The Local site co-ordinator will be able to provide the technical specifications and other conference details required by the conference controller. In the case of the SMVCN, the local site co-ordinator's tasks include registering the site with ERCC, seeing to the technical requirements of the conference, the room set-up and the furniture arrangement.

Where can the conference be held?

The video-conference facility may be in a meeting room, a lecture room or in the case of desktop systems, in an office or in someone's home. As far as the SMVCN is concerned, it is just a matter of checking with the local co-ordinator as to the location(s) and type(s) of rooms(s) on offer. At many institutions, there are two internal sites for video-conferencing; usually a meeting room and a lecture room. There may also be a separate ISDN connected site or ISDN may be integrated with the SMVCN facility. It is usually worthwhile to visit these sites and to become familiar with the equipment and its operation.

Lecture rooms at some institutions can be connected directly to video-conferencing equipment but it should be noted that in these cases, where the room has not been specifically designed to host video-conferences, both the facilities on offer and the results can be variable.

What equipment is needed?

The equipment required to operate a video-conference will vary widely depending on the nature of the facility (e.g. Dedicated VC studio or Desktop solution). However, there is a basic set of requirements as outlined below.

- Television monitors/Screens (or display window on desktop systems)
- Link to transmit/receive signals
- Camera(s) to relay live action images
- Video-Recorder to feed in video-tapes
- Visualiser for feeding in objects and documents

Notes.

1. 83Desk top systems may not have the capability to feed in external sources such as VCR or visualiser.

2. The use of VCR's with ISDN-2 (2x64kbps) systems is rarely successful due to bandwidth constraints.

Optional facilities may also be provided:

- Telephone backup
- Equipment for recording the conference
- Fax machine(s) for incoming questions etc.
- Electronic Mail
- Data and application sharing facilities (built into many, particularly desktop, systems)

In every case, if you know you will require a facility, don't assume - ask!

The Video-conferencing environment

The environment in which a video-conference is held is of crucial importance to it's success (or otherwise). Close attention should be paid to a number of areas but particularly the following:

Video (screens) and Audio (loudspeakers)

Ensure, before the start of the conference, that you are receiving both video and audio. Make sure that everyone has a good view of the incoming picture and can clearly hear the sound. Try to ensure that you don't have too many people crowded round a single undersized screen.

Lighting

Lighting should be arranged so that there is sufficient light on the participants for both note-taking and for the camera to obtain a good quality image. In particular, avoid light directly above, or shining directly on to the monitors. If a visualiser is being used, make sure that the correct lighting is used (top or bottom light depending on material), and that there is not any glare from either the visualiser's own lights or from the room overhead lights.

Print Materials

Have all print materials ready to distribute to participants, or place the materials on the desks beforehand. Keep spare copies to hand, and if possible, send material to participants in advance.

Workshop seating

If your conference is organised as a workshop, where the main presentation is combined with 0n-site local activities, you might want to use a workshop style layout of furniture. This is a good way to incorporate interactive activities, where appropriate. You will divide participants into groups seated around tables but check with the local site co-ordinator to ensure that this layout is compatible with the positioning of microphones, lights, cameras etc.

Presentation seating.

If your conference is organised as a presentation, lecture, interview, or panel discussion, you might prefer to lay the room out in classroom style. Use seats in rows with writing surfaces. Sometimes desks can be moved into small groups to encourage interaction and to give more writing surface. However, again check with the local co-ordinator to ensure that the layout is compatible with the technical services in the room.

Lecture Theatre Seating

Theatre style arrangement focuses attention onto the screen and tends to inhibit local group interaction. It can be used if the objective is to persuade the viewer, or to inspire the viewer to action. This arrangement seats participants in rows. Writing surfaces may often be limited and a conference involving extensive written activities may be problematic. It is possible to arrange people in such away that they can work with each other in groups of two or more. For example, try putting the handouts only on certain chairs so that people gravitate to the "grouped" seats. There might be areas at the sides of the room for people to get up and form small groups.

Interactive work using a lecture theatre setting can be very difficult to achieve successfully. There are usually problems with both lighting and voice pickup. In a lecture theatre context, it will usually be necessary to use video projection as the main display. However, most video projectors require a considerable degree of dim-out to attain a satisfactory picture quality and this presents considerable difficulty in achieving a high enough light level for television cameras to pick up the audience. Similarly, unless you are very fortunate, there will not be a microphone at every seat in the lecture theatre. There are ways round this problem such as the use of fixed interaction positions, roving hand held radio -microphones and so on. If there is likely to be a requirement for this kind of interactive facility, it is vital to discuss these requirements with the local site co-ordinator well before the video-conference.

<u>Participants</u>

In all learning situations a positive atmosphere is important. When working with adults in particular it helps to remember:

- They wish to control their own learning
- They bring a wide range of previous experience, knowledge, skills and interests to any learning situation.
- They need to integrate present learning with this past experience.
- They will resist learning situations that they believe to be attacks on their competence

Adults are more concerned with meeting their own objectives for learning rather than those set by others. They will learn, retain and use what they find relevant to their needs.

Facilitator Checklist

The following comprises a number of actions which facilitators will find useful before, during and after the conference. The list is a series of suggested actions and is not in any way either exhaustive or compulsory. However, it should provide facilitators with a structure around which to plan the execution of their video-conference.

Several weeks before the video-conference.

- Synchronise diaries of participating sites, ensuring that video-conferencing facilities are available on the chosen day and time. You should know how long the conference will last and have a number of alternative starting dates and times.
- If you are planning a multipoint conference, book the multipoint control unit through its operators.
- In the case of a conference on the SMVCN, book the conference through your local SMVCN booking contact.
- It data sharing is to be used, make sure that all sites are aware of the fact and that they have the correct software properly configured.
- Arrange flip-charts, markers etc.
- Ensure that telephone, fax and/or computer connections are in place.
- Copy printed material for participants. Send this well in advance if possible.
- Study the agenda to plan the timing for welcome and introduction.
- Plan activities and discussion sessions.

The day before the video-conference.

- Confirm all details with the sites involved.
- Test the conference connections if possible. This is particularly important if you are communicating with a new site or if the conference is a multipoint.

The day of the video-conference.

- Make sure the video-conferencing sites are marked by clear signposts.
- Recheck equipment.
- Ensure the data sharing facilities are operational.
- Ensure flip chart and markers present.
- Introduce all participants at both local and remote sites.
- Welcome guests and hand out any remaining printed materials.
- If participants' contributions are to be assessed, make clear how this will be effected.
- Assist with call, faxes and computer messages.
- At the conclusion of the conference, thank participants for their involvement, summarise the main conclusions resulting from the conference and detail any follow on activity.

After the video-conference.

- Access the video-conferencing process.
- Evaluate feedback from participants.

3 The users' view of Lecture Theatre 2's facilities

The Learning Technology Centre carried out a survey of staff who had used Lecture Theatre 2 since its facilities were upgraded. This asked for comments on how satisfactory staff had found the teaching environment to be and on the ways in which it might be improved.

3.1 The survey

The Lecture Theatre 2 room-bookings for courses over the previous year were taken as the basis for this sample, and departments were contacted to identify which staff had taught on these courses. This resulted in a list of 25 staff, each of whom were sent a questionnaire. The questionnaires were readministered after a period of three weeks. The survey resulted in 15 valid replies, one refusal and nine non-responses.

This survey gives an indication of the users' views on Lecture Theatre 2's facilities, with useful written comments elaborating on the main points.

3.2 Kinds of teaching

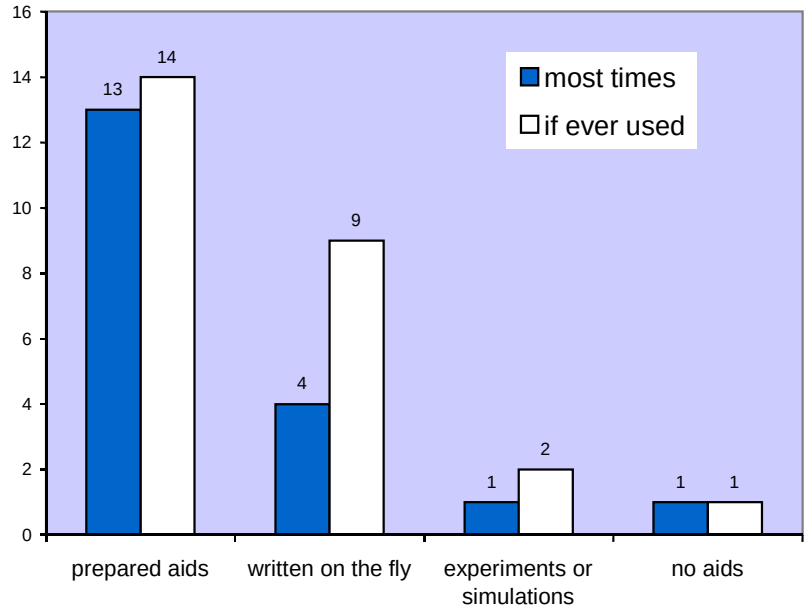
To set the context for this survey, staff were asked what kinds of teaching they did in this Lecture Theatre. The majority of lecturers brought prepared materials with them to supplement their verbal presentation (Table 1/Figure1). Many also used the boards or acetates to write notes on as they went along, at least from time to time. A minority used the lecture theatre for interactive discussions with their students, or to demonstrate experiments or simulations.

Table 1: What kinds of teaching did you use Lecture Theatre 2for?

[frequencies]

every time	*most times*	*once or twice*	*not at all*	*tick one box for each*
9	4	1	1	verbal presentation, supported by prepared materials *(e.g., overhead slides or computer presentations)*
1	3	5	6	verbal presentation, with materials written on board or acetate as you went along
1	0	0	14	verbal presentation, unsupported by visual aids
0	1	3	11	interactive discussion with students
0	1	1	13	demonstration of experiments or simulations
0	1	0	14	something else *(please say what)*……

Figure 1: Modes of use for lecture theatre 2 extracted from table 1.



3.3 Facilities needed

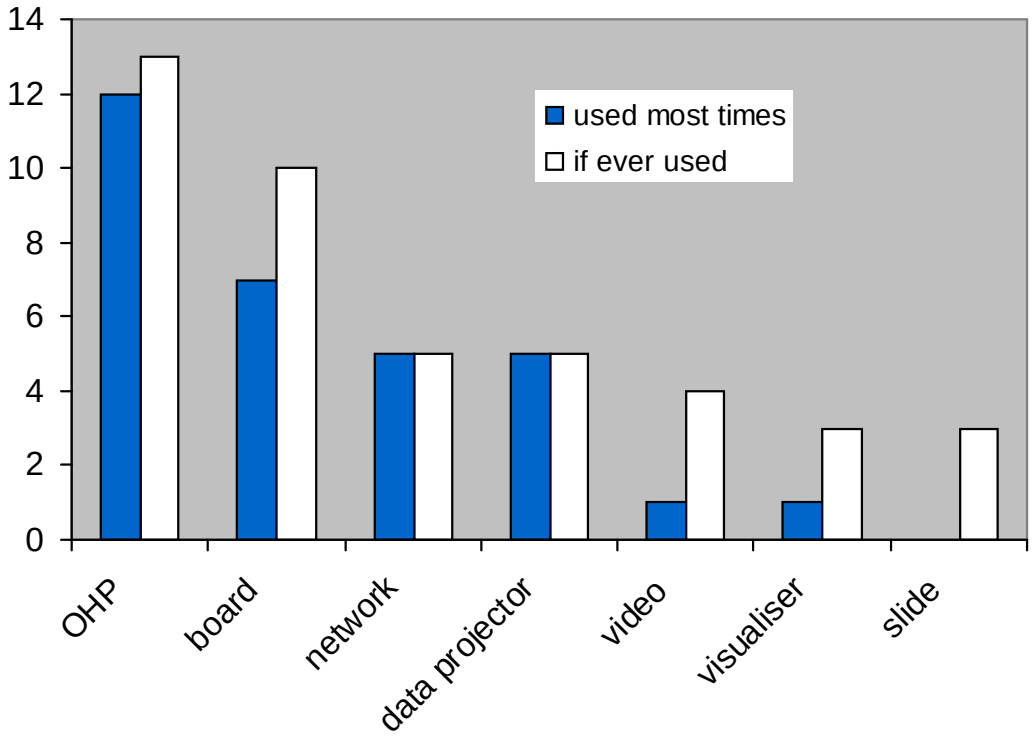
A third of the lecturers used the networked computer frequently (Table 2/Figure2) with video and slides being added occasionally by about a fifth of these lecture theatre users. The overhead projector was the piece of equipment most in demand. The context for this was given in written comments, which pointed to the different facilities available in teaching rooms and the difficulties in managing to be timetabled to teach in a room with appropriate levels of facilities. The natural tendency for lecturers was to work with the lowest level of technology commonly available.

Table 2: Over the past year, which facilities in Lecture Theatre 2 did you use?

[frequencies]

every time	*most times*	*once or twice*	*not at all*	*tick one box for each*
7	*5*	*1*	*2*	overhead projector
5	*1*	*1*	*8*	table-tops for laying out equipment or papers
3	*4*	*3*	*5*	board to write on
3	*2*	*0*	*10*	a network connection
2	*3*	*0*	*10*	data-projector for showing computer-generated material
1	*0*	*1*	*13*	microphone or voice-enhancer
0	*1*	*3*	*11*	video playback facilities
0	*1*	*2*	*12*	a 3D visualiser for showing objects or slides
0	*0*	*3*	*12*	photographic slide projector
0	*0*	*5*	*10*	help-line telephone for audio-visual assistance
0	*0*	*0*	*15*	videoconferencing facilities
0	*0*	*0*	*15*	something else *(please say what)*……..

Figure 2: Facilities used extracted from Table 2



Their written comments elaborated on this.

> *There must be consistency between all lecture theatres - many classes are scheduled through different lecture theatres. To use more advanced facilities you would need to know they were always available.*
>
> *The course I taught in LT2 had two other timetabled hours elsewhere. This made re-jigging the course to use LT2's facilities totally impractical. Even if all time was in LT2 - would the course be timetabled the same next year?!*
>
> *If all my classes in a given module were held in LT2, I would consider making better use of its facilities. However, as all the other rooms used have more basic facilities, I'll stick with a format which I can use for the entire module.*
>
> *Priority booking to those who most need LT2 get to use it.*

The desire for standardisation extended to the networked computer, with the request that this environment should be identical to PC Caledonia.

> *Networked PC should be EXACTLY like a PC-Caledonia PC. I had problems because they were different. Perhaps it would be better if the computer centre were responsible for the PC.*
>
> *Computing Services should be fully responsible for the PC (perhaps they are but I think not).*

The PC in LT2 is maintained by the Learning Technology Centre and gives access to the standard central facilities provided through PC Caledonia. In the period in question, the machine could also be used locally as a Windows3.1 or Windows 95 machine. Over the last year, some LT2 users experienced difficulties because the departmental system they were used to differed from the one that they encountered through PC Caledonia in LT2.

The majority of staff using equipment in Lecture Theatre 2 were comfortable with it, though there was clearly still a training need in learning how to use all of the equipment fully (Table 3/Figure3). After the facilities were upgraded, a telephone was installed to enable staff to ask AV services for

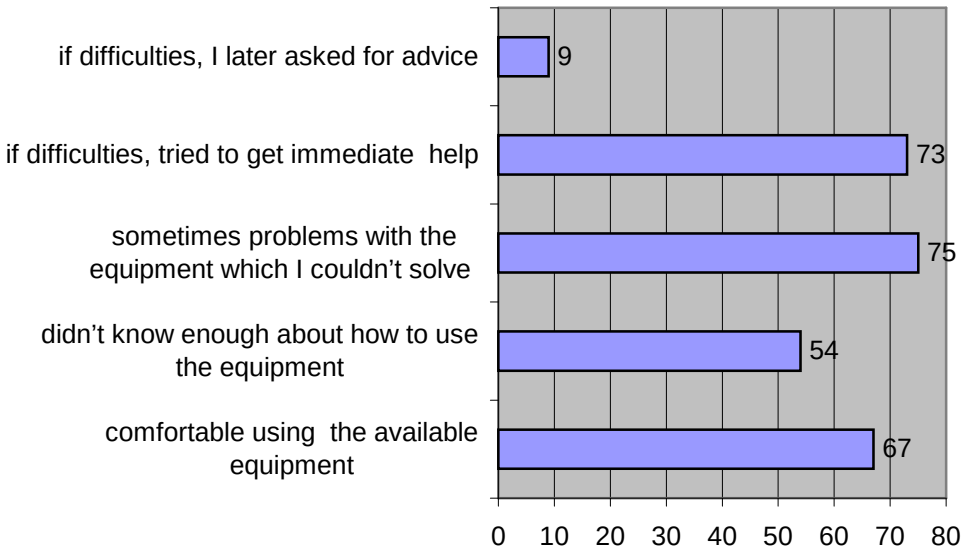
assistance with troubleshooting. Of the nine staff who had experienced problems, eight asked for help immediately: five of these were happy with the speed of response (one of whom followed this up with a later query to LTC). The speed of response to the query was sometimes less than satisfactory to lecturers as AV staff cover all centrally-timetabled rooms as well as the Conference Centre. Figure 3 showing the percentage that took a particular action or held a particular view demonstrates that most people were comfortable using equipment and if they need help they seek it immediately. It is perhaps not surprising that it is unusual to seek help after a lecture has finished – this mean that we cannot rely on later reporting to identify all problems.

Table 3: How did you find using the equipment in Lecture Theatre 2?

[frequencies]

N/A	*Yes*	*no*	*tick yes or no for each one*
3	*8*	*4*	I felt comfortable in using the available equipment
2	7	6	I felt I didn't know enough about how to use the available equipment
3	9	3	there were sometimes problems with the equipment which I couldn't solve
4	8	3	if I had difficulties, I tried to get immediate audiovisual help from LTC
4	1	10	if I had difficulties, I later asked for audiovisual advice from LTC
6	5	4	I was satisfied with how quickly LTC responded if I asked for help

Figure 3: Percentage likelihood of actions and views extracted from Table 3.



In commenting on how the facilities could be improved, it was suggested that written instructions on how to use equipment should be available in the lecture theatre.

> *Simple printed card at lectern to remind users how to start. The blanktouch screen is not self-evident. A class registered today in near-darkness until I accidentally visited it.*

> *With a MANUAL for the starship control panel!!! That's a MANUAL!!!*

3.4 General teaching environment

In terms of the general environment, both the whiteboards and the ventilation gave some cause for concern (Table 4/Figure 4). The boards were highlighted as a problem earlier in the year by the Maths department, and their comments are echoed in the survey's written comments.

> *I don't find the write-on boards very satisfactory. I think that it would be better to do away with the roll-down screen and just have a white rear wall. This would allow two overhead [slides?] at one side and the video projector to be used simultaneously.*

> *Large blackboards or whiteboards that can be used alongside the AV screen*

> *The boards are a disaster. You almost have to lie on the floor to write on them. The screens are the wrong height so that the first four rows of students can't see.*

> *The board needs to be lighted. Whenever I taught at the board I felt that I was writing in the dark! The promised supply of pens quickly ran out and was not replenished regularly. There is no place to put down the marking pens when one pauses while writing on the board.*

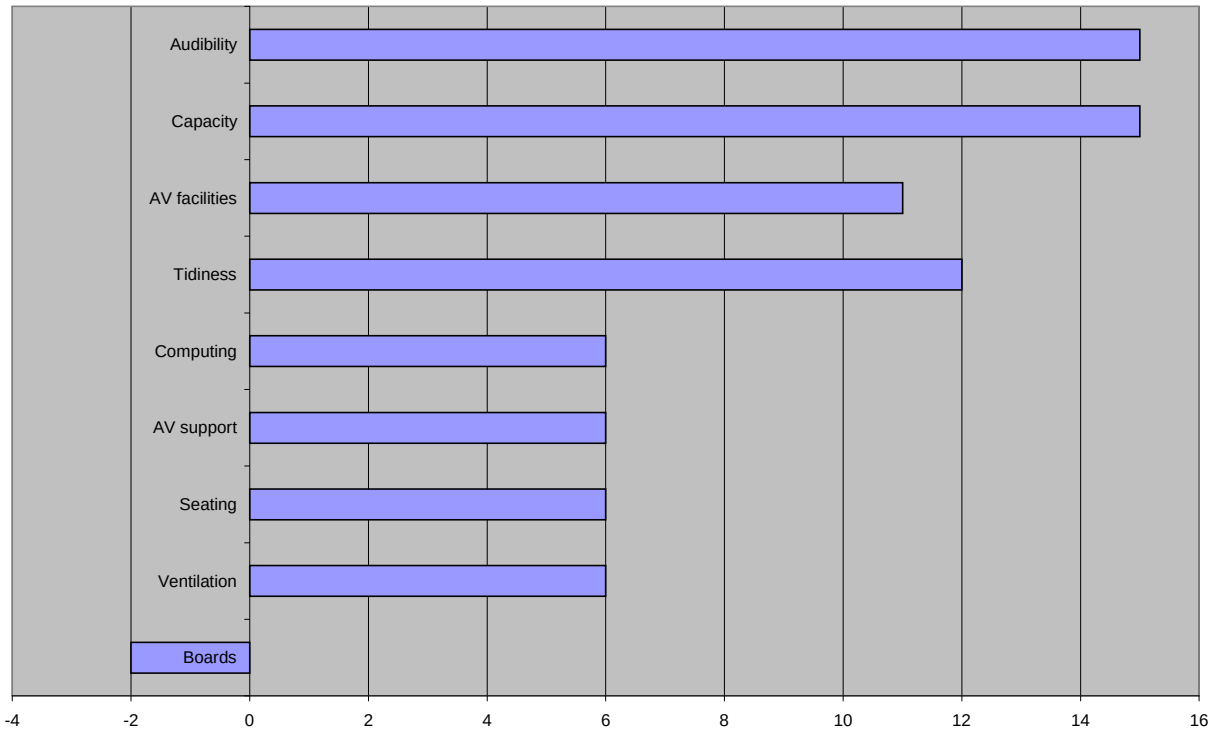
Table 4: Overall, did Lecture Theatre 2 provide a satisfactory environment for the kinds of teaching you did there, this year?

[frequencies]

N/A	*very much*	*some what*	*not at all*	*tick one box for each*
3	2	3	7	boards for writing on
1	3	7	4	ventilation
3	4	5	3	seating flexibility
7	2	5	1	level of audiovisual support to fix problems
7	4	3	1	computing and network facilities
1	7	6	1	tidiness and decor
4	5	6	0	audiovisual facilities
0	8	7	0	seating capacity
0	9	6	0	audibility & acoustics

Satisfaction ratings were calculated from Table 4 by subtracting those indicating “not at all” from those “very much” and “some what” satisfied (Figure 4). These illustrate that, while satisfaction is high for the new facilities, the basic provision of ventilation and especially boards are seen as unsatisfactory.

Figure 4: Satisfaction ratings extracted from Table 4.



3.5 Other ways in which Lecture Theatre 2's teaching environment could be improved

Some of the suggestions for improvement related to low cost facilities which could be easily achieved:

> *A coat-hook would help, for putting your jacket on.*

> *There were some tables to put things on but they seemed to disappear to a conference part of the way through term and never came back.*

The request for an hourly AV technician service has greater cost implications, for a need, which might be met through better training.

> *Having a technician present at the start of each hour to check everything is working.*

3.6 Training for use of the facilities in Lecture Theatre 2

Only four of the 15 respondents felt that they had received adequate training to prepare them to use the lecture theatre's facilities. Hands-on training sessions and demonstrations had been offered both when LT2 was commissioned and before the start of term for lecturers who might be using LT2 for the first time. These had been advertised through *Circuit* (the University's bulletin) and the *Staff Development* brochure. Clearly more is needed.

In their written comments on how training could be improved, staff pointed to the need both for higher levels of on-the-spot support and for brief documentation to be available in the lecture theatre.

> *I need the help of a technician, not to be trained as a technician.*

You can't go looking for help with a class full of students waiting to start. Where is the light-switch for the spotlight? I couldn't attend training at the time offered.

Don't know as I didn't get any.

Focus for training

The trainers were not well informed regarding teaching which depends on writing on a board. They clearly hadn't given the logistics of this sort of teaching any thought. It is hard to see how the room can be used effectively for this sort of teaching. Whenever I taught in the room I felt that my teaching was constrained by the environment rather than enhanced by it.

More hands on.

Written instructions

Provide 1-page crib-sheet on each of the facilities. If you only use a facility rarely (e.g., video) then it is easy to forget the method of use.

More introductory sessions and a factsheet to demonstrate capabilities

With an interactive simulation and a manual!

3.7 Recommendations

The recommendations coming out of this survey are:

1. That a standard set of presentation equipment be made available in centrally-timetabled teaching rooms.
2. That centrally-timetabled teaching rooms be allocated on the level of presentation facilities required, as well as for class size.
3. That more training sessions on use of facilities be made available.
4. That written instructions be made available in the lecture theatre.
5. That there is a demand for on-the-spot support and troubleshooting.
6. That the positioning and lighting of LT2's whiteboards be improved.
7. That the computer in LT2 be maintained by Computing Services.

4 New Teaching Rooms.

4.1 Introduction

This section compares the approach taken in developing the specification for the latest teaching rooms, currently under construction, to include a high level of technological support capability. It should be noted that we take a far more specific approach to the contractors briefing leaving much less to his discretion. The examples included here may provide a skeleton that can be followed for other specification tasks.

This is as a result of our increased experience based on previous projects. We still do not completely specify the system in terms of exact equipment items to be provided. However, we are much more specific about both functionality and connectivity.

The following comprises a number of excerpts from a contractor briefing for three new areas in the Edinburgh Business School based at Heriot-Watt University. It is separated into sections and would also be accompanied by a detailed pricing schedule. We believe that briefing documentation laid out in this way will give us much greater control over the procurement process.

4.2 Revised Contractor Briefing (Edinburgh Business School)

Audio-Visual Equipment & Room Control System

Project Aim.

1. To equip the dedicated teaching pods and Senate Room in the new Business School building with a high quality audio-visual provision including data projection capabilities. The services in the rooms to be fully integrated and controlled by a room control system.

The Rooms.

1. The teaching pods comprise two custom designed teaching rooms, building on the well established success of the existing teaching room within the Heriot-Watt Business Executive Centre.

The rooms are flexible in nature being un-raked and suitable for a range of furnishing layouts, however, they will typically be used as high quality executive environments with the tables and seating laid out as a flattened horseshoe.

The floor is solid in construction but includes cable containment between the projection room and dais area accessible via floor units (three) at the front of the room. Three compartment bus bar trunking is installed around the perimeter with access to the projection room.

All room control electronics, amplification, distribution etc. should be housed in the projection rooms.

The rooms are pre-equipped with PA amplifiers and induction loop systems

2. The senate room is finished to a very high standard and is equipped with fixed tiered seating.

The room is equipped with a projection room. Cable containment is provided by means of trunking running round the periphery of the room at high level with conduit access to the room at both high level for loudspeakers and low level for other connections

All room control electronics, amplification, distribution etc. should be housed in the projection room

The room is pre-equipped with an induction loop system.

Room Control System Teaching Pods and Senate Room

3 x Room Control System Hardware (Touch screen processor, required interfaces)

The room control system will be capable of controlling all aspects of the presentation technology in the room. It will provide for control of the following.

- All Room lighting (dimming)
- Video switching as per video data sheet
- Level control for all sound except voice reinforcement (pre-set)
- 35 m/m projector control (Projection room and in room capability)
- 35 m/m Telecine control
- Video Projector control
- VTR control
- Motorised screen control (Senate Room only)

The system should be based on the AMX system to provide continuity with previously installed systems in the University. It should be capable of expansion, at a future date, to enable the provision of an integrated videoconferencing control capability.

The programming should be flexible and provide for a wide variety of modes of use. The supplier will be expected to work closely with the users in determining both the functionality and layout of system. Suppliers should be able to demonstrate an extensive knowledge of the design of complex presentation systems. A full schematic of the program should be provided.

3 x Lighting Dimmers

Dimmer packs controlled by the room control hardware and by a button plate at the entry door

Video Replay and Projection - Teaching Pods and Senate Room

3 x Video Projector.

High Quality, High Brightness Video Projector. This should be capable of projection room mounting.

Projection throw 10.5 Metres (pods) 10 Metres (Senate Room)

Screen width approx. 3 Metres

The system should be capable of PAL and NTSC projection and of data projection at a resolution of at least 1024 x 768.Any compression or other processing required to achieve this resolution should be detailed. Expected output will be in the order of in excess of1200 ANSI Lumens.

3 x Video switch

A video matrix switch should be provided. It will have input capability to include the following.

- Built in PC
- Second PC (easily connected)
- VHS Videotape Recorder
- Visualiser
- 35 m/m Telecine
- 2 x Aux. Video

The matrix will be capable of providing 3 outputs separately switch-able - i.e. main projector, preview monitor and auxiliary output for recording etc.

3 x Visualiser

Should be of high quality and provide for both top and bottom lit material. (e.g. Elmo EV-550 AF)

3 x VHS Video Tape Recorder

Should be of high quality (4 head) and be capable of PAL and NTSC playback at both standard speed and long play.

3 x 15 " Preview monitor

Video/RGB Monitor for lectern mounting. (to be capable of 1024x768)

3 x 35 m/m Telecine

Telecine for the electronic projection of 35 m/m slides. Should be capable of pan/zoom under remote control.

Note: All switching and equipment control via Room Control system.

Audio System - Teaching Pods and Senate Room

The Audio System for each room will comprise three cabled microphones and a radio microphone. These will be controlled using a "SmartMixer". A range of other inputs from line level sources is also required and is detailed below.

Microphones -	6 x AKG CK97-C capsules complete with powering modules. 3 x AKG C747 microphone including mounting for lectern. 3 x Pocket radiomic system (UHF may be required e.g.Senheiser System 1083 -UHF)
Mic Stands	6 x 'dinky' table stands 3 x floor stand with boom
Mixer	3x Audio Technica AT 351 'smartmixer'
Amplification	1 x appropriate 100V line PA amp for voice reinforcement (Senate Room) 3 x appropriate "controllable" amplifier for projection sound
Loud speakers	8 x appropriate 100V Line speakers for voice reinforcement 6 x appropriate speakers for projection sound e.g. JBL control 5 Mounting Brackets for above

Auxiliary Sound equipment

The following line inputs should be available

- PC Sound
- PC-Aux. sound
- VTR Sound
- CD
- Tape
- Auxiliary

The Teaching Pods are already equipped with voice reinforcement amplifiers

The room control system must be capable of providing user control of the projection sound levels

The Senate room may require a four speaker voice reinforcement system due to the nature of its shape and seating arrangement

Auxiliary sound equipment comprises the distribution amplifiers, line amplifiers, power supplies etc. as required.

All audio should be available as a common feed for recording, feeding existing induction loop etc. (i.e. both voice reinforcement and projection sound mixed).

5 Lessons learnt

This report has examined as a case study the process of refurbishing a Lecture Theatre at Heriot-Watt University. A survey was carried out of the users of the new facility and this produced a set of recommendations that are repeated below:

1. That a standard set of presentation equipment be made available in centrally timetabled teaching rooms.
2. That centrally timetabled teaching rooms be allocated on the level of presentation facilities required, as well as for class size.
3. That more training sessions on use of facilities be made available.
4. That written instructions be made available in the lecture theatre.
5. That there is a demand for on-the-spot support and troubleshooting.
6. That the positioning and lighting of LT2's whiteboards be improved.
7. That the computer in LT2 be maintained by Computing Services.

The specific recommendations identified by the survey covered both needs for improving LT2 and also how lecture theatres need to be managed and dealt with as a whole. Some of these changes were implemented immediately (adjusting the set-up and responsibility for the computer, making available new guides to facilities, and rerunning training) but others imply changes in approach.

A new consultation process has been started to involve users in determining the way forward with other refurbishments. A clear problem revealed in this consultation is how best to deal with support for chalk-boards along with the new technology. These appear incompatible in the same room both because of dust from the chalk and the space occupied by the boards. In part this seems to be an issue of encouraging some users to try other methods and seeing that the same, or greater, detail can be presented on new surfaces as was available on the older rolling chalkboards. An alternative is to designate rooms to best support the different styles of teaching. This is only viable if additional information is used in the timetabling and room planning.

The need for staff development, training and supporting documentation was also revealed through the survey. This is particularly important to get the best use out of facilities – the main use of lecture theatres remains conventional presentation while the technology allows for the inclusion of demonstrations and simulations and integration with a more resource based approach. Some of this training is available in Scotland through TALiSMAN, particularly for video-conferencing but also for other approaches building on the availability of high speed networks. Training still needs to be tailored to the local environment and integrated with the provision of technical support and integration. A balance is needed between ensuring everyone can cope with the technology provided while avoiding asking lecturers to invest too much time acquiring unwanted technical skills.

A specific action taken by the University has been the formation of a group involving the Learning Technology Centre, Administration, Estates and academic representatives to look at the way forward. This includes a more detailed specification process (illustrated in next section), afresh look at timetabling, more consultation, and specification of responsibility over both the technology and basic facilities of the rooms.