

# Human Centred UI Design for Remote Interviews

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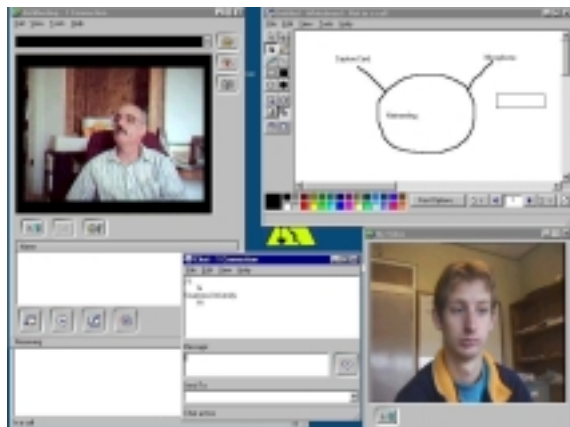
## Abstract

*Video conferencing is a typical setting where users interact with computers in multimedia. However, most existing video conferencing systems provide users with a very primitive user interface, which cannot be used to support structured human computer interactions and human-human communications. In this paper, we examine several different approaches to the design of multimedia user interface, in the context of remote recruitment interviews. In particular, we present TRIUMF, a videoconference system that has been purposely designed for use in recruitment interviews, and discuss its multimedia user interface which has been designed specifically to support a variety of users. We demonstrate how multimedia interactions and communications can be utilised to overcome many of the difficulties currently associated with remote video interviews, such as the inadequate visual information and the lack of any physical contact.*

**Keywords:** human centred interfaces, multimedia, user interface design, video conferencing.

## 1. Introduction

Videoconferencing technology is now being brought into use by large corporations for the purpose of recruitment interviewing. However, most of these systems have a primitive user interface with few communication tools. As shown in Figure 1, a typical video conferencing session consists of a view of the remote site, a simple data communication tool such as a white-board and a text-based chat channel. Normally, the same user interface is used to support ordinary users' interactions and communications in real time, as well as system configuration tasks carried out by technically experienced users. Therefore, to be able to operate such a system, prior knowledge of the system usage is essential. Novice users often feel intimidated by the technology, which is especially undesirable in a recruitment interview.



**Figure 1.** A typical video conferencing session.

Recently, research into software environments for video-conferencing addressed a number of design issues, including application control [1], floor control and question management [1, 2], meeting history management [3], and video recording for video-conferences [4]. More significantly, in the field of distributed computer graphics, visualisation and virtual reality, video-conferencing has been used to support collaborative visualisation, multimedia presentation and augmented reality [5, 6]. A number of custom video conferencing packages are emerging for the purpose of remote clinical diagnoses, allowing almost immediate medical consultancy by specialists in remote locations. A number of distance learning courses are now taught via video link, which often supports multi-point broadcasting to allow students at different locations to attend the same lecture.

Existing research into life size displays [7], multiple camera views [8, 9] and the effective use of video clips [10] have drawn a parallel with the technical development of TRIUMF (Technology based Remote Interviews Under a Multimedia Framework) which were reported in authors' previous papers [11,12].

However, most of the existing work in areas of video conferencing has been focused on the technical developments, and little emphasis was placed on the human factors in designing appropriate multimedia user interfaces to facilitate effective interactions and communications.

Like most technology-based systems where technology interacts with people, video conferencing systems have a definite human purpose. Therefore, the design of such systems should be led by the requirements of users, rather than software/communication engineers. The emphasis of the design should be placed on the human component of the system, rather than the technology.

The design goals of TRIUMF were defined as: (a) to provide a system that is usable by both novice and expert, (b) to provide multimedia features that simulate real-life human interactions, and (c) to provide an integrated multimedia user interface that supports a range of software tools and utilities. Our overall goal was to facilitate interactions and communications that are comparable to, and sometimes better than, those found in face-to-face interviews. The implementation of TRIUMF has demonstrated that these goals have been achieved through a human-centred design approach, which is becoming a standard design methodology for interactive systems (ISO 13407).

In the rest of this paper, we first give an overview of TRIUMF. This is followed by a discussion on the human factors in video conferencing, which provides us with a conceptual guidance in the design and implementation of TRIUMF's hardware configurations and software architecture. We then focus on the design principles of the multimedia user interface.

## 2. TRIUMF – An Overview

Recruitment selection is an indispensable part of almost every organisation. To many organisations, this is a day-to-day business. For example, a sizeable company often recruits hundreds of new employees each year, while an employment agency or university career centre provides services to thousands of potential employees.

To these organisations, every interview is of critical importance to the employer and the individual concerned. An error in a selection decision is usually undetectable and irreversible. It is almost certain that these organisations will feel uncomfortable to replace traditional interview rooms with simple desktop video-conferencing units such as that shown in Figure 1.

TRIUMF is a special purpose system for remote multimedia interviews. It is designed to be housed in large-to-medium sized companies, higher education establishments such as universities and colleges, government employment services, recruitment agencies and other reasonably sized organisations. TRIUMF aims to provide an adequate alternative to face-to-face interviews. This means a video system

that gives a true feeling of telepresence, a data system that can perform most of the pen and paper tasks that would normally be performed throughout an interview, and an audio system that is up to the industry standards for videoconferencing, but without the need to attach clip-on microphones to the interviewees and interviewers – as with many systems. We aim to be able to reach a standard such that a fair and correct selection decision can be made remotely without intimidating either parties.

## 3. Human Factors in Multimedia Conferencing

Video conferencing is the core function of remote recruitment interviews. Results of human factors study in areas of multimedia communications in general, and tele-/video-conferencing in particular, became available recently to researchers and software developers in the field. These include the comparison between face-to-face meetings and video-conferencing [13, 14], the study of quality of services and its effects in telepresence [15-18], and human factors in the design of multimedia interfaces [19].

One important aspect of human factors study is the proper allocation of bandwidth to different media in videoconferencing. Prior to the development of TRIUMF, we conducted a set of experiments [16] to reveal whether the current standard (ISDN-2, 128K bandwidth) can provide an adequate feeling of telepresence to both “interviewers” and “interviewees” while in a videoconference session.

One of our experiments, which involves 24 participants, was to study the importance of image quality. We used CIF (352x288) format for 50 percent of video transmission in the trials, and QCIF (176x144) for the other percentile. CIF video provides a much lower image update rate than QCIF due to the amount of data being transmitted. However, results from the experiment show that CIF is the preferred video format as the higher quality images allow better eye contact to be established between remote parties; this in turn results in a better feeling of telepresence and a better overall impression of the multimedia communication.

Another experiment has revealed the importance of audio communication. Poor audio communication causes a detrimental effect on the interviewers impression of the remote candidate. However, an interesting result discovered from the experiment was that perceived sound quality improved with increased visual quality even though the sound quality was kept at a constant level.

These experiments led us to believe that an emphasis should be placed upon visual information while

maintaining an adequate quality of audio service. Video transmission usually takes the lion's share of a videoconference call. The bandwidth for data communication is often small and only allocated when needed. Because of the cost-effectiveness of data communication, it is desirable to utilise graphics to improve the quality of visual information. Furthermore, some graphical data can be preloaded on the remote machine, and can be activated by the transmission of a short signal. From the perspective of human factors, the graphics, together with high quality video images, would enhance the level of telepresence in remote interviews.

## 4. Hardware Configurations

We have defined three configurations for TRIUMF to suit organisations with varying operational requirements and financial capacity, namely *basic*, *standard*, and *deluxe*.

The main equipment in the basic configuration is very much similar to that of a desktop videoconferencing environment. It is a transitional configuration, and thus can easily be upgraded to either the standard or deluxe configuration. The standard configuration is based on a set of affordable hardware devices that allow most of the features of the TRIUMF software to be utilised. The deluxe configuration is considered to be an ideal configuration achievable with the current technology of multimedia systems and allows all functions in TRIUMF to be fully utilised.

In addition to common elements, such as multimedia PCs and document cameras, the deluxe configuration also features:

- *large video screens* — This enables the display of the remote participant in near life size, hence removing one of the most obvious artifacts in desktop video conferencing. By allowing participants to sit further away from the screen, we enhance their feeling of sharing a social space in telepresence.
- *head tracking cameras* — In a face-to-face interview [13], one would naturally remain focused on the opposite participant, even when the person is moving around. This is often the problem with a simple desktop videoconferencing unit, as a person at the remote site often disappears from the display if asked to do anything other than sit and talk. TRIUMF utilises auto head tracking cameras (Sony D31) as part of the solution to this problem. Additional cameras that are positioned in different locations around the room also present a participant with a full view of the opposite interview room, hence providing a better simulation of human vision. This would make it

possible to track the interviewee regardless of where they position themselves.

- *video splitter/mixer/recorder* — The main function of video splitter/mixer is to facilitate multiple camera views – up to four views at once. In addition, it enables the capture of selected views onto videotape through a VCR (and hard disk via capture card if specified) for later playback. Audio is dubbed to videotape with interviewee and interviewers voices recorded onto separate audio channels.
- *dual purpose rooms* — The rooms have been designed such that they can easily be changed from an interviewee room to an interviewer room and vice versa by simply moving around a few items of furniture. An organisation therefore needs to allocate just one room and purchase one set of equipment to be able to perform both configurations.

Our current prototyping environment is essentially of a standard configuration, and it is designed to support the development of TRIUMF, and to perform psychology analysis experiments into the usage of videoconferencing systems. Whenever we are conducting a significant experiment, a local company provides us with a 40 inch back-projected screen (Cadman Xtravision, Figure 2) so we can transmit life-sized images of the remote site and close the gap between telepresence and physical presence. The merits of using such a large video screen with TRIUMF has been clearly noticeable in our experiments from the comments made in the feedback forms we provide. This has also been demonstrated by other projects reported in the literature [7, 18].



Figure 2. The TRIUMF prototype environment.

## 5. The Software Tools

The primary use of TRIUMF is to assist interviewers in managing activities during remote interviews. These activities range from initial introduction to final data recording, and include many types of

controls such as modifying camera views and performing an online test. TRIUMF divides its functionality into three groups of tools, namely *interview management*, *system management* and *data management*.

Interview management tools are used by interviewers to manage an interview session. Tools in this group include:

*Auto-cue management* — an electronic notepad for interviewers to prepare an interview session in advance in a structured and consistent manner, modelled in the post-it sticky style (Figure 3).



**Figure 3.** An auto-cue display.

*Time management* — a scheduling tool for managing a session and its sub-sections, including functions such as a time alarm, automated forwarding to the next interview stage, rescheduling after hold-ups, and on-screen prompts for guidance via autocue. Complete schedules can be created, deleted, loaded and saved, allowing different schedules to be run depending on the type of job you are interviewing for, or based on varying amounts of time available for the interview period itself. (Figure 4)



**Figure 4.** Time Management

*Relaxation gadgets* — a collection of activities designed to bring a “human-touch” into remote

multimedia interviews. For example, introducing the candidate to the touch screen by showing a large clown on the screen, and then asking for the nose to be pressed – pressing the nose results in an amusing and light hearted response from the clown (Figure 5).



**Figure 5.** A relaxation gadget.

*Case study videos* — a computer-assisted interview technique for showing short videos prior to some role-play questions (Figure 6). Interviewers are provided a collection of video clips including many commonly used scenarios, such as “an awkward customer”, “long distance commuting”, “professional ethics”, “reporting a colleague” and “technical difficulties”. Each scenario is accompanied by a set of optional questions which can be automatically shown by the auto-cue when the video progresses. New pre-recorded video clips can be easily added into the system prior to the beginning of the session. The biggest benefit of case study videos is the consistency it provides makes it fairer to each candidate. This technique also reduces substantially the interviewer’s time and effort necessary for preparing and presenting case studies, as playing a video involves only a few button operations.



**Figure 6.** A video case study.

*Camera controls* – this allows the interviewer to switch between multiple views or single views

during a call, typically up to four views are available and all can be visible simultaneously if desired (Figure 7). The ability to control the movement of the cameras is also provided, allowing you to manually pan, tilt, and zoom the cameras in on a location or to switch on the auto-tracking feature to allow the cameras to follow the candidate automatically.



**Figure 7.** Camera control.

*Application sharing* — facilities for sharing common applications such as a whiteboard and automated file transfer between the two locations.

System management tools are mainly used to assist in the management of TRIUMF hardware and the customisation of the system. Most tools are designed to be used by technically-experienced interviewers or designated technicians. These tools are:

- *general controls* — general settings for software customisation.
- *network controls* — settings for connection, protocol and bandwidth management.
- *multi-camera controls* — settings for camera activation and deactivation, zooming and head-tracking.
- *multi-view and display controls* — view selection, colour settings, resolution, and multiple view controls.
- *audio controls* — settings for microphone, audio quality, volume, duplexity and echo cancellation.
- *recording controls* — settings for medium selection and channel separation.

Data management is a key element in an interview process. Although it is likely that most communication during the main interview session is via visual and auditory media, there are often other activities involving data exchanges, such as filling a form and having a technical or psychometric test. In a face-to-face interview, these activities are considered separate from the main interview session and are often looked after by a personnel assistant

outside the interview room. In a remote interview, because of the physical constraints in video-conferencing, such activities will likely form a part of the interview session. In TRIUMF, tools for supporting these activities include:

- *Personnel Database* — a link to an external database management system.
- *Online Form Filling* — a facility for displaying and completing a form electronically during an interview.
- *Online Testing* — a facility for conducting a test electronically during an interview.
- *Online Statistics* — a research component for studying how statistics about visual and auditory communications can be used to provide interviewers and selectors with quantitative information about an interview.
- *Online Help* — online user manuals and technical help messages.
- *Interview Guidelines* — professional guidelines for interviewers, interviewees and career advisers.

## 6. User Interface Design

Although TRIUMF was designed primarily to assist interviewers, we have considered the human factors in the context of four user groups, namely *interviewers*, *interviewees*, *technical support staff* and *administrative support staff*. The abilities of these four groups to interact with a multimedia conferencing system differ in a number of ways, including their IT knowledge and skills, the opportunity of receiving training on the system, the experience in using the system, and other human factors. In order to facilitate effective interactions and communications, we adopted a human-centred approach by providing a different user interface for each user group, with a coherent look-and-feel throughout the system.

The system is further split into two separate executables, one for the interviewers' site, and one for the interviewees' site.

### 6.1 The Interviewers Interface

In a typical situation at the interviewers' site, the system, through its multiple displays, may be operated by one of the interviewers, and perhaps an administrative staff member, such as a personnel assistant. A technician will likely be involved in the initial setting up, and may also be available during interview sessions. The design of the user interfaces at this end reflects such needs as shown in Figure 8. There is a top-level user interface which can be customised to suit a particular interview session. At the top-left corner of the screen, three buttons

provide access to three sets of tools as interview management (used mainly by interviewers), system management (mainly by technical support staff), and data management (mainly by administrative staff).



**Figure 8.** The interviewers' desktop.

The customisable top-level user interface allows an experienced interviewer, or any interviewer with the help of a technician, to arrange all the tools needed for a session on a virtual desktop – much like the concepts of desktop and shortcuts in modern operating systems. Figure 9 shows an interface being customised. Note the wastebasket on the top right of the screen, where unwanted icons can be discarded. Any new buttons wanted on the desktop can be dragged from the tool panel to their desired location on the interface screen.



**Figure 9.** Customising the top-level user interface at the interviewers' site.

A “start-bar” is also present at the bottom of the screen to allow quick selection of regularly needed functions. The main benefit of this start-bar is that it is completely invisible until the mouse is moved to the bottom of the screen, this allows us to provide access to the bar from every screen throughout the entirety of TRIUMF without cluttering the display in any way.

The background illustrated in Figure 8 remains constant throughout the entirety of the TRIUMF interface with the exception of a slight change in hue when in system or data management tools. All backgrounds maintain a priority towards the blue colour, as this is the least dominant colour as seen by the human eyes, allowing the eyes to focus more on the buttons placed upon the background instead.

On pressing a button, an interface change or event will occur directly related to the image shown upon the button. For example, if you were to press the Call button with the telephone icon, you will switch to the “Call remote site” screen ready to place a call (Figure 10). Buttons such as “Autocue” change the existing screens by activating or deactivating a post-style notepad and showing/hiding it on screen.



**Figure 10.** Placing a video conferencing call.

Metaphoric Icons have been used wherever possible to improve the speed in which buttons are located by human eyes.

## 6.2 The System Managers Interface

This interface is designed to be accessed mainly by video conference technicians, and it gives access to all changeable functions of the system. Rather than a button based interface with metaphoric icons, a tool-based interface is chosen with many options available in view at any one time. The purpose of this design is to enable the technical to access all options quickly without the need of navigating through multiple levels of interface (Figure 11).

## 6.3 The Data Managers Interface

This part of the interface is current under development but the initial investigation has led to an interesting design that suggests to utilise a web browser. Many aspects of the interface is being implemented in HTML and CGI, and some as a browser plug-ins. Figure 12 shows part of an online psychometric test, implemented in HTML and CGI.

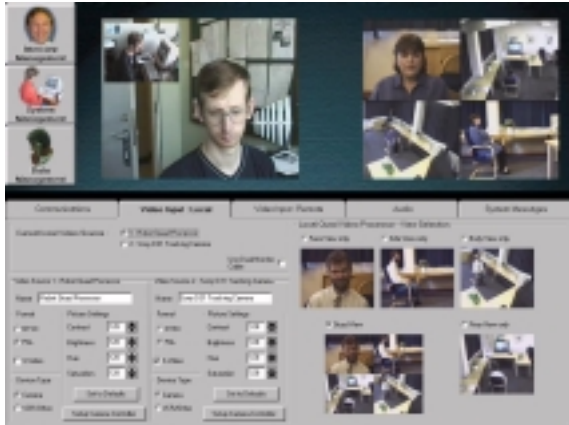


Figure 11. System Management.



Figure 12. Online psychometric testing.

In general, for the interfaces for interviewers' site we considered the relationship between text and image (as outlined in Section 3), and therefore attempt to encompass the variation of user preferences in this cognitive continuum of end user appreciation. To a certain extent, this is achieved by the ability of the interviewer to customise the interface to their preference. This may vary with the emphasis being pictorial employing the full usage of icons representing events and using a sizeable background, to that of employing greater use of the auto-cue which can be articulated to textually represent all the main events to be conducted.

## 6.4 The Interviewees Interface

This interface has been designed to be as simple as possible, as we cannot expect an interviewee to have prior knowledge of the system. As with the interviewers interface, wherever controls or functions need to be accessed, metaphoric buttons are used along with short textual representations. However, there are less buttons, buttons tend to be bigger and text is usually slightly longer, giving more detailed instructions. The imagery complements what has been applied to the

interviewers interface in principal, but restricts options available and dictates a far simpler path throughout the interface (Figure 5). This is because the process of interviewing is somewhat an intensive procedure and thus restricting user options prevents unnecessary distractions and allows the user to focus on the interview itself.

The production of this application has attempted to be as objective as possible by taking into account many subjective limits, for example in relation to text and image used throughout the interface, and thereby the application has evolved to encompass the different subjective and perceptive preferences of users.

## 7. Conclusions

The interface has been demonstrated to a diverse range of potential users, including staff in careers services, students, company directors and managers.

Feedback so far has been very positive, and the majority of people from industry and commerce feel that a system like TRIUMF could easily be put to use as a real world system. In particular, the video case studies and the time management facilities are regarded as the most beneficial features of TRIUMF. The relaxation gadgets are considered typical examples of an effective use of graphics. Most participants would use such a system at least for pre-selection interviews, though some would still prefer face-to-face interviews for final selection. Almost everyone is happy to have a multimedia user interface to structure an interview session. Our human-centred design has been commented by many as the best approach for such a multimedia communication system.

We are currently taking the system to companies around the region for further evaluation. We are also integrating the system with Netmeeting [20] in order to take advantage of extra features such as whiteboards.

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