INTERACTIVE VIDEO: A PROJECT REVIEW WITH IMPLICATIONS FOR TRAINING IN THE BRITISH ARMY

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ABSTRACT

The concept of Interactive Video (IV) is examined in the light of the training requirements of the British Army. The reasons for the IV project are detailed, together with the basis for the selection of the system, project implementation, subject identification and the courseware design processes. Difficulties in project management and in interactive design are discussed and a structured approach to the design process presented. This approach was based on the combined use of structured design methods, flow charts, and screen layout documents. The results indicated that the approach was valid, that effective interactive design was difficult, and team stability vital. The knowledge gained from the study suggests that in view of the extent of initial and continuing resource overheads, the military use of IV is likely to focus on such applications as simulation where cost benefits may be more easily identified.

INTRODUCTION

There are an increasing number of computer controlled video systems, commonly referred to as Interactive Video, now available for use as training devices. These vary in their capabilities and many are pro-moted as providing some form of student management, rapid access to high quality video pictures and trainee interaction. These systems have attracted considerable interest in both military and civilian organisations within the UK and are seen as being potentially powerful and effective training tools.

BACKGROUND

The training organisation within the British Army is constantly facing increasing demands upon the resources available to meet essential training needs. In 1982 the Army School of Training Support (ASTS) was tasked to review the use of Interactive Video in both military and civilian contexts, (1) and to investigate the military potential of low-cost tape systems based upon existing Army equipment. Tasking was extended in November 1985 to embrace an advanced disk-based IV system in order to assess the implications and potential of this new technology for use in Army Training.

There were a number of possible options considered in arriving at this extension of tasking. These included monitoring and/or involvement with suitable civilian and military projects sponsored by various Government departments. All of these options were rejected because they either did not reflect the needs of the Army, or did not exist.

SYSTEM SELECTION

Criteria

To meet Ministry of Defence (MOD) criteria and guidelines, a variety of possible systems and combinations of equipment were investigated. Included in the selection considerations were the following essential requirements:

The developers of the authoring system/language must have an established track record and it must have a substantial presence in the UK market.

The system must have the ability to incorporate flexible approaches to instructional design strategies, coupled with maximum ease of use and reliability.

The CBT authoring system must be compatible with PAL videodisk equipment and be able to present computer and video images on a single screen, in colour.

The system must comply with the current policy of standardisation on MS-DOS as the operating system for microcumputers in Army training.

The Army Television Studio facilities, at ASTS, were to be used to produce video material without commercial costs and constraints.

The cost of the selected system was just over $52,000 at June 1986 prices (using an exchange rate of $1.522=£1.00). The system is illustrated in Figures 1 and 2 and consists of:

* A Zenith Z-200 microcomputer (IBM AT compatible).
* A Pioneer Laservision videodisk player (PAL).
* A high quality dot-matrix printer.
* The Tencore authoring language.
* A PLUTO graphics image digitiser and peripherals.

Figure 1 INTERACTIVE WORKSTATION

Figure 2 PLUTO GRAPHICS SYSTEM

Equipment Acceptance

A number of problems arose during the installation and acceptance trials of the overall system. These were mainly the result of the procurement procedures in force at the time. The problems encountered were far greater than anticipated and included hardware incompatibilities between the various components causing difficulties in system integration. This required extensive liaison between the system supplier and various hardware component suppliers.

PROJECT PLAN

A critical path analysis chart of the project is shown in Figure 3. The chart is only a partial representation of the project, (it does not extend to validation) and it makes a number of assumptions. This chart formed the core of the project plan and in spite of some time delays associated with procurement and system acceptance, was in general adhered to.

Project Team

An IV project is not an individual task, but requires a team. There are six main functions and areas of expertise. These required the skills embraced by:

*Project Officer.
*Subject Matter Expert.
*Training Designer.
*Systems Expert.
*Computer Programmer.
*Specialist Media Advisers.

Prior commitments required the designated team members (five principal members during the critical design period, with three others available on an ad-hoc basis for advice on video technology, TV studio capabilities, quality control and learning styles) to contribute to the project concurrently with their other tasks/projects. This staffing level was never realised and the project was essentially conducted with two officers. The man-days available were less than had been forecast and this compounded the delays experienced in procurement and acceptance.

PROJECT MANAGEMENT

The approach adopted required a consideration of the project life cycle, the guidelines to be adopted, quality and progress checks, and modification reviews. These mechanisms and their relationships involved:

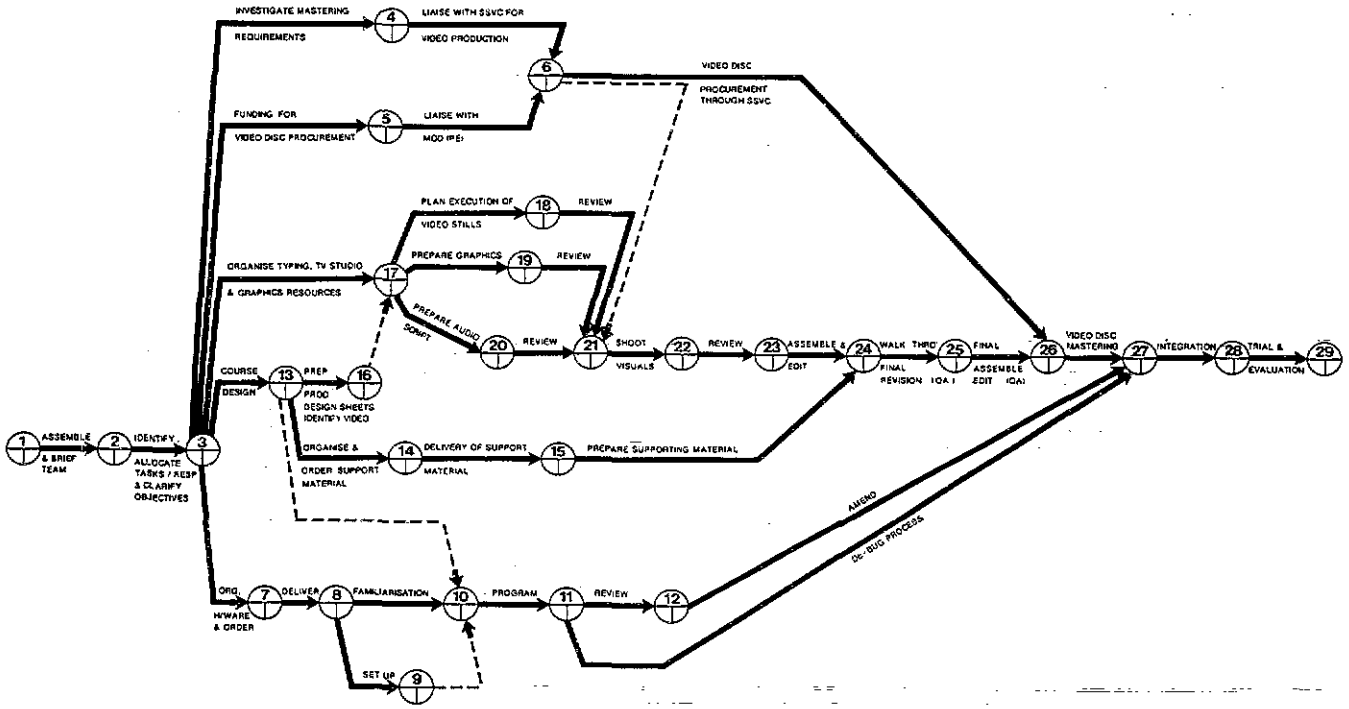

Figure 3 PROJECT MANAGEMENT CHART

The Project Life Cycle

Central to the project, this was taken to include all elements from tasking to system evaluation and initial courseware trial. The cycle considered the project to be decomposed into identifiable activities which could be evaluated. This facet of project control was the core of all the other elements within the concept of project management.

Guidelines Adopted

There were three areas for which guidelines were determined. These encompassed the tasks and activities, the procedures, and the project documentation.

The tasks and activities guide detailed what had to be done and the relationships between these activities.

The procedures guide described how the activities would be performed.

The documentation guide prescribed the form in which the progress and completion of each element of the project would be recorded.

Quality & Progress Checks

Whilst not established as a formal mechanism, checks were made internally by the project team with verbal reporting. In view of the R&D nature of the project, this was deemed to be acceptable at the time but in practice, the project would have benefited from a more formalised procedure, had resources allowed.

Modification Control

This was an activity to monitor changes in the course development and the consistent interpretation of the design by team members throughout the project life cycle. Because of changes to the team composition, and the need to accommodate other priorities, there was a lack of coherency in this procedure.

IMPLEMENTATION AND POST-IMPLEMENTATION

Terms of Reference

The terms of reference for the IV project were:

* To extend R&D on the use of IV in Army training.
* To assess the problems in the processes and production of IV courseware.
* To recommend a course of action for the Army in the use of IV in training.

Subject Identification

It was considered desirable to select a subject currently taught in an Arms School (giving Army-wide utility). The practicality of working away from the unit for protracted periods, however, ruled out any School but ASTS. Consideration of the Training Development Courses run at ASTS identified Course Design (2) as a suitable area for the project, and within this area Instructional Analysis was selected, since it incorporated task simulation as part of the course and current experience suggests that simulation is appropriate for CBT/IV. The main criteria for subject selection included a consideration of the following indicators should be:

* Visualization of tasks formed part of the course.
* Training courses were to be modularised.
* A need existed for courses to be more flexible.
* Repetition of courses.
* Trainee starting levels in knowledge and ability varied considerably.

Potentially, there would be a secondary advantage in that the material would be capable of extension into distance learning concepts, such as for the Managers of Training, both in the Regular and Territorial Army, at their parent Units.

Subject Content

The content of the module consisted of:

Context Setting. Since the module was to be used in a stand-alone setting it was necessary to provide a feel as to where IA fitted into the overall Systems Approach to Training (SAT), model shown in Figures 4 and 5.

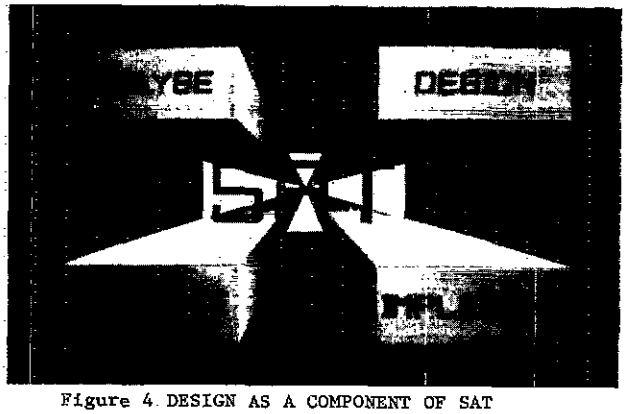

Figure 4 DESIGN AS A COMPONENT OF SAT

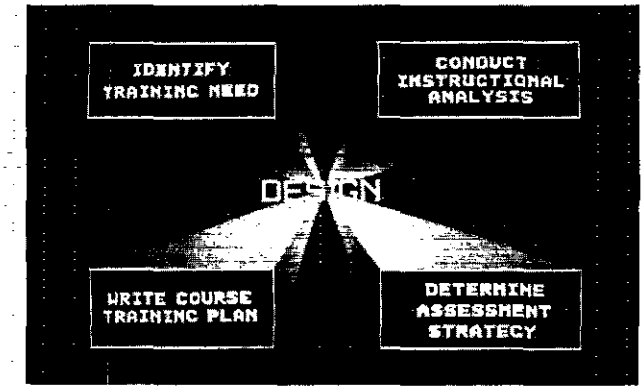

Figure 5 INSTRUCTIONAL ANALYSIS AS A COMPONENT OF DESIGN

Definition of Terms. This introduced the technical terms the user must understand to make effective use of the module. Minimal prior knowledge was assumed.

Process Demonstration. This consisted of a "walk through" of a simplified task, using reference materials, task observation, identification of task components, and the construction of a scalar. The two demonstrations were of familiar tasks, making toast and Cardio-Pulmonary Resuscitation (CPR). Within these demonstrations, good and bad points could be identified and any unrecognised assumptions or inconsistencies highlighted. The importance of the walk-through was particularly apparent in the second demonstration, CPR, when it was noted that the SME used two different hand grips for compressing the chest without realising it and also made assumptions concerning the patient's breathing, and the location of the carotid artery. Trivial though these might be in the context of the task selected, they do illustrate the difficulties likely to be experienced by those involved with developing training courses.

Practice Task. Having walked through the various stages of IA the whole topic was brought together through a second study. The aim being to build a model of all the components in IA and use it as a basis for assessment. This took some considerable effort and again was a significant element to the complexity mentioned earlier.

Assessment & Case Study. This was the final element of the module, and was only partially computer based. A very effective method of promoting learning is the use of syndicates. In order to retain this feature of the TD courses at ASTS, together with team working, the case study was delivered by the computer, but the work was prepared using materials which would be available on the job. The case study was then presented either to another syndicate or to the Directing Staff.

Supporting Activities

ASTS undertook a review of a series of other IV packages, including:

* National Bus Co. Crew/passenger relationships.
* Post Office. Inter-personnel skills for supervisors.
* British Gas. Systems Approach to Training.
* Interactive Information Systems. Interviewing.

These were found to be of variable instructional quality, but generally of a straightforward and principally linear in form. The ASTS programme was of greater complexity with more effort put into the remedial instruction where students wrongly answer the questions put.

A Basis for Design

"Begin at the beginning and go on to till you come to the end: then stop." said the King to the White Rabbit (as Lewis Carroll would have it). This would seem to be a reasonable way to proceed, and so it was in the past, but today the Training Organisation uses tools such as computers, video, and graphics all linked together. Such an arrangement is a complex system and the established ways of thinking - of managing things - is no longer competent to cope. The need now is to manage the complexity in training. This is a reflection of the increase in the complexity of operational roles, developing technology, and the increasing pressure on scarce resources.

Looking at examples of CBT - and IV is an enhanced CBT system - many of these do not measure up to expectations, this was referred to earlier. One of the problems, and there are many, is how to design a truly interactive program and not just one that is essentially linear, with a minimum degree of branching. This branching, if extensive, is where further complexity (in the course design) can arise. There is no doubt that a well designed branching programme is superior to a linear programme. This introduces variety and variety is an integral part of any effective training situation. Variety is a measure of complexity, it is defined as the number of achieve. Show me an interactive linear programme, and I will show you a denatured entity! Trying to specify all possible pathways and conditions in any program design that is non-trivial, is a brief that God himself could do nothing with! Design in the past has depended heavily upon flowcharting, as a method of representation of the sequence of operations.

This alone is totally inadequate to cope with the degree of complexity which effective CBT can imply. One step forward, and it is only that, is to employ a methodology which includes an interpretation of a Structured Design Method (SDM), in addition to the more usual tools. This method of representation will be referred to later. It is not a panacea but does allow an increased degree of flexibility and interaction to be accommodated. From this, the design sheets showing all the visual elements, together with their associated audio and text, as appropriate, were developed.

The design of interactive branching it must be more than just a re-routing through previous material. It must, for example, provide options for such activities as:

Help - related to the position from which it was invoked.

Directions - the user must not be left in the position where the next step is a matter of guesswork.

Glossary - the various technical terms should be always available for reference. degree of flexibility and interaction to be accommodated. From this, the design sheets showing all the visual elements, together with their associated audio and text, as appropriate, were developed.

Suspension - this should enable the user to temporarily halt activities and return to the same section, at some later time, if desired.

Review - depending upon whether the user has completed the module before, this option should provide the means to review any of the module elements.

Remedial - this must include provision for a variety of strategies. These should include new approaches, such as using fresh video from a different perspective, different language levels, changed forms of text, and possibly alternative learning styles. If understanding was lacking before, merely repeating the same sequence may be unproductive. An option for repetition should however be available at the user's selection, since the problem could be inattention.

It may be argued that such activities should be built into the authoring system. It is the authors contention that what should be done and that which is done, often diverge. Whilst it is comparatively easy to state what should be achieved and how, in practice the achievement of this is often lacking. The glossy production is all too easy to produce.

Design & Development

The design and development of the courseware was approached by considering it from three related but separate perspectives. In outline, these consisted of:

A Program Structure Overview. This was produced using a methodology based upon an interpretation of SDM (3). This method of representation (Figures 6 and 7) were used in the project to represent the events that would affect the trainee progressing through the course and the control functions of the courseware. There were a number of positive attributes to this approach. These included:

* Program documentation being part of the design process.

* The logical structure providing easier and more thorough testing.

* Flexibility in design and an enhanced standard of maintenance. This is because it is clear where any alterations are required and the locations can be easily identified.

* Rigour enables ambiguities and errors in specification to be identified early, rather than at the trial stage.

A Flow Chart. This showed the overall program structure and trainee interactions with the course. This also represented how, when and what material the trainee would be presented with.

Screen Layout Sheets. These specified in detail the precise information that would be presented and how (positioning, colour, style), options available and the control functions to be provided (4).

There is nothing new in these techniques, the essence is to bring all of these aspects into a logical and coherent entity. Each view gives only a partial description, each describes only one aspect of the process, together they provide a comprehensive picture of the authoring requirements. None of these views are created in isolation, each requires user involvement.

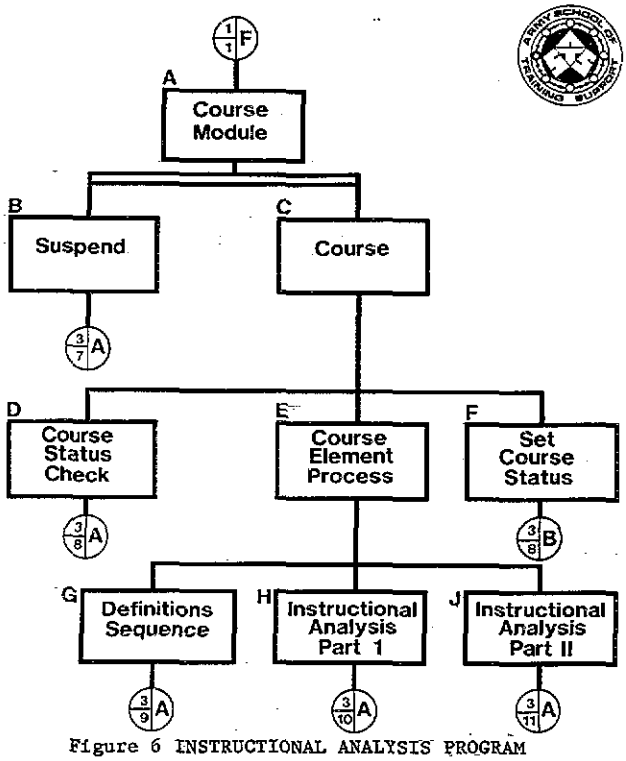

Figure 6 INSTRUCTIONAL ANALYSIS PROGRAM STRUCTURE

Courseware Style

The philosophy of CBT is one which proclaims that students are trained individually in response to their particular needs, whilse allowing a measure of trainee control. The potential of this for the accommodation of management, the monitoring of performance and matching trainee needs to the training courseware is tremendous.

The difficulties of realising such potential, however include those of an increasing burden upon the training skills and resources available. An example might be the need to recognise and take account of a wrong answer, other than in a trivial sense, and provide a number of different views or approaches relating to the same subject matter or task. This situation has the potential to increase the complexity of the courseware design to a stage where it becomes unmanageable using existing authoring tools.

A limited study was carried out at ASTS to investigate the extent of serialist/holistic learning styles (after Pask) within the target population that would be using the IV Instructional Analysis module. The purpose of the study was to explore the application of this approach to CBT/IV. Initial results (5) indicated that there was a definite serialist trend within the broad spread of styles. This suggested a mainstream design with a serialist bias.

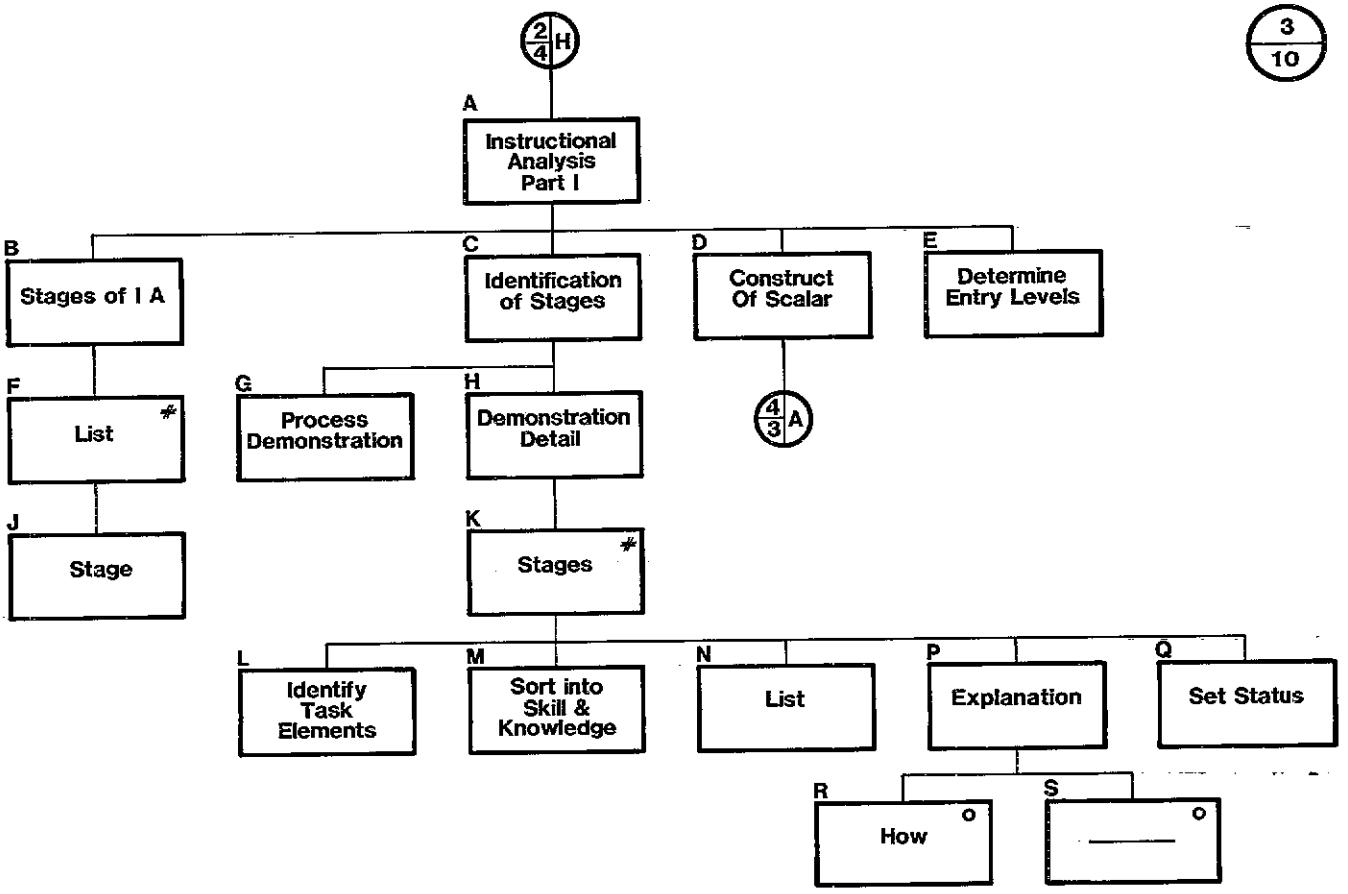

Figure 7 PROGRAM STRUCTURE-DETAIL

Video Production Requirements

Within the terms of reference, there was a requirement to investigate the feasibility of using the Army's video facilities in producing IV courseware. The equipment available at ASTS and used in the project consisted of a low-band U-matic system (ANSI Type E videotape format) using 3/4-inch cassette tapes, with the ability to record digitised graphics pictures from the PLUTO system. All source tapes were therefore U-matic, and additional material, in the form of stills, was produced using 35mm photographic slides. The master tape for disk pressing was produced outside ASTS by the Services Sound and Vision Corporation (SSVC).

Validation

To establish the effectiveness of the IV module there will be a need to implement a validation program. It is proposed to conduct a number of comparative trials within ASTS in the Winter of 1987.

CONCLUSIONS

An IV project requires the commitment of a team capable of performing six main functions. Unless an establishment is lavishly resourced, this level of effort is very difficult to sustain over a long period when there are competing demands and changing priorities.

It would seem that the training needs of the Army do not equate to the perceived needs of many commercial organisations within the UK. in particularly, the outcomes of training for the Army do not appear to be the same as the expected outcomes in the commercial world, where the considerations of marketing, image, and public relations (PR) are significant factors (eg. IBM point of sale programme in the UK). This preliminary conclusion is based upon a limited review of some of the private sector IV training programs.

The project team must exist throughout the duration of the project as a coherent unit. This is not a new proposal, it is a reinforcement of previously stated views.

The method adopted in design and development paid dividends in terms of time and reliability despite the appearance of this adding to the project overheads.

The selection of suitable topics for CBT/IV requires a re-appraisal of the implementation of the criteria advanced in the past. In many cases these may be too loose, or may not take sufficient account of operational need. Examples would include:

* Ratings of CBT/IV benefits - often subjective.
* Decentralised instruction - may be an argument for distance learning, not CBT/IV.
* Student throughput (quantity) - should also take account of quality.
* Consideration of existing or forecast on job performance.

A more selective and critical assessment by prospective users of IV would improve cost-effectiveness since time and manpower are increasingly scarce resources. It would seem, as a generalisation, that the use of IV in various forms of simulation would be the most fruitful area for exploitation, with others being the exception, rather than the rule.

The subjects for which IV may be proposed must merit the high allocation of resources and costs which IV implies. The staffing of the ASTS project indicates probable manning levels but in addition to this there are the requirements for television studio resources and availability. Such considerations indicate that the cost-effective use of IV is unlikely to lie in those areas in which training is already effective, unless other significant management factors apply.

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