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Personnel

INFORMATION FOR DESIGNERS OF INSTRUCTIONAL SYSTEMS

ADVANCED DISTRIBUTED LEARNING:

INSTRUCTIONAL TECHNOLOGY AND DISTANCE LEARNING

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Instructional Technology – using technology to enhance the learning experience. Whether through self-paced, computer-based instructional programs, or through video teleconferencing technology to bring subject matter experts into the classroom, the proper use of technology can greatly increase the effectiveness and efficiency of instruction.

Instructional technology can be used to support traditional classroom instruction (technology insertion) or it can be used to expand the reach of instruction through distance learning, where instructors are physically separated from the learners and where the learners may be separated from each other.

With increasing frequency, distance learning is becoming the instructional solution of choice. Because distance learning usually employs multiple technologies, developing a distance-learning program requires the active participation of numerous specialists. These specialists make up the cross-functional team responsible for the analysis, design, development, implementation and evaluation of the distance-learning program. Each team member fulfills a unique function.

Instructional designers must become the guardians of educational integrity because the distance learning development process involves critical hardware and software integration, and there is increasing involvement from other functional specialists. There are a number of reasons for this.

The education and training community does not control many of the resources that are employed during the development and implementation of a distance-learning course.

Those who control the distance learning technology assets have often sought to exploit their technologies – to showcase new capabilities – sometimes without adequate regard for the principles of education and training.

Technology cannot drive the learning experience; technology is simply the way in which instructional content is transmitted to the learner. It can either facilitate learning or impede learning. The instructional designer must ensure that the selected technology complements the established objectives and provides the *best* instructional solution.

In order to assume this responsibility, instructional designers must understand the technology options. They must understand the capabilities and limitations of each technology and the impact it has on the learner and the learning environment. In order to participate as an effective team member, instructional designers must fully appreciate the expertise that each member of the team contributes to the final product. This handbook is designed to address these issues and provide the guidance necessary to encourage instructional designers to ask the right questions as technologies evolve.

This volume provides information and guidance for designers of instructional systems on how and under what conditions to incorporate training technologies into the Instructional System Development (ISD) process. This guidance addresses the use of instructional technologies in both resident and non-resident instructional systems. This handbook should be used in conjunction with MIL-PRF-29612 and its supporting handbooks.

Chapter 1
INTRODUCTION

General Information

Purpose of handbook

This volume provides information and guidance on applying the application of the Instructional Systems Development (ISD) process to implementing for instructional technology in resident instructional systems (technology insertion) as well as using and distance learning instructional systems to replace residential instruction.

Content

This handbook contains the following chapters:

Chapter 1: Introduction
Chapter 2: Instructional Systems Development and Project Management
Chapter 3: Instructional Technologies – Definitions and Descriptions
Chapter 4: Instructional Technologies – Selection Criteria
Chapter 5: Instructional Systems Development Considerations for Traditional Media
Chapter 6: Instructional Systems Development Considerations for Computer-Mediated Communication
Chapter 7: Instructional Systems Development Considerations for Interactive Multimedia Instruction and Support Technology
Chapter 8: Instructional Systems Development Considerations for Interactive Video Teletraining
Chapter 9: Instructional Systems Development Considerations for Internet Based Instruction
Chapter 10: Support Technology

Where to read about it

This chapter contains three sections:

Section	Title	Page
A	Instructional Technology	7
B	Technology Insertion	10
C	Distance Learning	12

Additional information

For additional information see:

MIL-PRF-29612 Training Data Products
MIL-HDBK-29612-1 Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services
MIL-HDBK-29612-2 Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education
MIL-HDBK-29612-3 Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)
MIL-HDBK-29612-4 Department of Defense Handbook, Glossary of Training Terms
AF HDBK 36-2235 Volume 4, Manager's Guide to New Education and Training Technologies

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AFDLO reference

The Air Force Institute for Advanced Distributed Learning Distance Learning Office (AFIADLO) Home Page Web site is a source for information and guidance about pertaining to Instructional Systems Development (ISD) and distance learning.

http://www.au.af.mil/afdlowww.maxwell.af.mil/afiadl/

Three key terms

Instructional Systems Development (ISD) is an adaptation of the systems engineering process to the process of curriculum development.

ISD is a systematic approach to developing instructional materials by integrating the processes (phases) of analysis, design, development, implementation, and evaluation.
The ISD process has been traditionally used for the development of individual-type instructional programs.

Technology Insertion is the use of appropriate instructional technology in resident instructional programs.

Distance Learning is structured learning that takes place without the physical presence of the instructor.

References

References are listed in Appendix A.

Section A
Instructional Technology

Introduction

This section identifies the instructional technologies that may be selected for resident instructional programs or employed in the distance-learning environment.

Instructional technologies

Numerous technologies are available for delivering instruction. Most often, these technologies are used in combination with each other to meet education and training requirements at an acceptable cost. The following table lists the instructional technologies that can be utilized used in both the resident classroom and for the non-resident distance learning process.

Instructional Technology	Types	
Traditional Media	Print Print and Slide Print, Audio, and Slide Audiotape	Videotape Audioconferencing Television and Cable Models and Mock-ups
Computer Mediated Communications	Audiographics Computer Mediated Conferencing/Collaborative Computing	
Interactive Multimedia Instruction	Interactive Courseware Computer Based Instruction/Computer Based Training Intelligent Computer Assisted Instruction Electronic Performance Support Systems/Job Performance Aids Computer Simulation	
Interactive Video Teletraining	Interactive Television Video Teleconferencing	
Internet Based Instruction	Text Only Multimedia Virtual Conferencing/Collaborative Conferencing	

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Instructional Technology	Types
Support Technology	Electronic Testing Computer Managed Instruction Advanced Distributed Learning (ADL) Electronic Help Desk Electronic Publications Interactive Electronic Technical Manuals E-mail, Bulletin Boards, and Fax Conferencing Voice Mail Student Response Units, Audioconferencing Units (ACUs)

Table 1 Instructional Technologies

Benefits of incorporating instructional technology

Instructional Technology (IT) is more than just applying information technology to the learning environment; it is making use of technology to promote learning by creating interactive, structured, and integrated units of instruction. When appropriately employed, IT can increase the effectiveness and efficiency of instruction.

When inappropriately employed, the insertion of technology in instructional courses can result in:

Ineffective instruction and substandard learning.
Increased learning time.
Excessive costs for course development, logistics, and maintenance.
Increased personnel requirements.
Unacceptable changes in the training organization's operating structure, functions, and resources.

A process for selection

Instructional designers have long used technology to support learning objectives in:

General Military Education and Training
Operations Training

Continued on next page

A process for selection (Continued)

Professional Continuing Education
Professional Military Education
Graduate Education
Workshops

To make appropriate instructional technology choices, apply a disciplined process to selecting the training solution. Using the Instructional Systems Development (ISD) process helps structure the analysis and design processes to facilitate selecting the selection of the most resource-effective media solution.

This means that instructional designers must understand the benefits and costs associated with each technology option, they must understand the learning needs of the students, and they must understand the impact of the learning environment on the selection of presentation media and course design.

The goal

Each instructional situation presents unique challenges. The goal of this handbook is to familiarize the user with the instructional technology options, the strengths and weaknesses of each, and the techniques and processes associated with managing projects that are based on the effective use of alternative media.

There is a wide array of techniques and processes. It is important to recognize that each IT program is unique – each has different requirements and constraints. It is the responsibility of the project manager to tailor the guidance in this handbook to the unique attributes of a given project.

Section B
Technology Insertion

Application

While the instructor may or may not be present at the time the student is actually using the instructional technology, technology insertion applies **only** to the use of technology to support training instructional programs conducted at the schoolhouse. That is, instructional technologies can be integrated directly into a traditional classroom or laboratory course of instruction, can be used for remediation and self-study to reinforce learning in a resident course, or can be used to augment or refresh training received through a resident program.

Background

Technology insertion is not new. The use of language laboratories where students use headphones to listen to foreign language tapes and then repeat phrases into a microphone so the instructor can monitor their progress represents one example of technology insertion that has been employed for more than 30 years. A more recent example is the use of computer-generated presentations to reinforce learning concepts.

Everything from flip charts to mock-ups to simulators can be used to enhance traditional instruction. As technological options evolve at an ever-increasing rate, project managers, instructional designers, and instructors must understand how these technologies work and how they can help or hinder the learning process. These participants in the development process must understand the roles now assumed (and sometimes funded) by representatives of other organizations; they must understand the infrastructure requirements and how to coordinate the resources necessary to employ the new technologies effectively.

Benefits of technology insertion

Research indicates that the benefits of technology insertion, appropriately applied, can include:

- An increase in levels of interactivity with instructional materials
- An effective method of providing performance measurement tools for assessing student progress and mastery of learning objectives

Continued on next page

Benefits of technology insertion (Continued)

An increase in student retention of instruction over time
Reduction in training time
Reduction in instructor requirements
An increase in the transfer of learning to the operational job environment.

Impact of technology insertion

Technology insertion impacts instructional programs from planning the training project through implementation and evaluation of the course of instruction. Quality technology insertion decisions rely on a structured Instructional Systems Development approach, solid project management, and a thorough understanding of the impact of each media alternative – the impact on learning, on instructional staff, on project development and delivery, and on life cycle cost of the training program.

Section C
Distance Learning

Definition of distance-learning

Distance learning is structured learning that takes place without the physical presence of an instructor. The following key attributes are essential for any Air Force DL program:

Physical distance between learner and instructor.
Academic institution or functional organization sponsorship.
Part of a structured curriculum with stated objectives.
Two-way communication and feedback between sponsor and learner.
Deployment outside the confines of the resident schoolhouse.
Includes process to evaluate program effectiveness.

Background

Distance learning is not new; it has been an effective method of instruction for more than 200 years.

The Boston Gazette ran ads for shorthand lessons by mail in 1728.
Australia's University of Queensland offered an external degree program in the 1890's.
Columbia University offered extension programs in the 1920's, while other schools began using radio for instructional purposes in the 1930's.

Effectiveness of distance learning

There seems to be an assumption that unless a learner is in a classroom to receive face-to-face instruction, the quality of the learning will be compromised. Exhaustive research overwhelmingly suggests otherwise:

Analysis of more than 600 courses spanning more than 40 years proves there is no significant difference in learning outcomes for courses offered at a distance when courses are properly designed and the best medium is selected.
Learning outcomes often *increase* with distance learning because the student is more actively engaged in the learning process.

Continued on next page

Effectiveness of distance learning (Continued)

Thus, there is no direct correlation between face-to-face interactivity and student performance. What is important is the *quality of instruction*, not location.

"The key to success in distance learning is the teacher. If the teacher on the system is good, the technology itself can become almost transparent. Conversely, no technology can overcome poor teaching; poor teaching is actually exacerbated at a distance." – OTA's *Linking for Learning: A New Course for Education*

Application

Distance learning programs are packaged into units of instruction and delivered to users at non-resident education and training sites – such sites range from distance learning centers to learners' own homes. The instruction can be delivered to the user by:

- Satellite networks
- Terrestrial networks (e.g., computer networks, telephone lines, modems, cable TV)
- Mail

There are two modes of delivery for distance learning instruction:

- *Synchronous instruction:* consists of real-time interaction and transmission of instruction, and requires simultaneous participation of all students and the instructor.
- *Asynchronous instruction:* consists of other than real-time interaction and the transmission of "stored" instruction or files that do not require participation of all students and instructors at the same time.

Benefits

Existing resident methods for instructing large groups of individuals generate student travel costs and overhead expenses such as facility operating and maintenance costs. The primary objectives of distance learning are to extend the learning environment (instructor and/or instructional media) to the students at their location or remote site, increase learning opportunities, and ensure mission readiness in a cost-effective manner. Downsizing and reductions in military budgets have

Continued on next page

Benefits (Continued)

required the Department of Defense (DoD) to develop cost-effective methods such as distance learning to educate, train, and certify personnel.

Some of the benefits of distance learning are:

Increased training opportunities.
Timely instruction to multiple or individual students at many locations.
Real-time access to widely dispersed subject matter experts.
Increased flexibility in instructional media and methods.
Increased instructor and instructional media resource sharing.
Increased productivity by providing instruction at student's work area.
Reduced student travel and facility expenses.

Air Force DL goals

Air Force distance learning goals are to:

Create an environment that recognizes the value of distance learning.
Ensure availability of resources to meet education and training requirements.
Ensure Total Force interoperability for all distance learning instructional technology.
Capitalize on appropriate leading edge technology.
Improve educational and training efficiencies where practical and cost effective.

Air Force Distance Learning Points of Contact

DL organizations in the Air Force

Air Force Institute for Advanced Distributed Learning Distance Learning Office: The AFIADLO, located at Maxwell AFB Gunter Annex, was established as the focal point within the Air Force for implementation of distance learning policy and emerging technology. As the hub for distance learning, AFIADL the office provides policy and guidance, as well as consultation and support for the planning and development of distance learning programs.

2 AF: 2nd Air Force is tasked with developing and providing operations (technical) training for the Air Force. 2 AF is actively delivering distance-learning courses using print materials, videotapes, Interactive Multimedia Instruction (IMI), Interactive Video Teletraining (IVT), and the Internet, as well as converting existing resident courses to distance learning formats.

AFIT: AFIT wears two hats for distance learning: (1) AFIT manages the Center for Distance Education and (2) is also the Program Manager for the Air Technology Network (ATN), a satellite-based education and training network.

AFRC: The Air Force Reserves Command (AFRC) is a proponent of distance learning since it can simplify meeting the training and education needs of reservists. AFRC uses T-Net, a two-way video satellite broadcast system.

ANG: The Air National Guard is also a big proponent of distance learning for the same reasons as the Reserve. ANG operates the Warrior Network that is identical to ATN and has more than 200 receive sites across the US.

AU: Air University offers a number of PME and Professional Continuing Education (PCE) courses using various distance learning delivery media including paper-based, IMI, IVT, and the Internet.

Extension Course Program / ECI: The Extension Course Program, formerly the Extension Course Institute (ECI) and now a major component within AFIADL, has operated as the Air Force's oldest distance learning provider institution for more than

Continued on next page

DL organizations in the Air Force (Continued)

40 years. Today, the Extension Course Program ECI offers more than 400 courses including career development and other specialized courses.

MAJCOMs: MAJCOMs use distance learning for MAJCOM-unique training.

Functional Organizations: Functional organizations (e.g., SC, SG, and SE) use distance learning to educate and train members on new requirements in career fields.

In this handbook …

In this handbook, the user is presented with guidance on the processes and tools needed to make informed decisions about instructional technology and distance learning and their application to today's learning instructional needs. While distance learning is not a panacea, it is a viable means to expand the impact of training instructional programs, increase readiness, and develop and maintain critical skills.

Deciding to develop a DL course impacts the traditional development processes. It requires designers to look again at how information is organized. It requires special instructor skills and constant attention to implementation issues. The following chapters, which provide insight into the IT environment with emphasis on distance learning, offer the project manager guidance and best practices to support the IT planning process and discuss each technology as it currently applies to distance learning.

It is important to recognize that technology changes on an almost daily basis. What was just a possibility three years ago is standard practice today. This handbook is designed to provide the user with the framework necessary to ask the right questions as technologies advance and as the role of the instructional developer evolves.

Chapter 2
INSTRUCTIONAL SYSTEMS DEVELOPMENT AND PROJECT MANAGEMENT

Overview

Introduction

This chapter provides an overview of the Instructional Systems Development (ISD) process, an overview of the major processes and principles associated with managing an instructional systems development project, and the special considerations associated with managing an instructional technology and/or DL development project.

Where to read about it

This chapter contains four sections:

References

The material in this chapter is based on the following references:

MIL-PRF-29612, *Training Data Products*
MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*

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References (Continued)

MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*
MIL-HDBK-29612-4, *Department of Defense Handbook, Glossary of Training Terms*
Distance Learning Curriculum Analysis and Media Selection, Air University, Maxwell AFB, AL, 4 Feb 1994
AF Handbook 36-2235, *Information for Designers of Instructional Systems, Volume 4*
AF Manual 36-2234, *Instructional Systems Development*
AFIADLO Home Page web site:
http://www.au.af.mil/afdlowww.maxwell.af.mil/afiadl/

Section A
Overview of the ISD Process

Overview of Instructional Systems Development

Introduction

This section provides an overview of the ISD process and addresses the use of ISD for IT projects. Detailed information on the ISD process may be found in MIL-PRF-29612, *Training Data Products,* and its supporting handbooks.

Analysis phase

The Analysis Phase is the process used to identify the critical tasks that are required for job performance. It identifies and defines those tasks for which education or training must be accomplished.

Course entry requirements are defined (prior education, training, and/or experience).
The target population and training environment are defined.
Mission/job performance requirements are identified to develop a task list.
Critical tasks are identified; education and/or training must be accomplished for each critical task.
The performance standards, performance behavior, conditions of behavior and performance measurement standards are determined for each critical task.
The knowledge, skills, and attitudes (including judgment and decision-making knowledge and skills) required to perform each job task are identified.

The following flowchart, figure 1, describes the ISD Analysis Phase.

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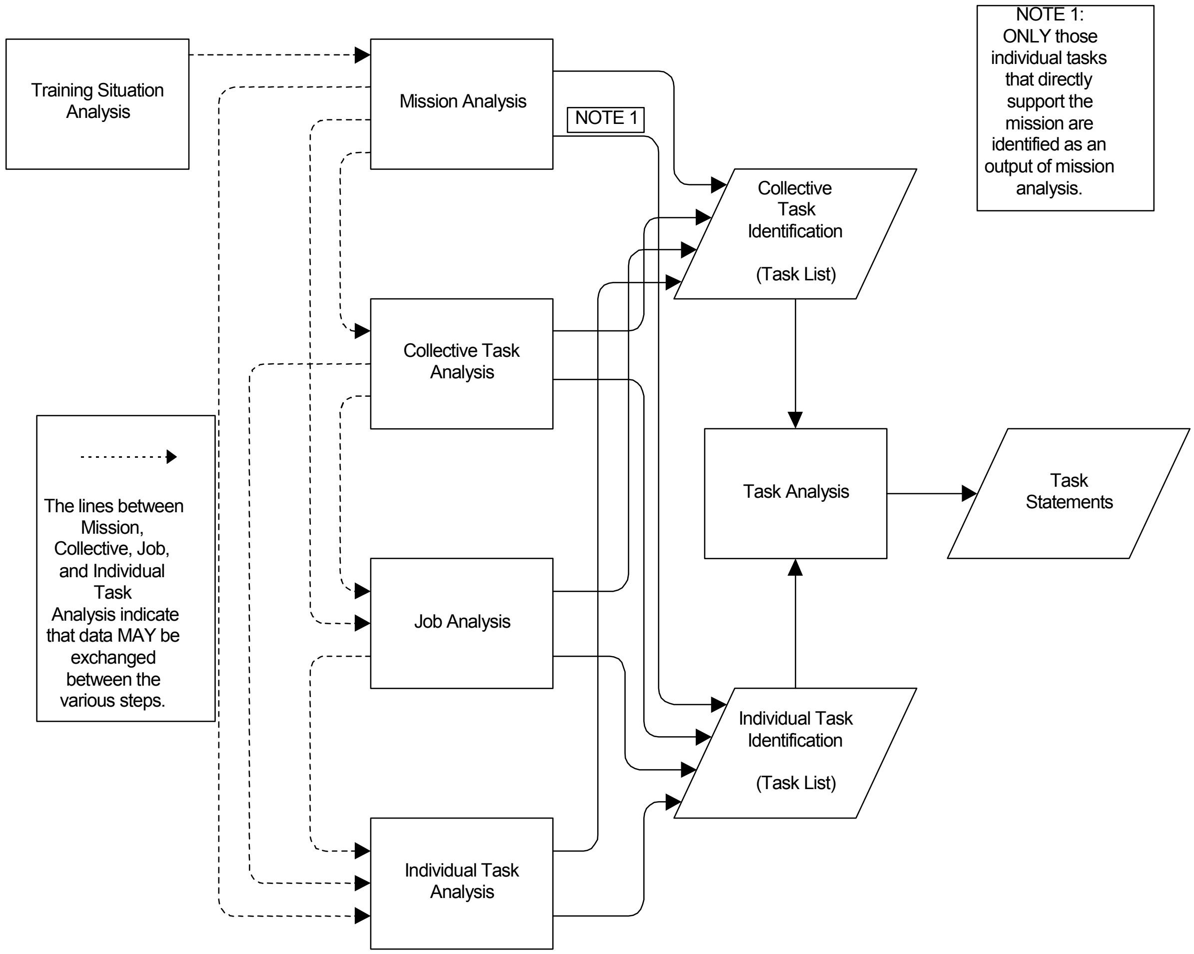
Analysis phase (Continued)

Figure 1 ISD Analysis Phase



Design phase

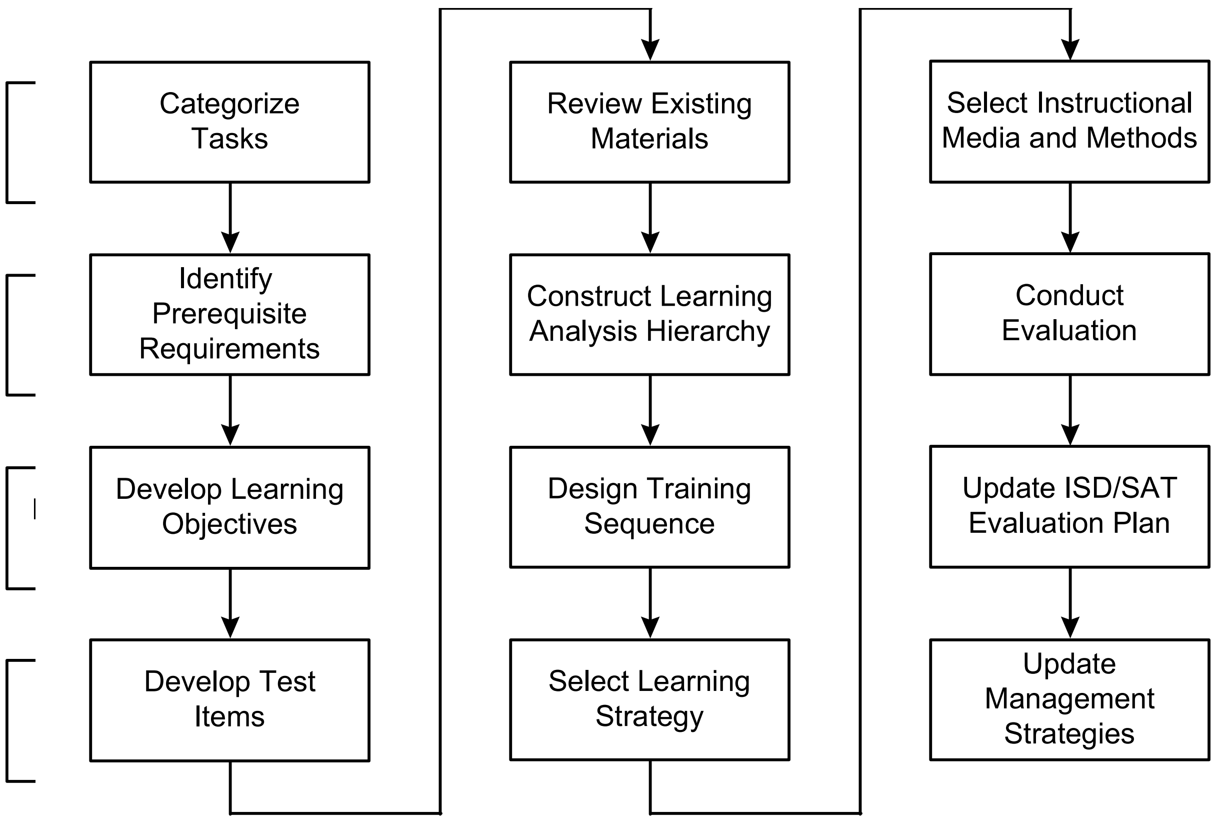
The Design Phase is based on the results of the Analysis Phase.

- Knowledge, skill, and attitude learning objectives are developed.
- Performance test items are developed.
- Existing instructional materials are reviewed for applicability.
- The instructional methods and media are selected.
- The Course of Instruction (phases, units, modules, and lessons) is designed.
- The Implementation Plan for the Course of Instruction is designed.
- A Training Information Management System for the Course of Instruction is designed.

Design process flowchart

The following flowchart depicts the ISD Design Phase.

Figure 2 ISD Design Phase



Development phase

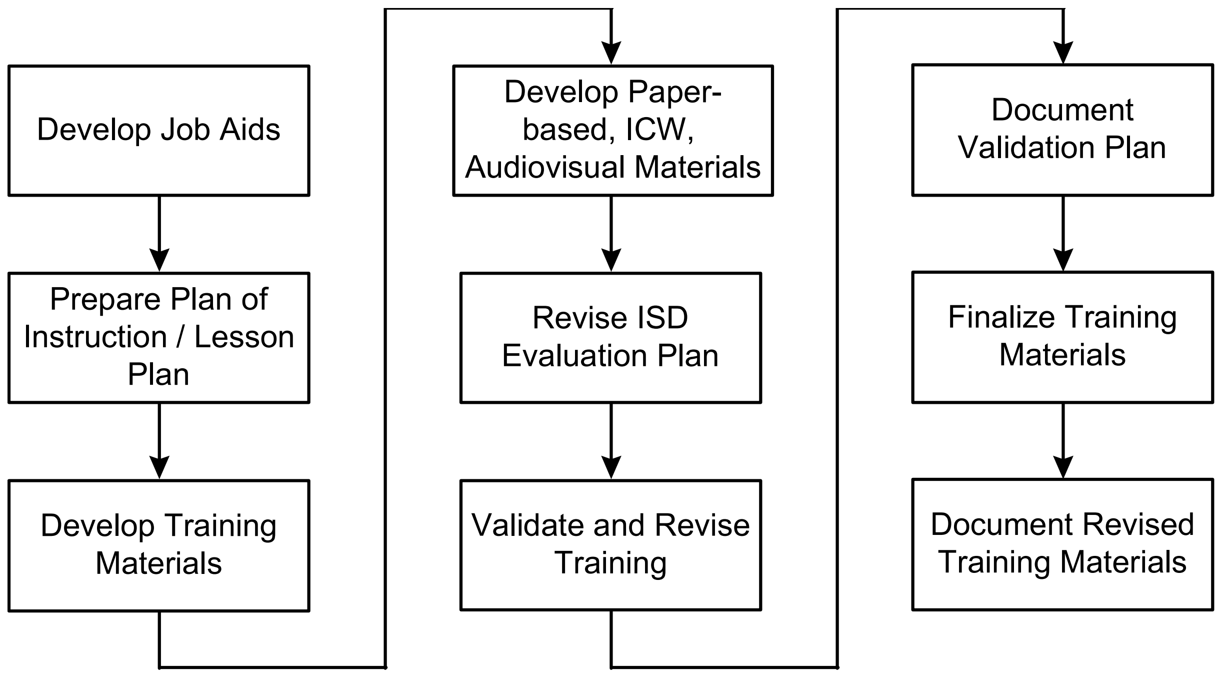
The Development Phase is based on the results of the Design Phase.

The student and instructor lesson materials (instructor guides, student guides, lesson plans and scripts, etc.) are developed.
Instructional media are developed.
The implementation plan is updated.
Formative evaluation of instructional materials and the Course of Instruction are accomplished.
Summative evaluation of the instructional materials and the Course of Instruction are completed.

Development process flowchart

The following flowchart depicts the ISD Development Phase.

Figure 3 ISD Development Phase



Implementation phase

The Implementation Phase is completed after the Design and Development Phases are completed.

The instructional system is fielded.
Operational evaluation (field evaluation) of the instructional system is accomplished.

Evaluation phase

Evaluation is a continuous process that is integrated into each phase of the ISD process. It starts in the analysis phase with the formative evaluation of the development process and products and continues for the life cycle of the instructional system.

It provides feedback used to modify the education instructional or training program as necessary.
It identifies both intended and unintended outcomes so that decision-makers can make necessary adjustments in the instructional program.
It usually involves formal and informal processes that measure the effectiveness of instruction, delivery systems, and support functions.

There are three types of evaluation:

Formative
Summative
Operational

Formative evaluation

Provides information about the effectiveness of products and processes as they are being developed. Performed periodically from initial ISD planning throughout the development phase; can include small-group tryouts of instructional components; used to validate design of individual components of the instructional system for integration. Objective is to identify deficiencies early, when revision is least expensive.

Summative evaluation

Provides information to determine the “summed effect” of instruction under operational conditions. Used to assess full system integration and effectiveness of the individual components; based on an operational tryout of the program (normally 2 or 3 classes) using real student throughput and full instructional system operation. Objective is to ensure that the instructional system is fully integrated and achieves desired outcomes.

Operational evaluation

Includes periodic internal and external evaluation of the instructional program to ensure graduates meet established education and training requirements. Performed periodically from completion of the operational tryout throughout the life of the instructional system. Objective is continuous improvement and maintenance of instructional effectiveness.

Summary

Formative evaluation occurs at each phase of the project and usually involves both an internal review by the team as well as a review and approval by the customer. Formative and summative (try-out) evaluation processes can involve validation of the instruction (conducting a beta test of the instruction) with sample student groups as appropriate. The objective is to identify and address problems before the training instructional program is fully deployed. This can involve the redesign of faulty lessons, resolution of technical problems, and the refinement of support documentation.

The course owner usually conducts the operational evaluation of instructional effectiveness to determine whether the instruction accomplished its intended purpose.

The ISD Process and Instructional Technology (IT)

Introduction

With the increasing use of advanced technologies over the past 15 years, emphasis has been placed on defining the costs and benefits of technology options earlier in the ISD process. Instead of waiting until the design phase to identify the optimum mix of media for a given instructional program, the IT development team will begin considering support and delivery options as it analyzes the course requirements. This section addresses the special considerations associated with the development and implementation of training programs delivered by means of instructional technology.

IT considerations in the analysis phase

Phase 1: Analysis

The analysis phase is very complex. As you will see later in the section on project management, and again in Chapter 4, most project planning decisions are made during this phase. This is when the customer requirements are clarified and defined and plans are developed. Information is gathered through the needs analysis, task analysis, media analysis, audience analysis, infrastructure/ resource analysis, environmental analysis, cost analysis and other sources and processes to enable the IT team to design and develop instruction.

The primary focus of the analysis phase is to establish the boundaries of the instructional program, including:

Requirements

Type of learning required.
Prerequisite knowledge and skill requirements
Requirements and optimum processes for student practice.
Feedback requirements.
Student data file requirements.
Course data management requirements.

Continued on the next page

IT considerations in the analysis phase (Continued)

Program Elements

Scope and sequence of the instructional content.
Optimum instructional media and delivery options.
Optimum level of student interaction.
Pre-testing and testing strategies.
Help functions.
Support materials.
Student tracking methods.

The IT team must evaluate the technical infrastructure and the hardware and software options carefully.

The team will identify current and future hardware and software requirements and resources (including access to broadcast facilities, downlink locations, availability of adequate computers, etc.) and the pros and cons of various instructional technology options.

It is usually not worth it to develop an instructional program in outdated software, just as it is usually not worth it to develop a program that is so state-of-the-art that it relies on hardware that is not available to the end users.

The IT team will examine the costs and benefits of each potential training solution and will strive to identify that solution that will deliver the greatest Return On Investment (ROI). That is, the team must define the approach that, given all of the training factors and constraints, will give the biggest "bang for the buck."

Critical to the process of determining ROI is the accurate calculation of the costs of employing the instructional technology alternatives. The team will not be able to choose intelligently among alternatives if the cost of each alternative is not based on sound analysis. Chapter 4 identifies the cost factors that must be considered when comparing instructional technologies.

During this phase, the project manager and IT team will conduct the required DITIS and DAVIS searches, conduct COTS

Continued on the next page

IT considerations in the analysis phase (Continued)

research, and identify development team training requirements. The project manager also implements the metrics program, the quality control program, and project evaluation procedures.

The selection of the correct medium/media is critical and this decision must be made it is during the Analysis Phase that this decision must be made. Guidance on media identification, planning, selection, and implementation are presented in this handbook. Chapter 3 identifies the media alternatives; Chapter 4 addresses the advantages and disadvantages of each medium; and the subsequent chapters discuss the use of the media alternatives. But the media selection and planning processes must be completed before the project moves into the Design Phase.

IT considerations in the design phase

Phase 2: Design

Because changes during the development and implementation phases are costly, the development team should use this phase to ensure all members of the project understand what the resulting instructional program will look like – before full scale development begins. The design phase documents how the instruction will look and function.

Given the approved approach to training, the project manager should arrange for the required staff training (identified in the project planning) to enable the team to design and develop instruction for the selected media.

The project manager will document the instructional strategy for customer review and approval. This is a high-level description of the design, including the look and feel, navigation, testing, etc. The customer will also review and approve plans for managing student data files.

The team may create a prototype so the customer can actually review the "look and feel" of the design.

Once the prototype and instructional strategy have been approved, the team creates flowcharts and storyboards.

Flowcharts make it clear how the instructional and administrative elements will connect and how to navigate through the instruction.

Storyboards should include screen text, graphics, audio/video scripts, branching instructions, and descriptions of

Continued on next page

IT considerations in the design phase (Continued)

functionality. High level scripts (outlines) for Interactive Video Teletraining (IVT) or Computer-Mediated Communication (CMC) instructors should be developed here. Templates and web page designs for Internet instruction should also be developed at this point.

The customer's role as reviewer is particularly critical during IT design efforts.

The project manager should schedule walk-throughs and review sessions where the team explains to the customer and Subject Matter Experts (SMEs) the decisions made and materials developed.

The customer and SMEs have a responsibility to review the design deliverables (instructional strategy documents, flowcharts/ storyboard web page designs) thoroughly and provide timely, specific, constructive feedback.

Remember that developing a prototype is a good way for the customer to experience the team's vision of how the instruction should be presented. It can save valuable resources later. Be sure to avoid scope creep during this phase.

Instructional technology considerations in the development phase

Phase 3: Development

The length of the development phase depends on the complexity of the project and the accuracy and level of detail achieved during the design phase. Development activities include the pre-production, production, and post-production of the content and various instructional media elements including audio, video, graphics, animations, photos, and coordination of team resources.

Depending on the complexity, this phase can involve graphic artists, producers, directors, editors, animators, narrators, programmers, quality assurance personnel, etc. all working at the same time to create the instructional media elements.

The customer should provide existing instructional media such as photographs, videotapes, graphics, animation, and illustrations. All final instructional media elements must be reviewed and approved by the customer. At this point, changes are costly.

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Instructional technology considerations in the development phase (Continued)

One common problem during the development phase is that there are too many people with a variety of opinions regarding production details (“everyone is a director”). Therefore, the customer should designate one point of contact to represent the collective point of view in any situation.

During this phase, the development team should:

Assemble all of the instructional media elements described on the storyboards into a fully functional application of instructional technology. This is a tedious and exacting process whether creating videotape, interactive courseware, or presentation materials for the IVT instructor.

Ensure the customer has the opportunity to review and approve all instructional media elements. The main purpose of these reviews is to make sure everything on the storyboards is in the instruction and that there are no discrepancies.

Develop the instruction in increments so the customer can review each increment in progress as well as when completed. The team must be vigilant in the area of project scope, however, and not allow the customer to add requirements at this point.

Plan for and document the quality control efforts during this phase. Be sure to conduct a summative evaluation at the end of the development phase to test IT products (especially important for IMI and IBI).

Instructional technology considerations in the implementation phase

Phase 4: Implementation

All the IT products are developed. The customer is satisfied with the product. The materials have been subjected to a rigorous quality control process. Now it is time to deliver the program. Hardware and software integration and compatibility, instructor and student comfort with the technology, and special preparation requirements all combine to create special challenges when the training is based on the use of instructional technologies.

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Instructional technology considerations in the implementation phase (Continued)

If the project involves technology insertion in the schoolhouse, the implementation phase may likely become the responsibility of the instructor or course owner.

Most instructors are comfortable with traditional media and computer-based support materials. Even so, conduct a pilot course where instructors integrate the chosen media into the instructional program and develop an appropriate pace of instruction.

During the pre-production phase for IVT, include rehearsals for instructors with the studio staff. Coach them on techniques such as maintaining eye contact with the camera, setting the stage for the students (helping them become comfortable with the use of the chosen media), and establishing clear-cut rules, procedures, and processes.

Prepare the studio environment for live broadcast if applicable and conduct an equipment check well before, as well as just prior to broadcast.

If the project is DL,

- Ensure that the implementation process is continuously monitored by the appropriate support organizations. Be sure to maintain communications with supporting organizations. The failure to coordinate effectively is never more obvious than during the implementation phase.
- Conduct final coordination with facilitators, field representatives, or site POCs and distribute all materials just prior to implementation (to ensure everyone has the latest version of the training materials).
- Ensure appropriate student help is available for the duration of the implementation phase. (See the next section for information on special DL issues.)

If not already done, the course owner must provide input to the Air Force Catalog (AFCAT), the Air Force Training Management System (AFTMS), and ensure course materials are fielded for student use.

Instructional technology considerations in the evaluation phase

Phase 5: Evaluation

Research indicates that the instructional format itself actually has little effect on student achievement as long as the delivery technology is appropriate to the instructional content and all students have access to the same technology. However, it is important to establish that the chosen media is the appropriate vehicle for the given instruction prior to implementation. An analysis of student data files after implementation will be key in determining the overall effectiveness of the IT program.

Formative evaluations should be used throughout the Analysis, Design, and Development Phases to verify that the selected media is effective in supporting the training learning objectives. Summative and operational evaluations will be the joint responsibility of the IT team, support organizations, and the course owner. The IT team must define and collect appropriate metrics data and forward necessary reports to senior management as requested. See the next section for information on metrics.

The following project management activities should be accomplished during this iterative phase.

- Monitor established milestones, budget expenditures, and development progress against what was planned.
- Compare estimated and actual ROI.
- Review instructional content and materials for accuracy, currency, and availability.
- Monitor processes to measure the impact of instructional technology on student performance and learning outcomes.
- Compile and analyze evaluation results. Analyze student data files.
- Document inspection and evaluation results, including course/instructional deficiencies, support system problems, administrative barriers, efficiencies realized (cost, labor, training time), and other metrics that could contribute to lessons learned and quality improvement of the instructional system.

Section B
Overview of Project Management

Introduction

The desired result of the ISD process is customer satisfaction – which means the delivery of a cost-effective instructional program that adequately meets the established learning need and is provided to the right people at the right time. Project management is the means by which all the planning, analysis, development, implementation, and evaluation actions discussed in the previous section are coordinated and controlled. This section addresses first the planning that must take place before the project even begins and then defines the general management principles and processes associated with an instructional systems development project.

Project Planning

Purpose

The Project Manager's primary tool is the project plan – its proper development and implementation are the keys to delivering a quality instructional program. The project plan can take any one of a variety of forms, from a formal deliverable to a folder that contains the agreed-to plan of action and milestones. The degree of formality is dependent on the scope and complexity of the project.

Regardless of the form it takes, project planning information must be documented — it is used to define the scope of the development project (including deliverables), the resources required to accomplish each phase of the project (including personnel and costs), and the project schedule. In this handbook, the term *project plan* refers to project planning documentation – however formal or informal.

The project plan is the vehicle used to confirm senior management and customer buy-in. It is worth the time it takes to develop, not only because it structures the program, but also because it serves as a convenient tool to make sure there is a common understanding between the development team and the customer about requirements, responsibilities, timelines, and expectations.

Note:

The scope of the project plan depends on the scope of the assigned tasking. If the scope of assigned tasking is limited to defining the instructional alternatives before the customer commits to the development effort, the scope of the project planning might be limited to the Analysis Phase. Once the customer has selected the solution (the desired approach) and expanded the tasking to include the actual development of the instructional program, the project plan is then updated to reflect the entire instructional system development effort.

The project plan is a tool.
It is up to the project manager to make it an effective tool.

Prepare to begin

The project manager begins by assembling all available data about the project.

What does the team have to produce and how is it going to get there?
How will the team know it is on track and doing a good job?
What resources are required to get the job done?
What are the points along the way where the customer will participate in the process?
Who needs to be involved and what are their responsibilities?
What is the experience level of the team?

Each of these questions must be answered and documented BEFORE the IT team gets authorization from senior management to begin its work.

Define the project

There are six major steps associated with project definition.

Step	Definition
1	Identify customer requirements.
2	Define the IT development process, from inputs to outputs of the development process.
3	Define and establish required support processes.
4	Define staffing and resource requirements
5	Develop a master schedule.
6	Obtain senior management buy-in.

Step 1: Identify customer requirements

In order to complete the most critical step in any development process – defining what is required – it is essential that the project manager correctly identify the primary customer. Who is it that must ultimately be satisfied with the product? While there are often several customers of instructional systems, the primary customer is the person or organization that retains decision-making authority. This usually is the training manager, course director, program manager, or an instructor who works directly with the career field functional managers.

Identifying other customers

Other customers of the instructional system include the students, students' supervisors, other individuals who will work with students after they have completed their instruction, and the subject matter experts working with the project. In addition, senior-level managers, MAJCOMs, instructors, and support personnel are customers of the project team. Customer feedback throughout the life cycle of the instructional system is a critical component of the quality assurance process.

Defining the customer's needs

During the Analysis Phase, the requirements and views of each identified customer group must be solicited and defined – the better defined the requirements, the better the chances of fulfilling them successfully. It is impossible to design an adequate instructional system without defining these requirements. The data collected will feed the task, training situation, and media analysis processes as described in MIL-PRF-29612 and its supporting handbooks. Understanding the customer's requirements will help instructional designers determine the instructional delivery media best suited to the training situation and learning needs. Refer to Chapter 4 for a discussion of media selection criteria.

Obtaining and keeping customer "Buy-In"

The ultimate goal is a satisfied customer. And a customer who has helped make decisions along the way is far more likely to feel invested in the final product. The project plan should be built around customer reviews and feedback. If the customer disagrees with the team's solutions or ideas, it is better to find out and make adjustments early in the process. Surprising the customer is the surest road to failure – there is a chance s/he will be satisfied – but there is a greater chance that the team did not anticipate every decision the customer would have made.

Step 2: Define the development process

First, the project manager must think through the entire project from the beginning through to delivery of the end product; it may be helpful to gather trusted advisors and conduct a brainstorming session. Think of the ISD process – what does the team have to do to get through the Analysis Phase? Refer to MIL-PRF-29612 and the supporting handbooks for a detailed description of the ISD tasks the team will have to complete.

Continued on next page

Step 2: Define the development process (Continued)

List the steps, or tasks, required for each phase. Tailor the tasks as appropriate to the scope of the project. Make sure the inputs and outputs of the process are clearly defined – and that the products to be delivered to the customer are identified. Once the list is completed, look at the whole list and make sure all tasks are included and that they progress logically from one to the next.

For each task, identify the information in the following table:

Task Information	Description
Title/Name of the task	Keep It Short and Simple
Purpose of the task	Clearly state the purpose of the task – what is the value added to the project?
Steps necessary to achieve the task	These are subtasks and should be as detailed as is useful. They should be descriptive enough to enable a team member to understand clearly what must be done and how it should be accomplished. There is no need for micro-management, but there is a requirement for clarity. Include In-Process Reviews (IPRs) with the customer and consultations with Subject Matter Experts as well as internal quality control reviews. Include recurring and periodic reports under a project management task; development of such reports takes time and staff resources.
Products resulting from the task	Include draft deliverables and interim deliverables such as sample lessons.
Documentation used in developing the products	Include reference materials, technical manuals (make sure the team has the latest version), Instructional Technology data (information on the technologies and equipment systems to be employed for development and delivery of the product), etc.

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Step 2: Define the development process (Continued)

Task Information	Description
Skills required to accomplish the task	Identify by job and skill level (e.g., Senior Instructional Designer).
Other resources required to accomplish the task	Support tools, software, etc.
Organizations/ Agencies with which the project must interface to accomplish the task	Include internal and external organizations and agencies; identify the points at which interface is essential.
Review and approval process for the task/deliverable	List all reviews (internal and external) and estimated time each cycle will take.

Table 2 Development Process Task Information

Step 3. Define and establish required support processes

There are a number of support processes that must be defined before the planning process is completed. By defining the requirements associated with quality assurance and metrics programs early in the planning process, the project manager ensures that such processes are an integral part of the program and that necessary resources are allocated.

Establish a quality assurance program

Quality assurance is the organized creation of beneficial change to the process of designing and developing products, whether an instructional program or an aircraft. The objective of quality assurance is to foster improvement in the process and products, as they are being designed and developed rather than waiting until after they are implemented. It has become a primary function of Project Management.

Each phase of the ISD process is designed to force project managers and designers to ask the right questions to help focus

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Establish a quality assurance program (Continued)

on the effectiveness of the instructional system – to force them to ask whether some aspect of the system could be improved. Customer satisfaction is the number one goal; and customer satisfaction translates into meeting instructional requirements in the most effective and efficient manner possible.

Continuous improvement of Air Force instructional programs is essential to the readiness of our forces. With decreasing manpower and budgets, instructional designers must find more effective and efficient ways to maintain the skills of Air Force personnel. A proficient project manager will make quality assurance an integral part of the instructional system life cycle management process (from inception through retirement).

Develop quality control procedures

The Quality Control (QC) process, part of the quality assurance program, must be an integral part of the project. The QC procedures should be updated throughout the project to ensure that lessons learned in one part of the project are applied to work remaining to be accomplished. Include the following in the QC procedures:

Establish a review and approval process to make sure that all products meet quality standards. A form documenting a deliverable's progress through the QC process should be developed and retained with the deliverable files.

The review and approval form should be filled out and attached to each product associated with a lesson. As the product is reviewed and approved, the approving authority should sign the document. The document should be complete for each product associated with the lesson. The primary author should date the form to tell the reviewer when the review must be completed. The form should not be signed until all suggested corrections are made, checked, and approved. Disapproved products should be returned to the author for correction.

QC is the collective responsibility of the entire development team. Each member should be assigned specific review and approval duties.

Make sure the quality control steps for each task are included in the project planning.

Develop project metrics

Establish the means by which project progress will be measured. Some organizations have established reporting processes that dictate the data the project manager needs to collect, analyze, and present to senior management and the customer. Metrics and reporting requirements for DL projects have been defined by the AFIADLO. The project manager should investigate current requirements before establishing and integrating a metrics program into the project.

Track costs

Make sure you have a process to collect and track costs associated with the project. You will have to estimate costs prior to initiating an IT project and monitor actual costs associated with project development. More information on cost analysis and cost models is included in Chapter 4.

Step 4. Define staffing and resource requirements

The required skill levels for each task were defined during the initial step in this process. They indicate the type of expertise needed for the project team. The required implementation date directly affects the number of people required. Given enough time, one highly skilled person could probably develop an entire IT program. However, there is usually a point at which assigning more people to a task does little or nothing to accelerate the schedule. Therefore, scheduling constraints must be identified early in the process. Be prepared to recommend contract and outsourcing options if in-house resources are scarce.

Given the tasks, the skill requirements, and the schedule, identify the numbers of people required to accomplish each task. *Don't forget to identify the staffing requirements for life-cycle maintenance of the course after the IT product is implemented.* Sometimes senior management will require that staffing requirements be expressed in hours, other times they require that staffing be expressed as FTEs (Full Time Equivalents). The bottom line is that the project manager must determine how many people and what skill mix is required to accomplish each task.

The project manager will map out a staffing requirements chart, which shows when the various staffing resources are required to support the established schedule.

Refine team composition

Once all of the tasks are analyzed to define staffing requirements, it is good practice to back up and look at the staffing plan as a whole. Review the tasks, schedule, and staffing plan. Look for ways to realize efficiencies.

> Can tasks be staggered more effectively to make better use of staff?
> Are there coordination or support functions that have been overlooked?

The challenge is to optimize staffing resources – to have enough staff so that the work can be accomplished without driving everyone over the edge, but to tailor the process and staffing carefully enough so that team members are not sitting around waiting for others to finish their tasks.

Define IT team positions and responsibilities

With staffing requirements defined, identify the general roles and responsibilities of each position. Team member position descriptions may be modified to accommodate the individual strengths and weaknesses of team members as the development team evolves.

The project plan is also the place to explain how the staffing resources will be organized. Subteams should be identified and associated responsibilities defined.

More information on IT Team composition is included in Section C.

Identify resource requirements

Identify other resources needed for the project. Be sure to include facilities and equipment requirements, needed software and development tools, and services or resources needed from support organizations.

Step 5. Develop a master schedule

The project manager must identify any scheduling or time constraints that impact the staffing and resource requirements. Include any events that will affect the development schedule. Often, there is a target date by which the instructional program must be delivered (e.g., for an equipment maintenance-training program, the training schedule might be driven by the delivery of the new equipment system to the initial installation site).

Working back from the required delivery date, define the schedule for each task. Some tasks can be done concurrently while others are dependent (when the results of one task must be available before another task can begin). Include the review and approval cycles for each deliverable.

Based on the length of time it will take to accomplish each task, identify the start and end dates. This is usually developed using a scheduling software package, but can be accomplished manually on graph paper.

When the project schedule is drafted, examine it carefully and make sure it makes sense. Make adjustments based on revised task sequencing and dependencies. Software tools can be used to develop GANTT or PERT charts that reflect task sequence and dependency.

Incorporate staffing and resource requirements

Insert staffing and resource requirements data into the schedule. This is a critical component of the project plan. The master schedule should give a clear overview of what needs to be accomplished, when it will be accomplished, who is responsible for accomplishing each task, and when the customer and SMEs will participate in the process. Validate and adjust as necessary the staffing resources assigned to each task.

Step 6: Obtain senior management buy-in

The project manager must ensure that managers and customers understand the scope of the project and the impact it will have on manpower, budgets, and schedules. The best way to ensure customer and managerial support is to obtain their approval of the project plan. The first step in getting buy-in is to establish a reasoned, well-planned view of the proposed project.

Assemble the project plan

Assemble the data to tell a solid story. Include the following:

What does the team have to produce and how is it going to get there?
- Task list
- Deliverables
- Life-cycle support
- Development team structure

How will the team know it is on track and doing a good job?
- Master schedule (GANTT or PERT charts)
- Internal evaluation procedures/Quality assurance program
- In-process reviews with the customer
- Project metrics

What resources are required to get the job done?
- Staffing
- Facilities/Equipment/Networks
- Software/Development tools

What are the points along the way where the customer will participate in the process?
- Review and Approval Cycles
- In-Process Reviews

Who needs to be involved and what are their responsibilities?
- Coordination with other organizations/agencies
- Upper management responsibilities
- Customer/SMEs

Remember that this information can be compiled into a formal Project Plan, a Plan of Action and Milestones (POA&M) chart, listed in an MOA/MOU with the customer, or summarized in a briefing for senior management. In any event, the project manager and the development team will use the planning documentation on a daily basis – its form should support that purpose.

Management "buy-in"

The project manager may be required to submit the project planning documentation for internal review and approval before it is formally reviewed with the customer. It is the project manager's responsibility to ensure that all senior management questions are adequately addressed.

Keeping management informed is the key to success. Submit both formal and informal reports to senior management to make sure they know how hard the project team is working, how well the project is being managed, how pleased the customer is.

But don't hide bad news. Don't let issues grow until they are full-blown problems. Define the problem carefully and develop a plan of action for addressing it. Explain the risks and costs and explain why this approach is the best way to solve the complete problem.

It is important to recognize that the morale of the entire project team can be deeply affected by the way management views the project. Get senior management involved early and then maintain the dialog. Let them know the project team values their advice and support.

Commitment of resources

Obtaining resources frequently requires endorsement or approval of senior management. It is prudent project management to involve senior management early, to identify project support requirements early and clearly, and to keep senior management informed about issues before they become problems. The course owner or customer can often help identify (and emphasize to senior management the importance of) support resource requirements.

Identify and obtain senior-level management endorsement or approval for:

- Purchasing hardware, software, or curriculum materials.
- Training for the project team.
- Facility resources.
- Manpower and support personnel.
  - Selection, training, and assignment of personnel.
  - Obtaining assignment longevity/commitment of personnel resources.

Summary of project planning activities

The following list summarizes the planning activities accomplished by the project manager. It provides some reminders and key points to consider while developing and managing the project plan.

Analyze Requirements

Validate the instructional need.

Analyze alternative media solutions to the instructional problem; conduct cost/benefit and ROI analyses to define the optimum IT solution. Identify the recommended solution in the project planning documentation. (See Chapter 4).

Identify management constraints (including cost and schedule constraints) that could affect development and implementation of the instructional system.

Plan for system resource requirements including funding, equipment, personnel, facilities, and maintenance. Plan to monitor resource utilization throughout the project cycle and track project costs.

Develop Strategies

Develop and document the management strategy for the development, implementation, and life cycle support of the instructional system.

Develop a POA&M for each phase of the project to reflect all associated tasks and the related task performance schedule.

Identify and establish liaison with related support organizations (e.g., faculty development, information management, and facilities).

Establish a metrics program. Determine what data will be collected, who the recipient of the data will be, how often it needs to be collected, data sources, and what the purpose of the data is (what it will be used for). Allocate resources for metrics program design and implementation as well as data collection and processing.

Ensure the project planning documentation incorporates an appropriate quality assurance program to include formative, summative, and operational evaluations.

Ensure project-planning documentation reflects on-going customer involvement in the design, development, and implementation of the training instructional program through periodic reviews and working sessions.

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Summary of project planning activities (Continued)

Staffing

Identify staffing requirements and establish project team membership; ensure appropriate cross-functional representation (e.g., subject matter experts, user group representatives, instructional designers, graphic artists, evaluation specialists, and technical writers). Plan for any additional staff training, if necessary. (See next section on Instructional Technology Teams).

Define team operating guidelines and clarify roles and responsibilities. Monitor the team to ensure all members fulfill his/her/their responsibilities.

Make recommendations for contracting out the project if in-house resources are inadequate to meet the need in the specified timeframe.

Plan for the certification of instructors and instructors' supervisors, site and subject matter facilitators, and continuation training programs to ensure continued qualification of the instructional staff.

Implementation

Obtain senior management and customer approval to implement the project plan. Keep them in the loop throughout the project.

Implement the plan and manage the ISD process.

Provide briefings on the status of the project and adherence to the project plan.

Avoid scope creep. Do not allow the customers or a creative development team to add unnecessary bells and whistles or to broaden the scope of the project without solid justification. When things change (as they always do), assess the impact on scheduling and budgets. Do not incorporate the change until required contractual actions have been completed. Once management has approved the change, adjust the project plan accordingly.

Section C
The Instructional Technology Development Team

Introduction

The project manager must identify special skills required to fulfill project requirements. This presents special challenges to the manager of an Instructional Technology project. This section explains the special skill sets that may be required for successful development and implementation of an IT program. It is provided to help the project manager tailor the skill mix of the IT development team to the unique features of the project. This section also provides suggestions for getting the IT development team organized and off to a solid start.

IT team

The development organization should have a core management team that serves to organize and coordinate all IT resources regardless of the type of IT project. The IT Team comprises key members who ensure the following essential functions are established and coordinated (some members may oversee more than one function).

Table 3 Roles and Responsibilities of the IT Team

IT TEAM	
Role	**Responsibilities**
Project Management	This function ensures the capability to direct the overall development process, including coordination of projects with senior management and support organizations. A project manager is assigned for each project.
Subject Matter Expert (SME)	This function Coordinates the identification and provision of subject matter expertise. SMEs are those who have a thorough knowledge of a job, tasks/duties, or a particular topic and are qualified to assist in the instructional development process. SMEs review lessons and instructional material for technical accuracy and currency. They may also author lessons as required.
Instructional Design	This function ensures the capability to develop standards and instructional strategies for lessons. Instructional designers may assist with lesson authoring when required. They review completed lesson designs, flowcharts, and storyboards for instructional integrity and conformance with standards and strategies.

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IT team (Continued)

IT TEAM (Continued)	
Role	**Responsibilities**
Instructional Development	This function ensures the capability to author lesson designs, flowcharts, and storyboards for the selected medium. Instructional developers design and/or create static and animate graphics, performance exercises, simulations, and interactive sequences. They also program lessons with authoring systems, write scripts and narration, develop home pages and hot links, etc.
Registrar	This function ensures the capability to register students properly for a course, track student progress through a course, and update student records.
Visual Information Support	This function ensures the capability to develop and control audio-visual material such as slides, filmstrips, audiotapes, and videoclips. Visual information support specialists manage audio-visual equipment, broadcast facilities and video production capabilities. They also assist with graphics support.
Quality Control	This function ensures the capability to establish procedures for the continuous monitoring of ISD processes and the review of all materials and products produced by the IT development team.
Evaluation Support	This function ensures the capability to establish and implement an evaluation program. Evaluation support specialists develop processes and materials to gather information about student performance and satisfaction. They also assist with overall program evaluation and the collection of metrics data. Usually, this function is performed by course directors, training managers, instructors, or a formal office to identify standards and evaluation processes.
Student Support*	This function ensures the capability to assist students with administrative functions and help solve technical problems that students have. Student support specialists may establish an electronic “help desk”, or on-line support provided throughout the implementation of a training program.
Production, Editing and Distribution*	This function ensures the capability to produce, duplicate, and distribute course materials to students or remote-site locations. This may involve editing, formatting, and production of print materials, computer discs, or electronic publications.
DL Site Administration*	This function ensures the capability to schedule and implement DL courses in the field, usually at base-level DL Centers within the educational services office (ESO) or through a Job Site Training POC.
* – denotes functions of particular importance to DL	

IT Development Team Roles and Responsibilities

Define functions and responsibilities

In the project definition phase, the project manager identified the staffing requirements for the specific IT project. Now a development team must be put together.

Each development team comprises members who perform different functions. They come from academic, technical, support, contract organizations, etc. to ensure a systems approach to project development and execution.

A team member's assigned responsibilities should be based on his/her individual area(s) of expertise related to the type of instructional technology used in the project. Some members may perform more than one function. If the project is large is scope, several people may be required to perform the same function.

Whatever the team composition, the project manager must ensure that roles and responsibilities are clearly defined. Only then can subteams and team members begin to function effectively and be held accountable.

These functions are a guide. Based on available manpower, some team members may fulfill multiple functions.

The following paragraphs identify the special skill sets that will be required to develop and implement various instructional technology programs. These descriptions are provided as a checklist for the project manager as s/he refines the composition of the development team. The use of these resources may be coordinated through the IT Team.

Specialized Skill Sets

Special skills

Depending on the IT employed, the development team will require specialized expertise. The following charts identify the key skills required for each of the technologies addressed in this handbook. Multiple skills may be provided by an individual, depending on the scope of the IT project and the skill set of the individual.

CMC functions

For a Computer Mediated Communication development project, the development team may require the following additional functions described in Table 4.

CMC FUNCTIONS	
Role	**Responsibilities**
Instructor	Hosts the learning session. Defines ground rules, introduces thread, guides discussion, asks questions, integrates responses, summarizes, and ends session.
Support Staff	Handles the administrative actions needed to support a computer mediated conference such as taking registration, mailing instructional materials, publishing the help desk number, compiling critiques, etc.
Instructional Designer	Develops standards and instructional strategies for computer mediated conferencing lessons. Assists with lesson authoring when required. Reviews completed lesson designs and flowcharts for instructional integrity and conformance with standards and strategies.
Courseware Developer	Authors lesson designs and flowcharts. Designs and creates performance exercises, simulations, and interactive sequences.
Webmaster	Works with the courseware developer and instructional designer in the creation of the course by providing technical assistance for Web issues.
Help Desk	Is available up to 24 hours a day to handle technical questions or problems for both instructors and learners.

Table 4 Roles and Responsibilities in a Computer Mediated Communication Project

Interactive audioconferencing functions

To conduct an interactive audioconference (either as technology insertion or DL), the IT development team may require the following additional functions described in Table 5.

INTERACTIVE AUDIOCONFERENCING FUNCTIONS	
Role	**Responsibilities**
Moderator	Hosts the learning session. Conducts roll calls, introduces speakers, defines ground rules, guides discussion, defines breaks, summarizes, and ends session.
Support Staff	Handles the administrative actions needed to support an interactive audioconference such as taking registration, mailing instructional materials, reserving and publishing the audiobridge number, establishing the conference call, compiling critiques, etc.
Content Expert	Can be the course instructor or a guest speaker.

Table 5 Roles and Responsibilities in an Interactive Audioconference Project

IMI functions

For an Interactive Multimedia Instruction development project, the IT development team may require the following additional functions described in Table 6.

IMI FUNCTIONS	
Role	**Responsibilities**
Courseware Developer	Authors lesson designs, flowcharts, and storyboards. Designs and/or creates static and animate graphics, performance exercises, simulations, and interactive sequences. Programs lessons with authoring systems.
Courseware Programmer	Programs lessons with authoring systems or programming languages. Develops static and animated graphics with authoring languages. Assists in converting American Standard Code for Information Exchange (ASCII) code when automatic conversion is unavailable. Develops subroutines and writes applications to read/analyze student data files.
Graphic Artist	Develops graphics, and is the advisor for visual conventions.
Media Specialist	Films motion and still-frame sequences. Coordinates audio narration. Assists in planning pre-master media layout.

Table 6 Roles and Responsibilities in an Interactive Multimedia Instruction Project

IVT functional team For an Interactive Video Teletraining development project, the IT development team may require the following additional functions described in Table 7.

INTERACTIVE VIDEO TELETRAINING FUNCTIONS	
Role	**Responsibilities**
Scheduler	Schedules uplink/broadcast facilities for rehearsals and broadcasts. Ensures that downlink facilities are identified and scheduled to receive programs. Also, schedules programming with satellite/network manager. Enters program schedule into annual and quarterly DL Guide.
Instructor	Presents live instruction to DL audience using teaching skills and techniques suitable for IVT delivery. Usually a subject matter expert who has completed the required IVT instructor course and understands the dynamics of this instructional environment.
Producer/Director	Actually puts the live broadcast out to the network. Works with the instructor to ensure best delivery of lessons, recommends corrections to slides and graphics not designed for TV, edits prerecorded videos, and designs and produces video graphics. Conducts training for new instructors.
Videographer	Operates camera during the actual broadcast unless remote cameras are used.
Engineer/ Equipment Maintainer	Keeps video and related equipment in good working condition. Talks with the network management center (satellite manager) to ensure proper broadcast electronics to the satellite. Operates audio bridge during live broadcast. Works with downlink sites to ensure proper alignment of equipment, and to help identify downlink IRD numbers and POCs.
Production Assistant	During live broadcast is responsible for audio output, graphic generator, videotape inserts, clock, and video taping of broadcast.
Broadcast Center Manager	Overall manager of the studio. Usually schedules equipment, personnel, and equipment purchases and may serve as program scheduler. Develops procedures for quality control and customer satisfaction. Maintains records for studio utilization, costs, and other metrics data.

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IVT functional team (Continued)

INTERACTIVE VIDEO TELETRAINING FUNCTIONS (Continued)	
Role	**Responsibilities**
Subject Matter Facilitator	Facilitates instruction at a downlink site through such things as overseeing special projects or practical exercises, observing hands-on activities, facilitating guided discussion, monitoring tests, and answering questions. Usually this person has completed special training or certification prior to assuming this role.
Job Site or DL POC	Organization or person at base level responsible for all aspects of Technical Training DL administration.
Site Coordinator or Site Monitor	Person at base level who ensures the downlink classroom and equipment are ready to use. Assists Job Site or DL POC or Subject Matter Facilitator in using the classroom equipment and by providing minor administrative support.

Table 7 Roles and Responsibilities in an Interactive Video Teletraining Project

IBI functional team For an Internet-Based Instruction development project, the IT development team may require the following additional functions described in Table 8.

INTERNET-BASED INSTRUCTION FUNCTIONS	
Role	**Responsibilities**
Webmaster	Manages the Web site. Provides configuration control of Web based content and maintenance of information presented. Develops procedures for quality control and customer satisfaction.
Server/Systems Administrator	Responsible for information security and stability, as well as hardware/software management. Maintains network system and trains staff on use.
Programmer	Programs lessons in selected authoring languages (e.g., HTML, Java, ActiveX). Integrates media and source materials into structured instructional format. Develops subroutines.
Authoring System Specialists	Ensures compatibility and compliance with established standards. Selects media presentation techniques and software. Implements programming standards and guidance in the development of new courseware, as well as conversion of existing courseware.
Graphic Artist	Develops graphics and media content in the appropriate format utilizing compression and optimization techniques. Advisor for visual conventions. Ensures graphic conventions and screen presentation quality and consistency.
Instructor	Subject matter expert who has completed the IBI instructor course and understands the dynamics of this instructional environment; responsible for coordinating the learning process. Can communicate with students on-line via e-mail or via other media (may establish supporting audioconferences to discuss related topics with groups of students).
Help Desk	Provides responsive support (either on-line or via e-mail) to student questions about system operation. Requires internet expertise as well as expertise on software application(s) employed.

Table 8 Roles and Responsibilities in an Internet-Based Instruction Project

QC team responsibilities

While quality control is the collective responsibility of the entire IT development team, each member should be assigned specific review and approval duties. Examples are provided in Table 9.

QUALITY CONTROL RESPONSIBILITIES OF IT DEVELOPMENT TEAM MEMBERS			
	A	**B**	**C**
	Position Title	**Quality Control Responsibility**	**Significance of Review and Approval Sign-Off**
1	Courseware developer	Authors an easy-to-understand, technically accurate lesson that is consistent with design documents.	Product has been reviewed and is judged to be satisfactory and consistent with design documents.
2	Instructional designer	Reviews lesson products for instructional integrity and conformance with design documents.	Product has been reviewed and is judged to be instructionally effective and consistent with design documents.
3	Subject matter expert	Reviews lesson products for technical accuracy, currency, and completeness.	Product has been reviewed and is judged to be technically accurate, current, and complete.
4	Courseware programmer	Programs lessons according to design documents and storyboard instructions. Assists in the development of clear, easy-to-read graphics according to storyboard instructions. Checks all lesson paths, especially in test and evaluation components.	Operational lesson has been reviewed online and is judged to be "bug"-free and to operate as specified. Static graphics are clear; animated graphics operate as specified and correct video and graphics are called into lesson at the correct location.
5	Graphic or computer artist	Develops clear, uncluttered, easy-to-read graphics according to storyboard instructions.	Online graphics have been reviewed and are judged to be correct, clear, and easy to read.
6	Media specialist	Produces high quality, clear videotape according to shot list and storyboard instructions.	Videotape has been reviewed and is judged to be high quality.

Continued on next page

QC team responsibilities (Continued)

QUALITY CONTROL RESPONSIBILITIES OF IT DEVELOPMENT TEAM MEMBERS			
	A	**B**	**C**
	Position Title	**Quality Control Responsibility**	**Significance of Review and Approval Sign-Off**
7	Quality specialist	Reviews lesson products for instructional integrity and conformance with design documents.	Product has been reviewed and is judged to be instructionally effective and consistent with design documents. Operational lessons are user-friendly and consistent.

Table 9 Quality Control Responsibilities of Team Members

Support Functions and Organizations

Introduction

The development of an instructional program often requires the support of other organizations. Table 10 lists the major functional groups and organizations with which the project team may need to interface. It is important that the IT development team utilize experts from these areas as appropriate. The use of these resources is also coordinated through the IT Team.

Organization	Related Functions
Civil Engineering	Constructs training and support facilities such as classrooms and test pads Modifies existing facilities (e.g., adding new electrical outlets and air conditioning, building multimedia labs).
Resource Management	Provides human resources (e.g., instructors, instructional system designers, maintenance personnel, and database developers). Manages training and support equipment. Provides funding for day-to-day operations.
Information Management	Edits instructional material such as student workbooks and student study guides. Produces instructional material such as student handbooks and plans of instruction.
Contracting	Develops contracts for courseware development, maintenance, and other services. Processes local purchase forms to procure equipment and supplies. Processes outsourcing and privatization efforts.
Maintenance Organization	Performs quality assurance inspections on instructional, support, and test equipment. Performs scheduled and unscheduled maintenance on instructional, support, and test equipment. Fabricates trainers and training aids.
Communication and Computers	Manages local communication network and infrastructure. Develops and implements plans for local network expansion, integration, and interoperability.

Table 10 Functions of IT Support Organizations

Establishing The IT Development Team

Introduction

The master schedule has been developed. The skill set requirements have been defined. The roles of all project team members have been clearly delineated. Senior management and the customer understand and concur with the project plan. It is now time to assemble the development team, share information on the project, obtain support tools, and define staff training requirements. In brief, the development team must get ready to implement the project plan. This section includes guidance for establishing and preparing the project team.

Implement staff training requirements

The key to determining team members' training requirements is to examine the background of each team member. If members do not have experience with the specific technology and/or tools being used on the project, they are likely to need some training. For example, before beginning the design phase for IVT development, instructors, instructional designers, and instructional developers should attend the video teletraining/teleseminar course.

The project manager should develop a list of recommended staff training and review it with each team member – the best source of information in this case is the individual team member. The cost of staff training must be factored into the overall project budget.

Conduct the kick-off meeting

The project manager should have met with each member of the development team to clarify roles and responsibilities and define training requirements. The purpose of the kick-off meeting is to assemble the team and begin the process of integrating the team resources.

In order to perform effectively, the members of the IT development team must:

Include and instructor skilled in the given technology.
Know the subject (SME participation is critical).
Know what is expected of the team as a group as well as the nature and scope of each individual's responsibilities.

Continued on next page

Conduct the kick-off meeting (Continued)

Know what products are required, and when they are to be delivered.
Know how products will look and function within the user organization or DL environment.

The development team members will need copies of documents that explain how they are supposed to do their jobs. They should also receive documents that are required to develop the training program. These documents include the following:

MOU with customer
Project planning documents
Development process outline
Quality control procedures
Support tools and documentation (e.g., hardware/software and user's manuals)

The kick-off meeting is the time to review the project planning with the staff, clarify roles, responsibilities, timelines, and expectations, and ensure that the team composition is appropriate for the effort.

Note: It takes time to build an effective team. The project manager might consider using a trained facilitator to orchestrate the kick-off meeting. The facilitator could help the team define its goals, ground rules, and essential team processes.

Meet the customer

Inviting the customer to meet the development team helps both the customer and the development team members. The customer has an opportunity to discuss his/her view of the project and to express any concerns about pressures or constraints. The development team members get to see the person they are working for and to hear firsthand what the customer thinks. This meeting may be the appropriate forum for the following actions:

Introduce the staff and summarize the skills of each member in terms of what s/he brings to the team.

Continued on next page

Meet the customer (Continued)

The development team will explain the process and the services they provide. If there are any questions about roles and responsibilities, now is the time to answer them and to work out any problems.
Conduct a question and answer session. Discussing – and documenting – the issues up front will avoid misunderstandings later that could seriously affect production, milestones, and the delivery schedule.
Make sure all members of the team understand the customer's requirements.

Clarify customer responsibilities

The customer has certain responsibilities, which are often included in a written MOU and reviewed at the kick-off meeting. The customer should agree to the following roles and responsibilities during the planning phase:

Pre-Startup

Designate one point of contact for the project (customer representative).
Commit to spending a considerable amount of time working on the project, especially in the early phases.
Provide the development team access to the target audience.
Provide timely and complete access to all course documents, systems, and other information requested by the team.
Dedicate the appropriate number of SMEs for the life of the project – substituting SMEs will significantly delay delivery.

Project Implementation

View as many instructional media products as possible to determine what design or structure works for the course content. Make preferences known at the beginning of the project.
Set aside time to thoroughly review all deliverables (storyboards, flowcharts, graphics, scripts, etc.)
Give specific, constructive feedback and include examples.
Be flexible! Circumstances change frequently and rapidly.
Avoid scope creep (expanding the scope of the project).
Alert the project manager to any new developments or course changes (planned or actual) that may impact the project.

Continued on next page

Clarify customer responsibilities (Continued)

Ensure proper coordination with higher headquarters and functional managers.

Follow-up

Take action to input new course information and changes into the Air Force Catalog of Formal Schools (AFCAT), the Air Force Training Management System and broadcast schedules as needed.
Ensure course materials are fielded for student use.
Market new DL courses and programs to the DL community.
Conduct operational evaluations and give feedback to the team.

Refining IT development team composition

Once all of the tasks are analyzed to define staffing requirements, it is good practice to back up and look at the staffing plan as a whole. An IT development team must meet these general requirements:

Must have a variety of experiences in Instructional Systems Development (ISD).
Must include members who have expertise in the selected instructional technologies to be developed.
Should be scaled to the size and scope of the project and include enough people (manpower) to meet critical deadlines.

Section D
Distance Learning Project Management

Introduction

The management of a Distance Learning (DL) project requires all of the diligence described in the previous sections on project management. However, there are special considerations associated with DL, and the project manager must ensure that all of these factors are reflected in project planning documentation. This section describes those peculiar aspects of DL that must be considered when planning the project and allocating resources. It also addresses the metrics associated with assessing the effectiveness of the DL program and special issues associated with the conversion of conventional training programs to DL format.

What's different

DL simply means that the student and instructor are separated. Virtually any media can be employed for DL – correspondence courses can use paper or computer-based training, an instructor using IVT can employ videographs, videos, or audiotapes for reinforcement, etc. The development of a DL training program must be based on the selection of the media appropriate to the instructional objectives and training environment. Chapters 5 through 9 details the special considerations associated with the selection and use of the various instructional technologies.

When planning to implement a DL program, the development team must be sensitized to the DL environment; learning strategies appropriate to that environment must be incorporated into the program. For example, the students must be allowed to become comfortable with the delivery medium. The instructors must learn to make the most of the instructional technologies – it takes practice to talk to the camera and teach with little, if any, immediate student feedback.

A solid understanding of the DL learning environment is a critical component of the DL project manager's tool kit.

DL planning and organization

In developing or adapting distance instruction, the instructional objectives often remain basically unchanged, although content presentation requires new instructional strategies and additional preparation time. The planning phase of DL project management must be used to identify and define all obvious and hidden costs and resource requirements. The project manager should be versed in instructional technology options and their use in the DL environment.

DL Planning and Organization	
Strategy/Guidance	**Implementation/Impact**
Begin the course planning process by studying distance education research findings.	Appropriate research facilitates the identification of resource requirements and lessons learned that might be applied to the project being planned.
Before developing something new, check and review existing materials for content and presentation ideas.	There may be modules already developed that could be incorporated in part or in their entirety into the new IT program thus reducing development requirements. New presentation concepts can increase the effectiveness of training and add to the inventory of presentation options. Adequate research time should be built into the schedule to assess existing military and commercial courseware inventories.
Analyze and understand the strengths and weaknesses of the possible delivery systems available (e.g., audio, video, data, and print) not only in terms of how they are delivered (e.g., satellite, microwave, fiber optic cable, etc.), but also in terms of learner needs and course requirements before selecting a mix of instructional technology.	By fully understanding the options and examining them in light of requirements, the development team can make better recommendations about appropriate presentation and delivery options. The project manager should ensure that research materials are readily available to the development team. Research can be conducted in the field as well as at the development site; an on-site visit to a DL site targeted to receive the DL program may be extremely valuable to the development team.

Continued on next page

DL planning and organization (Continued)

DL Planning and Organization (Continued)	
Strategy/Guidance	**Implementation/Impact**
Hands-on training with the technology of delivery is critical for the development team, the teacher, and the students.	Factor in time for the development team to practice with the delivery technology so that they gain an appreciation of the teaching and learning environments. Ensure the team has access to both the transmission and receiving equipment systems.
Make sure each receiving site is properly equipped with compatible, functional equipment.	As part of the analysis process, the team will identify constraints. The ability of target sites to receive the instruction is a critical factor; system capabilities of the target sites must be thoroughly documented. If target sites have different capabilities, the customer will decide whether to develop the training program to the lowest technical capability or to develop different DL programs for those sites with limited capabilities. Such factors are considered in the cost/benefit and Return On Investment (ROI) analyses.
Define the services offered at the receiving sites.	The extent to which the DL course must provide administrative information, IT familiarization, facilitators, and other support features is defined by the support structures provided by the receiving sites. Support service requirements should be defined by the development team and then matched to the capabilities of the receiving sites. The results of this analysis must be factored into the recommendations made to the customer regarding the design of the training program.
Plan to start off slowly with a manageable number of sites and students. The logistical difficulties of distant teaching increase with each additional site.	While this is a customer decision, the development team can assist by running practice and pilot courses where the training program is tested thoroughly for content, presentation, and instructional effectiveness. Such an approach must be factored into the project plan and requisite resources must be budgeted.

Table 11 Distance Learning Planning and Organization

Meeting students' needs

In order to enhance the effectiveness of a DL program, it is important to understand the challenges students face in the DL environment. Mechanisms for interactivity can be built into the training program to facilitate student receptiveness to learning – this will result in increased training effectiveness. The program manager must be sensitive to the need to budget time for ensuring that student considerations are adequately incorporated into the training program.

To function effectively, students must become comfortable with the nature of teaching and learning at a distance. The selected delivery system should be the one that will best motivate and meet the needs of the students, in terms of both content and preferred learning styles.

When planning the DL training program, a process must be established to help students resolve the technical problems that will arise. The process should reflect a focus on joint problem solving, not placing blame for the occasional technical difficulty. Time and resources must be allocated for developing these student-interface processes.

Meeting instructors' needs

Some media require live instructors. Factoring the needs of the instructors into the IT program also has implications for the planning, design, development, and implementation of DL instruction. For the most part, effective distance teaching requires the enhancement of existing skills rather than developing new abilities. However, there are some considerations that will help make the instructors more effective as described in Table 12.

Meeting Instructors' Needs	
Strategy/Guidance	**Implementation/Impact**
Realistically assess the amount of content that can be effectively delivered in the course. Because of the logistics involved, redesigning, developing and presenting content at a distance is usually more time consuming than for the traditional classroom.	Structure the course into realistic "chunks" that can be assimilated by students. Build in frequent feedback mechanisms to maintain student involvement and assess "learner saturation" (when too much content is provided to students). Build summaries into the training to help students digest what they have learned. Incorporate the resources required to design and develop feedback materials and mechanisms into the project plan. Include these materials/mechanisms in the evaluation process.
Diversify and pace course activities and avoid long lectures. Intersperse content presentations with discussions and student-centered exercises.	This is related to "chunking" the information into realistic content blocks and making sure the student is still involved in the training program from time to time. Employ a variety of presentation styles, media, and interactive techniques to maintain student attention and interest. The design, development, and distribution of multi-media solutions have cost and schedule impacts. Also consider the additional development expertise that might be required to support development of a highly varied program of instruction. The alternative solutions should include a variety of approaches to meeting the need for instructional vitality.
Consider using a print component to supplement non-print materials.	Print materials are usually cost-effective to develop (compared with other support media). There may, however, be additional logistical issues associated with distributing print materials to DL receiving sites – these issues must be defined and accommodated in the planning process.

Continued on next page

Meeting instructors' needs (Continued)

Meeting Instructors' Needs (Continued)	
Strategy/Guidance	**Implementation/Impact**
Provide DL techniques to the instructor staff (e.g., use short, cohesive statements and ask direct questions, realizing that technical linkages might increase the time it takes for students to respond).	Budget resources for the development and practice of these techniques.
Involve instructors in the planning and development processes – get their buy-in and address their concerns.	Include review and working group sessions in the project plan. Budget the resources necessary to support the preparation of materials for these sessions and ensure time is incorporated into the schedule to permit development team members to participate. Also factor in the time and resources necessary to incorporate review comments. Refer to sections 2.B and 2.C on customer, instructor, and subject matter expert involvement in the analysis, design, and development processes.

Table 12 Meeting Instructors' Needs

Improving interaction and feedback

Using effective interaction and feedback strategies will enable the instructor to identify and meet individual student needs and provide a forum for suggesting course improvements. When planning and budgeting for the evaluation program, the program manager should be aware of the expanded role that feedback plays in the DL environment – it not only provides information to the course developers but can also provide a means for the student to remain “connected” to the learning situation.

Suggested techniques for facilitating student involvement in the learning process are listed below. These techniques do not apply to all situations. The appropriate feedback mechanisms for a given instructional program will be defined during the analysis and design phases.

Early Interactions

Use pre-class study questions and advance organizers to encourage critical thinking and informed participation on the part of all learners. Realize that it will take time to improve poor communication patterns.

Early in the course, require students to contact the instructor and interact among themselves via electronic mail, so they become comfortable with the process. Maintaining and sharing electronic journal entries can be very effective toward this end.

Arrange telephone office hours using a toll-free number. Set evening office hours if most of the students work during the day or are distributed widely over several time zones.

Integrate a variety of delivery systems for interaction and feedback, including one-on-one and conference calls, fax, E-mail, video, and computer conferencing.

During Learning

Contact each site (or student) every week if possible, especially early in the course.

Use pre-stamped and addressed postcards, out-of-class phone conferences, and e-mail for feedback regarding course content, relevancy, pace, delivery problems, and instructional concerns.

Continued on next page

Improving interaction and feedback (Continued)

Have students keep a journal of their thoughts and ideas regarding the course content, as well as their individual progress and other concerns. Have students submit journal entries frequently.

Use an on-site facilitator to stimulate interaction when distant students are hesitant to ask questions or participate. In addition, the facilitator can act as your on-site "eyes and ears".

Call on individual students to ensure that all participants have ample opportunity to interact. At the same time, politely but firmly discourage individual students or sites from monopolizing class time.

Make detailed comments on written assignments, referring to additional sources for supplementary information. Return assignments without delay, using fax or electronic mail, if practical.

Management of DL Projects

Project management responsibilities – Planning

Based on a complete understanding of the IT project management process (discussed in the previous section) and an appreciation of the unique characteristics of the DL environment, the DL project manager is ready to begin the most critical phase of the project – planning.

DL project management responsibilities are the joint responsibility of the project manager and the course owner or customer. The project manager must perform all of the planning activities identified in the previous sections on project management as well as the following activities.

- Coordinate with related organizations to identify resources and constraints.
  - Consult with AFIADLO representatives and higher up headquarters management.
  - Consult AFIADLO Homepage for latest guidance on DL standards and procedures.
  - Obtain organizational support for the DL project.
  - Coordinate with Air Force Career Field Managers (AFCFM) and other stakeholders.
  - Coordinate with accrediting agencies or certifying agencies to ensure that credit extends to DL applications.

- Get buy-in from leadership and stakeholders at all levels.
  - Course directors or training managers.
  - Air Force Career Field Managers (AFCFM).
  - IT team and all DL project and support staff.
  - DL instructors and facilitators.
  - Site Point of Contacts (POCs).

- Define end-user the resources and constraints of the end users.
- Conduct an in-depth resource analysis to identify infrastructure issues.
- Identify DL facilities, delivery systems networks, and technical infrastructure requirements and constraints.

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Project management responsibilities – Planning (Continued)

Define special DL project team resource requirements.
- Identify DL development platforms and facility requirements.
- Identify need for facilitators, library resources (TOs and reference materials), administrative support etc.
- Ensure design/development resources and equipment are in place.
- Define staff training requirements.

Assess project feasibility.
- Conduct media feasibility and comparative cost analysis to identify potential media and Return on Investment (ROI) for course conversions.
- Perform a DL environmental and infrastructure/resource analysis.
- Establish project timelines and milestones.
- Determine if scope and schedule exceed in-house capability.
- Make a decision to contract or not to contract project development.
- Determine if there is adequate staffing support for the project.
- Determine if contract funds are available.

Develop project plan.
- Include contract oversight procedures, identify deliverables, and product quality standards.
- Obtain formal approval for your IT project plan via Memorandum of Understanding (MOU), Staff Summary Sheet (SSS), Memorandum of Agreement (MOA), etc.

Obtain project funding.

Project management responsibilities – Design

The Project Manager should ensure that required resources are available, and that the development team knows what to do.
- Establish the DL development team.
- Obtain DL-trained project manpower or provide training for your DL team.
- Coordinate with site managers and base-level DL POCs.
- Establish life-cycle management procedures including the archiving of data.
- Schedule facilities, equipment, and networks well in advance.

Project management responsibilities – Production

Advertise and market the DL course (announcements, base newspapers, DL guide, Air Force Catalog of Formal Schools).

Project management responsibilities – Post-production

Collect and report metrics data. (See information on metrics later in this section).

Matrix of the DL project management process

Table 12.1 (on the next two pages) is a summary of sample tasks and activities associated with a DL project. The project plan must reflect the cost, schedule, and other resource requirements associated with each of those that apply.

Matrix of the DL project management process

Requirement	Academic Development	Instructional Design	Production	Transmission	Reception
Planning	Develop concept Contracting Funding Faculty selection	ISD technician selection Contracting Funding Course selection	Model development Contracting Funding Staff acquisition Production management planning Video classroom renovation New video classroom Broadcast site survey Equipment installation	Model development Contracting Funding Staff acquisition Broadcast management planning High speed data line Equipment installation	Model development Contracting Funding Facilitator selection Site surveys Site management plan Equipment installation
Equipment	Admin. supplies	PC stations PC hardware Graphic support Admin. supplies Database server	Video classrooms Cameras VCRs Duplication decks PC stations Printers Development servers	Broadcast room Satellite transformer Audio bridge Fax machines Web servers	Classroom Satellite receiver Large screen TVs Audio transmitter PC stations Printers • Fax machines

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Matrix of the DL project management process (Continued)

Requirement	Academic Development	Instructional Design	Production	Transmission	Reception
Operations	Needs analysis Learning objectives definition Course selection Faculty training Student selection Testing/ feedback Admin./Funding	Course design Instructional media selection Graphic layout Testing and evaluation	Video taping Audio taping CBI development Graphic arts Live presentation Printing	Distance teaching Satellite transmission LAN transmission Telephone / Fax Mail	DL Facilitating Equipment operations Room and equipment scheduling Telephone / Fax Mail
Manpower	Faculty/SME Faculty development staff Video instructor Library staff Registrar Plans staff Admin. staff Maintenance staff	Program manager ISD technician Graphic artists CBI programmer Contract manager	Video/audio engineer Communication Computer staff CBI programmer Depository staff Print staff Graphics staff Duplication staff	Camera crews Audio bridge manager Satellite manager Schedulers Postal staff Fax support Communication / Computer staff	Education and training officer Site technicians Site facilitators Maintenance staff Admin. staff Public affairs staff

Table 12.1 Matrix of DL Project Management Process

Coordination requirements for DL projects

Before initiating and fielding a DL project, be sure to coordinate with all appropriate organizations and agencies.

Senior headquarters and MAJCOM must approve the project and provide funding, manpower, and other support if needed.

The Air Force Institute for Advanced Distributed Learning Distance Learning Office (AFIADL) will ensure there is no negative impact on infrastructure. AFIADLO should know project requirements as soon as possible to help size the infrastructure and fund infrastructure expansion if necessary.

Notify field level personnel and DL site managers in plenty of time so they can schedule facilities and staff, and be prepared to facilitate the new course.

Notify the National Guard and Reserve Command so that they can take advantage of expanded instructional opportunities for their members.

Notify other services that may want to participate in a joint project.

Notify the ATN Program Manager if the new course will be delivered using ATN.

Coordinate with the AFIADL Extension Course Institute if the new course will be distributed through that organization.

Coordinate with Testing Centers as appropriate to help with proctored testing.

Metrics for Distance Learning

Purpose of metrics

The purpose for establishing DL metrics is to ensure consistency in collection, analysis, and reporting of data used to measure DL effectiveness. Metrics are used to monitor trends and levels of effectiveness and efficiency over time.

Metric indicators and sample data elements

The next paragraphs detail the following:

Instructional effectiveness / efficiency
Technical / system usage and reliability
Administrative / operational effectiveness
Customer Satisfaction

Instructional effectiveness / efficiency

Instructional effectiveness/efficiency includes measures of the value of DL instruction to the organization.

Student performance. (Examples include test scores, certifications, course completions, honor graduates, pass-fail rates, or dropout/attrition rates).

Quality/relevancy of instruction. (Examples include customer review, student critiques, formative evaluations of DL products and process, operational surveys).

Time savings. (Examples include IT compression rates compared to hours of resident instruction, fewer instructors, and reduction in travel time).

Costs.
Total cost per course/program.
Cost per student.
Cost per instructional hour.
Estimated and actual Return On Investment (ROI).

Technical / system usage and reliability	This includes measures of the usage and reliability of all technical systems and networks used for instructional delivery and the degree to which students and DL centers have technical difficulties. System utilization rates. Equipment failures. Percent down time. Point of failure/cause of failures. Student requests for technical assistance (student critiques, technical help desk).
Administrative / operational effectiveness	This includes measures of the effectiveness of support functions and processes. Learner/Site notification procedures. Registration and learner administration. Materials handling (Examples include production and distribution of materials, complete shipping list, on-time delivery, sufficient quantity). Learner access to equipment.
Customer Satisfaction	This identifies the level of satisfaction of various customers and stakeholders. Data are usually collected from all primary customers and learners and samples of other user groups as required. Primary customers (Individual or organization having decision authority over a course of instruction – usually training managers/course directors who give feedback during formative evaluation process). Learners Instructors DL site POC/ESO/Job Site Training POC Course sponsors/functional managers MAJCOM/Learners' supervisors

Standard Distance Learning Course Conversion Process

Purpose

The purpose of the Standard Course Conversion Process is to ensure each schoolhouse follows standard procedures based on the principles of Instructional Systems Design (ISD) and best practices when converting resident courses to DL. A project manager who employs the Instructional Technology Development Process and the Project Management Process for DL defined in this chapter will be following the basic process. The following additional techniques and guidelines apply to the unique considerations associated with converting training materials to a DL presentation format.

Assumptions for converting resident courses to DL

There are several important assumptions to bear in mind when considering conversion of a resident course to DL:

It is assumed that a course and an approved curriculum already exist in resident format. ISD has been applied previously. Course documentation is available for review.

Not all courses are good candidates for DL. A curriculum analysis and media feasibility analysis must be performed.

The main reason to convert a course to DL is to make quality education and training opportunities available to learners in the most cost-effective manner.

A comparative cost analysis using standard procedures and formulas will indicate the expected ROI for course conversions. This will indicate whether or not a conversion project is cost-effective in the long term.

It is possible to use DL to shorten the length of a resident school by using DL for portions of the course. Instruction may be delivered in a DL format as a prerequisite or as follow-on to a resident course.

DL project management is essentially the same as that used for IT development and should be coordinated and monitored by the appropriate instructional systems design professional acting as the project manager

All of the warnings and techniques associated with DL project development must be considered during the conversion process. These were identified earlier in this section. The course must be converted to the *DL environment*, not just reformatted for application of other media.

Continued on next page

Assumptions for converting resident courses to DL (Continued)

The curriculum will be redesigned and configured to take advantage of IT. Think about the course in different ways and organize objectives into modules if possible. As curriculum is redesigned for life-long learning and in support of ADL, this will be necessary.

Use a mix or combination of media, if necessary, to deliver a course in DL.

To form modules, prioritize and cluster and sequence objectives based on the types of learning, levels of learning – knowledge, skills, and attitudes – and the required levels of interactivity.

Validate instructional technology selection. Ensure selected media can support required levels of learning and levels of interactivity and that the technical and support infrastructure is robust enough for your project.

Chapter 3
INSTRUCTIONAL TECHNOLOGIES

Overview

Purpose

This chapter provides definitions and descriptions of instructional technologies that can be applied in the delivery of Air Force instruction. It identifies new technologies, as well as the more traditional technologies available to instructional developers. Information relevant to the design and application of these technologies is included in subsequent chapters.

Where to read about it

This chapter contains six sections:

Instructional technologies and types

Table 13 below lists the six general categories of instructional technologies discussed in this chapter, and the specific types within each category.

Instructional Technology	Types	
Traditional Media	Print Print and Slide Print, Audio, and Slide Audiotape	Videotape Audioconferencing Television and Cable Models and Mock-ups
Computer Mediated Communications	Audiographics Computer Mediated Conferencing/Collaborative Computing	
Interactive Multimedia Instruction	Interactive Courseware Computer-Based Instruction / Computer-Based Training Intelligent Computer Assisted Instruction	

	Electronic Performance Support System / Job Performance Aids Computer Simulation
Interactive Video Teletraining	Interactive Television Video Teleconferencing
Internet Based Instruction	Text Only Multimedia Virtual Conferencing/Collaborative Conferencing
Support Technology	Electronic Testing Computer Managed Instruction Advanced Distributed Learning (ADL) Electronic Help Desk Electronic Publications Interactive Electronic Technical Manuals E-mail, Bulletin Boards, and Fax Conferencing Voice Mail Student Response Units, Audioconferencing Units (ACUs)

Table 13 Types of Instructional Technologies

References

The material in this chapter is based on the following references:

MIL-PRF-29612, *Training Data Products*
MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*
MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*
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AF Handbook 36-2235, *Information for Designers of Instructional Systems, Volume 4*
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AFIADLO Home Page web site: http://www.au.af.mil/afdlomaxwell.af.mil/afiadl/
Air Force Publications and Forms: http://AFPUBS.HQ.AF.MIL/
American Distance Education Consortium: http://www.adec.edu/
Best Practices in Distance Learning: http://snow.utoronto.ca/best/distance.html
Distance Education at a Glance: http://www.uidaho.edu/evo/distglan.html
Distance Education Primer: http://www.teletrain.com/Primer.html
Educational Resources Information Center: http://www.aspensys.com/eric/
US Distance Learning Association: http://www.usdla.org/
WWW Virtual Library – Distance Education: http://www.cisnet.com/~cattales/Dedication.html
Federal Government Distance Learning Association: http://www.fgdla.org/index.htm

Section A
Traditional Media

Introduction

The next paragraphs explain the definition and description of the following traditional media:

Print
Slides
Audiotape
Videotape
Audioconferencing
Television and cable
Models and mock-ups

Print

Definition: Print media consists of paper-based text and graphics materials.

Description: Print materials include documents such as books, manuals, syllabi, training guides, brochures, programmed text, photographic prints, and photocopies. These documents usually contain text, diagrams, pictures, or line drawings. These materials may stand-alone or serve as ancillary material that accompanies other instructional media.

Slides

Definition: Slides are static photographic images of text and/or graphics that can be displayed by means of a slide projector or integrated into a computer-based program.

Description: Slides are usually used in combination with other media, such as self-study guides and/or audiotapes, or are used to support instructor-led training. When integrated into a computer-based program, photographic or graphic images can be used to support training concepts.

Audiotape

Definition: Audiotape consists of sounds that are recorded on electronically readable tape using a digital or analog mode.

Description: The most common type of audiotape used for instruction is the audiocassette tape that can provide up to 120 minutes of audio recording. Workbooks or readings are usually used to complement audio materials.

Videotape

Definition: Videotape is a magnetic tape that can record and play back audio and video. It can also hold electrical signals used in editing and in interactive video applications.

Description: The most common type of videotape used in the classroom is the one-half inch, Video Home System (VHS) videocassette tape. The standard T-120 VHS tape can provide up to two 2 hours of recording in the standard play (SP) mode, four 4 hours in the long play (LP) mode, or six 6 hours in the extended play (EP) mode. Study guides are usually used to support video-based training.

Audioconferencing

Definition: An audioconference is simply a meeting where people are connected by audio, such as the telephone. Audioconferencing is a structured audioconference used for instruction with specific learning outcomes. When media supports audioconferencing, it is called audiographics conferencing.

Description: Interactive audioconferencing can be as simple as an interview between the instructor and learner, or as complex as a panel discussion with many sites and learners. Participants in a typical conference call use a speakerphone connected through an audiobridging system, which allows for multiple callers. Depending upon the system used to make the connection, up to 240 sites can be connected simultaneously. Audio media in use today include the radio and real audio over the Web.

Television and cable

Definition: In the context of training, television is a device used to present audio and visual instructional information to students at remote sites. The use of cable television expands the number of channels available for training instruction.

Description: Instructional television is used as a vehicle for distance learning and in support of resident instruction. It may be used as a synchronous medium used to present programmed instruction at specific times. However, through the use of videotape recorders, programmed instruction can be videotaped and viewed in an asynchronous mode.

Models and mock-ups

Definition: 3-D devices that replicate some component (or the entirety) of the system being studied to increase realism and provide students with an opportunity to study specific aspects of the system and/or perform related operation/maintenance tasks.

Description: Models and mock-ups can range from a plastic cross-section of the human skull, to support medical training instruction to a cutaway of a diesel engine. Their complexity depends on the nature and criticality of the training tasks supported. They are often used when it is impractical to make an entire system available for training instruction or when only a portion of the system is the subject of training instruction.

Section B
Computer-Mediated Communications

Introduction

The next paragraphs explain the definition and description of the following computer-mediated communications:

Audiographics
Computer-mediated conferencing / collaborative computing

Audiographics

Definition: Audiographics is a term that has typically been used to describe two-way computer data and two-way audio communications using computer and telephone networks.

Description: Audiographics combines audioconferencing with computer data presentation capabilities, supporting both voice and data transmissions to participating sites. The computer is used for distributing and sharing data such as text and graphics. The instructor normally has the communications lines open for an audio conference, while transmitting on-screen presentations to all student monitors.

Computer-mediated conferencing / collaborative computing

Definition: Computer-mediated conferencing (also referred to as collaborative computing) is essentially a text-based computer conferencing system with limited graphics capabilities depending upon the amount of available bandwidth and the processing power of each participant computer.

Description: Asynchronous computer-mediated conferencing provides instructor-student and student-student discussions and interaction using e-mail and bulletin board systems. The computer provides the primary means for exchanging messages and dialogue, and for accessing information.

Real-time, or synchronous, computer-mediated conferencing is rapidly evolving due to multimedia teleconferencing standards. These standards address Real-Time Data Conferencing (T.120), ISDN Videoconferencing (CH. 320), Audiovisual communication over LANs (H. 323) and High Quality Video and Audio over telephone modem connections (H. 324). T.120 allows for sharing of applications, data, and voice over single line

Continued on next page

Computer-mediated conferencing / collaborative computing (Continued)	connections. The broader the connection's bandwidth, the smoother and faster the data exchange. The T.120 standard enables all parties to actively contribute annotations and other changes to the materials presented. Developments in the area of video compression are facilitating real-time video computer-mediated conferencing.

Section C
Interactive Multimedia Instruction

Definition

Interactive Multimedia Instruction (IMI) is a term applied to a group of predominantly interactive, electronically delivered training instruction and training instruction-support products.

Description

Text, audio, video, and graphics are commonly used in IMI products and other digital electronic products used in the delivery of instruction. IMI can be presented as a stand-alone, self-paced program, an instructor-led presentation, or a program to support on-the-job training or personal performance enhancement.

Interactive Courseware (ICW)

Definition: ICW is computer-controlled courseware that relies on student input to determine the pace, sequence, and content of training delivery. ICW is also referred to as Computer-Based Instruction (CBI) and Computer-Based Training (CBT).

Description: ICW can link and present a combination of media including, but not limited to, programmed instruction, videotapes, slides, film, text, graphics, digital audio, animation, and full-motion video to enhance the learning process.

Intelligent Computer Assisted Instruction (ICAI)

Definition: ICAI is a type of ICW that includes an intelligent tutor that provides an interactive learning environment, diagnoses student errors, and individualizes instruction based on student responses.

Description: ICAI, sometimes referred to as Intelligent Tutoring Systems (ITS), incorporates expert knowledge into an instructional model designed to emulate the behavior of an experienced teacher. ICAI systems can present challenging scenarios, monitor and evaluate student actions, provide feedback in response to student actions, respond to requests for information, provide hints, and tailor the training program based on a student’s demonstrated strengths and weaknesses. Some development systems (XAIDA) are also considered under the ICAI umbrella.

Electronic Performance Support System (EPSS) /Job Performance Aid (JPA)

Definition: An EPSS or JPA is an integrated, on-demand, processor-based performance aid that enables the user to gain rapid on-line access to large amounts of information about a specific task area. EPSSs are frequently employed to provide on-line assistance to individuals so they can perform their job tasks with minimal support and intervention by others. An on-line help system for a word processing system is an example of an EPSS.

Description: EPSSs can be used to support training instruction or actual task performance. On-the-job, they provide immediate access to integrated information and expert consultation. A maintenance technician, for example, might use an EPSS/JPA to help troubleshoot a system problem, either as part of or after completing formal training instruction. As life-long learning gains acceptance, EPSS will play an increasingly important role.

EPSSs are also known as Interactive Performance Systems (IPS), Performance Support Systems (PSS), Performance Support Tools (PST), and On-line Help Systems.

Computer simulation

Definition: Computer simulation is an artificially generated representation of reality that provides an interactive educational or training experience. It is typically based on the actual job environment. It allows the learner to practice procedures and solve problems in life-like situations. War-gaming simulation to teach combat decision-making is an example of this instructional approach.

Description: Simulations are effective when teaching hazardous tasks and decision-making skills or when costs of hands-on-training are prohibited. Computer simulations allow learners to try alternative solutions to a problem without worrying about physical consequences. Computer simulations vary widely in sophistication; they can be presented as games, as on-line replications of real job situations, or as full-motion, video-enhanced trainers (e.g., flight simulators).

Section D
Interactive Video Teletraining

Overview

IVT consists of:
Interactive Television (ITV) (one-way video; 2-way audio)
Video Teleconferencing (VTC) (2-way video; 2-way audio)

Two types of IVT video imagery can be delivered to students at the local sites:
Pre-produced moving images with audio (e.g., film and videotape)
Real-time moving images combined with audio conferencing

Interactive Video Teletraining (IVT)

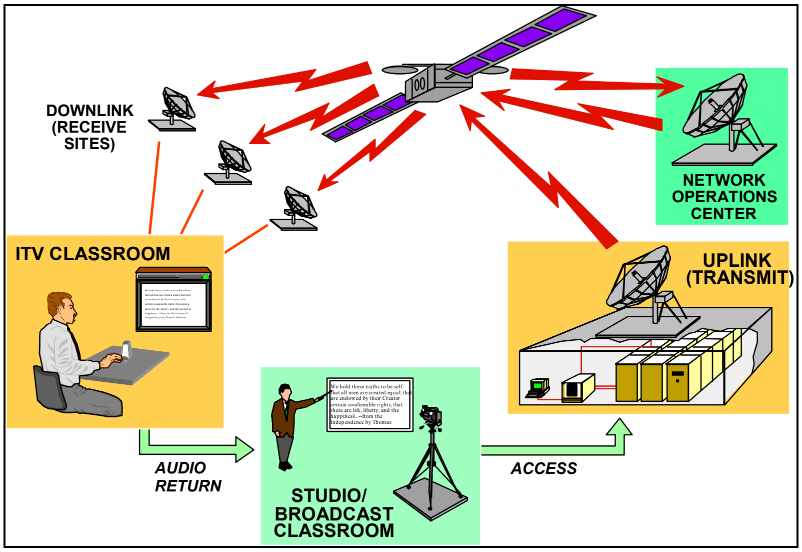
Definition: IVT provides for one- or two-way video, and two-way audio telecommunications between the instructor and students over broadcast television networks (satellite and/or terrestrial) and telephone networks. It comprises both Interactive Television and Video teleconferencing.

Interactive Television (ITV)

Definition: IVT technology that employs one-way video with two-way audio communications is called Interactive Television or ITV. ITV is known commercially as *Business Television*.

Description: ITV provides one-way, site-to-site or site-to-multiple site transmission of audio and video instruction from a studio or broadcast classroom. This is done via an uplink to ITV classrooms at downlink receive sites equipped with television monitors and student response units. The audioconferencing units provide audio feedback via telephone networks.

Figure 4 Interactive Television



Video Teleconferencing (VTC)

Definition: IVT technology that employs two-way video and audio communications and is called Video Teleconferencing or VTC. VTC is also referred to as *video teletraining* (VTT) and *videoconferencing*.

Description: VTC provides two-way site-to-site or site-to-multiple site video and audio instruction, simultaneously transmitted over the satellite television network from the studio/VTC classrooms. Typically, a VTC classroom is equipped with two monitors that can selectively display the individual speaking, other sites, or supporting graphics, etc., as desired.

Interactive Video Teletraining Networks

Introduction

Table 14 identifies the current status of IVT networks. Throughout the DoD, several satellite network systems can be used to support IVT instruction. Following are descriptions of the existing DoD IVT networks.

Network	Description
Air Technology Network (ATN)	ATN is a satellite-based delivery system that supports one-way video and two-way audio communications. There are four active duty uplink facilities and 72 downlink facilities at Air Force bases throughout the United States. A fifth studio is planned for Randolph Air Force Base. When it becomes cost-effective, bases in the Pacific will be connected to ATN.
ANG Warrior Network	The Air National Guard (ANG) uses the Warrior Network satellite delivery ITV system to provide part of the required Enlisted Professional Military Education (EPME) course of instruction. The Warrior Network: Has 3 broadcast studios and 208 downlink sites throughout the United States. Uses the same satellite system as SEN and ATN, and is completely compatible.
Satellite Education Network (SEN)	The US Army SEN network matches the US Air Force ITV network and uses the same satellite. SEN uses four broadcast sites at Fort Lee, VA, and has 79 downlink sites. SEN is completely interoperable with the ATN network.
T-Net	The US Army Training and Doctrine Command's (TRADOC) T-Net is a terrestrial-based, near full-motion, two-way video and two-way audio teleconferencing system. T-Net is used to reach 118 Army sites, as well as 47 Air Force Reserve (AFRC) downlink sites throughout the country. T-Net operates from a different satellite system than the ATN. ATN can connect to and transmit over T-Net using special arrangements through SEN. The Total Army Distance Learning Program includes a plan to expand network capability to over 500 sites.

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Interactive Video Teletraining Networks (Continued)

Network	Description
Government Education and Training Network (GETN)	To increase interactivity and sharing of program facilities, the GETN was established as a single government-wide ITV network used by approximately 20 government agencies. Created by the AFIT, GETN incorporates the Air Force ATN, ANG Warrior Network, and the Army SEN. GETN has a total of 950 interoperable downlink sites and 14 uplink sites throughout the United States.

Table 14 IVT Networks

Section E
Internet-Based Instruction

Overview

Definition: Internet-Based Instruction (IBI) is instruction that makes use of internet technologies and provides a platform for the integration and distribution of multimedia instructional components.

Description: IBI is the term used to encompass a full range of instruction and data provided over the Internet/WWW – from simple text-based files and applications, to interactive multimedia instruction and virtual conferencing. IBI consists of digital text, audio, video, and graphics, and makes use of Internet technologies such as:

Usenet and listserv
File Transfer Protocol
E-mail
Threaded discussion
Chat room
Bulletin board
TCP/IP browsers
Browser plug-ins
HTML
Virtual shared white boards

IBI provides a platform that allows for the integration and distribution of multimedia instructional components.

Types of IBI instruction

There are three general types of IBI:

Text. This is the basic type of IBI, which consists primarily of text-based files and tutorial instruction (with limited graphics). Most text instruction is asynchronous (not real-time) and ancillary to other modes of instruction. Text-based IBI can be effective for dissemination of information and research applications.

Multimedia. This type of IBI is similar to ICW in that it is generally self-paced (allowing for student control and pacing), interactive, and uses multimedia for presentation of the instructional material on a PC. However, unlike stand-alone

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Types of IBI instruction (Continued)

ICW, multimedia IBI uses the Internet/WWW to deliver the instruction on-line and IBI incorporates the uses of graphical browsers such as Netscape Navigator™ and Microsoft Explorer™. These browsers provide a friendly familiar user interface when used with multimedia instructional materials.

Multimedia IBI. This type of IBI is similar to ICW in that it is generally self-paced (allowing for student control and pacing), interactive, and uses multimedia for presentation of the instructional material on a PC. However, unlike stand-alone ICW, multimedia IBI uses the Internet/WWW to deliver the instruction on-line.

Virtual conferencing. Virtual conferencing, also referred to as collaborative conferencing, is a term that applies to the application and integration of all synchronous and asynchronous "chat" modes for instructional purposes. It may be integrated with other instructional and support IBI technologies into a multiple media, virtual "classroom" environment.

Delivery of IBI

IBI is delivered via the Internet/WWW and can be accessed using web browsers and bundled plug-ins controls. IBI also uses transport protocols and provides hypertext links to WWW pages and files. IBI uses the source language for WWW "pages": Hypertext Markup Language (HTML) (a special formatting language that tells the web browser how to display the delivered content), which is the source language for WWW "pages". HTML is a special formatting language that tells the web browser how to display the delivered content.

Transport protocols

Below are some of the key standard protocols for IBI that allow different computers to communicate with each other include:

TCP/IP (Transport Control Protocol/Internet Protocol) is a network protocol designed for alphanumeric data transmission.
UDP (Universal Data Packet) protocol sacrifices lost data in favor of maintaining a continuous flow. UDP can dynamically adjust data output to the client's minute-to-minute reception bandwidth.

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Transport protocols (Continued)

FTP (File Transfer Protocol) is the protocol used to access and download files that are stored on a remote computer.
HTTP (Hypertext Transport Protocol) is a client/server-based protocol used to create hypertext links in WWW documents; a necessity for any document display on the Web.
SMTP (Simple Mail Transfer Protocol) is the protocol used by Internet mail programs that allows the client to talk to the server and exchange messages.

WWW technologies

Some of the key WWW technologies that are employed for IBI include:

Digital video and audio files. Audio and video images are converted to a digital file format or real-time streaming format that can be stored, copied, transmitted, or broadcast over the Internet/WWW. Digital video and audio can be played back on a computer.

Coder/Decoder (Codec). An encoding process that compresses data into a file that requires only 1/2 to 1/200 of the original storage space. Compression minimizes the space a computer needs to represent the data in a file, and allows files to be stored and transmitted more efficiently.

Virtual Reality Modeling Language (VRML). VMRL has become the standard format for distributing 3-dimensional images over the Internet/WWW. It is a text-based language used by developers to implement interactive 3D graphics/objects and multimedia content. The international standard is VRML 2.0 is an international standard.

Emerging standards

XML. Extensible Markup Language (XML) is a much more powerful language than HTML, but will be able to work with it. For DoD and the Air Force, it will become important for entering metadata into HTML-based documents. This will make it possible to quickly find precisely what you are searching for and will also be essential for automating the management of course and student data.

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Emerging standards (Continued)

DHTML. Dynamic HTML is not so much a language as it is a combination of Java Script, Cascading Style Sheets, and distributed object model (DOM). It will allow the manipulation of text and objects on the Web page after it is displayed. Microsoft and Netscape are not entirely compatible in how they support DHTML. However, there are sites on the Internet that offer guidance and tips on developing pages that will display correctly in both of these browsers.

Java. Java is a programming language that allows the creation of small, independent applications (applets) that can perform operations on the server or on the client machine. With Java on the client's machine, it is possible to create interactive web pages, and to provide the user with applications to the user that are not his/heron the client's machine. There are ongoing security issues with Java, but these may eventually be overcome.

Java Script. Java Script is not the same as the Java language. It does, but will allow you to perform operations to create interactive web pages like you can with as with Java, as well as perform operations but does not create applets. This assures security but does without sacrificing power.

New enhancements

There are many additions that are being developed to make HTML-based documents much more flexible and powerful. Please check the AFIADLO Homepage (http://www.maxwell.af.mil/afiadl/) for update information and guidance.

Section F
Support Technology Media

Electronic testing

Definition: Electronic testing is a general term used to encompass all methods for applying computers in the assessment and reporting of human knowledge, skills, and attitudes. It is also known as Computer Adaptive Testing (CAT).

Description: Computer-based electronic testing and polling can:

Adapt the sequence, content, or difficulty of test items according to the responses of the person being tested.
Present test items in response to individual actions.
Branch to predetermined test items based on individual answers to previous test items.

Computer-Managed Instruction (CMI)

Definition: CMI is software for course administration and management that provides information concerning performance trends, records individual and group performance data, schedules training, and provides support for other training management functions. The instructor has the responsibility to diagnose, to identify performance deficiencies, and to prescribe the next level of instruction.

Description: The functions of CMI include:

A management information system to track student performance over a period of time.
A system to provide information concerning student performance trends.
A system to record individual and group performance data.
A system for generation recommendations for study path (learning prescription).
A system to schedule training.
A system to provide support for other education and training management functions (e.g., data collection to support inputs to student training records).

CMI Type: Advanced Distributed Learning (ADL) and instructional management system project

ADL is a DoD initiative to promote widespread collaboration, exploit Internet technologies, develop next generation learning technologies and create reusable content, and lower costs, with object-based tools. ADL will rely on an Instructional Management System (IMS) to tag and manage the learning objects produced as a result of ADL. One of the goals is to develop an automated management system that will perform CMI functions by keying on the IMS indexing.

IMS is a non-proprietary, Internet-based Instructional Management System that provides the means to customize and manage the instructional process and to integrate content from multiple publishers in distributed or virtual learning environments.

The IMS Project is developing and promoting open specifications for facilitating on-line activities such as locating and using educational content, tracking learner progress, reporting learner performance, and exchanging student records between administrative systems. These specifications will increase the range of distributed learning opportunities and they will promote the creativity and productivity of both teachers and learners in this new environment.

Check the AFIADLO Homepage for information (http://www.maxwell.af.mil/afiadl)

Electronic help desk

Definition: Typically, an Electronic Help Desk is an on-line repository of pertinent information, both technical and general, that users can access.

Description: Help desks may incorporate a knowledge base, as well as synchronous and asynchronous communication with technical experts to answer questions and provide support.

Electronic technical manuals

Definition: Interactive Electronic Technical Manual (IETM), as defined in DoD IETM specifications, is as a package of information required for the diagnosis and maintenance of a weapons system, optimally arranged and formatted for interactive screen presentation to the end-user.

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Electronic technical manuals (Continued)

Description: IETMs are in digital form (electronic media) and are designed for interactive display to the maintenance technician or system operator end user by means of a computer-controlled electronic screen display system. An IETM is more than an on-line technical manual; it has the following three characteristics:

- The information is designed and formatted for screen presentation to enhance comprehension.
- The elements of technical data making up the technical manual are interrelated.
- The computer-controlled technical manual display device functions interactively (as a result of user requests and information input) to provide procedural guidance, navigational directions, and supplemental information.

E-mail

Definition: An electronic delivery system used to send digital messages over the Internet/Intranet to contact and collaborate with other individuals.

Description: Computers are used to send E-mail (text-based) messages to selected electronic "mailboxes". Users can attach documents, files, or links to web pages to the message, providing another method of distributing instructional materials.

Bulletin boards

Definition: An on-line electronic repository used to provide information and announcements to students. The information is accessed by means of asynchronous communications.

Description: On-line bulletin board systems are generally used for course administration, communications, and interaction to:

- Post messages, new ideas, questions, opinions, or requests to the group.
- Read what others have written and respond to the author.
- Upload and download files.

Fax conferencing	**Definition**: Electronic data transfers between individuals over telephone networks using facsimile equipment or over the Internet using fax modems. **Description**: The fax can be used to support instruction by providing a method to exchange printed materials such as text, charts, graphics, etc. For example, it can be used with IVT and other conferencing technologies as a way to distribute handouts to remote sites or as a way for students to pose questions and comments to the instructor.
Voice mail	**Definition**: Asynchronous means of voice communication using the telephone, computer, and/or voice mail device to store and play back voice messages. **Description**: Voice mail systems enable callers to leave voice messages which are later retrieved by recipients. Typically, voice mail systems are accessed by telephone. However, some on-line systems enable individuals to send and retrieve voice messages by computer; these systems require the users to have special software, microphones, and other peripheral equipment. Passwords are usually built into the systems to prevent unauthorized users from retrieving messages.
Student Response Unit (SRU), Audioconferencing Unit (ACU)	**Definition**: SRUs are devices that provide a means for the student to provide verbal feedback or response data to the instructor. An Audioconferencing Unit (ACU) is a stand-alone microphone; an SRU is a keypad unit that provides response data to the instructor. **Description**: SRUs may consist of a personal microphone and/or key pad, located at each student's desk, that is connected via a telephone or computer network to the instructor's station or location. SRUs are normally used in conjunction with other instructional delivery systems such as ITV.

Chapter 4
INSTRUCTIONAL TECHNOLOGIES – ANALYSIS AND SELECTION CRITERIA

Overview

Purpose

This chapter presents a standard set of criteria that can be applied to any instructional medium to evaluate the relative effectiveness of the medium. It then applies the criteria to each instructional medium presented to determine the advantages and disadvantages resulting from its use. The chapter concludes with a presentation of a process for selecting instructional media when migrating existing resident instruction to an instructional technology or distance learning format.

Where to read about it

This chapter contains six sections:

References

The material in this chapter is based on the following references:

MIL-PRF-29612, *Training Data Products*
MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*

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Distance Learning Curriculum Analysis and Media Selection, Air University, Maxwell AFB, AL, 4 Feb 1994
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http://www.adec.edu/
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Distance Education at a Glance:
http://www.uidaho.edu/evo/distglan.html
Distance Education Primer:
http://www.teletrain.com/Primer.html
Educational Resources Information Center:
http://www.aspensys.com/eric/
US Distance Learning Association: http://www.usdla.org/
WWW Virtual Library – Distance Education:
http://www.cisnet.com/~cattales/Dedication.html
Federal Government Distance Learning Association:
http://www.fgdla.org/index.htm

Section A
Media Feasibility Assessment

Feasibility criteria

The instructional design characteristics identified in the following table can be applied to each type of instructional technology to gauge the appropriateness of the various media. These characteristics can be applied to the use of technology to support resident courses as well as distance learning initiatives. The following criteria are used in this section to compare and contrast the media alternatives.

Characteristic	Description
Development Effort	The time, effort, and/or resources required to plan, design, develop, implement, and evaluate the instruction.
Convenience of Instruction	The extent to which the participant is allowed to control or determine the time, place, pace, or duration of instruction, and/or accessibility of the instruction
Student Motivation	The ability of the instructional system/media to motivate and/or involve the student when used as the primary vehicle for instruction.
Equipment and/or Support Requirements	The degree to which special equipment or other support systems are required for delivery of the instruction.
Instructor Requirements	The degree to which instructor involvement is required during delivery of the instruction to employ the medium effectively.
Level of Interactivity	The potential level of engaged response/interaction between the student and the medium provided or supported by the medium.
Feedback Capability	The type and nature of student feedback supported by the instructional medium.
Ease of Revision	The complexity of revising or updating the medium to accommodate changes in course content.
Ease of Use	Comfort of the instructor and the student with the medium; degree to which time must be spent familiarizing users with the technology.

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Feasibility criteria (Continued)

Characteristic	Description
Versatility	The ability of the medium to support instruction and/or supplement other technologies.

Table 15 Instructional Design Characteristics

Potential applications

Each medium is examined in terms of its potential applications – when it is most appropriate to use the given medium to support instruction. In those cases where there are conditions under which the given media would not be effective, the conditions are noted.

Cost/benefit considerations

Cost/benefit analysis is being used with increasing frequency to help define whether a proposed approach to instruction is worth the projected costs. Later in this chapter, the user will find detailed discussion on cost models and processes. In this section, the relative costs and benefits of each medium are discussed. In addition, the estimated compression rate and development ratios are identified. The areas covered are compression rate and development hours.

Compression rate

Presented as a percentage, the compression rate is the figure used to estimate the number of hours of instruction required to conduct an existing resident course if converted to the given technology.

For example – The estimated compression rate for courses converted to ICW is 35%. That is, the course duration for a resident course would be reduced by 35% if converted to ICW. If you are converting a 40-hour resident course to ICW, you would use the following formula to compute instructional hours:

40 hrs. resident instruction x 35% compression rate =
14 hours reduction
40 hrs. – 14 hrs. = 26 hrs. ICW

Thus, you can expect to accomplish a 40-hour traditional course in 26 hours of instruction if the course is converted to ICW format.

Development hours

Presented as three ratios indicating the number of man- hours per hour of instruction for an IT program of low/moderate/high complexity.

For example – The factors for ICW are estimated at 50/265/700 man-hours of development per hour of compressed instruction. Therefore, if a 26-hour course of low complexity is being developed, you would use the following formula to calculate development hours:

26 hours compressed instruction x
50 hours development per hour of instruction =
1,300 man-hours of development time

If it is a complex course, it may take an estimated 18,200 hours for development.

Cost/benefit considerations

A word of caution

The compression rates and development hours are estimates only—they are based on Air Force and industry experience. The development times are based on the time it takes education and training personnel—the IT development team—to complete the ISD process and field *new* instruction. It does not take into account the task analysis process that is conducted by a career field nor does it take into account the ongoing operational evaluation or life cycle management of a course of instruction. The development times do not account for man-hours provided at remote sites in support of DL programs.

The low-end estimates assume a best case scenario with a simple topic and experienced personnel with good knowledge of content and tools. The high-end estimates imply that the topic is abstract or complex and developers have limited knowledge of the content and lack experience with development tools. The middle number represents the most likely estimate based on Air Force experience.

The more technically sophisticated the medium, the greater the need for highly skilled instructional designers and technologists. So it is not only the complexity of the course material that must be accommodated, but also the availability of a skilled development team.

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Cost/benefit considerations (Continued)

The use of templates and other tools can reduce development time. The need to coordinate and share scarce resources can increase development time. It is the responsibility of the IT team to define, document, and factor in all of the quantitative and qualitative costs and benefits associated with a given instructional alternative so that each alternative can be fairly evaluated and the optimum solution selected on the basis of solid, well-documented analysis.

Section B
Application of the Criteria to the Media

Purpose

This section applies the criteria to each of the instructional technologies. The table presents the criteria, describes the medium's major strengths and weaknesses against those criteria, and provides an overall assessment of the effectiveness of the medium. Some potential applications of the medium and the cost/benefit considerations for each medium follow the table.

Criteria Applied to Print Medium

Introduction

The following table applies the criteria to the use of print as the primary instructional medium.

Criteria	Application to Print	Effectiveness
Developmental Effort	The effort required varies depending on the scope and content of the print materials. Professional authoring of complete instructional print documents, manuals, or textbooks requires significant time and effort to research, design, develop, edit, and publish effective instruction. Available desktop publishing software has made it much easier to develop professional-looking print materials in-house.	-/+
Convenience of Instruction	Students can study at their own pace and review information as required.	+
Student Motivation	Requires higher level of student motivation for effective learning to take place. Student learning is dependent on reading ability. Lack of reading skills significantly impacts effectiveness of instruction.	-
Equipment/Support Requirements	Requires no special equipment or support.	+
Instructor Requirements	Minimum supervision, participation, or communication required.	+
Level of Interactivity	Passive in nature – low level of student interactivity.	-
Feedback Capability	Low level of feedback and reinforcement.	-
Ease of Revision	While easier to revise than most other media, revisions will require some time, resources, and effort to accomplish. Revised materials must also be reproduced and distributed to all applicable sites.	-
Ease of Use	Print is the most familiar of media. Instructors and students are comfortable using it.	+
Versatility	Handouts, outlines, booklets, brochures, ready reference guides can supplement other technologies/media.	+

Table 16 Criteria Applied to Print Medium

Potential applications

Consider using print when:

The task to be taught follows a set procedure and steps are easy to follow.
Written materials are required for later reference.
Self-study is an option.
Ease of use is crucial.
Equipment limitations exist.
Close supervision and interaction are either not required or not available.
When dollars are limited.

Print cost/benefit considerations

Considerations: Print materials are relatively inexpensive to produce compared with other media such as satellite/computer-based instruction. Cost considerations include:

Number of requirements (student/trainee throughput).
Student location and distribution requirements.
Complexity of the required instruction and format (color graphics, drawings, diagrams, photographs, etc., will generally consume more time and resources).
Projected content changes and revision requirements.

Compression rate: It is estimated that a distance learning print-based course (e.g., a correspondence course) will reduce the instructional time required to cover the same material in a resident course by 25%.

Estimated development time: Use the following development estimates (per hour of compressed instruction) (includes editing):

Low Complexity	Moderate Complexity	High Complexity
15 hours	100 hours	250 hours

Criteria Applied to Videotapes

Introduction

Videotape-based training presents information to the student through visual and auditory sensory channels. The more varied the means of delivery, the more effective the communication. Instructional video builds on the old cliché that "a picture is worth a thousand words." The following table applies the criteria to the use of videotape as the primary instructional medium.

Criteria	Application to Videotape	Effectiveness
Developmental Effort	Professional quality, effective video instruction requires complex planning and a significant amount of time and effort to produce.	-
Convenience of Instruction	Students can study and review information at their own pace.	+
Student Motivation	Requires a higher level of student motivation for effective learning to take place.	-
Equipment/ Support Requirements	Videotapes are highly transportable and can reach many students. A videocassette recorder is required and is readily accessible.	+
Instructor Requirements	Little instructor supervision, participation, or communication.	+
Level of Interactivity	Passive in nature – low level of student interactivity.	-
Feedback Capability	Low level of feedback and reinforcement.	-
Ease of Revision	Course content needs to be stable since revisions normally require complete reproduction/ redevelopment of the taped instruction. Tapes must also be duplicated and distributed to all sites.	-
Ease of Use	Videotape technology is familiar to instructors and students, and they are comfortable using it.	+
Versatility	Videotapes can provide effective instructional support for other types of instruction. Also, videotapes can be retained for future reference.	+

Table 17 Criteria Applied to Videotape

Potential applications

Consider using instructional videotapes when:

Audio/visual presentations are important for clarity.
Visual realism is necessary to accomplish learning objectives.
Self-paced instruction or independent study is an option.
Content is stable (no changes for at least a year).
Interaction with or observation of performance by, an instructor is not required.

Videotape cost/benefit considerations

Video production can be expensive, time consuming, and technically demanding depending on how it will be produced (i.e., an in-house effort or professionally produced).

Compression rate: It is estimated that a distance learning videotape-based course will reduce the instructional time required to cover the same material in a resident course by 30%.

Estimated development time: Use the following development estimates (per hour of compressed instruction) (includes production):

Low Complexity	Moderate Complexity	High Complexity
50 hours	175 hours	500 hours

Criteria Applied to Audiotapes

Introduction

Audiotapes are used much like print, but instead of reading the content, the student listens to it using a tape player. Audiotapes can be used effectively for student learning, especially when combined with other instructional media. The following table applies the criteria to the use of audiotapes as the primary instructional medium.

Criteria	Application to Audiotapes	Effectiveness
Developmental Effort	Requires less time and effort than most other instructional methods. Similar to print.	+
Convenience of Instruction	Students can study and review information at their own pace.	+
Student Motivation	Requires a higher level of student self-motivation for effective learning to take place. Student learning is dependent on listening ability. Lack of auditory skills significantly impacts the effectiveness of the instruction.	-
Equipment/Support Requirements	Audiotapes are highly transportable and can reach many students. A cassette tape player is the only equipment required, and is widely available.	+
Instructor Requirements	Little instructor supervision, participation, or communication.	+
Level of Interactivity	Passive in nature – low level of student interactivity.	-
Feedback Capability	Low level of feedback and reinforcement.	-
Ease of Revision	Course content needs to be stable. Revisions require re-taping, duplicating tapes, and distribution to all sites.	-
Ease of Use	Audiotape technology is familiar to instructors and students, and they are comfortable using it.	+
Versatility	Audiotapes can provide effective instructional support for other types of instruction. Also, audiotapes can be retained for future reference.	+

Table 18 Criteria Applied to Audiotapes

Potential applications

Consider using instructional audiotapes when:

Visual and textual representations are not required, but verbal. Communication and explanation will contribute to content clarity.
Transmission of verbal cues and sounds are required.
Self-study is an option.

Audiotape cost/benefit considerations

Audiotape development requires careful scripting; talent must often be hired for the final narration.

Compression rate: It is estimated that a distance learning audiotape-based course will reduce the instructional time required to cover the same material in a resident course by 25%.

Estimated development time: Use the following development estimates (per hour of compressed instruction) (includes production):

Low Complexity	Moderate Complexity	High Complexity
20 hours	80 hours	200 hours

Criteria Applied to Audioconferencing

Introduction

Audioconferencing can be accomplished with off-the-shelf speakerphones. In order to connect numerous locations, however, additional equipment may be required. Audioconferencing can be an effective means of providing students access to experts. The following table applies the criteria to the use of audioconferencing as the primary instructional medium.

Criteria	Application to Audioconferencing	Effectiveness
Developmental Effort	Requires advanced planning to provide handouts with agenda/discussion topics, prerequisite assignments, etc. The easiest conference to set up on short notice.	+
Convenience of Instruction	Nearly everyone has access to a telephone and participants can connect from almost any location. However, requires all to meet/connect at a specific time.	+/-
Student Motivation	Provides real-time communications, collaboration, and interaction.	+
Equipment/Support Requirements	Other than a telephone, or speakerphone for larger groups, no special equipment is required. Most, if not all, telephone systems provide multi-site audio bridging. Existing SRUs can also be used for audioconferencing.	+
Instructor Requirements	In addition to instructing, the instructor must also facilitate, moderate, and manage student discussions and interactions.	-
Level of Interactivity	Allows everyone to participate and interact. Although large numbers can participate, it is generally more effective if the numbers are limited to ensure interaction.	+
Feedback Capability	Provides immediate verbal feedback. However, it can be a barrier for learners who process information visually.	+/-
Ease of Revision	The real-time nature of the instruction allows for instantaneous changes and revisions as required.	+
Ease of Use	Telephone technology is familiar to instructors and students, and they are comfortable using it. No equipment training required.	+

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Criteria Applied to Audioconferencing (Continued)

Criteria	Application to Audioconferencing	Effectiveness
Versatility	Can be used in conjunction with, and provide effective instructional support for, other types of instruction. Conferences can be taped and retained for future reference or review.	+

Table 19 Criteria Applied to Audioconferencing

Potential applications

Consider using instructional audioconferencing when:

Student feedback and remediation are required.
Site visits with subject matter experts cannot be arranged.
Short courses/Tutorial type lessons are used.
“Live” or synchronous communication is needed.
Interviews/group discussion is required.
Used in conjunction with other media.
Student-instructor and student-student interaction is required.

Audioconferencing is not appropriate for training tasks that require development and/or application of psychomotor skills.

Audioconferencing cost/benefit considerations

There are many compelling reasons to use interactive audioconferencing. They include the following:

Item	Reason
Cost	One of the least expensive technologies.
Accessibility	Nearly everyone has access to a telephone.
Interactivity	Allows everyone to participate.
Convenience	Can connect to a conference from any location.
Spontaneity	Provides instantaneous communications and feedback.
Well-established	Has been used effectively for years.
Easy to use	No equipment training required!
Recordable	Can be taped for future reference.
Versatility	Can be used with other instructional technologies.
Scalability	Can talk to one site or many sites.

Table 20 Audioconferencing Cost / Benefit Considerations

Limitations

There are relatively few drawbacks to using interactive audioconferencing. Most can be addressed in the design process. Limitations include the following:

***Is synchronous*.** Forces learners to meet at a specific date and time
***No visual feedback*.** Can be a barrier for learners that process information visually; also requires more concentration
***Can be impersonal*.** Can make some participants feel isolated since they can't see non non-verbal cues or body language
***Requires advance planning*.** Must be planned in advance to provide any handouts; thus, difficult to establish a conference on short notice
***Limited number of students*.** While it can be connected to hundreds, is more effective if size is limited to ensure there is interaction
Potential equipment costs. Potential additional costs to consider include devices that may be required for larger groups, such as speakerphones, microphones, or response units, and an audio bridge to interconnect multiple phone lines and control noise.

Compression rate: It is estimated that a distance learning audioconference-based course will reduce the instructional time required to cover the same material in a resident course by 25%.

Estimated development time: Use the following development estimates (per hour of compressed instruction) (includes production):

Low Complexity	Moderate Complexity	High Complexity
10 hours	40 hours	80 hours

Criteria Applied to Audiographics

Introduction

Audiographic conferencing combines computers and audio communications. Usually, this involves the use of PCs (to support computer-to-computer conferencing) and telephones so that students can interact with the computer presentation while consulting by telephone with the instructor, other students, and/or experts. The following table applies the criteria to the use of audiographics as the primary instructional medium.

Criteria	Application to Audiographics	Effectiveness
Developmental Effort	Requires advanced planning to provide handouts with agenda, instructional material, prerequisite assignments, etc. Moderately difficult to set up conference on short notice.	-
Convenience of Instruction	Requires all participants to meet/connect at a specific time.	-
Student Motivation	Provides real-time communications, collaboration, and interaction.	+
Equipment/Support Requirements	Requires a telephone, or speakerphone for larger groups, and reliable access to a computer, network system, and/or fax machine as applicable.	-
Instructor Requirements	Can be difficult to manage, particularly with larger groups.	+
Level of Interactivity	Allows everyone to participate and interact. Although large numbers can be accommodated, it is generally more effective if the numbers are limited to ensure active participation and interaction by all.	+
Feedback Capability	Provides immediate verbal feedback. Some visual feedback can also be provided if on-line application sharing is incorporated.	+
Ease of Revision	The real-time nature of the instruction allows for some immediate changes and revisions if required.	+
Ease of Use	Telephone technology is familiar to instructors and students. However, some degree of instructor computer literacy and training will be required.	-

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Criteria Applied to Audiographics (Continued)

Criteria	Application to Audiographics	Effectiveness
Versatility	Can be used in conjunction with, and provide effective instructional support for, other types of instruction.	+

Table 21 Criteria Applied to Audiographics

Potential applications

Applications of audiographics include:

- Courses that require large amounts of electronic graphic data transfer (e.g., engineering and technical data).
- For document sharing, and joint development or collaboration on projects/tasks.

Audiographics cost/benefit considerations

Relatively inexpensive and, depending on existing computer networking, may not involve significant infrastructure investments.

Compression rate: It is estimated that a distance learning audiographic-based course will reduce the instructional time required to cover the same material in a resident course by 25%.

Estimated development time: If used as the primary means of instruction, support materials (syllabus, handbooks, guides, etc.) would be required. Refer to analysis of medium selected for distribution of such materials (print, audioconferencing, etc). Computer graphics and data must be prepared. Use the following development estimates (per hour of compressed instruction):

Low Complexity	Moderate Complexity	High Complexity
25 hours	50 hours	75 hours

Criteria Applied to Computer-Mediated Conferencing

Introduction

The following table applies the criteria to the use of computer-mediated conferencing as the primary instructional medium. Computer-mediated conferencing incorporates asynchronous communications conducted by means of computers – it includes conferencing software, electronic bulletin boards, and/or e-mail. Computer-mediated conferencing also includes synchronous communications conducted by means of computers. Pop-up mail is a simple example of real-time (synchronous) computer conferencing.

It is important to recognize that while computer-mediated conferencing used to mean communication by written word, technological advances and the use of collaborative technologies have blurred the dividing line between computer-mediated conferencing and other forms of electronic video and audio conferencing, such as virtual conferencing.

Criteria	Application to Computer-Mediated Conferencing	Effectiveness
Developmental Effort	Requires some advanced planning and time to develop and post discussion topics and reference information. Relatively easy to set up an electronic "discussion" on short notice.	+
Convenience of Instruction	Allows participants to communicate and interact independent of time and distance.	+
Student Motivation	Promotes collaboration, interaction, and self-learning. Can be used effectively as a primary media for instruction. Unless required and enforced, students may not participate or respond.	+/-
Equipment/Support Requirements	Requires reliable and consistent access to a properly configured network computer.	-
Instructor Requirements	Can be difficult to monitor and facilitate electronic discussions and send/reply to e-mail messages with large groups; difficult to monitor student participation and progress.	-

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Criteria applied to computer-mediated conferencing (Continued)

Criteria	Application to Computer-Mediated Conferencing	Effectiveness
Level of Interactivity	Allows everyone to participate and interact. Although large numbers can be accommodated, it is generally more effective if the total number of participants is limited to encourage active participation and interaction by all.	+
Feedback Capability	Can provide timely dissemination of information and feedback to participants. Users may experience difficulty following discussion threads and receiving feedback due to the potentially large volume of messages.	+/-
Ease of Revision	The flexible nature of electronic discussions allows for some immediate changes and revisions to ongoing discussions or information as required.	+
Ease of Use	Some degree of computer literacy and training will be required for participants to ensure effective use.	-
Versatility	Can be used in conjunction with, and provide effective instructional support for, other types of instruction.	+

Table 22 Criteria Applied to Computer-Mediated Conferencing

Potential applications

Computer-mediated conferencing traces its history to more than 20 years ago when it was first created for instruction. Since then, its use has blossomed to hundreds of institutions using it for continuing education, graduate courses and supplemental programs. Computer-mediated conferencing is most effective in the following situations:

Short courses.
Courses designed to promote higher order learning such as analysis, synthesis, and evaluation.
Group discussion is required – seminars and talks.
Courses requiring cooperative learning or group learning.
Courses requiring written products.
Ideal for course where learners are encouraged to share their own personal experiences.

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Potential applications (Continued)

Useful for handicapped learners.
Used in conjunction with other media.
In support of correspondence or other distance learning courses where students must submit materials; also facilitates effective feedback to students.

As part of an overall course of study, computer-mediated conferencing may be used to establish a bulletin board which could be accessed by students and others, whether geographically separated or not. Correspondence with experts, posting of web sites for research, and sharing of development projects are facilitated through computer-mediated conferencing.

Computer-mediated conferencing cost/benefit considerations

Some of the many compelling reasons to use computer-mediated conferencing include:

Item	Reason
Cost	One of the least expensive technologies.
Accessibility	More and more learners are gaining access to the Web.
Expanded faculty	Great for guest lecturers since it is easy to connect them.
Interactivity	Because everyone must participate to learn, this is perhaps the most interactive form of distance learning.
Convenience	Not necessarily tied to a specific location or time.
Asynchronous communication	24-hour a day accessibility enables self-pacing. Provides time for reflection, research, composing.
Synchronous communication	Can design “live” interaction using structured chat rooms.
Versatility	Can be used with other instructional technologies.
Currency	Easy to update course materials.
Scalability	Can talk to one site or many with the potential for global connectivity.
Learner-centered	Focuses on the needs of the learner.

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Computer-mediated conferencing cost/benefit considerations (Continued)

Item	Reason
Audit trail	Provides documentation or transcript of interaction; can track who is contributing.
Promotes teamwork	Fosters more learner-to-learner interaction through discussion, guided projects, and individual conversations.

Table 23 Computer-Mediated Conferencing
Cost / Benefit Considerations

Constraints in using computer-mediated conferencing

The drawbacks to using computer-mediated conferencing include the following:

Requires Web access**.** Requires proprietary software or Web access. Requires learners and instructors to use Web browsers for Internet-based Instruction (IBI).
Equipment training**.** Assumes learners and instructors are conversant in using the equipment and technology to access the Web.
Can be impersonal**.** Can make some participants feel isolated since they cannot see non non-verbal cues or body language; in addition, medium is difficult to express emotions.
Assumes a mature learner**.** Requires a more disciplined, responsible learner as well as one that has good time management skills.
Limited number of students**.** While it can be connected to hundreds, is more effective if class size is limited to fewer than 30 learners.
Geared to verbal learners. Learners not able to clearly express themselves using the written media may be at a disadvantage.
Susceptible to technical problems. Medium is vulnerable to technical failures, software/hardware compatibility problems.
Time consuming**.** Responding to high volume of traffic is time consuming and may inhibit in-depth discussion.
Cultural resistance. Faculty and learners may resist this alternative instructional approach or may not view it as “real training/education.”

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Constraints in using computer-mediated conferencing (Continued)

*Multithreads***.** More than one conversation may take place simultaneously making it difficult to keep them separate.

Compression rate: It is estimated that a distance learning CMC-based course will reduce the instructional time required to cover the same material in a resident course by 35%.

Estimated development time: Usually employed as a support medium. If used as the primary means of instruction, support materials (syllabus, handbooks, guides, etc.) would be required. Use the following development estimates (per hour of compressed instruction):

Low Complexity	Moderate Complexity	High Complexity
50 hours	125 hours	250 hours

Criteria Applied to Interactive Multimedia Instruction (ICW)

Overview

The Interactive Multimedia Instructional technologies addressed in this section are: Interactive Courseware (ICW); Intelligent Computer Assisted Instruction (ICAI); Electronic Performance Support System (EPSS); Job Performance Aid (JPA); and Computer Simulation.

The following table applies the criteria to the use of interactive courseware (ICW) as the primary instructional medium. ICW is usually employed as a self-paced, asynchronous form of instruction. An ICW-based course may be distributed electronically, by disk, or (as technology is improving) may be downloaded from the Internet.

Criteria	Application to ICW	Effectiveness
Developmental Effort	Requires significant advanced planning and lead-time. Requires experienced instructional designers and developers, full storyboarding and scripting, and considerable resources and support.	-
Convenience of Instruction	Usually independent of time and distance. Most ICW is developed for individual use rather than group or cooperative learning environments. Students can proceed at their own pace.	+
Student Motivation	A high level of learning normally takes place because of the stimulation of multiple senses and the high degree of interaction. There is usually reduced learning time as compared to traditional delivery of the same material. However, students need to be highly motivated to ensure effective comprehension and timely completion of the instruction.	+
Equipment/ Support Requirements	Requires reliable and consistent access to a properly configured computer, and availability of technical support. Courseware must contain student "help" functions if an instructor/proctor is not present or available to answer questions. Presentation software is sometimes required.	-

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Criteria applied to interactive multimedia instruction (ICW)

Criteria	Application to ICW	Effectiveness
Instructor Requirements	ICW applications generally reduce instructor requirements. Help functions can also be incorporated into the software to assist students.	+
Level of Interactivity	High level of student interaction with the medium and instructional content is possible. In a DL environment, the lack of instructor/student interaction can be mitigated through the use of CMC and other communications support media.	+
Feedback Capability	Provides immediate and effective feedback to the student that can increase student motivation.	+
Ease of Revision	Revisions to computer-based instruction require significant time, effort, and resources.	-
Ease of Use	Some degree of computer literacy and proficiency training will be required for students to ensure their effective use of the instructional media.	-
Versatility	Can be used in conjunction with, and provide effective instructional support for, other types of delivery methods such as instructor-led, group-paced instruction. ICW is easily stored – makes it ideal for student review and remediation; provides for consistent learning experience.	+

Table 24 Criteria Applied to ICW

Potential applications

Consider ICW when:

Realism and/or simulation are required.
Course content is relatively stable (no more than 25% change per year).
Course content contains some affective and psychomotor skills.
Self-paced instruction is an option.
Safety is a factor – ICW simulations offer a non-threatening, safe practice environment.
Large numbers of widely dispersed students must be trained.

ICW cost/benefit considerations

Computer-based instruction, whether it is an electronic performance support system, a three-dimensional simulation, or a linear presentation requires experienced instructional designers and developers.

ICW development can be relatively costly if the computer hardware, instructional networks, and support are not already in place. However, the potential decrease in training time is 35%.

Compression rate: It is estimated that a distance learning ICW-based course will reduce the instructional time required to cover the same material in a resident course by 35%.

Estimated development time: Use the following development estimates (per hour of compressed instruction):

Low Complexity	Moderate Complexity	High Complexity
50 hours	265 hours	700 hours

Criteria applied to ICAI

Intelligent Computer Assisted Instruction (ICAI) is ICW with a brain. The courseware is programmed to respond to student actions and tailors the course of instruction accordingly. Because of the analysis required to anticipate student responses and the additional programming required to make the ICW "intelligent" course content must be stable and courseware developers must be highly skilled. The following table applies the criteria to the use of ICAI as the primary instructional medium.

Criteria	Application to ICAI	Effectiveness
Developmental Effort	Requires a considerable amount of time and effort to develop an expert model/system. Experienced instructional designers, developers, and programmers with unique skills/expertise are required, and they are not normally available in-house.	--
Convenience of Instruction	Usually independent of time and distance. Most ICAI is developed for individual use rather than group or cooperative learning environments. Students can proceed at their own pace. High-end equipment is sometimes required.	+

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Criteria applied to ICAI (Continued)

Criteria	Application to ICAI	Effectiveness
Student Motivation	A high level of learning normally takes place because of the stimulation of multiple senses and interactivity. There is usually reduced learning time as compared to traditional delivery of the same material. Because course content is tailored on the basis of student response, ICAI is usually more effective than traditional ICW.	++
Equipment/Support Requirements	Requires reliable and consistent access to training equipment or properly configured computer as applicable, and availability of technical support.	-
Instructor Requirements	Reduces instructor requirements. An expert system recognizes mistakes commonly made by students, and can detect and diagnose errors, and present information to correct misconceptions that would normally require an instructor.	+
Level of Interactivity	Very high level of student interaction with the medium.	++
Feedback Capability	Provides immediate and effective feedback and instruction to the student that can increase student motivation.	++
Ease of Revision	As with the development of ICAI systems, corrections and revisions to the instruction take even more time and expertise than revisions to ICW programs.	--
Ease of Use	Some degree of computer literacy and proficiency training may be required for students to ensure their effective use of the instructional media.	-
Versatility	Can be used in conjunction with, and provide effective instructional support for, other types of delivery methods such as instructor-led, group-paced instruction. ICAI is easily stored – makes it ideal for student review and remediation; provides for consistent content and varied learning experiences.	++

Table 25 Criteria Applied to ICAI

Potential applications

ICAI provides an excellent medium for instruction and performance measurement of:

Problem solving cognitive skills (the highest level of knowledge).
Diagnostic and troubleshooting skills (Judgment and Decision-Making Knowledge and Skills).

It is also excellent for remediation as feedback is immediate and, depending on the sophistication of the system, the system will automatically take the student through various approaches to a given concept until student responses indicate that the student has mastered it.

ICAI cost / benefit considerations

ICAI systems have the potential to instruct, diagnose, evaluate, and individualize instruction and remediation. However, development is generally labor intensive and requires unique skills/expertise.

Because of the expense involved in development of expert systems, they are usually reserved for teaching high-risk knowledge and decision-making skills. Such training may be an appropriate and cost-effective way to prepare military personnel for major military exercises, for example. ICAI is also used to develop skills that cannot be practiced during field or laboratory exercises (e.g., handling of nuclear material). In this case, the cost/benefit analysis would have to examine what the cost will be if the target population does not get this type of training.

Compression rate: It is estimated that a distance learning ICAI-based course will reduce the instructional time required to cover the same material in a resident course by 35%.

Estimated development time: It could take 2-4 years to develop, test, and refine an expert instructional system. Use the following development estimates as minimums (per hour of compressed instruction):

Low Complexity	Moderate Complexity	High Complexity
250+ hours	600+ hours	1,000+ hours

Criteria applied to EPSSs/JPAs

Electronic Performance Support Systems/Job Performance Aids (EPSSs/JPAs) are frequently employed to provide on-line assistance to individuals so they can perform their job tasks with minimal support and intervention by others; they are designed to support performance of specific job skills. They may be incorporated into formal training programs to help students learn how to use them effectively on the job, but are most often developed to support on-the-job skill development. EPSSs/JPAs are typically single-purpose tools used during actual operations to help technicians perform in a more effective, efficient, timely, or cost-effective manner. The following table applies the criteria to the use of EPSSs/JPAs as the primary instructional medium.

Criteria	Application to EPSSs/JPAs	Effectiveness
Developmental Effort	Requires significant advanced planning and lead-time. Very difficult to develop an EPSS/JPA with an integrated expert system. Requires experienced instructional designers and developers with unique skills/expertise, normally not available in-house.	-
Convenience of Instruction	Enables the user to gain rapid access to large amounts of information/instruction on demand from the work site.	+
Student Motivation	Increases user productivity and job/task performance. Reduces training time/requirements. Motivation is maintained because information is delivered on demand and is directly related to job performance.	+
Equipment/Support Requirements	Requires EPSS/JPA delivery equipment/system availability at each work site/station for user access.	-
Instructor Requirements	Reduces instructor/expert support requirements. Allows users to perform tasks with a minimum amount of external intervention or training normally requiring an instructor.	+
Level of Interactivity	High level of user interaction with the support system content and intelligent tutoring system is possible.	+
Feedback Capability	Provides immediate feedback to the user.	+

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Criteria applied to EPSSs/JPAs (Continued)

Criteria	Application to EPSSs/JPAs	Effectiveness
Ease of Revision	As with other similar computer-based applications, it takes some time, effort, and resources to develop and implement revisions to an EPSS/JPA.	-
Ease of Use	Some degree of computer literacy and/or equipment training will be required for users to ensure effective use of the EPSS/JPA.	-
Versatility	EPSSs/JPAs are retained and available in an electronic format at the work site for reference on demand when required. Requires much less physical storage than paper-based aids/manuals.	+

Table 26 Criteria Applied to EPSSs/JPAs

Potential applications

Consider using Electronic Performance Support Systems/Job Performance Aids when:

Providing on-the-job training for development of low-risk skill sets. Trainees can access the information whenever required.
Providing reinforcement after formal training; use of the EPSSs/JPAs can be addressed during the formal training so that optimum use can be made of the EPSSs/JPAs when the user returns to the workplace.
There is a need to reduce formal training time; effective support tools at the job site can reduce the requirement for formal training.

EPSS/JPA cost/benefit considerations

EPSS/JPA costs and effectiveness vary depending on the complexity of the support system. Task performance time can be reduced by as much as 50%.

A very basic and less costly EPSS/JPA may only provide a database and an on-line help system.
A complex EPSS/JPA can include a hypermedia database, interactive courseware, an expert system, and a dynamic

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EPSS/JPA cost/benefit considerations (Continued)	maintenance system which, like ICAI, could require significant development time, expertise, and cost. Estimated development time: Varies according to complexity of the system.

Criteria Applied to Computer Simulation

Overview

Computer simulation techniques allow the learner to practice procedures and solve problems in a life-like, safe learning environment. While these techniques can be employed using print or other non-electronic media, this examination of the technology assumes the use of computers as part of the simulation process. The following table applies the criteria to the use of computer simulation as the primary instructional medium.

Criteria	Application to Simulation	Effectiveness
Developmental Effort	Requires significant advanced planning, lead-time, resources, and effort. Expertise is required to reduce the desired learning objectives to algorithms that capture real-world events. Software is complex and generally costly to develop and test – significant prototyping and testing of the instructional simulation program are required.	--
Convenience of Instruction	Simulation instruction may be developed for individual or group use. Group participation is less flexible since participants must start/interact at the same time. Because simulation training is normally accomplished in real-time, the student has less control of the sequence and pacing of the presentation.	-
Student Motivation	A high level of learning normally takes place because of the realistic presentation and interaction provided.	++
Equipment/Support Requirements	Requires access to the simulation computer/equipment, and availability of technical support. Development platforms required.	-
Instructor Requirements	Requires instructor monitoring, supervision, management, and/or participation.	-
Level of Interactivity	Simulations provide a real-world learning environment and allow active “hands on” participation and performance of tasks in a safe environment.	++

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Criteria Applied to Computer Simulation (Continued)

Criteria	Application to Simulation	Effectiveness
Feedback Capability	Participants and simulator provide immediate and realistic feedback to the student that can increase student motivation.	+
Ease of Revision	As with development, significant time, programming skills and expertise are required for changes and revisions.	-
Ease of Use	Some degree of computer literacy and proficiency training will be required for students to ensure their effective use of the computer simulation instructional media.	-
Versatility	Can be used in conjunction with, or to replace, training accomplished using actual equipment or other media. Can be used following formal training to permit transition between the laboratory and the real world – to permit students to practice what they have learned in a safe environment.	++

Table 27 Criteria Applied to Computer Simulation

Potential applications

Potential applications include:

Training procedural tasks and simulating “hands-on” equipment operation.
Support of experimentation (“what if...”) without expenditure of critical resources.
Practicing life-threatening skills in a non-threatening environment.
Simulation methods can be employed to provide instruction, assess/track performance, or provide remediation as required.

Simulation cost/benefit considerations

Simulation provides very effective instruction and training in complex skills that would otherwise require actual performance of those skills in the operational environment. A significant cost savings may be realized if simulation is used vice operational equipment.

Cost varies significantly depending on the fidelity of the simulation and the delivery equipment required (training device). Since high (physical) fidelity simulation comes at a considerable cost, it must be determined how closely the simulation needs to duplicate the real performance tasks.

Development requires careful scripting; talent must often be hired for the final narration.

Compression rate: It is estimated that a distance learning simulation based course will reduce the instructional time required to cover the same material in a resident course by 35%.

Estimated development time: Use the following development estimates (per hour of compressed instruction):

Low Complexity	Moderate Complexity	High Complexity
250 hours	600 hours	1,000+ hours

Criteria Applied to Interactive Video Teletraining (IVT)

Overview

Interactive Video Teletraining (IVT) comprises two technologies: Interactive Television (ITV) and Video Teleconferencing (VTC). The following table applies the criteria to the use of ITV as the primary instructional medium. ITV provides one-way, site-to-site, or site-to-multiple site, transmission of audio and video instruction from a studio classroom to distance learning classrooms equipped with television monitors and student response units.

Criteria	Application to ITV	Effectiveness
Developmental Effort	Requires advanced production planning, coordination, and development efforts. Requires training for instructors.	-
Convenience of Instruction	Live lessons are scheduled only at specific times and because ITV broadcasts are accomplished in real-time, the student has little control of the timing, sequence, and pacing of the instruction. Success is also contingent on a host of technologies working without problems. Transmission/reception problems can interfere with flow of instruction. Has the advantage of distance learning in that the student does not have to travel to the training site whereat which the training is being conducted.	+/-
Student Motivation	Can provide a cost-effective means for conducting live, full motion quality training instruction to large number of students at widely dispersed locations. Allows instructors to communicate visually and be seen by students at remote locations.	+
Equipment/Support Requirements	Requires special satellite uplink/downlink and production equipment. Requires the availability of studio facilities and student access to ITV classrooms. Facilitator training and technical support are required to ensure efficient and effective operations.	+

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Criteria Applied to Interactive Video Teletraining (IVT) (Continued)

Criteria	Application to ITV	Effectiveness
Instructor Requirements	Requires active preproduction planning, coordination, rehearsals, and formal instructor training to ensure successful ITV instruction. But overall instructor requirements may be reduced if multiple iterations of the course are planned.	-/+
Level of Interactivity	Provides verbal communication and interaction by the students; but there is little direct interaction with the medium.	+
Feedback Capability	Allows for immediate verbal and visual feedback to the student. However, instructors cannot visually observe or receive visual feedback from the students.	+/-
Ease of Revision	Live broadcasts allow for immediate changes to the instruction.	+
Ease of Use	Students and DL site facilitators will require training in the use of equipment.	-/+
Versatility	Can be used in conjunction with, or to replace, training instruction accomplished using other media.	+

Table 28 Criteria Applied to ITV

Criteria Applied to Video Teleconferencing (VTC)

Overview

Video Teleconferencing (VTC) provides two-way, site-to-site, or site-to-multiple site video and audio instruction, simultaneously transmitted over satellite or terrestrial lines. The following table applies the criteria to the use of VTC as the primary instructional medium.

Criteria	Application to VTC	Effectiveness
Developmental Effort	Requires more advanced planning, preparation, organization and coordination than ITV.	-
Convenience of Instruction	Live lessons are scheduled only at specific times, and because VTC broadcasts are accomplished in real-time, the student has little control of the timing, sequence and pacing of the instruction. Success is also contingent on even more technologies working without problems. Transmission/reception problems can interfere with flow of instruction. Has the advantage of distance learning in that the student does not have to travel to the training site whereat which the instruction is being conducted.	+/-
Student Motivation	Can provide a means for conducting live, full-motion interactive video training. Allows two-way visual and audio communications between the participants at the remote locations. Provides wider access to instructors/ subject matter experts.	+
Equipment/Support Requirements	Requires special production equipment at all participating sites. Requires the availability and access to VTC facilities and classrooms. Facilitator training and technical support are required at all sites to ensure efficient and effective operations. VTC systems for education and training are not widely available in the AF.	-

Continued on next page

Criteria Applied to Video Teleconferencing (VTC) (Continued)

Criteria	Application to VTC	Effectiveness
Instructor Requirements	Requires active preproduction planning, coordination, rehearsals, and formal instructor training to ensure successful VTC instruction. But overall instructor requirements may be reduced if multiple iterations of the course are planned.	-/+
Level of Interactivity	Provides for verbal and visual communications and interaction among the participants. The number of sites and students may need to be limited to allow adequate interaction and direct observation of the students by the instructor.	+
Feedback Capability	Allows for immediate verbal and visual feedback at selected sites.	+
Ease of Revision	Live broadcasts allow for immediate changes to the instruction.	+
Ease of Use	Requires training for instructors, students, and facilitators in the use of the VTC communications equipment at all sites.	-
Versatility	Can be used in conjunction with, or to replace, training instruction accomplished using other media.	+

Table 29 Criteria Applied to VTC

Potential applications

Consider using IVT technologies when:

Many iterations of the same course are planned and projected travel costs for attendees are substantial.

There is an emergency training requirement to train a large number of geographically separated people in a short period of time.

A subject matter expert will conduct special or one-time training instruction and attendees are geographically separated – or subject matter expert cannot be physically present.

ITV applications are suitable for large audiences when there is no requirement for the instructor to observe student performance.

VTC is suitable for applications involving a limited number of sites or limited student enrollments.

IVT cost/benefit considerations

Since VTC lessons increase satellite uplink/bandwidth requirements, equipment, and support costs, the necessity of two-way video communication for delivery of instruction and accomplishment of learning objectives must be considered. Also, scrambling of the IVT transmission will require additional equipment, personnel, and increase costs.

The use of existing networks and facilities or the ability to lease networks and facilities can drive the decision to use ITV instead of VTC. Air Force users should leverage the existing ATN, Warrior Network, and GEWTN infrastructure.

Compression rate: It is estimated that a distance learning IVT-based course will reduce the instructional time required to cover the same material in a resident course by 20-30%.

Estimated development time: Use the following development estimates (per hour of compressed instruction) (excludes rehearsals and broadcasts):

Low Complexity	Moderate Complexity	High Complexity
10 hours	90 hours	250 hours

Criteria Applied to Internet Based Instruction (IBI)

Overview

Internet Based Instruction (IBI) is instruction that makes use of Internet technologies. The following table applies the criteria for instruction that combines text, multimedia, and conferencing techniques delivered over the Internet.

Criteria	Application to IBI	Effectiveness
Developmental Effort	Requires careful planning, coordination, and support to fully develop and integrate the IBI technologies into an effective and efficient instructional system.	-
Convenience of Instruction	Can be synchronous or asynchronous, self-paced or group-paced. Allows participants to communicate and interact independent of time and distance.	+
Student Motivation	When properly developed and employed, IBI can facilitate a high level of learning. Capable of combining self-paced instruction with group and instructor interaction.	++
Equipment/ Support Requirements	Requires reliable and consistent access to a properly configured networked computer, and availability of technical support. An on-line student "help desk" is necessary if an instructor, facilitator, or proctor is not always available to answer questions.	-
Instructor Requirements	In addition to instructing, the instructor must also facilitate, moderate, and manage student discussions and interactions. Life cycle instructor requirements may be reduced by converting course to text or multimedia format. Virtual conferencing may increase instructor life cycle requirements.	-
Level of Interactivity	High level of student interaction with the instructor, other students, and the instructional content is possible.	+
Feedback Capability	Provides various feedback vehicles and methods; feedback mechanisms must be built into asynchronous training programs.	+

Continued on next page

Criteria Applied to Internet Based Instruction (IBI) (Continued)

Criteria	Application to IBI	Effectiveness
Ease of Revision	The Internet is used for the distribution of training materials; the format of that material dictates the relative ease/difficulty of the revision process. Users have immediate access to course updates.	+/-
Ease of Use	Some degree of computer literacy and proficiency training will be required for instructors and students to ensure they can use the instructional media effectively.	-
Versatility	The various IBI technologies can be employed separately as the primary instructional delivery medium, or used in collaboration with each other as an integrated instructional system.	+

Table 30 Criteria Applied to IBI

Potential applications

IBI is appropriate when:

Students are widely dispersed and real-time interaction is required between students and instructors.

Rapidly changing electronic data must be transferred to students.

IBI cost/benefit considerations

The Internet is used for the distribution of training materials; the format of that material dictates the development time and life cycle costs of the training materials.

Compression rate: It is estimated that a distance learning IBI-based course will save the following estimated percentages of the instructional time required to cover the same material in a resident course.

25% if text-based
35% if multimedia-based
0% if virtual conferencing-based

Estimated development time: Refer to medium selected for development of training materials. Ensure adequate testing and quality review of materials is built into the schedule and that materials to be transmitted over the Internet can be downloaded and/or managed by the receiving systems.

Support Technology

Introduction

By definition, support technologies are used to support, or augment, instructional programs. They may be integrated into the instructional program or be used in conjunction with other technologies as separate components of the instructional program. In this section, each support technology is examined in terms of its strengths and weaknesses when employed to support the other technologies used as the primary means of delivering training.

Electronic testing

The strengths and weaknesses of electronic testing are summarized as follows:

Electronic testing strengths

Electronic testing strengths include:

- Automates the testing process and eliminates the task of manually tabulating, recording, and assessing the test results.
- Provides for random selection of test items and creation of individualized tests.
- When properly designed, developed, and employed, electronic testing can instruct, as well as evaluate.
- High level of student interaction with test content is possible.
- Provides immediate feedback on student performance – provides immediate test results.
- Provides for electronic storage and retrieval of test data which facilitates timely updates/revisions and better version control.
- Reduces future time and effort required to administer and manage the testing.
- Can be employed as standalone support tool or integrated into a computer-based instructional program.

Electronic testing weaknesses

Electronic testing weaknesses include:

- Requires some planning and coordination to effectively design, develop, and integrate electronic testing capabilities into an instructional program.
- Requires reliable and secure access to a properly configured computer.

Continued on next page

Electronic testing weaknesses (Continued)

Security is an issue. Verification is required to ensure that the individual taking the test is indeed the student. An instructor, facilitator, or proctor is usually required to verify student identification and monitor the testing.
Formal testing is normally a structured activity requiring students to participate at a specific time and location.
Some degree of computer literacy and training will normally be required for instructors and students to ensure they can effectively use of the instructional media for testing purposes.

CMI

The strengths and weaknesses of computer-managed instruction (CMI) are summarized as follows:

CMI strengths

CMI strengths include:

Reduces instructor time required for development and management of class data.
Can provide timely feedback on student status and performance (progress reports are easily produced).
Reduces time and effort required for student administration and management.
Generally transparent to the student.
Usually embedded in ICW; no special development or delivery equipment required.
Revision capability usually built into CMI software; updates accomplished with relative ease.
Greatly facilitates data collection and management relative to the instructional program (numbers of students trained, location of trainees, attrition rates, etc.)

CMI weaknesses

CMI weaknesses include:

Requires some planning and coordination to design, develop, and integrate CMI capabilities effectively into an instructional program.
Requires development software (though usually embedded in authoring systems) and skilled developers.
Some degree of computer literacy and training will normally be required for instructors and students to access CMI data.
When used with other than ICW, separate equipment may be required.

Electronic help desk

The strengths and weaknesses of the Electronic Help Desk are summarized as follows:

Electronic help desk strengths

Electronic help desk strengths include:

- Provides quick response to student inquiries, increasing sense of interaction.
- If purely electronic, there is minimal cost once established.
- Easy way to provide reference materials to students – prevents having to e-mail materials to individuals; enables students to answer their own questions.

Electronic help desk weaknesses

Electronic help desk weaknesses include:

- Mechanisms must be established to address all user contacts, either through direct response or through referrals.
- Help desks must be staffed with knowledgeable people; there may be a requirement for extended hours to support students of distance learning programs who are in different time zones or who may be studying during non-business hours.
- If student responses are not addressed in a timely manner, student interest could be negatively affected.
- Maintaining the help desk and ensuring help desk staff have complete and accurate information requires planning and coordination.
- The student-to-help desk support personnel ratio must be calculated realistically. Like instructors who are expected to respond to hundreds of e-mails while teaching a regular course load, help desk personnel can be inundated with requests – the end result is poor quality service.
- For purely electronic help desks, an effective search engine may be required to facilitate student research on a help topic.

Electronic publications

The strengths and weaknesses of electronic publications, including interactive electronic technical manuals (IETMs), are summarized as follows:

Electronic publications strengths

Electronic publications strengths include:

- Enables the user to gain rapid access to large amounts of information on demand during training or at the work site.
- When properly designed, developed, and employed, IETMs provide search capabilities that can instruct as well as provide information.
- Hypertext can be incorporated to facilitate linking to related sections internal to the IETM, or, if employed on Internet-capable system, to related websites on the Internet.
- Reduces instructor/expert support requirements. Allows users to access necessary information and perform tasks with a minimum amount of external intervention or training.
- High level of user interaction and branching with the IETM support system content is possible.
- Generally, user-friendly. Some training will normally be required for instructors and students to ensure they can effectively access and use the available information.
- Can be employed separately (portable), or integrated into the instructional system (can become an effective Job Performance Aid).

Electronic publications weaknesses

Electronic publications weaknesses include:

- The time, resources, and effort required to develop an IETM vary depending on the complexity and content of the application. Careful planning, coordination, and support will be required to fully integrate IETM into an instructional system.
- Requires IETM delivery device/computer availability at each work site/station for user access.
- Revisions are usually costly; best used for stable designs. It is feasible to accomplish minor database/technical information updates in a relatively short period of time if required.

Electronic support

The strengths and weaknesses of e-mail, electronic bulletin boards (EBB), and fax conferencing are summarized as follows:

E-mail strengths

E-mail strengths include:

Facilitates individualized student-instructor communications in a distance learning environment.
Can be used to communicate with students before they attend a resident course of instruction (to lessen course time spent on administrative matters).
User-friendly; requires minimal user training.

E-mail weaknesses

E-mail weaknesses include:

Can require a significant amount of instructor time if total student population is large. Instructor support may be required to handle communications in a timely manner.
E-mail is vulnerable to failure.

EBB strengths

EBB strengths include:

Facilitates announcements to all participants (e.g., assignments; conferencing times/locations; responses to frequently asked questions).
Not time-dependent; users can access information at any time.
After initial set-up, requires little preparation.
Minimal computer literacy required to access and employ EBB.

EBB weaknesses

EBB weaknesses include:

Requires technical support for set-up and administration of EBB (e.g., adding new users).
EBBs can be filled with junk mail; limits on posting access rights may be required.
Security is an issue – unless encrypted, virtually anything placed on the internet can be accessed by others.

Fax conferencing strengths

Fax conferencing strengths include:

Facilitates transfer of technical data; useful when supporting audio and/or video conferencing.
Equipment requirements are minimal.
User-friendly requires minimal user training.

Fax conferencing weaknesses

Fax conferencing weaknesses include:

Faxing to multiple sites can interrupt flow of interactive conferences.
Quality of faxed copy is highly variable.
Requires access to fax machine.

Voice mail

The strengths and weaknesses of voice mail are summarized as follows:

Voice mail strengths

Voice mail strengths include:

Minimal set-up and maintenance.
Provides inexpensive vehicle for asynchronous communications between instructors and students in support of DL or resident instruction.
User-friendly requires minimal user training.
Capable of screening and routing incoming student calls.

Voice mail weaknesses

Voice mail weaknesses include:

Voice mail capacity may be limited; student frustration could be a problem if prevented from leaving messages due to capacity limits.
Like e-mail, voice mail can require a significant amount of management on the part of the instructor or administrative personnel if student population is large.
While voice messages can be archived, there is usually a capacity limit – there is no communication trail to document commitments/expectations or other decisions reached.
Computer-based voice mail requires special equipment and software – not yet widely used.

Student response units

The strengths and weaknesses of student response units (SRUs) are summarized as follows:

Student response unit strengths

Student response unit strengths include:

- Provides for confidential student responses so that instructor can assess student understanding without embarrassing students.
- Facilitates reinforcement of learning.
- Provides for data collection so that instructional staff can analyze student responses and identify areas of instruction needing improvement.
- Can be used effectively to support brainstorming, team building, and consensus building activities.
- User-friendly requires minimal user training.

Student response unit weaknesses

Student response unit weaknesses include:

- Requires some preparation to structure the learning experience to make the most of SRU capabilities.
- Requires special equipment and instructor familiarity with the capabilities of SRUs.
- May be expensive to implement.

Section C
Curriculum Analysis and Media Feasibility

Overview

This section describes the steps for conducting a curriculum and media feasibility analysis – the analytical process of identifying and prioritizing media based on their capability to accomplish instructional goals. The process incorporates several phases:

- Review of learning objectives and levels of learning.
- Identification of instructional modules that appropriately group objectives into manageable chunks of instruction.
- Assessment of the importance of instructional design characteristics and strategies.
- Comparative analysis of the capability of various media to satisfactorily fulfill the instructional design characteristics.

The media feasibility analysis is designed for use by the IT project manager/instructional designer with ultimate responsibility for conducting a front-end analysis (FEA). It must be completed in conjunction with the course manager or primary customer capable of providing course and student data.
The purpose of this analysis, when combined with an initial resource and infrastructure analysis and a comparative cost analysis, is to identify viable, cost-effective technology options.

Background

The media feasibility process begins only after the needs analysis, task analysis, and objectives and tests have been accomplished. A needs assessment is completed by the training/course manager, or in some cases by a career field functional manager, to identify appropriate solutions to defined problems. If the needs assessment identified a training problem or an educational deficiency, then a task analysis (educational elements refer to this as an instructional requirements analysis) is performed to define the content of what should be taught. This leads to defining specifically what a learner will do with the content by clearly writing learning objectives and tests. At this point, a media feasibility analysis should be performed.

Task analysis

The *Task Analysis* identifies the *types of learning*, i.e., the *Knowledge, Skills, and Attitudes* (KSA), that are required for a new IT-based lesson. KSAs are the human performance factors that are required to perform a job task:

Knowledge is what an individual needs to know before performing a procedure under *normal conditions.* This is the ability to recognize and state facts, rules, procedures, discriminations, and problem solutions that are related to the performance of normal procedures. *Knowledge* must be retained in long-term memory (cognitively internalized) prior to performance of job tasks (educational elements refer to this as cognitive activities).

Skills are what an individual physically needs to be able to do in performing a procedure under *normal conditions.* These are the physical abilities or actions that are associated with the performance of normal procedures (educational elements refer to this as behavioral activities).

Attitudes are the *Judgment and Decision-Making (JDM) Knowledge* and *Skills* that an individual needs to apply in response to *abnormal or emergency condition cues* encountered during the performance of normal procedures. *Attitudes* encompass *Situational Awareness Knowledge* and *Resource Management Skills (countermeasures)* for abnormal and emergency conditions (educational elements refer to this as affective activities).

The *Learning Analysis* defines the *Levels of Learning* for each KSA identified during the Task Analysis process.

The KSA levels of learning represent a hierarchy of *learning behaviors* from simple to complex.

With each level of learning, there are associated *action verbs* that describe the *learning behavior*.

The associated *action verb* and the *performance standard* for each KSA *learning behavior* are determined, and the KSA learning objectives with *learning conditions*, *behavior*, and *performance standards* are documented.

An outline of instruction is developed for each learning objective, and the learning objectives are sequenced into modules of instruction.

Curriculum and learning objective analysis steps

The five steps involved with Curriculum and Learning Objective Analysis are:

Step 1: Identify a particular "piece of instruction" that you will analyze. This piece of instruction may range from a section of a course, to an entire course, to a group of related courses.

Step 2: Collect all related instructional documents and the outline of instruction. Review the objectives to ensure they are clearly written and describe a specific learning outcome.

Step 3: Identify each objective by KSA type based on the behavioral *action verb* (MIL-PRF-29612 and supporting handbooks; AFH 36-2235, Vol. 10).

Step 4: Determine the level of learning and the level of interactivity for each KSA learning objective (MIL-PRF-29612 and supporting handbooks; AFH 36-2235, Vol. 10).

Step 5: Review the instructional methodologies used to teach each learning objective in the current course (AFH 36-2235, Vol. 10).

Identification of instructional modules steps

Step 1: Organize the objectives into manageable modules or chunks of instruction. Resequence the objectives if necessary. The following criteria may help you define a module:

- Group by types of objectives – knowledge, skill, or attitude.
- Group optional or supplemental content not required by all students.
- Group content that is self-contained and could be exported independent of the rest of the course.
- Group segments of instruction that are managed or taught by different departments or whose personnel do not have full knowledge of the requirements of the other blocks of instruction.
- Group rapidly changing content that will require frequent updates.

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Identification of instructional modules steps (Continued)

Step 2: Identify specific attributes of each module that might affect conversion to an instructional technology format. For example:

Course materials are subject to frequent changes.
Guest speakers from outside the command are used.
External guest speakers are used.
Extensive student research is required.
Small student-to-instructor ratios are required.
Extensive student interaction with instructional materials is required.
A long period of time is required to learn the objective.
Real-time, one-on-one instructor observation of the student is required to ensure mastery of a skill objective.
Copyright restrictions.
Course materials are classified secret or higher.

Media feasibility steps

After defining the modules and determining the learning objectives that are to be migrated to an instructional technology format, perform the following media feasibility steps for each module:

Step 1: Determine the Importance Factor for each of the following instructional design characteristics that are required to meet the learning objectives associated with a module. Ask: "how important is it that the medium selected be able to accommodate each characteristic." Rate each characteristic on a scale of 0 (least important) to 5 (most important):

Continued on next page

Media feasibility steps (Continued)

Instructional Design Characteristics	Importance Factor
1. Allow real-time interaction between students and instructor.	
2. Allow real-time interaction and collaboration among students (group interaction).	
3. Provide instructional feedback from programmed or system (non-human) sources.	
4. Allow self-pacing of instruction.	
5. Allow learner control of scope and sequence of instruction.	
6. Support individualized instruction (ability to adapt to learner's needs).	
7. Support privacy of student inquiry and response.	
8. Fit various student schedules.	
9. Allow short-notice changes to the curriculum.	
10. Support inclusion of job task realism and emulated or simulated job task scenarios.	
11. Support inclusion of high quality, color, still graphics.	
12. Support animated 2D or 3D graphics.	
13. Support full-motion video.	
14. Provide high-fidelity audio.	
15. Support higher levels of knowledge learning (cognitive skills).	
16. Support higher levels of skill learning (psychomotor skills).	
17. Support higher levels of attitude learning (Judgment and Decision-Making KSA and affective learning).	
18. Be retained as a reference tool for later applications.	
19. Support student accessibility.	
20. Support sporadic, uneven student loads.	
21. Provide just-in-time access of stable for a task or procedure.	

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Media feasibility steps (Continued)

Instructional Design Characteristics	Importance Factor
22. Provide just-in-time access to volatile content for a task or procedure.	
23. Allow observation of performance.	

Table 31 Instructional Design Characteristics Rating Table

Step 2: Determine each medium's ability to meet each Instructional Design Characteristic. In the following table, Media Feasibility Matrix, each instructional design characteristic is matrixed with types of media. Each medium has been assigned a Rating Score from 0 (cannot meet the characteristic) to 3 (meets the characteristic effectively). The matrix spans two pages and incorporates all media presented.

Multiply the Importance Factor that was determined for each Instructional Design Characteristic by the Rating Score and record the Total Score for each type of instructional medium.

Media Feasibility Matrix

P: Print	AT: Audio Tape	VT: Videotape	AC: Audio Conferencing	AG: Audio Graphics	CMC: Computer-Mediated Conferencing

Instructional Design Characteristics	P	AT	VT	AC	AG	CMC
1. Allow real-time interaction between students and instructor.	0	0	0	3	3	3
2. Allow real-time interaction with other students (group interaction).	0	0	0	2	2	3
3. Provide instructional feedback from programmed or system (non-human) sources.	0	0	0	0	3	1
4. Allow self-pacing of instruction.	3	2	2	1	2	3
5. Allow learner control of scope and sequence of instruction.	1	1	1	0	1	3
6. Support individualized instruction (ability to adapt to learner's needs).	0	0	0	1	1	2
7. Support privacy of student inquiry and response.	3	1	1	0	0	0
8. Fit various student schedules.	3	3	3	1	1	3
9. Allow short-notice changes to the curriculum.	1	2	1	3	2	3
10. Support inclusion of job task realism and emulated or simulated job task scenarios.	1	1	2	1	2	1
11. Support inclusion of high quality, color, still graphics.	3	0	3	0	3	1
12. Support animated 2D or 3D graphics.	0	0	3	0	1	0
13. Support full motion video.	0	0	3	0	2	0
14. Provide high-fidelity audio.	0	3	3	3	3	0
15. Support higher levels of knowledge learning (cognitive skills).	2	2	2	2	2	3
16. Support higher levels of skill learning (psychomotor skills).	1	1	2	1	1	1
17. Support higher levels of attitude learning (Judgment and Decision-Making KSA and affective learning).	2	2	2	2	2	3
18. Be retained as a reference tool for later applications.	3	3	3	2	1	3
19. Support student accessibility.	3	3	3	3	2	3
20. Support sporadic, uneven student enrollments.	3	3	3	1	1	1
21. Provide just-in-time access to stable content for a task or procedure.	3	3	3	2	2	0
22. Provide just-in-time access to volatile content for a task or procedure.	0	2	2	3	3	0
23. Allow observation of performance.	0	0	0	0	1	0

Media Feasibility Matrix

Instructional Design Characteristics	ICW	JPA, EPSS	CS	ITV	VTC	IBI TG	IBI MM	IBI VC	IBI DVC
1. Allow real-time interaction between students and instructor.	0	2	0	3	3	0	1	3	3
2. Allow real-time interaction with other students (group interaction).	0	2	0	3	3	0	0	3	1
3. Provide instructional feedback from programmed or system (non-human) sources.	3	3	3	0	0	1	0	1	0
4. Allow self-pacing of instruction.	3	3	3	0	0	3	3	3	0
5. Allow learner control of scope and sequence of instruction.	3	3	3	1	1	3	3	2	1
6. Support ability to adapt to learner's individual learning needs	2	3	2	1	1	2	2	2	0
7. Support privacy of student inquiry and response.	3	3	3	0	0	2	2	0	0
8. Fit various student schedules.	3	3	3	1	1	3	3	2	1
9. Allow short-notice changes to the curriculum.	1	1	1	3	3	3	3	3	3
10. Support inclusion of job task realism and emulated or simulated job task scenarios.	3	3	3	2	2	1	3	1	2
11. Support inclusion of high quality, color, still graphics.	3	3	3	3	2	2	3	1	1
12. Support animated 2D or 3D graphics.	2	2	3	2	1	0	1	0	0
13. Support full motion video.	3	3	3	3	2	0	2	0	2
14. Provide high-fidelity audio.	3	3	3	3	3	0	2	2	2
15. Support higher levels of knowledge learning (cognitive skills).	2	2	3	2	3	1	2	3	2

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Media Feasibility Matrix (Continued)

Instructional Design Characteristics	ICW	JPA, EPSS	CS	ITV	VTC	IBI TG	IBI MM	IBI VC	IBI DVC
16. Support higher levels of skill learning (psychomotor skills).	2	3	3	2	3	1	3	1	2
17. Support higher levels of attitude learning (Judgment and Decision-Making KSA and affective learning)	3	3	3	3	3	2	3	3	3
18. Be retained as a reference tool for later applications.	3	3	3	2	2	3	3	3	0
19. Support student accessibility.	2	2	1	2	1	1	1	1	0
20. Support sporadic, uneven enrollments.	3	3	3	1	1	3	3	1	1
21. Provide just-in-time access to stable content for a task or procedure.	3	3	3	1	1	3	3	0	1
22. Provide just-in-time access to volatile content for a task or procedure.	1	1	1	1	1	3	2	0	2
23. Allow observation of student performance.	0	0	0	0	2	0	0	0	1

ICW: Interactive Courseware	JPA/EPSS: Job Performance Aid/ Electronic Performance Support System	CS: Computer Simulation
ITV: Interactive Television	VTC: Video Teleconference	IBI T/G: Text and Graphics
IBI MM: Multimedia	IBI VC: Virtual Conference	IBI DVC: Desktop Video Conference

Media feasibility steps (Continued)

Step 3: Calculate the totals for each medium. The Total Score that was computed for each medium indicates the medium's appropriateness for the migration of resident instruction to an instructional technology or distance learning format.

Continued on next page

Media feasibility steps (Continued)

Step 4. Identify potential media. The media receiving the highest Total Scores are potential tools for conversion of resident instruction. This selection process is not a final decision for migration of learning objectives to instructional technology, or for selection of a particular type of media.

Review the data, and take a hard look at the characteristics that were rated as a "4" or "5" Importance Factor. Ensure that the characteristics merit a high Importance Factor. Consider only those distances learning media with the highest Total Scores that are capable of satisfying your critical Importance Factor characteristics and learning objectives.

Media feasibility software

Commercial software is available to conduct an automated media feasibility analysis that utilizes the model described above. It includes a comparative cost analysis module that will allow you to estimate and compare the costs of various technologies to the cost of traditional classroom instruction. It will generate estimated and actual resource utilization charts, return on investment, and the breakeven point.

To obtain information on how to obtain this software, contact the AFIADLO or check the AFIADLO Web site http://www.maxwell.af.mil/afiadl/.

Other instructional technology selection models

The Government developed the Automated Instructional Media Selection (AIMS) Model to allocate selected media to specific training objectives for the Air Force Primary Aircrew Training System (AFPATS) Ground Based Training System (GBTS).

AIMS was developed in 1992 from a synthesis of current instructional delivery technology selection models.

AIMS derived instructional characteristics and attributes associated with specific learning objectives, and matrixed the instructional characteristics against a pool of available media to define the instructional media which could best deliver the required instructional characteristics of each learning objective.

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Other instructional technology selection models (Continued)

The concepts of the AIMS Model have been incorporated in the instructional delivery technology selection process described in:

MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*
MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*

Section D
Infrastructure and Resource Feasibility Analysis

Introduction

There are several very important questions that must be answered before the decision is made to actually convert existing courses, or course modules, to distance learning instruction, or before the decision is made to insert technology into the resident program. You must also look at infrastructure and resource requirements.

This feasibility analysis is not intended to be a complete instructional technology resource analysis. Additional detailed information will be required for Front End Analysis (FEA). It will, however, give decision-makers an estimate of the relative magnitude of a project and whether or not conversion to instructional technology or distance learning is "do-able" with existing resources. If existing resources are not available, initiate steps to fund and acquire them.

Infrastructure and resource issues

Consider the following:

How critical is the conversion project to mission readiness?

Includes a review of the intended goals of the project and an understanding of whether the project is being undertaken because it is mission critical, (resources must be allocated) or to save money (resources will be allocated only if return on investment is favorable), for example.

What resources are required to deliver the instruction in its current format and what are the current costs?

Consider all categories of resources to include instructor and student personnel costs, and other direct and indirect costs. The next section on cost analysis lists the primary resource categories.

Is the technical infrastructure in place to support the implementation of the project?

Continued on next page

Infrastructure and resource issues (Continued)

Determine if instructional systems are available for the development and delivery of IT courseware. Will students have adequate access to the system? If it is feasible to use more than one media for a project, select the one that has a robust infrastructure already in place; or be prepared to fund and perhaps build, the required architecture.

Is the organizational, administrative, and technical support structure adequate to ensure successful implementation of the project?

This is usually not a big problem if the project involves technology insertion in the resident program but may be very problematic in the DL environment. Includes everything from a consideration of student registration procedures to DL site personnel who will help facilitate the project in the field. (See section D, Chapter 2).

Is manpower available and trained to perform all ISD functions and to successfully field the project?

Includes instructors and facilitators, administration support personnel, students at anticipated remote site, and the IT core team and development team.

Is commercial off the shelf (COTS) courseware available?

Always look for existing solutions to avoid duplication of effort.

Is Defense Technical Information Service (DITIS) or Defense Audio Visual Information Service (DAVIS) available?

These databases have an abundant amount of existing courseware.

Is funding available for in-house or contracted efforts?

Determine what the budget constraints are first.

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Infrastructure and resource issues (Continued)	*What is the estimated length of time required to get resources and funding in place?* Compare this and the estimated development time for a given technology to the required operational date or estimated time of completion.
Next step	If, based on the answers to the above questions, you determine that conversions to certain instructional technologies is practical (you may have excluded some technologies due to lack of infrastructure), you should conduct a cost analysis to compare the cost of current instruction to other appropriate IT options and to estimate the overall cost of the project.

Section E
Comparative Cost Analysis

Overview

Before making a final selection of instructional media, it is important to determine if the potential benefits accrued by distance learning or technology insertion outweigh the potential costs, or whether the instruction will be cost-effective and provide an acceptable Return On Investment (ROI).

The purpose of a cost analysis is to provide the necessary information to facilitate and improve the evaluation and decision-making processes. Therefore, it is important that an accurate and comprehensive analysis of cost/benefit data be accomplished. This section provides:

An overview of the concepts involved in cost analysis.
The typical cost and benefit factors considered in the analysis.
A general approach for selecting or developing an appropriate cost model.

There are automated cost analysis tools available that can be used to assist decision-makers. Refer to the AFIADLO Web site (http://www.maxwell.af.mil/afiadl/ http://www.au.af.mil/afdlo) for the most current cost analysis information and references.

Basic cost analysis approaches

The focus of the cost analysis and the basic approach taken will depend on what you intend to assess. If you are assessing whether training is working, or if training solves a problem, then you must assess the outcomes. If you are assessing how to reduce training costs, or the most efficient way to conduct training, then you must assess elements other than outcomes. The two general types of cost analyses are:

Cost/benefit analysis. Cost/benefit analysis is used when decision-makers need to understand the full impact of an alternative, not only the financial costs of the alternative, but also qualitative costs and benefits. This approach to decision-making is used when the objective is to select that instructional alternative which presents the “best value” – and this may result in the selection of other than the lowest cost

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Basic cost analysis approaches (Continued)

alternative. When comparing alternative approaches to training, a cost/benefit analysis is often performed for each alternative and then the results are compared.

Cost-effectiveness analysis. This analysis is used when cost is the major decision factor. Compares the costs of two or more instructional alternatives to determine whether the selected medium can reduce costs, or is the most efficient method of instruction. For instance, does a move to interactive media training save time and money?

Cost modeling definition

Effective cost analysis relies on the implementation of carefully constructed financial models of training. A model defines:

The variables involved in calculating the cost of training.
The relationship of those variables to one another.
The assumptions being made.

Variables might include labor, materials, equipment, facilities, and travel expenses.

A model places the variables in an equation to represent training costs. For example:

TC = L + M + E + F + T

Where (TC) training costs are the sum of the (L) labor, (M) materials, (E) equipment, (F) facilities, and (T) travel.

A model dictates what data is to be collected. That is, it determines what costs are to be measured.

Cost factors

A valid cost analysis must be complete. All costs involved in all aspects of design, development, evaluation, and implementation of the training must be included. Both the one-time “start-up” costs and recurring operational costs need to be considered in the analysis. Thus, the first step in conducting any type of cost analysis is to identify all the costs that must be defined (figuring

Continued on next page

Cost factors (Continued)

out the actual costs for each cost category comes next). When determining the cost categories, remember that these costs will have to be defined for each alternative being analyzed. The typical cost factors include:

Hardware and Software Costs: computer systems, production equipment, training equipment, programming and application software, etc.

Network/Telecommunications Costs: telecommunications costs/fees as applicable to include access/user costs for satellite and terrestrial networks.

Instructional Material Costs: purchase, production, and distribution costs for courseware and other instructional materials.

Personnel Costs: manpower costs for instructors, facilitators, instructional developers, programmers, technicians, maintainers, administrators, participant's time spent in training, etc., as applicable.

Maintenance Costs: repair, upgrade, and replacement of equipment, and the revision and maintenance of courseware.

Travel and Per Diem Costs: travel to/from the schoolhouse or training site.

Other Support Costs: administrative, contract, overhead, facilities, etc.

Training Attendance Costs: participant's time spent in training; lost productivity or cost of replacing the individual while in training.

Instructor Costs: Instructor's time spent in training, lost productivity or cost of replacing the individual while in training.

Other Instructional Development Costs: Non-personnel resources used during the design and development of the training materials.

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Cost factors (Continued)

Course Metrics: Expected course life; course length; number of students in each class; number of times the course is to be presented; number of instructors per class

Others: Opportunity costs (lost sales); production and materials cost; development and evaluation time.

Benefits

Measuring the direct benefits or results of the instruction is a more complex task since some benefits may be difficult to quantify. The objective is to attach a cost or quantitative value to each benefit – and each benefit must be derived from the instructional alternative being examined. That is, there may be other factors that contribute to a given benefit; the analyst must isolate and measure only the effects of training. Typical benefits to consider include:

Reduced training time: Reductions may be realized in facility, personnel, and TDY costs, as well as less nonproductive/lost time while student is in training.

Reduced material costs: Potential cost savings for revision, distribution, and maintenance of instructional materials/courseware in electronic format versus printed or "hard copy" materials.

Improved on-the-job safety: Translates into fewer accidents and increased productivity.

Improved job performance: Less time to perform/accomplish tasks, increased productivity/efficiency/quality of work, or improved management/command/supervision/decision-making ability, amount of positive versus negative feedback from "clients", changes in employee morale and motivation.

Reduced manpower requirements: Potential manpower savings as a result of increased efficiency or productivity, less supervision required, etc.

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Benefits (Continued)

Reduced equipment requirement: Simulation training may reduce the need, impact, or expense of allocating actual equipment to train hands-on skills.

Higher equipment operational availability: Fewer operator/maintainer errors, safety incidents/accidents, etc., may result in lower maintenance requirements and equipment/system downtime.

Cost/benefit models

There are many different types of cost/benefit models available, from basic models, to very specific models tailored for a particular type of training situation. The choice of the model is dictated by the purpose of the assessment. Three of the most common types of general cost models are:

Resource requirements model (additive model)
Life cycle model
ROI model

Resource requirements model

In general, the resource requirements model identifies the associated costs over a specified time period. This type of model (see example below) can be used to sum up the costs of a particular instructional system during the various phases of development for comparison with the costs of using other instructional media. One matrix is developed for each medium or approach being considered. The matrices are compared and provide data to support selection of one alternative.

Phase	HW/SW Costs	Network Costs	Material Costs	Personnel Costs	Maintenance Costs	Travel Costs	Other Costs
Analysis							
Design							
Development							
Implementation							
Evaluation							
Totals							

Table 32 Instructional Design Characteristics

Life cycle model

The life cycle cost model identifies the cost of the instructional system over its useful life. This type of model looks at the initial start-up costs for implementation and the recurring costs of a particular instructional system based on the projected life cycle. The initial start-up costs for technology-based instructional systems are generally high as compared to the traditional classroom lecture costs. However, when these initial costs are amortized (start-up cost spread over the number of life cycle years) and combined with the lower recurring costs, the actual operating cost over the life cycle period is usually much less, particularly when calculated as cost per student. That is, as the number of students trained increases, the cost of training each student decreases. The following diagram demonstrates this principle.

Life cycle cost of instructional programs

In the following diagram, "A" represents a small technology-based instructional program while "B" represents the same program developed as a traditional lecture-based resident instructional program. In this case, we are looking at the cost per student. At about 380 students, the cost per student is the same for each alternative. After that point, the cost of alternative "A" is less per student. Cost savings are realized by introducing technology if more than 380 students are to be trained.

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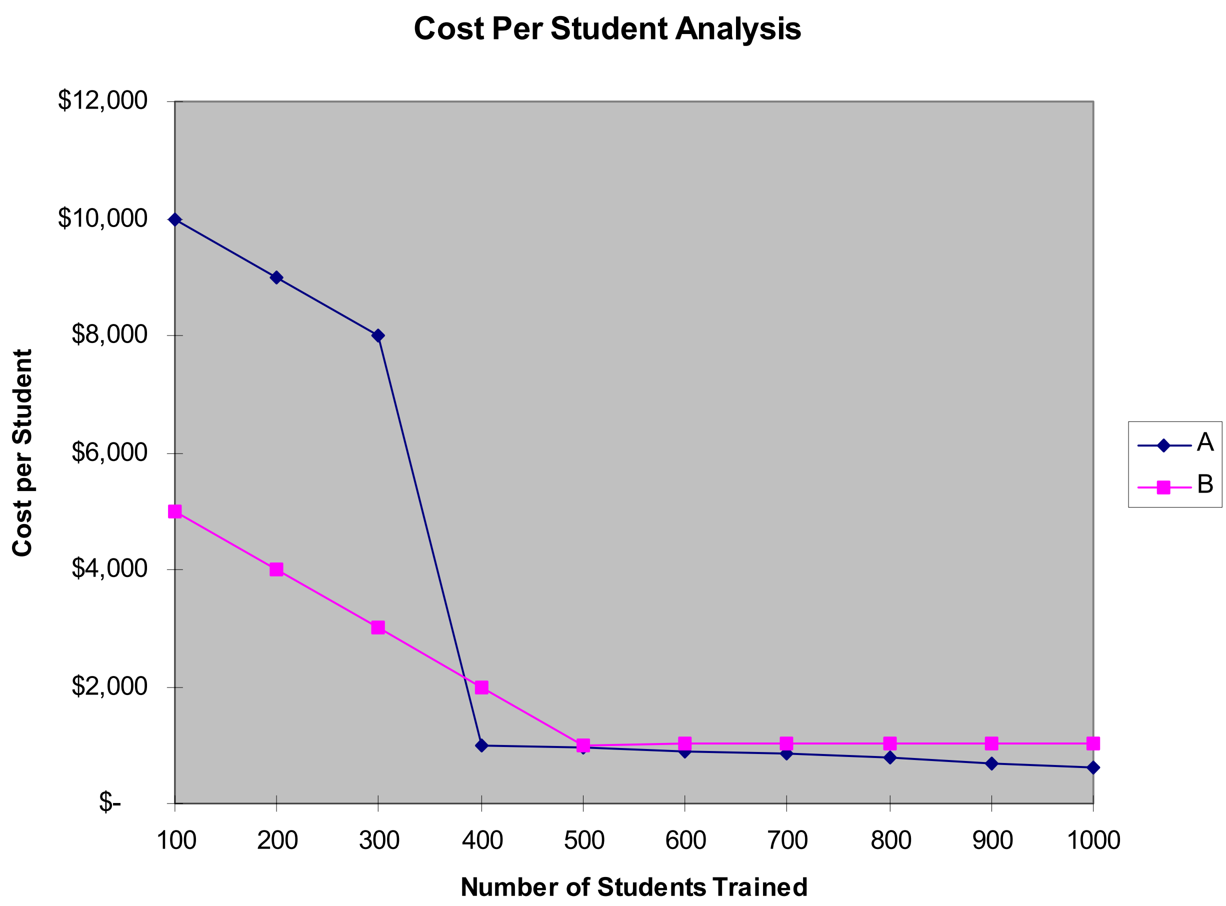
Life cycle cost of instructional programs (Continued)

Figure 5 Example of Life Cycle Cost of Instructional Programs



Return Of Investment (ROI) model

The ROI model addresses the effectiveness of the instructional system in terms of a ratio of benefits versus costs. The ROI model could be applied for various instructional systems to determine the media with the highest ROI. For example if:

ROI = (value of benefits – cost of instruction) / cost of instruction

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Return Of Investment (ROI) model (Continued)

When comparing one system with a determined value of benefits of $2,000 and a cost of $500, and another system with a value of $1,500 and a cost of $1,000, the corresponding ROIs would be as follows:

(1) ROI: (2000 – 500) / 500 = 3

(2) ROI: (3000 – 1500) / 1500 = 1

In this example, system (1) is more cost-effective.

Conducting the cost analysis

The general steps associated with conducting a cost analysis are depicted below. Although it shows a linear series of steps, the actual analysis process may very well end up to be an iterative, ongoing process – many of the steps are performed concurrently and feed into one another as the application of processes and estimation techniques are refined. Teamwork is essential to effective cost analysis – the more expertise there is when estimating costs and benefits, the better the chances of establishing realistic cost comparisons.

Step 1. Determine the type of analysis to be conducted – what kind of results expected? (Refer to AFIADLO website (http://www.maxwell.af.mil/afiadl/) for cost analysis guidance.)

Cost/Benefit – compare and contrast costs and benefits of proposed alternative approaches to training.
Cost-effectiveness – cost comparison of alternative systems/media.

Step 2. Identify cost factors and benefits or results that will be measured.

Determine what it is that you want to measure – what factors do you want to compare? Consider the availability of the information for each system/medium considered and document assumptions made.

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Conducting the cost analysis (Continued)

Step 3. Select/develop appropriate model that will provide the desired results.

Resource requirements model
Life cycle model
ROI model
Other model(s)

Step 4. Collect data and ensure data is valid.

This can be the most time consuming part of the cost analysis process. If you are comparing the cost of instructor-led resident instruction to the cost of technology-based instruction, make sure you understand what is included in the cost figures maintained for resident instruction. Know what is meant by cost per student day, or cost per graduate, etc. For example, are the cost of facilities and manpower included in these cost figures? Be sure you compare the same cost factors and DOCUMENT ALL ASSUMPTIONS.

Step 5. Apply data to the model.

Step 6. Determine and assess the results.

Section F
Media Selection

Overview

After a Media Feasibility Analysis, Infrastructure/Resource Feasibility Analysis and Cost Analysis have been accomplished, perform a reality check on the media selected, and make a final media selection/recommendation.

Issues

Cost and learning effective media selection requires a formal decision process. Refer to Chapter 2 for information on the project management process.

The personnel required to accomplish a Media Feasibility Analysis are not the same as the personnel required to accomplish a Cost Analysis. Refer to Chapter 2 for information on team composition and coordination with other organizations.

> Final media selection occurs only after a Media Feasibility Analysis, Infrastructure/Resource Feasibility Analysis and a Cost Analysis have been accomplished.
>
> The final decision to convert a course or a module of instruction to an IT format is made by the course or training manager (or primary customer) based upon the results of the analyses and the recommendation of the instructional designer or project manager.

Next steps

The Project Manager/Instructional Designer documents and reports findings to the primary customer. If the decision is made to proceed with in-house development, the Instructional Technology development team is assigned and a Memorandum of Agreement (MOA) or a project plan is negotiated with the customer according to the process described in Chapter 2. At this point, the IT development team will update DITIS/DAVIS database if appropriate to the selected medium, and initiate the project folder along with man-hour data collection and life-cycle management.

Front-end analysis

Developing courseware requires a front-end analysis tailored to the chosen instructional technology. Chapters 5-9 describe some of the analysis issues pertinent to each media. A highly effective tool for conducting a front-end analysis for computer-based media is AL-TP-1991-0048, entitled "Characterization of Air Force Training and Computer-Based Training Systems," from Armstrong Laboratory, Brooks AFB, TX.

Chapter 5
ISD CONSIDERATIONS FOR TRADITIONAL MEDIA

Overview

Introduction

This chapter describes ISD considerations for the analysis, design, development, implementation, and evaluation of traditional media.

Where to read about it

This chapter contains four sections:

References

The material in this chapter is based on the following references:

MIL-PRF-29612, *Training Data Products*
MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*
MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*
MIL-HDBK-29612-4, *Department of Defense Handbook, Glossary of Training Terms*
Distance Learning Curriculum Analysis and Media Selection, Air University, Maxwell AFB, AL, 4 Feb 1994
ECI Guide for Authors, 1997, Fourteenth Edition, web site: http://www.au.af.mil/au/oas/eci/eciproto.htm
Government Printing Office (GPO) Style Guide
AF Handbook 36-2235, *Information for Designers of Instructional Systems, Volume 4*
AF Manual 36-2234, *Instructional Systems Development*

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References (Continued)

AFIADLO Home Page web site:
http://www.maxwell.af.mil/afiadl/ http://www.au.af.mil/afdlo
AFH 37-137, *The Tongue and Quill*
AFI 37-160, *Air Force Publications and Forms Management Programs – Guide for Proponents of Air Force Publications, Volume 5*
AFM 37-126, *Preparing Official Publications*
AU Style Guide, web site:
http://www.au.af.mil/au/oas/aupress/style/

Section A
Print Materials

Analysis Considerations

Why use print materials?

Most current instruction is still accomplished primarily or in conjunction with printed documents and materials. Print materials will always have an important role in the delivery of instruction.

Print materials serve as a basis for student learning by providing information, facts, examples, and explanations. Examples of print items include placards, flip charts, illustrated booklets, and photographs. Print is also highly transportable and suitable for self-instruction by students at any location. Technologies are emerging that facilitate the production of materials by course developers.

When to use print materials

Print materials can be used to deliver:

An entire course of instruction that is based on cognitive (knowledge) learning objectives (i.e., correspondence courses).
Combined with other instructional technologies as collateral material for any type of course.

Since print materials are passive in nature and can only provide knowledge-based instruction, they would not be appropriate as the primary media for accomplishing learning objectives that require performance skills or a high level of interactivity and communication with others. Print instruction is most effective when it is integrated with other types of media and instruction.

General applications of print materials include:

Study Guides
Textbooks
Manuals, Workbooks, and outlines
Instructor/student guides
Documents
Illustrated booklets/handouts

Continued on next page

When to use print materials (Continued)

Case studies
Scripts
Assignments and schedules
Tests, quizzes, and critiques
Pictures, drawings, and graphics

Print resource requirements and constraints

It is important to identify and assess the print resource requirements and constraints. This will help to determine the feasibility of using print instruction, and whether or not the print materials should be produced in-house.

Equipment. Minimum required equipment would include a PC (with a word processing/desktop publishing application), high quality laser printer, and a collating copy machine. Optional: Color-capable printer and copier.
Facilities. As a minimum, an office would be required with the minimum equipment to produce the instruction.
Funding. Is there a budget? This factor will determine if outsourcing is an option.
Personnel. Minimum recommended personnel would include a Subject Matter Expert (SME), writer, editor, and publisher. These would not necessarily be different individuals. In some situations, they may be one and the same person.
Time. Is there a time limit? Since the potential requirement exists for the development and production of complete textbooks, manuals, etc., which can be complex and time consuming, time is a significant factor. Large in-house print production efforts usually take longer than anticipated.

In-house development or outsource?

With the current availability of powerful, user-friendly desktop publishing software, the capability to produce *professional-looking* print materials is now available to any user. However, to produce *professional-quality* print materials, special designing, writing, editing and publishing skills are still required. Therefore, if *quality* is an issue and funding is available, consider using professional publishing personnel.

For most applications, well-written print materials developed in-house will effectively meet instructional requirements. The only

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In-house development or outsource?

outside assistance that may be required is the reproduction of copies for distribution. However, for the larger and more complex instructional textbooks and manuals, a significant amount of time and effort will be required to complete the task. This may necessitate outsourcing some or all of the effort if unit personnel will not have the time to produce the materials in-house.

At times, a "mix" of in-house developed materials and external resources (i.e., stock photography) can be used to produce high quality materials.

Design Considerations

Determine the objectives

Determine the specific knowledge and attitude objectives that must be achieved. Decide what it is you want to do and accomplish with the print materials.

Determine what approach to use

Determine whether the print materials will be developed as the primary instructional media, or used as collateral instruction for other media.

Based on how the print instruction will be used, determine what type of print materials should be employed to meet the specific learning objectives (e.g., textbook, workbook, and student guide)?

Design strategy

Determine the design strategy. Because print instruction is mostly self-directed and self-paced, the print materials should be designed to motivate, stimulate, and hold the attention and interest of the student.

Determine what type of test and evaluation methods should be used to measure the students' comprehension of the instruction provided. AF HDBK 36-2235, Volume 12, *Test and Measurement Handbook*, provides general guidance.

General design guidelines

Before designing the print materials, you should be aware of the students' reading skills and knowledge level of the subject material. Consider the following guidelines when designing print materials:

- The print instruction should facilitate creative thinking, encourage self-instruction, maximize interaction, and provide a means for self-assessment.
- The print instruction should be performance-oriented – it should tell the students what they need to know and what to do.
- The print instruction should use the full presentation capabilities of print materials (pictures, diagrams, graphics, color and text).

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General design guidelines (Continued)

The print instruction should be provided in manageable chunks.
The print instruction should correlate with other media instruction provided.

What to do

For effective design, use:

Writing:

Plain conversational English.
The active voice and personal pronouns.
Short sentences.
A logical sequence for paragraphs and sentences (e.g., general then specific, right ways then wrong ways, advantages then disadvantages).
Questions that focus on student understanding to help them identify important material and make the desired inferences.
Humor constructively to improve student retention and interest.

Visuals:

Examples and illustrations to link the familiar with the unfamiliar.
Pictures to show spatial relationships and object form.
The same format throughout – be consistent.
Eye-pleasing layout with lots of "white space."

What not to do

Design considerations should avoid:

Irrelevant information and verbosity.
Compound sentences.
Complex and difficult words.
Double negatives.
Jargon.
Gender terms.

Develop an outline

Determine how the content will be organized and structured based on the objectives and purpose of the instruction. Then develop an outline of the material to be covered before you start working on any of the content.

Get approval

Once you have developed an outline, you should probably get the necessary coordination, evaluation, and approval of the outline and design strategy before proceeding.

Development Considerations

Where to go for guidance

The following Internet sites can be accessed to obtain information on AF and AETC publications, handbooks, instructions, etc., that provide guidance related to the development of documentation.

http://afpubs.hq.af.mil
http://www.aetc.af.mil/m/

You will also need to consult any applicable MAJCOM, Numbered Air Force, and local unit publications for guidance.

If the print materials will be used as the primary instructional media for a correspondence type course, you should contact AFIADLECI for initial guidance and reference information.

Gathering information

The amount of time and effort that will be required to research the subject and gather the required information will most likely depend on the type(s) of print materials being developed (textbook, workbook, study guide, lesson outline, etc.). This is the key function in development process; so make sure sufficient time is planned and allocated to do this.

If you are not the SME, then you will be working with a SME during the development of the instruction. The SME is usually the primary source of information. However, solicit inputs and information from other sources such as the training manager, technical experts, the other services, and DoD agencies as applicable. Also, review any existing courseware and technical/training materials.

Develop a draft

If you are writing the instruction yourself and you are not somewhat proficient in using a PC or word processing application, then you are already in trouble! Plan ahead and obtain any necessary support or training.

While developing the draft, keep focused on the specific learning objectives and make sure the content is relevant and useful. Develop test questions and evaluation tools that will effectively

Continued on next page

Develop a draft (Continued)	measure the students' knowledge of the required material, provide feedback, and meet the specific learning objectives. When the initial draft is complete, you may want to consider conducting an internal review prior to the formal review and coordination process. For an internal review, get as many eyes as possible to look at the material. If feasible, include disinterested third party people who do not have a stake in the product.
Final review, editing, and approval	Conduct a summative evaluation and make any necessary changes or edits to the material. If the preceding analysis, design, and development processes were accomplished properly, then very few changes will probably be required at this stage in the game. Finally, go and get approval.

Implementation Considerations

Print copy reproduction

Determine if unit reproduction support or contract services are already available to accomplish this task. If they are not, you will need to determine if the capability exists to reproduce the print materials in-house, and whether it would be cost-effective to do so. A high quality laser printer will normally be required to produce a camera-ready master copy of the printed materials for reproduction. Also, a high speed collating copy machine should be used if the multiple copies will be made in-house to minimize the time and effort required.

If color copies are required, access to a color printer and copier will be required unless commercial support is used.

Electronic copy reproduction

Most units have established procedures, standards, and/or methods for the format and electronic reproduction of courseware materials. You will need to check with the unit administration or training personnel for information.

Many print shops are now capable of generating print materials from electronic files. Consult with your print shop before formatting and laying out the materials. The print shop may designate required formats for text, graphics, and other items. They may also recommend the best way to organize the document into a master file and sub files.

Distribution

Once again, most units have established procedures and methods for the distribution of formal courseware materials, including electronic versions. Assuming that you will not be responsible for the actual distribution of the materials, you should still make sure, as a minimum, that the distribution list is current.

Evaluation Considerations

Evaluation of print instruction

As with other instructional technologies, the evaluation process for print instruction consists of a formative, summative, and operational evaluation. If the print materials were developed as supporting instruction for other instructional media, then these materials should be evaluated as part of the primary lesson/course evaluation.

The distance learning evaluation metrics are described in Chapter 2. The general guidelines for evaluations are contained in MIL-PRF-29612 and its supporting handbooks.

This section addresses the special considerations for conducting evaluations of print materials when developed as the primary instructional medium.

Formative evaluation

The formative evaluation begins in the analysis phase and continues through the development phase of the ISD process. During the initial phases of development, the primary focus would be on the technical accuracy of the learning objectives, content, and test items.

Once draft versions of the materials are developed, individual and small group tryouts of the instruction can be accomplished. General areas to evaluate include:

- Instructional material organization, structure, and format.
- Content accuracy, relevancy, currency, effectiveness, completeness, spelling, and grammar.
- Use, clarity, and effectiveness of pictures, graphics, diagrams, test questions, etc.
- Student comprehension and accomplishment of the learning objectives.

Results of these evaluations are used to revise and finalize the print materials.

Summative evaluation

The operational tryouts for the summative evaluation of the print instruction should be conducted at various sites.

Operational evaluation

The operational evaluation is an ongoing process that is accomplished after the formative and summative evaluations. This evaluation is based on internal and external feedback data such as:

Instructor/facilitator comments (internal)
Student critiques (internal)
Test results (internal)
Inspection and evaluation reports (external)

To ensure the quality of the instruction is maintained, conduct these evaluations on a regular basis. There is always room for improvement.

Section B
Videotape

Analysis Considerations

When to use videotape

In general, videotape would be appropriate for any instruction that requires visual communication with the student (visual cues, motion, actions, etc.). Videotape presentations can enhance, and help clarify, the instruction provided. It is an effective medium to use to reach large, widely distributed audiences.

Videotapes can be used:

- To support or reinforce other instruction by providing visual demonstrations of tasks, and showing actual equipment, locations, people, etc.
- To deliver instruction from instructors, technical experts, etc., that is not always available for live presentations at the various sites.
- When consistency/standardization of the instruction is required at all sites.

If videotapes are used alone as the primary instructional media, there is no guarantee that any learning will take place. For videotapes to be effective, other collateral instructional materials and activities should be used to reinforce the videotape instruction.

Videotape resource requirements and constraints

It is important to identify and assess the videotape resource requirements and constraints. This will help to determine the feasibility of using videotape instruction, and whether or not the video production capability exists in-house.

- **Equipment.** Minimum required equipment would include video camera(s), video cassette/tape recorder, TV monitor, tripod, lighting equipment, microphones, and headphones.
- **Facilities.** Can the taping be accomplished on site, or will a production studio be required? If a production studio will be used, is there one available in-house (e.g., IVT studio), or will a studio need to be rented?

Continued on next page

Videotape resource requirements and constraints (Continued)

Funding. Is there a budget? This factor alone may determine if outsourcing is even an option.
Personnel. This is a variable factor that may need to be limited based on available resources. Assuming that professional personnel are used, the production team may include a production manager, producer, director, editor, casting director, cast, camera crew, lighting/sound technicians, stagehands, makeup person, and various other assistants as desired.
Time. Is there a time limit? Since video production can be complex and time consuming, time is a significant factor. In-house video productions almost always take longer than anticipated or planned.

In-house development or outsource?

The production of professional quality videotapes requires years of experience. If quality is an issue and funding is available, consider using only professional production personnel. On the other hand, considering that the most important factor from an instructional standpoint is the content, a well-written script and a home video camera may fit the bill. Obviously, the answer will probably lie somewhere between these two. In any event, some or all of the effort may need to be outsourced if the required production resources are not available in-house.

Is videotape cost-effective?

A good cost-effectiveness analysis will provide the answer. However, assuming that the videotape will in fact meet the required learning objectives, the initial cost, student throughput, and content stability will probably be the key factors in this determination. Therefore, make sure this data is accurate and valid.

Design Considerations

Preproduction

The design phase, or *preproduction* phase, encompasses all of the planning, design, and development that occurs prior to the actual filming.

Determine the objectives

Determining the specific objectives or purpose of the videotape is critical since all of the following efforts will be based on meeting those objectives. Decide what it is you want to do and accomplish with the videotape instruction. It may be necessary to limit the scope or purpose in order to effectively cover the required subject/topic in the time allotted.

Determine what approach to use

Solicit ideas and inputs from others to help decide what approach to take. There are many different approaches or presentation formats that can be used to deliver the instruction such as:

Lecture
Demonstration
Dramatization
Interview or group discussion
Game or talk show
Question and answer
Event walk-through

Determine what type of test and evaluation methods should be used to measure the students' comprehension of the instruction provided. AF HDBK 36-2235, Volume 12, *Test and Measurement Handbook*, provides general guidance.

General design guidelines

When designing the instruction, keep focused on the objectives of the videotape. Following are some general design guidelines:

Plan to keep the program or program segment as short as possible. Long videotaped programs will lose effectiveness since it is difficult to maintain the student's attention and interest. Ten minutes or less would be optimum.

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General design guidelines (Continued)

- As with briefings and other presentations, limit your program or program segment to three major points if possible.
- Plan and design collateral activities that will require student actions or performance of tasks (i.e., hands-on activities).
- Employ the full presentation capabilities of video by using audio, real-time events, still/moving pictures, slow/fast motion, animation, color, and text.
- Determine what supporting materials will be required (e.g., outlines, readings, quizzes), and how they will be used (before, during, or after).
- Plan some type of follow-on activities to reinforce the instruction provided such as group discussions, assignments, quizzes, etc.

Develop a script

The script provides the outline and guide for producing the video. Make sure it communicates exactly what you want said and done.

The script should:

- Focus on the objectives.
- Communicate and reinforce the major points.
- Deliver the instruction in a coherent and logical sequence.
- Be written in plain and simple conversational English. Remember the object here is to ensure the students understand what is said – not to impress them with your command of the English language!

Bottom line: Writing a good script takes time and practice.

Develop storyboards

The storyboards are used to convey visual ideas and concepts. For videotape instruction, they need to show the sequence of the visual shots with the corresponding dialogue.

The general guidelines provided in Chapter 8 for developing IVT storyboards can also be applied to videotapes.

Determine who and where to film

Two other planning decisions will need to made:

Who to shoot. That is, are you going to use real people or professional actors?

Actors know the drill, but you will pay for their expertise.

In most cases, real people will do if they are carefully selected (i.e., ensure that they are not only good speakers, but credible speakers).

Where to shoot (if not already determined). Will the filming be done on location or in a production studio?

On location provides realism, including all the real noise, lighting problems, distractions, etc., that will need to be dealt with for the shoot.

Studio settings are more controlled which will reduce the time required to complete the shoot. However, this will probably be more costly if a studio has to be rented.

Get approval

Make sure you know what the approval process/protocol is, and get the necessary approval before proceeding. The storyboards can be used in the review and approval process to get the "go-ahead" before committing the resources and starting the actual production.

Development Considerations

Production

The development phase, or *production* phase, involves the last minute preparations for the shoot, and the actual shoot itself. If a professional production team is used, many of the following preparation and filming considerations will not be concerns or issues. They are provided as information for inexperienced personnel and in-house productions.

Audio preparations

Make sure that appropriate microphones will be used:

Determine what type (unidirectional, bi-directional, or omni-directional) and kind of microphones (floor/table stand, hanging, camera, lavaliere, handheld, wireless, etc.) are available for use.
Select which type(s) and kind(s) of microphones will be used.
If possible, test the microphone(s) on location to check audio levels and background noise.

Video preparations

Determine how many cameras will be required and/or used:

In most situations, only one camera (VHS, VHS-C, Beta, or Hi-8) will be necessary. The taping can be planned to continue uninterrupted during the production, with the editing performed after the shoot.
More than one camera should be considered if an event that will be taped cannot be recreated or repeated.

Final preparations for the filming

The use of a production and equipment checklist will help to ensure smooth execution of the shoot. Below are some of the things you should do prior to the shoot:

Distribute the scripts.
Notify the cast members; notify the production crew.
Confirm studio arrangements (if applicable).
Visit and assess the on location shoot site (if applicable).
Ensure all production equipment is or will be on hand.

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Final preparations for the filming (Continued)

Ensure all set props, instructional materials, cue cards (if applicable), etc., are or will be on hand.
Have contingency plans – Murphy's Law is alive and well!
Schedule and conduct "script reading" rehearsal(s) with the cast.
Consider conducting a dry run for the more complex productions prior to the actual shoot.

Conducting the filming

With good storyboards, a well-written script, proper preparation, and a knowledgeable director, the actual production should proceed as planned with minimal problems.

Video tips:

Be aware of copyright laws when compiling videotapes, recording from public broadcasts, and providing multiple copies for student access. Obtain permission from copyright owners when producing videotapes that contain sound, pictures, and segments from other productions.
Have all "on-camera" talent sign appropriate releases
To keep viewers oriented, use the "far-shot, medium-shot, close-up-shot" sequence or "zoom-in" approach when showing an object.
Avoid "quick" or moving camera shots. Each time the camera focuses on a new object, the viewers should be given sufficient time to be able to see and comprehend what it is that you are showing them.

When setting up the individual shots or segments, make sure adequate lighting is provided so that the viewers will be able to recognize what is being shown. The basic *lighting triangle* set up depicted below, is one lighting method that can be used.

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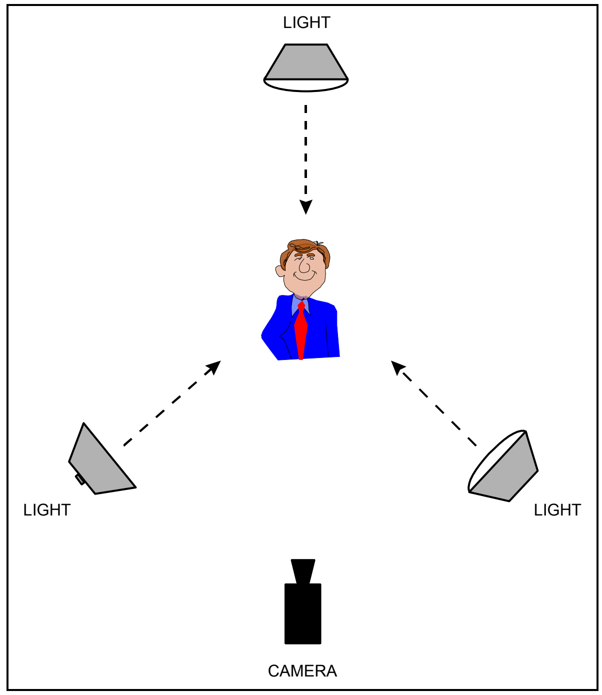
Conducting the filming (Continued)

Figure 6 Lighting Triangle



Editing the tape

Basic editing involves reviewing all of the videotape, selecting which shots will be used, and combining the selected segments in the desired sequence. If the entire program was already taped in the proper sequence, only minor editing should be required. Otherwise, a minimum of two videotape recorders and monitors, with a video controller linking the two recorders would be recommended to do the editing in-house.

Editing video using a PC is an option, but this would require additional video hardware (for digital/analog conversions), software, and expertise, which will be more costly.

“Voice Over” and narration can be added along with music during the editing phase. The use of photographs and other graphics can greatly enhance the “message” of the video (i.e., Ken Burns’ use of photographs, narration and music in his Civil War series).

New blank videotape should be used to make a master tape from the original. Add any desired narration and transitions between the segments to complete the instructional tape.

Implementation Considerations

Tape reproduction

Each time a tape is copied, the image quality of the tape is reduced. Since the master tape is a copy of the original production tape, it is a second-generation tape. Any duplicate master tape that is made as a precaution, would be a third generation tape.

When the videotape copies are made for distribution (normally in VHS format), you should consider using the second generation versus third generation master tape as the duplicating master. Although there is some risk involved, the quality of the reproduced tapes will be greater.

In any case, you should review one of the final distribution copies so you are aware of what the students will see.

Tape distribution

Ensure that the distribution copies of the videotape have the version number or date printed on the label. This will help the end users in making sure they have the most current version of the tape when revisions are made.

You should also maintain an updated copy of the videotape distribution list even though you may not be responsible for the actual distribution. This list can be used as a reference for future distribution of revisions and instructional materials.

Emerging technologies

Generally, the videotape in use today is analog video. Digital video is becoming more readily available. Examples of digital video include laser disks, and the new DVD systems. Digital video maintains better clarity when reproduced than does analog video. Digital video is also more readily distributed over computer networks than is analog video.

Pattern recognition software is enabling the searching of video presentations for specific tapes or segments.

Evaluation Considerations

Evaluation of videotape instruction

As with other instructional technologies, the evaluation process for videotape instruction consists of a formative, summative, and operational evaluation. If the videotape was developed as supporting instruction in conjunction with other instructional media, the evaluations may be conducted as part of the evaluation for the primary medium.

The distance learning evaluation metrics are described in Chapter 2. The general guidelines for evaluations are contained in MIL-PRF-29612 and its supporting handbooks.

This section addresses the special considerations for conducting evaluations of videotape instruction.

Formative evaluation

The formative evaluation begins in the analysis phase and continues through the development phase of the ISD process. Since developmental versions (e.g., alpha and beta versions) of videotape programs are not usually produced, as is the case with computer-based programs, a validation of the video instruction would not be possible prior to the actual production of the videotape. However, a technical accuracy review of the objectives, storyboards and script can be conducted.

Following production of the videotape, individual and small group tryouts of the edited master tape can be accomplished. If deficiencies or problems are identified and cannot be corrected by additional editing, another shoot may be necessary.

Summative evaluation

The operational tryouts for the summative evaluation of instructional videotapes should be conducted at various sites.

If the videotape was designed for use as supporting material, it may also be necessary to present the primary instructional material for the evaluation. This would allow the video instruction to be viewed within the proper context, which will provide more meaningful and valid results.

Operational evaluation

The operational evaluation is an ongoing process that is accomplished after the formative and summative evaluations. This evaluation is based on internal and external feedback data such as:

Instructor/facilitator comments (internal)
Student critiques (internal)
Test results (internal)
Inspection and evaluation reports (external)

As with the summative evaluation, the videotape should be viewed along with the primary instruction it was designed to support. Also, it may be difficult to isolate and determine the actual effectiveness of the videotape instruction from test results, unless the material tested was only provided in the videotape.

Section C
Audiotape

Analysis Considerations

Why use audiotape?

Audiotape can be used to reproduce real life instructional events such as lectures, tutorials, seminars, and conference presentations.

Audiotape can provide one-way aural communication between the instructor and student. The spoken word is often a richer information source than the printed word.

Audiotapes are also highly transportable and suitable for self-instruction by students at any location.

When to use audiotape

Audiotape can be:

- Used to deliver short course of instruction that is based on cognitive (knowledge) learning objectives or verbal skills (i.e., correspondence and language courses).
- Combined with other instructional technologies as collateral material for any type of course.

Other applications of audiotape include:

- *Recordings of real life events.* For example, lectures, presentations, guest speakers, and meetings.
- *Interviews.* For example, experts and specialists for elements of instruction.
- *Procedures or sequences.* Verbal descriptions of procedures or sequences that are part on a course of instruction.
- *Recordings.* For example, music and information sources with a strong aural content.

Since audiotapes are passive in nature, they would not be appropriate as the primary media for accomplishing learning objectives that require performance skills or a high level of interactivity and communication with others. Audiotape instruction is most effective when it is integrated with other types of media and instruction.

Audiotape resource requirements and constraints

It is important to identify and assess the audiotape resource requirements and constraints. This will help to determine the feasibility of using audiotape instruction, and whether or not the audiotapes should be produced in-house. The most common type of audiotape used for instruction is the cassette tape. This is the only type of tape that will be addressed in this section.

Equipment. Minimum required equipment would include a cassette tape recorder and player, microphone, and speakers or headphones for playback.
Facilities. A recording studio or "soundproof" room equipped with a cassette tape recorder to produce the taped instruction.
Funding. Is there a budget? This factor will determine if outsourcing is an option.
Personnel. Minimum personnel would include a SME, writer, narrator, and sound technician (if applicable). These would not necessarily be different individuals. In some situations, they may be one and the same person.
Time. Is there a time limit? Although good audiotapes will still take some time to produce, they generally require less time than the other traditional media, with the possible exception of audioconferencing. Most of the time required is in the development of the script.

In-house development or outsource?

Unless the taped instruction will be very short, you should consider producing the tape in a sound studio with the proper equipment (in-house, rented, or contract). Anything less than professional quality sound can distract the student from concentrating on what is being said. Even though the student can replay the tape, the net effect of constant distractions is not only less effective learning taking place, but lower student motivation and interest.

Almost equally important, is the quality of the narration. Using professional narrators, although more costly, will usually require less recording and editing time (i.e., fewer retakes and less "cutting"), and be more cost-effective. If a professional narrator is not an option, it will be important to use someone who is articulate and has a pleasant, neutral voice. Everyone has

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In-house development or outsource? (Continued)	probably listened to voice recordings of non-professional actors on radio or television commercials that sound unnatural (read from a prompter) or are hard to listen to because of the person's voice tone, pitch, accent, pronunciation of words, etc. Now imagine trying to listen to an hour of that type of voice recording – enough said.
Are audiotapes cost-effective?	In most cases where audio recordings can be used to accomplish the objective, cassette tapes will generally be very cost-effective. This assumes of course, a stable content environment. As computer digital audio technology continues to advance and the cost of CD recording continues to decrease, audio CDs are becoming a viable alternative medium for instruction.

Design Considerations

Determine the objectives

Determine the specific knowledge and attitude objectives that must be achieved. Decide what it is you want to do and accomplish with the print materials.

Determine what approach to use

Determine whether the audiotape will be developed as the primary instructional media, or used as collateral instruction for other media.

Based on how the audiotape will be used, determine what approach will be used There are several approaches or presentation formats that can be used to deliver the instruction such as lectures, interviews, or in conjunction with programmed text.

Determine what type of test and evaluation methods should be used to measure the students' comprehension of the instruction provided. AF HDBK 36-2235, Volume 12, *Test and Measurement Handbook*, provides general guidance.

General design guidelines

When designing the instruction, keep focused on the objectives of the audiotape. Following are some general design guidelines:

Plan to keep the program or program segment as short as possible. Long audio programs will lose effectiveness since it is difficult to maintain the student's attention and interest.

As with briefings and other presentations, limit your lecture program or program segment to three major points if possible.

Plan and design collateral activities that will require student actions or performance of tasks (i.e., hands-on activities or exercises).

Use music and sound effects only to provide context, reinforce or reintroduce a theme, or capture, guide and hold attention.

Determine what supporting materials, if any, will be required (e.g., outlines, quizzes, handouts with pictures, graphics, text, etc.), and how they will be used (before, during, or after). As a minimum, use supplemental materials for objects, procedures, etc., that are difficult to describe in words.

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General design guidelines (Continued)

Plan follow-on activities to reinforce the instruction provided such as group discussions, assignments, quizzes, etc.

Develop a script

The script provides the outline and guide for producing the tape. Make sure it communicates exactly what you want said and done.

The script should:

- Focus on the objectives.
- Communicate and reinforce the major points.
- Deliver the instruction in a coherent and logical sequence.
- Be written in plain conversational English.
- Identify when music, sound effects, and pauses are to be used.

When describing objects, procedures etc., without supporting visual materials, select words and examples that paint pictures and link the familiar with the unfamiliar.

Bottom line: Writing a good script takes time and practice.

Determine who and where to record

Two other planning decisions will need to made:

Who to record. That is, are you going to use real people or professional narrators? If real people are used, make sure they are good speakers.

Where to record (if not already determined). Will the recording be done in a sound studio or at some other location?

- If selecting a location other than a studio, make sure the site is as "sound-proof" as possible (i.e., free from background noises such as phones, paging systems, cars, aircraft, people, heating/air conditioning units, etc.)
- Studio settings are more controlled and will reduce the possibility of having to re-record segments.

Get approval

The script or taped rehearsals can be used in the review and approval process to get the "go-ahead" before committing studio resources for the actual recording.

Development Considerations

Preparing for the recording

If a professional sound recording studio and technician are used, many of the following audio preparations and considerations will not be concerns or issues. They are provided as information for inexperienced personnel and in-house productions.

Audio preparations

Determine what type of recording equipment will be used:

- Studio recording equipment.
- Audiocassette recorder.
- PC with audio recording hardware and software, and adequate hard drive space (example: 650 MB required for 72 minutes of CD audio).

If using a PC, make sure there will be someone available who is knowledgeable in capturing, recording, and editing the sound recording on the PC.

Make sure that an appropriate microphone will be used:

- Determine how many microphones will be required.
- Determine what type (unidirectional, bi-directional, or omnidirectional) and kind of microphone (table stand, handheld, etc.) is available for use.
- Select which type(s) and kind(s) of microphones will be used.
- If possible, test the microphone(s) with the recording equipment at the recording site to check audio levels and background noise.

Final preparations for the recording

The use of a production and equipment checklist will help to ensure smooth execution of the recording session. Below are some of the things you should do prior to the taping.

- Distribute the scripts.
- Notify the narrator(s).
- Notify the studio and sound technicians (if applicable).
- Visit and assess the recording site (if other than the studio).
- Ensure all recording equipment is or will be on hand.

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Final preparations for the recording (Continued)

Ensure all music/sound effect tapes (if applicable) are or will be on hand.
Have contingency plans – Murphy's Law is alive and well!
Schedule and conduct rehearsal(s) with the narrator(s).

Conducting the recording

With a well-written script, proper equipment, and prior preparation, the actual recording should proceed with minimal problems.

Recording tips:

Use as few microphones as possible. Each microphone used adds noise to the system.
If there is only one microphone, and two or more narrators with different voice levels, adjust their positions either closer or farther from the microphone to maintain a proper sound balance.
After each audio segment, keep the tape going for a short period of time to provide "blank" tape segments that can be used during editing if required to "splice-in" pauses with the same background ambiance.
Use live sound effects and music if possible during the recording rather than trying to add them later.
Be aware of copyright laws when recording. Obtain permission from copyright owners when producing audiotapes that contain music and sound segments from other productions or sources.

Editing the tape

If the entire program was already taped in the proper sequence with all the desired sound effects included, only minor editing should be required. Anything more than minor editing should be done by specialists since it will normally require special equipment and expertise.

Implementation Considerations

Tape reproduction

Qualified personnel should also do audiotape reproduction with the proper equipment. You should review one of the final distribution copies so you are aware of what the students will actually hear.

Tape distribution

Ensure that the distribution copies of the audiotape have the version number or date printed on the label. This will help the end users in making sure they have the most current version of the tape when revisions are made.

You should also maintain an updated copy of the distribution list even though you may not be responsible for the actual distribution. This list can be used as a reference for future distribution of revisions and instructional materials.

Emerging technologies

Digital audio is enabling the distribution of audio (live and recorded) over computer networks.

Pattern recognition software is enabling searching of audio presentations for specific topics and segments.

Evaluation Considerations

Evaluation of audiotape instruction

The evaluation process for audiotape instruction consists of a formative, summative, and operational evaluation. If the audiotape was developed as supporting instruction in conjunction with other instructional media, the evaluations may be conducted as part of the evaluation for the primary medium.

The distance learning evaluation metrics are described in Chapter 2. The general guidelines for evaluations are contained in MIL-PRF-29612 and its supporting handbooks.

This section addresses the special considerations for conducting evaluations of audiotape instruction.

Formative evaluation

The formative evaluation begins in the analysis phase and continues through the development phase of the ISD process. Since developmental versions (e.g., alpha and beta versions) of audiotape programs are not usually produced, as is the case with computer-based programs, a validation of the audio instruction would not be possible prior to the actual production of the audiotape. However, a technical accuracy review of the objectives and script can be conducted.

Following production of the audiotape, individual and small group tryouts of the edited master tape can be accomplished. If deficiencies or problems are identified and cannot be corrected by additional editing, another audio recording session may be necessary.

Summative evaluation

The operational tryouts for the summative evaluation of instructional audiotapes should be conducted at various sites.

If the audiotape is designed as supporting material, it may also be necessary to present the primary instructional material for the evaluation. This would allow the audio instruction to be reviewed within the proper context, which will provide more meaningful and valid results.

Results of these evaluations are used to revise and finalize the audiotape instruction.

Operational evaluation

The operational evaluation is an ongoing process that is accomplished after the formative and summative evaluations. This evaluation is based on internal and external feedback data such as:

- Instructor/facilitator comments (internal)
- Student critiques (internal)
- Test results (internal)
- Inspection and evaluation reports (external)

As with the summative evaluation, the audiotape should be reviewed along with the primary instruction it was designed to support. Also, it may be difficult to isolate and determine the actual effectiveness of the audiotape instruction from test results, unless the material tested was only provided in the audiotape.

General evaluation criteria

The following are typical evaluation criteria for audiotape instruction:

Voice quality:
- Naturalness and spontaneity
- Articulation
- Pitch

Music:
- Did it enhance or detract from narration?
- Was the amount and length appropriate?

Sound effects:
- Did it enhance or detract from narration?

Pacing:
- Smoothness of flow
- Speed of delivery

Volume settings:
- Absence of peaks and drops
- Appropriate microphone placement

Ambient noise:
- Absence of background noise/distractions

Editing:
- Absence of noticeable audio ‘cuts’ or dubbing

Sequence/format:
- Logical sequence and format of instruction

Effectiveness:
- Did the recording capture, guide, and hold attention?
- Were the objectives met?

Section D
Audioconferencing

Analysis Considerations

Why use audio-conferencing?

Traditional audioconferencing using the telephone system and audio bridging capabilities is a simple, flexible, interactive instructional delivery system. Since the telephone is widely available, the instructor can reach students at almost any location. Military use of audioconferencing is particularly cost-effective if DoD telephone networks are used.

When to use audioconferencing

Audioconferencing can be used:

- When real-time discussion, interaction, and feedback are required.
- To reduce the students' sense of isolation and distance.
- To provide instruction from experts at other locations.

Audioconferencing instruction is most effective when combined with other types of media.

Audioconferencing resource requirements and constraints

In order to determine the feasibility of using audioconferencing as an instructional medium, you must identify and assess the resource requirements and constraints. Although audioconferencing can also be accomplished using computer networks, this section only addresses audioconferencing using the public telephone system.

- **Equipment.** Minimum required equipment would include a telephone with audio bridging capability and a speakerphone system for larger groups.
- **Facilities.** No special facilities are required.
- **Funding.** Additional funding would be required for long distance calling fees if the DoD telephone network (DSN) would not be used.
- **Personnel.** Other than the participants, moderators may be required.
- **Time.** Comparatively, development times per hour of audioconferencing instruction, will normally be less than other media.

Design Considerations

Determine the objectives

Determine the purpose of the audioconference and the specific learning objectives that must be achieved. Decide what it is you want to do and accomplish with the audioconference.

Determine what approach to use

Audioconferencing can be conducted using only audio communications between the participants, or combined with other instructional media such as print materials (text, pictures, graphics, etc.), videos, and fax machines. Based on how the audioconferencing will be conducted, several instructional approaches can be employed to include:

Lectures
Interviews
Guest speaker presentations
Student presentations
Group discussions or debates
Question and answer sessions

Determine what type of test and evaluation methods should be used to measure the students' comprehension of the instruction provided. AF HDBK 36-2235, Volume 12, *Test and Measurement Handbook*, provides general guidance.

General design guidelines

The challenge of designing an effective interactive audioconferencing course is to balance the strengths of the medium with its limitations. The greatest strength of interactive audioconferencing is its capability for interactivity; its major limitation is the absence of visual communication. To exploit its strength, design sessions that are interactive as described below. To minimize the limitations of visual cues, provide supplementary print materials in advance and 'humanize' the session by making the learners feel welcome.

Simultaneous use of WWW/Intranets and other computer networks can provide "live" video of participants and other images and data.

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General design guidelines (Continued)

General design guidelines for enhancing learning and learning transfer:

Take a student-centered approach towards instruction.
Structure the lesson to provide students with the opportunity to set their own goals and objectives.
Encourage the practical application of content, and relate subject matter to learners' needs and job tasks.
Instruction and learning at a distance takes more time.
During the design phase, be realistic about the amount of content to be presented and the assignments to be given.

Specific design guidelines are as follow:

Design for the medium of audio.
Limit sessions to 2 hours.
Schedule a break after 50-60 minutes of instruction.
Limit key concepts to 3-5 per hour.
Limit number of participants to maximize interaction; rule of thumb is 15-20 students.
Use preview, presentation, and review techniques to provide structure.
Ask questions and integrate student activities to facilitate interaction.

Plan interactive teaching activities every 10-15 min.

Role-playing exercises.
Participant presentations.
Celebrity guest.
Brainstorming.
Case study.
Q&A session.
Learner-to-learner discussions.

Add a variety of presentation methods.

Team-teach.
Interviews.
Guest speakers.
Learner-to-learner teaching.
Panels.
Debates.

Development Considerations

Development techniques

When developing audioconference instruction, consider the following general techniques:

Develop a lesson plan or 'script' of the planned session.
Divide the content into 10-15 minute presentation segments.
Connect new information with previous information.
Plan/schedule breaks after 50-60 minutes of instruction.
Alternate lectures with student interaction activities such as student presentations, role-playing exercises, brainstorming, question/answer, etc.
Include activities in the course syllabus/agenda that encourage independent study and student-to-student interaction.
Develop outlines and handouts for use during the session.
Develop quizzes or exercises to assess student comprehension of material.

Pre-conference package

Develop a read-ahead package for the students that contains:

Welcome letter(s) with the instructor's biography and picture.
Class roster with background information about each student.
Course syllabus, agenda, ground rules and protocols.
Readings, assignments, and bibliography.
Handouts with graphics, charts, pictures, etc., that can be used during the session.
Points of contact and instructions on how to connect to the conference call with phone numbers for technical assistance if disconnected.
Critique forms.

Place read ahead materials on the Web (in addition to snail mail). Conduct an orientation conference call prior to the first scheduled session to help acquaint learners with the medium.

Review phone protocol.
Ask learners to introduce themselves.
Encourage participants to use a speakerphone or headset so that their hands will be free to take notes or to do exercises.

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Pre-conference package (Continued)	Learn any peculiarities to the audiobridging system before course; practice with it. Call the technical assistance line and ask what the common problems are.

Implementation Considerations

Conducting an orientation session

Conduct an orientation audioconference prior to the first scheduled session to help acquaint students with the medium and procedures. During this orientation:

- Introduce yourself and advise the students on how they should address you.
- Ask the students to introduce themselves.
- Discuss what to do and who to contact if they experience any problems.
- Review the protocol for asking questions and making comments. Students should preface any comments with their name and location.
- Review any other audioconference ground rules or etiquette as applicable.
- Discuss the use of the audioconference equipment.
- Encourage students to use a speakerphone or headset so that their hands will be free to take notes or to do exercises during the sessions.

Conducting an audioconferencing session

Use the following to get an audioconferencing session started:

- Establish the conference call 10 minutes ahead of the session start time.
- As students join in, ask them questions to get them talking.
- Remind students to mute their speakerphones as appropriate.
- At the scheduled time, take attendance using a simple roll call.
- Review the agenda and clearly state the purpose of the session.
- Acknowledge and welcome any latecomers.

Use the following techniques when conducting an audioconferencing session:

- Speak in a normal conversational tone, and slow enough to be understood.
- Vary the pace of the session to maintain interest and energy.
- Engage students in discussions, debates, role-playing, etc.
- Do not let one person monopolize the time.

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Conducting an audioconferencing session (Continued)	Ask questions and direct them at individual students when possible. Allow 10-15 seconds after asking a question before continuing to give the students adequate time to respond. Create a matrix and keep track of each student's participation. Do a mid-way evaluation to ensure student's requirements are being met. You can also have students measure their own progress through self-assessment items such as study questions, checklists, and self-tests. Allow time for questions and answers at the end. Encourage students to also telephone, or E-mail you with questions and comments. Summarize session. Remind students to submit their evaluations.

Evaluation Considerations

Evaluation of audioconferencing instruction

The evaluation process for audioconferencing instruction consists of a formative, summative, and operational evaluation. If the audioconferencing instruction was developed to support other primary instructional media, then the instruction should be evaluated as part of the primary lesson/course evaluation.

The distance learning evaluation metrics are described in Chapter 2. The general guidelines for evaluations are contained in MIL-PRF-29612 and its supporting handbooks.

This section addresses the special considerations for conducting evaluations of audioconferences when developed as the primary instructional medium.

Formative evaluation

The formative evaluation begins in the analysis phase and continues through the development phase of the ISD process. During the initial phases of development, the primary focus would be on the technical accuracy of the learning objectives, content, and test items.

An initial evaluation of the lesson plan/script should be accomplished. Once a 'draft' version of the audioconferencing session is developed, plan and conduct individual and small group tryouts of the instruction. General areas to evaluate include:

- Instructional session organization, structure, presentation, and format.
- Instructor knowledge, presentation and delivery techniques, and effectiveness.
- Instructional content clarity, accuracy, relevancy, currency, effectiveness, and completeness.
- Use, clarity, relevancy, and effectiveness of supporting instructional materials (e.g., text, pictures, graphics, diagrams, quizzes, etc.).
- Effectiveness of interactive student activities.
- Availability, use, reliability, and effectiveness of audioconference system equipment.
- Availability and effectiveness of technical support.
- Student comprehension and accomplishment of the learning objectives.

Summative evaluation

The operational tryouts for the summative evaluation of the audioconferencing instruction should be conducted with several of the applicable sites participating at the same time.

Results of these evaluations are used to revise and finalize the audioconferencing instruction.

Operational evaluation

The operational evaluation is an ongoing process that is accomplished after the formative and summative evaluations. This evaluation is based on internal and external feedback data such as:

- Instructor/facilitator comments (internal)
- Student critiques (internal)
- Test results (internal)
- Inspection and evaluation reports (external)

To ensure the quality of the instruction is maintained, conduct these evaluations on a regular basis. There is always room for improvement.

Chapter 6
ISD CONSIDERATIONS FOR COMPUTER-MEDIATED COMMUNICATION

Overview

Introduction

This chapter describes ISD considerations for the analysis, design, development, implementation, and evaluation of Computer-Mediated Communication. Computer-Mediated Communication enables individuals, groups, and organizations to maintain continuous communications and information exchanges. Computer-Mediated Communication expands access to human and information resources. Two of the Computer-Mediated Communication applications that can greatly impact distance learning are audiographics and computer-mediated conferencing.

Where to read about it

This chapter contains two sections:

References

The material in this chapter is based on the following references:

MIL-PRF-29612, *Training Data Products*
MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*
MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*
MIL-HDBK-29612-4, *Department of Defense Handbook, Glossary of Training Terms*
Distance Learning Curriculum, Analysis and Media Selection, Air University, Maxwell AFB, AL, 4 Feb 1994

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References (Continued)

AF Handbook 36-2235, *Information for Designers of Instructional Systems, Volume 4*
AF Manual 36-2234, *Instructional Systems Development*
AFIADLO Home Page web site:
http://www.maxwell.af.mil/afiadl/
http://www.au.af.mil/afdlo/afdlo.htm

Section A
Audiographics

Analysis Considerations

Why use audiographics?

Audiographics provides real-time communication and interaction. Audiographic participants can audioconference using the telephone system, as well as share instructional materials simultaneously using computer networks. (Audiographics can also be accomplished to some degree by combining the phone system, fax machine, and hard copy delivery systems). Audiographics is usually considered to involve simultaneous transmission of audio and graphic information across a telecommunications network.

When to use audiographics

Audiographics can be used:

When real-time discussion and feedback are required.
When collaboration is required on documents, assignments, projects, etc.
To provide instruction from experts at other remote sites.
To reduce the students' sense of isolation and distance.

Audiographics resource requirements and constraints

To determine the feasibility of using audiographics as an instructional medium, you must identify and assess the resource requirements and constraints. Audiographics is similar to audioconferencing in that it uses the telephone system. Although limited audiographic instruction can also be accomplished using only computer networks, this type of audiographics is not included in this section.

Equipment. Minimum required equipment for each participant or group would include a networked computer, telephone with audio bridging capability, and a speakerphone system for larger groups.
Facilities. Facility requirements for participating sites would include reliable network access to Internet/Intranet/Electronic Bulletin Board System (BBS).

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Audiographics resource requirements and constraints (Continued)

Funding. Funding may be required for PCs, software, and network systems/access if they are not already in place at all participating sites. Additional funding is also required for long distance calling fees if the DoD telephone network (DSN) would not be used.
Personnel. Other than the participants, a moderator / facilitator may sometimes be required.
Time. As with audioconferencing, development time- per-hour of audiographic instruction, will normally be less than other media.

Is audiographics cost-effective?

If existing DoD telephone networks and computers with Internet/Intranet/BBS access are used, audiographics can be very cost-effective as an instructional delivery system. If networked computers are not available at all sites, then the cost-effectiveness of the instruction would depend primarily on the total effort and cost required installing the necessary systems.

Design Considerations

Determine the objectives

Determine the purpose of the audiographic instruction and the specific learning objectives that must be achieved. Decide what it is you want to do and accomplish with this instructional medium.

Determine what approach to use

Audiographics can be conducted using only audio communications between the participants, or combined with networked computers and other instructional media such as print materials (text, pictures, graphics, etc.), videos, and fax machines. Based on how the audiographics session will be conducted, several instructional approaches can be employed to include:

Lectures
Interviews
Guest speaker presentations
Student presentations
On-line group collaborative activities
Group discussions or debates
Question and answer sessions

Determine what type of test and evaluation methods should be used to measure the students' comprehension of the instruction provided. AF HDBK 36-2235, Volume 12, *Test and Measurement Handbook*, provides general guidance.

General design guidelines

The same general guidelines provided for audioconferencing, also apply to audiographics since the primary instructional component of both is two-way audio. The only significant difference between the two is the supporting media technologies that are used to deliver other instructional materials.

The design of audiographic instruction should draw upon the greatest strength of audiographics - that is the capability for students to see and share the same computer file or document on their individual PCs. This facilitates a high level of interactivity and collaboration among the students.

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General design guidelines (Continued)

General design guidelines for audioconferencing sessions:

- Limit the number of participants if possible, to a manageable size to maximize interaction.
- Limit sessions to 2 hours.
- Limit key topics to 3-5 per hour.
- Use preview, presentation, and review techniques to provide structure.
- Ask questions and integrate student activities to facilitate interaction.

General design guidelines for enhancing learning and learning transfer:

- Take a student-centered approach towards instruction.
- Provide students with the opportunity to set their own goals and objectives.
- Encourage the practical application of content, and relate subject matter to student's needs and job tasks.
- Instruction and learning at a distance takes more time. Be realistic in the amount of content presented, and the assignments given.

Development Considerations

Development techniques

When developing audiographic instruction, consider the following general techniques:

- Develop a lesson plan or 'script' of the planned session.
- Divide the content into 10-15 minute presentation segments.
- Connect new information with previous information.
- Plan/schedule breaks after 50 minutes of instruction.
- Alternate lectures with interactive student interaction activities such as student presentations, on-line group exercises, case studies, question/answer, etc.
- Include activities in the course syllabus/agenda that encourage independent study and student-to-student interaction.
- Develop outlines and handouts for use during the session.
- Develop quizzes or exercises to assess student comprehension of material.

Audiographics pre-session package

Develop a read-ahead package for the students that contains:

- Welcome letter(s) with the instructor's biography and picture.
- Class roster with background information about each student.
- Course syllabus, agenda, ground rules, and protocols.
- Readings, assignments, and bibliography.
- Handouts, CD-ROMs, diskettes, graphics, charts, pictures, etc., that can be used during the session.
- Points of contact and instructions on how to connect to the conference call and network server, with phone numbers for technical assistance if disconnected.
- Critique forms (if not provided on-line).

Plan to mail the packages early so the students will have them 1-2 weeks prior to the audiographics session.

Implementation Considerations

Conducting an orientation session

Conduct an audiographics orientation prior to the first scheduled session to help acquaint students with the media and procedures. During this orientation:

- Introduce yourself and advise the students on how they should address you.
- Ask the students to introduce themselves.
- Discuss what to do and who to contact if they experience any problems.
- Review the protocol for asking questions and making comments. Students should preface any comments with their name and location.
- Review the procedures and protocol for collaborating on shared applications.
- Review any other ground rules or etiquette as applicable.
- Discuss the use of the audioconferencing and computer network systems. Encourage students to use a speakerphone or headset so that their hands will be free to take notes or work on the computer during the sessions.
- For practice, have the students bring up a pre-selected 'demo' file from the Web/FTP site, CD-ROM, or diskette provided in the pre-session package (if applicable).
- Bring up a file for all to share as a demonstration, and allow time for everyone to manipulate the data to practice using the system.

Conducting an audiographics session

To get started with an audiographics session:

- Establish the conference call 10 minutes ahead of the session start time.
- As students join in, confirm that they have established a connection to the designated audiographics server.
- Remind students to mute their speakerphones as appropriate.
- At the scheduled time, either take attendance using a simple roll call or accomplish this electronically.
- Review the agenda on-line if possible, and clearly state the purpose of the session.
- Acknowledge and welcome any latecomers.

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Conducting an audiographics session (Continued)

Use the following instructor techniques when conducting an audiographics session:

- Speak in a normal conversational tone, and slow enough to be understood.
- Vary the pace of the session to maintain interest and energy.
- Engage students in discussions, on-line collaborative activities, etc.
- Do not let one person monopolize the audio or on-line time.
- Ask questions and direct them at individual students when possible.
- Allow 10-15 seconds after asking a question before continuing to give the students adequate time to respond.
- Create a matrix and keep track of each student's participation
- Do a mid-way evaluation to ensure students' requirements are being met. You can also have students measure their own progress through self-assessment items such as study questions, checklists and self-tests.
- Allow time for questions and answers at the end. Encourage students to also telephone, or E-mail you and/or each other with questions and comments.
- If collaboration among students is a goal, devise activities or projects that require use of the telephone and/or E-mail.
- Summarize the session.
- Remind students to submit their evaluations.

Evaluation Considerations

Evaluation of audiographics instruction

The evaluation process for audiographics instruction consists of a formative, summative, and operational evaluation. If the audiographics instruction was developed to support other primary instructional media, then the instruction should be evaluated as part of the primary lesson/course evaluation.

The distance learning evaluation metrics are described in Chapter 2. The general guidelines for evaluations are contained in MIL-PRF-29612 and supporting handbooks.

This section addresses the special considerations for conducting evaluations of audiographics sessions when developed as the primary instructional medium.

Formative evaluation

The formative evaluation begins in the analysis phase and continues through the development phase of the ISD process. During the initial phases of development, the primary focus would be on the technical accuracy of the learning objectives, content, and test items.

An initial evaluation of the lesson plan/script should be accomplished. Once a 'draft' version of the audiographics session is developed, plan and conduct individual and small group tryouts of the instruction can be accomplished. General areas to evaluate include:

- Instructional session organization, structure, presentation, and format.
- Instructor knowledge, presentation and delivery techniques, and effectiveness.
- Instructional content clarity, accuracy, relevancy, currency, effectiveness, and completeness.
- Use, clarity, relevancy, and effectiveness of supporting instructional materials (e.g., text, pictures, graphics, diagrams, quizzes, etc.).
- Effectiveness of interactive student activities.
- Availability, ease of use, reliability, and effectiveness of audioconference system and equipment.

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Formative evaluation (Continued)

Availability, ease of use, reliability, and effectiveness of the computer network system and equipment.
Availability and effectiveness of technical support.
Student comprehension and accomplishment of the learning objectives.

Summative evaluation

The operational tryouts for the summative evaluation of the audiographics instruction should be conducted with several of the applicable sites participating at the same time.

Results of these evaluations are used to revise and finalize the instruction.

Operational evaluation

The operational evaluation is an ongoing process that is accomplished after the formative and summative evaluations. This evaluation is based on internal and external feedback data such as:

Instructor/facilitator comments (internal)
Student critiques (internal)
Test results (internal)
Inspection and evaluation reports (external)

To ensure the quality of the instruction is maintained, conduct these evaluations on a regular basis. There is always room for improvement.

Section B
Computer-Mediated Conferencing

Analysis Considerations

Why use computer-mediated conferencing?

Computer-mediated conferencing can range from simple E-mail discussion between two people to list servers to sophisticated groupware programs like FirstClass or Lotus Notes which allow discussion among dozens of participants. Computer-mediated conferencing involves two types of interaction: (1) interaction between the learner and the material content; (2) interaction with others about the course material. Computer-mediated conferencing enables messages to be automatically sorted into pre-selected categories or “conferences” which can be followed as discussion “threads.” Computer-mediated conferencing products often include functions allowing instructors to see who has read a certain message. Computer-mediated conferencing can be done “live” via chat rooms (computer-mediated conferencing software often includes real-time chat via text and/or audio), or it can be conducted as an asynchronous learning experience via E-mail or the threaded discussions. Computer-mediated conferencing helps to develop student independence and a self-directed approach to the instruction.

New developments in the area of computer-mediated conferencing include:

Groupware: includes E-mail and shared databases.
Synchronous communication: real-time communications involving voice and video images.
Audio mail and Video mail: similar to E-mail but the messages are audio messages and or video messages.

When to use computer-mediated conferencing

Computer-mediated conferencing is most appropriate for:

Student administration and the dissemination of course information.
The distribution of instructional courseware and materials.
A means of correspondence between instructors and students.
Threaded discussions and group instruction.

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When to use computer-mediated conferencing (Continued)

Courses designed to promote higher order learning such as analysis, synthesis, and evaluation
Courses where group discussion is required
Seminars and talks by subject matter experts
Courses requiring cooperative learning or group learning
Courses requiring written products
Courses where learners are encouraged to share their own personal experiences
Students whose mobility is limited
Support in courses based on other delivery media.

Computer-mediated conferencing resource requirements and constraints

To determine the feasibility of using computer-mediated conferencing as an instructional or support medium, you must identify and assess the resource requirements and constraints. If a computer-mediated conferencing capability already exists, then determine if it will meet requirements.

Equipment. Minimum required equipment for each participant would include a properly configured computer with access to Internet/Intranet or other telecommunications system.
Facilities. No specific facility requirements other than student access to a facility with the required equipment.
Funding. Funding may be required for PCs, software, and network systems if they are not already in place at all participating sites. Additional funding may also be required for network access and services if not presently available.
Personnel. Technical support personnel would be required to maintain the computer-mediated conferencing system (in-house or contract). Also, assess user computer skills to determine if that will be a constraint, and whether training will be required. Instructor personnel may require the assistance of others to respond to E-mails; the administrative burden of individualized communications placed on instructor staff must be factored into instructor requirements.
Time. If the computer/network system is not already in place, a significant amount of lead-time will be required. If the computer/network system exists, then time required for a computer-mediated conferencing system should not be a constraint.

Is computer-mediated conferencing cost-effective?

If computer-mediated conferencing computer/network system capabilities already exist, then computer-mediated conferencing should be very cost-effective. The availability of PCs with access to the LAN/WAN will probably be the most significant factor in the cost analysis.

Design Considerations

Determine the objectives

Determine the purpose of the computer-mediated conference and the specific learning objectives that must be achieved. Decide what it is you want to do and accomplish with this instructional medium.

Determine what approach to use

There are five types of computer-mediated conferencing interaction that will need to be considered in determining the approach to be taken in the design and development of computer-mediated conferencing:

- Learner and instructor
- Learner to learner
- Instructor with content
- Learner with content
- Learner and other on-line resources

Frequently, E-mail and bulletin board applications would be used together to provide instruction, information, and interaction.

Design considerations

Computer-mediated conferencing requires adjustments in communication, teaching, and learning strategies to make it feel and function like a traditional classroom. That's quite a challenge given that most computer-mediated conferencing learners are not likely ever to meet one another in person and the fact they will only communicate through a personal computer. The challenge for the designer is to transform the desktop computer into a virtual classroom. Use the following to increase the effectiveness of learning via computer-mediated conferencing.

Do a thorough needs analysis at the beginning to determine learner needs; is computer-mediated conferencing appropriate for application for the learner needs?

Identify appropriate learning objectives

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Design considerations (Continued)

Design activities that promote interaction:
- Brainstorming
- Case study
- Q&A session
- Small group discussions
- Learning partnership, dyads
- Team presentations
- Role playing
- Guest speakers
- Learner-to-learner teaching
- Debates

Create a balance between independent, interactive and inter-dependent course activities

Use metaphors or analogies that learners can easily relate to previous learning experiences. Words like campus, schoolhouse, library, etc. can provide comfortable links to learner new to computer-mediated conferencing; here's a list of ideas:
- Orientation
- Goals
- Assignments
- Readings
- Conference room
- Chat room
- Feedback
- Cyber Café

General computer-mediated conferencing functions

The design of computer-mediated conferencing applications should support the following general functions:

To allow students:

Access course information and materials.
Exchange information and ideas with others.
Ask/answer questions.
Work on assignments alone or collaborate with others.

To allow instructors to:

Administer and manage course information and materials.
Distribute student assignments and provide feedback.
Communicate with the students.
Facilitate interaction and collaboration on instruction provided.

E-mail design features and capabilities

The E-mail application would not be specifically designed and developed. If an E-mail system is not already in place or available on each PC to be used, then a COTS E-mail application may need to be selected for use by some of the individuals. In most cases, this selection would be based on personal preferences unless one is provided or dictated. The most popular E-mail applications available today, all have similar features and capabilities. Any of these client applications would most likely be acceptable for use.

General bulletin board design guidelines

Bulletin boards should be designed to provide information and encourage student interaction. They should:

- Allow instructors to post course information such as schedules, assignments, reference information and sources, etc.
- Allow instructors to provide files containing courseware and other instructional materials that can be downloaded by the students.
- Provide access control on appropriate root directories, system files, etc.
- Establish discussion groups that allow students to read what others have written, and respond to the author publicly or privately.
- Allow students to post new ideas, opinions, or requests to the discussion group.
- Allow students to sort discussion group messages by date, author, subject, or topic.
- Provide a knowledge base with general information, frequently asked questions (FAQ), etc., that can be searched using keywords or phrases.
- Provide links to other important sites and reference sources.

Development Considerations

E-mail development

In preparing for sending out E-mail, consider accomplishing the following:

Create forwarding accounts (mailing lists) for individual classes or groups.
Create E-mail form letters or “templates” that can be re-used for normal, recurring correspondence and course administration.

Bulletin board development

Determine first what computer will be used as the server, and whether it has the capacity to support the planned computer-mediated conferencing applications and functions. Once you’ve identified the server, develop the content that will be posted or accessed on the bulletin board, to include:

General course information such as objectives, requirements, schedule, etc.
Student assignments, required readings, tests, reference materials, etc.
Class rosters with student names, background information, E-mail addresses, etc.
Discussion groups and topics that will be used for the course.
Technical support information, points of contact, links, etc.
Resource list with sources of information and links to electronic libraries and other appropriate sites.
Electronic evaluation and feedback forms.

General development guidelines

Consider the following when working with general development guidelines:

Need to state up-front that a student’s grade is directly related to his/her participation.
Must personalize or humanize this high tech instructional approach.
Make personal contact with the learner via letter or phone call before the course begins.

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General development guidelines (Continued)

Create an orientation program:
- Agenda.
- Course syllabus.
- Readings.
- Handouts; incorporate graphics, charts, pictures, etc., that can be used during the session.
- Assignments.
- Class roster with background information about each participant.
- Bibliography.
- Instructor biography with a picture.
- Instructions on how to get connected.
- Ground rules.
- Phone number for technical assistance.
- Evaluation form.
- Mail out so learners will have the packet 1-2 weeks in advance of the first session.

Provide a tutorial on how to use the software prior to the first class.

Post a "How to Take an On-Line Course" on a Web site.

Encourage learners to develop their own learning strategy:
- Establish a study pattern.
- Aggressively seek clarification and feedback.
- Become comfortable with the technology.
- Manage information overload.
- Decide on when and how often to contribute.

Other user information

Develop handouts or other appropriate materials that provide computer-mediated conferencing procedures and protocol, as well as information on how to use the applications. Include this type of information in the FAQ section or a separate section of the bulletin board.

Implementation Considerations

E-mail and bulletin board considerations

Consider the following actions when implementing the computer-mediated conferencing applications:

- Assign user names and passwords to the students if not already done.
- Review all resource lists and links provided in the bulletin board and update them as required.
- Send out a welcome “test” message to all students that requires a reply.
- Initiate and conduct a group discussion as an orientation for students, and ensure all students participate.
- Give students assignments that will require the use of E-mail and the bulletin board.
- Monitor all discussion groups, intervening only if necessary.
- Provide timely feedback and responses to student questions, test results, etc.

Implementation

Consider the following to help ensure effective computer-mediated instruction or programs:

How to Begin

- Begin course with introductions to help create a friendly learning environment.
- Consider establishing a buddy system where learners are partnered with other learners.
- Ask learners for their personal goals or objectives for the class.

On-line Ground Rules

- Explain on-line ‘netiquette.’
  - **Keywords**. Use keywords in E-mail subject line for easy reference.
  - **One-message, one-topic rule**. Discuss only one idea in each message supported by examples.
  - **Short messages**. No one wants to read a 500-word E-mail, so shorter is better. Try 2-3 short messages rather than 1 long one.

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Implementation (Continued)

Typos. For discussion E-mails, do not worry about typos or grammar errors. Forgive others' typos by focusing on what they are saying, and not format.

Tone. Watch the tone of your E-mails by writing in a conversational style, as if you were there in person. Use "emoticons" to express your emotions.

Your Role as Guide

- Remember role of instructor has changed to one whose primary role is to guide and support the learning process.
- Promote peer learning by encouraging participation and asking as many questions as you answer.
- Allow time for learners to learn.
- Reinforce positive behavior; correct inappropriate behavior.
- Insist on retaining original messages when responding to someone via E-mail.
- Do not lecture and avoid an authoritarian style.

Effective Strategies

- Model appropriate interaction and facilitation techniques to the learners.
- Announce theme of each thread and the agenda for it.
- Keep the discussion on track by weaving together various discussion threads and course components.
- Set reasonable time limits for responses realizing that not all learners have daily access to the Web.
- Be timely in responses.
- Present opposite views.
- Seek learner feedback.
  - Ask direct questions.
  - Conduct polls.
  - Tie discussion to participants' comments made earlier.
  - Compliment participants.

How to Wrap-up and Follow-up

- Conclude threads clearly, so there is no doubt you are moving on.
- Use technical support.
- Remind participants to submit their evaluations.

Evaluation Considerations

Evaluation of computer-mediated conferencing

The evaluation process for E-mail and bulletin board applications would normally be accomplished as part of the evaluation of the primary instructional media. The distance learning evaluation metrics are described in Chapter 2. The general guidelines for evaluations are contained in MIL-PRF-29612 and its supporting handbooks.

This section addresses the special considerations for conducting evaluations of computer-mediated conferencing when developed as a collateral instructional media.

Computer-mediated conferencing evaluation considerations

As part of the evaluation and quality improvement process, on-line electronic student critique forms and automatic E-mail “comment” links provided on the bulletin board can be used to provide timely feedback to instructor. Following are general areas to consider in the evaluation of computer-mediated conferencing:

Technical:
- Availability and reliability of computer-mediated conferencing computers.
- Network access and reliability.
- Availability and effectiveness of technical support.
- Computer-mediated conferencing server access and reliability.

E-mail:
- E-mail client application (functionality, reliability, etc.)
- Instructor use and application.
- Student use and application.
- Usefulness and instructional effectiveness.

Bulletin Board/Discussion Software:
- Design, structure, and format.
- Instructor use and application.
- Student use and application.
- User friendliness and readability.
- Clarity, relevancy, currency, and effectiveness of content.
- Resource/site links.
- Usefulness and instructional effectiveness.

Chapter 7
ISD CONSIDERATIONS FOR INTERACTIVE MULTIMEDIA INSTRUCTION

Overview

Introduction

The specific ISD analysis, design, development, implementation, and evaluation processes for Interactive Multimedia Instruction (IMI) are described in MIL-PRF-29612 and its supporting handbooks.

This chapter addresses special ISD considerations for the application of IMI technologies in delivering instruction. Although the design and application of each IMI product may be somewhat different, the common factor throughout all of these IMI technologies is the integration of multiple media elements (text, audio, video, graphics, etc.) into a single application. The ISD considerations provided in this chapter apply to IMI as an entire group of multimedia applications with specific differences mentioned in each stage.

What is IMI?

As indicated in Chapters 3 and 4, IMI consists of various computer-based training and training support technologies that can be used individually, or in combination with each other. These include the following:

Interactive Courseware
Computer-Based Instruction/Computer-Based Training
Intelligent Computer-Assisted Instruction
Electronic Support Systems/Job Performance Aids
Computer Simulation

General applications of IMI technologies

IMI technologies can be inserted in local resident programs, as well as applied in the distance learning environment. Although the only real distinguishing factor between the two applications of IMI is the physical separation of the instructor or courseware from the students, there are differences in the way certain types of distance learning IMI are accessed, delivered, and accomplished by the students.

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General applications of IMI technologies (Continued)

IMI insertion in resident programs. The typical or traditional resident IMI course consists of instructor-led and self-paced instruction accomplished primarily in a “stand-alone” mode. Normally, the IMI program files are either downloaded and installed on the user’s workstation, or accessed from a disk drive (e.g., floppy, CD-ROM, DVD) or LAN server.

IMI applied in non-resident programs. Distance learning IMI can either be delivered in the same stand-alone manner as described for resident programs, or accessed from a distant server over the Internet/Intranet and accomplished on-line.

IMI delivery constraints

Use of the on-line access method for IMI has been limited to wide bandwidth LANs/WANs with sufficient transmission capacity to deliver true multimedia instruction without presentation delays or disruptions. Because of present bandwidth and transmission constraints, most distance learning IMI courses cannot be effectively accomplished on-line over the commercial Internet/WWW. These constraints have led to the design and development of “hybrid” IMI courses that only require some of the courseware program or support files to be transmitted over the network system.

Hybrid IMI distance learning applications

In general, a hybrid IMI course is one that uses more than one medium or technology to access and deliver the instruction. That is, the courseware files may not all be “packaged” together and reside in one location or medium.

Described below are two of the general types of on-line hybrid courses:

One type of hybrid is a course where the main program files reside and run on a distant server. The larger support data files (e.g., graphic and video files) are accessed directly from a separate high capacity storage device such as the user’s hard drive, CD-ROM, DVD, etc. This minimizes the bandwidth requirements and constraints of transmitting the entire course content over the Internet/Intranet.

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Hybrid IMI distance learning applications (Continued)

Another type of hybrid is a course where most, if not all of the program and support files are either downloaded onto the user's hard drive or accessed from a CD-ROM, DVD, etc. The course is accomplished on-line, and the Internet/Intranet connection is used to link to a distant server that provides automatic file updates for the course as it is accomplished. These course content updates are "transparent" to the user.

IMI versus IBI

For the purposes of this handbook, a distinction is made between distance learning IMI and Internet Based Instruction (IBI). Presently, the differences in the design, development, and implementation of true IMI versus IBI (i.e., Web-based HTML courseware) are significant enough to warrant discussing the two separately. ISD considerations for IBI are provided in Chapter 9.

Focus of this chapter

The primary focus of this chapter is on the ISD process for IMI applied in a distance learning environment. Although the general ISD process for stand-alone IMI in resident and non-resident courses are essentially the same, there are some design and development differences that need to be considered for distance learning IMI.

Refer to MIL-PRF-29612 and its supporting handbooks for specific ISD information on IMI.

Where to read about it

This chapter contains five sections.

References

The material in this chapter is based on the following references:

MIL-PRF-29612, *Training Data Products*
MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*
MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*
MIL-HDBK-29612-4, *Department of Defense Handbook, Glossary of Training Terms*
Distance Learning Curriculum Analysis and Media Selection, Air University, Maxwell AFB, AL, 4 Feb 1994
AF Handbook 36-2235, *Information for Designers of Instructional Systems, Volume 4*
AF Manual 36-2234, *Instructional Systems Development*
AFIADL Home Page web site:
http://www.maxwell.af.mil/afiadl/

Section A
Analysis Considerations

Why use IMI?

As stated in MIL-HDBK-29612-3, "Interactive Multimedia Instruction may be a suitable instructional media delivery system for many training objectives. Thanks to the rapid development of computer technology, it is now possible to create, at a reasonable price, new ways of designing and developing educational and training materials. Today, computers can be used to deliver interactive, competency-based, individualized, multimedia instruction. Interactive Multimedia Instruction can tailor instruction to the individual student's needs, be deployable, reach a greater audience, and provide 'just-in-time' instruction."

When to use IMI

IMI can be used:

- When there are a large number of students distributed throughout multiple locations and a backlog of students exists.
- When accomplishment of the learning objectives requires continuous practice, or problem-solving and decision-making knowledge and skills.
- When the students vary in experience, learning style, and skill level.
- When students need to learn in a non-threatening environment
- To allow students to practice a skill on an expensive piece of equipment and potentially hazardous or high-risk activities that cannot be accomplished using actual equipment.

IMI requirements and constraints

It is important to identify and assess the IMI resource requirements and constraints. This will help to determine the feasibility of developing IMI for distance learning.

- **Equipment**. The hardware requirements and considerations would be as specified in MIL-PRF-29612 and its supporting handbooks. In addition, a network system with Internet/Intranet access will be required if the IMI will be delivered and/or accomplished on-line.
- **Facilities**. No special facilities are required.

Continued on next page

IMI requirements and constraints (Continued)

Funding. Is there a budget? This may affect the complexity and amount of IMI selected, and whether some or all of the development effort can be outsourced.

Personnel. The recommended project management and IMI team personnel are identified in Chapter 2. Identifying the minimum personnel required will be necessary to determine in-house support capability. Again, expertise may vary depending on the complexity of the application such as in intelligent tutoring agents, and simulation.

Time. Is there a time limit? Depending on the type (e.g., ICAI) and amount (hours) of IMI to be developed, significant lead-time may be required and could be a constraint.

In-house development or outsource?

There are many factors to consider in making this decision. However, the most significant factors are most likely to be the capability and availability of in-house resources to support the design, development, and maintenance of the required courseware. Courses incorporating instructional technologies such as expert systems, complex animations, professional recordings, and simulations are usually good candidate courses for outsourcing due to the unique skills and expertise required. Additional considerations in determination of whether the development of the course should be outsourced are technological upgrades, content updates, and maintenance.

Is IMI cost-effective?

A comprehensive cost-benefit analysis would need to be conducted to determine this. The development of IMI for distance learning will in many cases be cost-effective, particularly for large established programs that have high student throughput and stable course content. More importantly, the risk associated with not using simulated environments is much greater than the investment in the technology.

Section B
Design Considerations

Determine the objectives

As with any instructional course, it is important to determine the specific learning objectives to be accomplished, and what it is you want to do and accomplish with the IMI. The learning objectives will drive the selection of the type and design of the distance learning instruction.

Determine what approach to use

This will be a key decision in the design process for distance learning IMI since the mix of multimedia is dependent on what can be delivered in a timely and cost-efficient manner as well as the teaching methodology. The key considerations in the selection of a delivery approach for IMI courses include:

Number of students and the frequency of the course offering.
Geographical dispersion of students and training sites.
Content stability and frequency of required revisions.
Courseware configuration control and management.
Network system capabilities and connectivity.
Client computer configuration and capabilities.

As discussed earlier, there are two delivery approaches that can be taken when considering interactive courseware, EPSS, Job Performance Aids, and simulation:

Stand-alone IMI that is delivered off-line either through the IMI program files being either downloaded and installed on the user's workstation (which required greater storage capacity), or accessed from a disk drive (e.g., floppy, CD-ROM, DVD) or LAN server.

IMI that is delivered on-line over the Internet/Intranet. This would require a wide bandwidth network, unless a hybrid course is developed. Although the hybrid approach may not necessarily be a desirable or practical option for delivery of most distance learning courses, there are some situations where the benefits of a hybrid course may be realized. For example:

Continued on next page

Determine what approach to use (Continued)

For courses that require timely or frequent content updates to maintain the currency and accuracy of the instruction presented
To simply increase the speed, and improve the presentation of on-line courses delivered over narrow-band networks.

Special design considerations for on-line IMI courses

On-line IMI courses have the following special considerations:

Save graphics and other data in JPEG or GIF formats to reduce file sizes.

Use animations, 3-D modeling, and compressed motion video only if required to effectively present the instruction.

The following issues should be taken into consideration for computer-managed instruction (CMI) functions that will be incorporated and integrated with the IMI:

How will student identification/verification be accomplished? Validating that students complete their own work/test can be a sensitive issue for course certification.

How will student performance be measured? Will electronic testing methods be employed? A well-designed IMI course will build in a measurement and evaluation process to monitor progress, completion and test results.

How will student progress be tracked and performance be recorded? What mechanisms will be used to transfer student data to and from a database? Multiple standards-based tools are available on the market for transferring data to HTML pages.

Will the student be required to log on to a LAN and central CMI system, or will individual student floppy disks be used to record lesson data and book marking information? Will the student use emails or bulletin boards to send performance data?

Continued on next page

Special design considerations for on-line IMI courses (Continued)

Will student files be maintained locally or transmitted to a central site? Management and administrative planning are required to define these requirements since technical solutions are available.

Will course reference materials need to be provided on-line, downloaded, or printed, emailed, faxed, and distributed in hard copy form? Determine long range requirements and develop reference materials within the IMI.

What on-line help applications and technical or instructor support will be required? Carefully evaluate what Commercial Off-the-Shelf (COTS) products are available on the market since several development tools will include on-line help modules.

Section C
Development Considerations

Special considerations

The actual development of Interactive Multimedia Instruction for non-resident courses would not be much different than for resident courses. However, there are some special considerations for distance learning IMI:

For the development of on-line courses, the lowest delivery platform client computer configuration and Internet/Intranet connectivity will need to be determined at all potential sites. For example, developers should be cautious when producing an IMI course with a video segment that uses MPEG compression that requires a special video card for play back.
Technically, there are certain limitations on the capacities of different sized servers where courseware can be stored and accessed by students. This is particularly applicable to simulation courseware. The maximum number of students that will be taking an on-line course at the same time will need to be determined to identify server requirements.
The development of hybrid courseware is more complex and will require special programming efforts. Proper software and hardware configuration control and documentation will be important.
Some remote student training may be required in PC operations, network or courseware access procedures, and other fundamental computer skills. Additional student materials such as instructional handouts, guides, or a tutorial computer program for these students will need to be developed in coordination with the production of the interactive courseware, EPSS, or simulation course.
During the development phase for IMI courseware, instructional designers and developers should consider the reuse of media components such as video, audio, animation, and graphics. Cataloging and using previously developed modules or digitized segments of multimedia will save development time and reduce costs.
Compatibility with existing databases — IMI courseware needs to be developed in coordination with existing student management systems. The designing the tracking and access systems as well as integrating of these student's data can become a significant programming effort.

Section D
Implementation Considerations

Implementation

Fielding the interactive multimedia instruction distance learning course requires a comprehensive amount of functional planning for management, administration, and support. The number of students and training sites involved will impact the level of effort in each of these functional areas.

Management function

The importance of active management of the implementation process cannot be overemphasized for implementing interactive multimedia, EPSS, job performance aids, and simulation courses. Critical functions include organizing, scheduling, communicating, and coordinating IMI implementation. These functions involve database management, local management of distance learning students, site operations, and equipment as well as the IMI product and lifecycle management itself.

Administration function

Administrative procedures and processes should be in place for both students and hardware/software at all sites. Student registration, processing, tracking, and assistance just as important for interactive courseware, EPSS, and simulation Courses as traditional or IBI courses. Other administrative functions include resource scheduling, routine/preventive maintenance, and equipment refreshment/upgrades.

Support function

Particularly for on-line distance learning instruction, technical and maintenance support must be readily available to maintain continuous computer and network system operation for reliable student access. The students' motivation and interest level, which are more crucial in a distance learning environment, will be enhanced the more "seamless" and "transparent" the instruction is.

Section E
Evaluation Considerations

Evaluation of IMI instruction

As with other IMI courseware, the evaluation process would consist of a formative, summative, and operational evaluation. The evaluation procedures would be much the same for all IMI.

The distance learning evaluation metrics are described in Chapter 2. The general guidelines for IMI evaluations are contained in MIL-PRF-29612 and its supporting handbooks.

This section addresses the special considerations for conducting evaluations of IMI distance learning instruction.

Formative evaluation (Beta testing Phase I)

The formative evaluation begins in the analysis phase and continues through the development phase of the ISD process. The primary difference in the IMI validation process for distance learning would be the manner in which the individual and small group beta testing are conducted for on-line IMI instruction. It is best to conduct these evaluations at the remote sites in the actual environment that the course will be delivered. Selection of the least capable site would be preferred to fully “test” the delivery of the instruction under less than favorable conditions.

Summative evaluation (Beta testing Phase II)

The operational testing for the summative evaluation should also be conducted at several of the sites under actual distance learning conditions. If possible, plan to conduct the evaluation of on-line courses with all sites participating at the same time to “exercise” the server and the performance of the IMI on the system.

Operational evaluation

The operational evaluation is an ongoing process that is accomplished after the formative and summative evaluations. This evaluation is based on internal and external feedback data such as:

Instructor/facilitator comments (internal)
Student critiques (internal)

Continued on next page

Operational evaluation (Continued)

Test results (internal)
Inspection and evaluation reports (external)

This operational evaluation process requires the following procedures:

What information needs to be collected: performance, effectiveness, etc.
How the information will be gathered: on-line, printed questionnaires, etc.
How it should be stored and formatted for analysis: servers, databases, etc.
How and who should analyze: ISD team, managers, instructors, etc.

For on-line IMI courses, computer/network system access and reliability will need to be carefully assessed since these factors significantly impact the effectiveness of the distance learning program.

General IMI evaluation

Some general areas to consider in the evaluation of IMI distance learning instruction are:

Course content – organization, relevancy, clarity, quality, currency, etc.
Course materials – adequacy, availability, effectiveness, currency, etc.
Instructional methods/media – effectiveness, quantity, and quality of interaction.
Instructional equipment – availability, reliability, user friendliness, etc.
Internet/Intranet network – access, speed, reliability, etc.
Instructor support – necessity, availability, effectiveness, etc.
Proctor support – usefulness, availability, effectiveness, etc.
Technical/maintenance support – access, availability, timeliness, effectiveness, etc.
Administrative support – usefulness, adequacy, availability, etc.

Chapter 8
ISD CONSIDERATIONS FOR INTERACTIVE VIDEO TELETRAINING AND INTERACTIVE TELEVISION INSTRUCTION

Overview

Introduction

There are differences in the application of the course planning, design, production, and postproduction processes for IVT courses. This chapter describes the ISD considerations for the analysis, design, development, implementation, and evaluation of Interactive Video Teletraining (IVT).

One-way versus two-way video

During the analysis and design process, it must be decided if the course can be delivered using one-way video, or if two-way video is required for the effective accomplishment of the learning objectives. This needs to be determined since:

Satellite uplink capability is not available at most remote training sites.
Two-way video instruction is much more costly.

The Air Force currently provides only one-way video/two-way audio, or Interactive Television (ITV), instruction. As such, the primary focus of this chapter is on ITV instruction. Special ISD considerations for VTC lessons are addressed separately in Section E of this chapter.

Where to read about it

This chapter contains five sections.

References

The material in this chapter is based on the following references:

MIL-PRF-29612, *Training Data Products*
MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*
MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*
MIL-HDBK-29612-4, *Department of Defense Handbook, Glossary of Training Terms*
Distance Learning Curriculum Analysis and Media Selection, Air University, Maxwell AFB, AL, 4 Feb 1994
AF Handbook 36-2235, *Information for Designers of Instructional Systems, Volume 4*
AF Manual 36-2234, *Instructional Systems Development*
AFIADL Home Page web site: http://www.maxwell.af.mil/afiadl/

Section A
ITV Analysis and Design

Selecting the ITV Course

Selecting the course

In order to determine if a course of instruction or a segment of a course of instruction is a candidate for ITV, complete the following steps:

Perform media analysis to determine whether a course of instruction or a segment of a course of instruction is a suitable candidate for ITV based on the learning objectives.
Perform a cost analysis comparing costs of alternative methods with the estimated costs of ITV delivery.
Identify estimated offsets and/or expected educational or training benefits to be derived from conversion of the course of instruction—this is known as Return on Investment (ROI).
Identify the team responsible for developing the course of instruction for ITV.
Identify the instructor(s) for presentation of the course of instruction, and evaluation of student performance.
Identify and secure approval/participation of functional managers and guest presenters
Identify administrative procedures, and secure administrative support.
Ensure a DITIS search has been done to avoid duplication of instructional development.

Analysis and Design

Entertainment versus instruction

ITV instruction differs from television entertainment.

- Emphasis is on instructional content not video production.
- Visual presentations enhance the instructional content.
- Presentation is interactive, not passive.

Why planning is essential

ITV instruction differs from traditional classroom instruction.

- In classroom instruction, the instructor provides information, distributes course materials, operates presentation equipment (audiovisual and computer-based), personally interacts with the students, and is solely responsible for the presentation of instruction.
- In ITV instruction, the instructor must rely on a team of technical experts to produce (broadcast) the instruction.
- The video crew is a support group of television experts; the instructor is the content expert.
- The instructor must convey a plan of instruction to the video crew.
- Lesson plans that worked in the traditional classroom will not necessarily work for ITV. The ITV team may have to reconfigure instruction for the medium and use different instructional strategies.

Instructor Preparation for an ITV Course

Instructor preparation

Effectively teaching an ITV lesson requires preparation.

Specific training is required prior to developing and presenting an ITV lesson.
Instructors need an opportunity to practice effective ITV techniques.

Instructors should have a thorough understanding of the ISD process as presented in AF Handbook 36-2534*, Instructional System Development.* Use of the ISD process will ensure:

Development of instruction based on criterion-referenced education and training (job performance) requirements.
Sound instructional design and management decisions.
Graduates acquire the knowledge, skills, and attitudes (KSAs) to perform a job.

The affective component of distance learning

In any classroom situation, there is a strong relationship between attitudes and behaviors displayed by an instructor, and the attitudes and classroom behaviors shown by the students.

ITV instruction does not provide observable one-on-one student-teacher classroom relationships.
ITV instruction does not provide the ability to observe student non-verbal cues.

Maintaining student interest in distance learning is a challenge for the instructor. The instructor must employ variety, interaction, and involvement to maintain student interest. Instructors can mitigate the affective deficiencies of distance learning by:

Asking frequent in-depth questions (Key is to interact early and often and ask direct questions)
Fostering interactive discussions.
Using teaching interviews with recognized experts.

Team approach

An effective distance learning course requires a closely coordinated effort by a number of people working as a team.

Curriculum / Instructional Designer:

It is essential for an individual who understands the ISD process to work with the instructor and SME to develop the course.
Not all courses can be delivered by distance learning. After careful analysis, the designer may find only part of a course is appropriate for delivery via ITV.
A curriculum designer must be involved because a resident course usually does not work effectively via distance learning using the same format and learning materials.

Instructors and Administrative Support:

Instructors must take an active part in the administration of a distance learning course.
Instructors must have a class roster for each site receiving the broadcast.
Students must have required handouts and materials at each site prior to the broadcast.
The training manager, scheduler and/or instructor must coordinate procedures to determine who is in class for each session.
The instructor must establish a process for student evaluation (i.e., grading tests, getting tests from students to the instructor, and back to the students).
The training manager/scheduler, and/or instructor must determine a proper time for delivery of the course, taking into account various time zones.

On-site Facilitators, Monitors, or DL POCs:

A designated person must be available at each remote distance learning classroom to assist with administrative and technical issues.
The classroom must be prepared prior to each broadcast.
Multimedia delivery technology equipment and student instructional materials must be available for the students.

Continued on next page

Team approach (Continued)

Site facilitators are responsible for letting the instructor know who is in attendance for a given session or period.

Instructional or Subject-matter Facilitators:

Instructional facilitators help conduct instruction at the remote sites.
Special training may be required for instructional facilitators.

Technical Support:

Coordination between studio production crew (technical support personnel) and the instructor is essential.
Special camera angles and shots, technical advice on appearance, movements, and limitations should be discussed in advance of the broadcast.
The director can give advice to make presentations more professional and enhance overall delivery, ensure a smooth transition of camera shots from the presenter to the visual aids, and make the technology transparent to the student.

Visual Aid Support:

Due to limitations on print size and lines of text, more visuals will be needed for a distance learning course than for a traditional classroom course.
Work with visual experts to ensure the clarity and effectiveness of visual aids. Pay particular attention to colors. Colors that are acceptable in a typical classroom presentation may not pass the “groan” test when broadcast!

Communication skills

Distance learning students are usually more critical, and television is less forgiving of communication mistakes. Instructors need to consider two areas of communication skills:

Verbal Communication:

Clarity of speech and enunciation are more important for ITV than they are in a live classroom.
Changes in volume and unconscious sounds are more distracting to students.

Continued on next page

Communication skills (Continued)

Grammar and vocabulary are more important for ITV.
Effective questioning skills are critical for ITV. Allow brief periods of silence after asking a question to give students time to answer.

Non-Verbal Communication:

Eye contact is an important non-verbal behavior in the studio environment. Instructors must maintain direct eye contact with the camera.
The instructor should look at, and talk to, the camera. The instructor must appear to talk to the remote site students directly.
Minimize looking at the monitor that provides a view of what is being broadcast to remote sites when it is not collocated with the camera.
The instructor must maintain appropriate eye contact with students in the studio classroom and at remote sites.
The natural tendency when teaching live classroom students and remote site students at the same time is to have most of the interaction and eye contact with the live classroom students instead of the camera.
Instructors must make an effort to overcome this tendency, or the involvement of the remote site students may be limited.
Facial expressions of the instructor are very clear to remote site students.
Movement of the instructor is an important non-verbal behavior. Excessive movement is a distracter. Hand gestures can be a distracter. Be aware of movement limitations. Watch the monitor to ensure movement and gestures are not “off camera”.
Listening skills are an important non-verbal behavior. Listen attentively to student questions and responses. Ensure students at remote sites understand questions and responses by repeating or paraphrasing and asking direct questions.

Audience Analysis

Understanding the target audience

Planning a curriculum requires the following:

- Understanding the learner.
- Understanding the intended relationship between courses.
- Understanding how the learners will use the courses.

An effective curriculum requires a detailed understanding of the target audience. This is a sampling of questions used during an audience analysis:

- Why is the instruction needed?
- What are the specific needs of the target audience?
- What external data verify the need?
- What factors led to the instructional need?
- What past experiences indicate that the instruction being planned can effectively meet this need?
- What are the ages, cultural backgrounds, interests, and educational levels of the students?
- How will the audience apply the KSAs gained in the course, and how are they sequenced with other courses?

Impact of ITV on audience analysis

Target audience analysis considerations for ITV also include the following:

- How familiar are the students with the various telecommunication instructional methods and delivery systems under consideration?
- Will students other than the primary target audience be allowed to participate in the ITV course?
- How will the expanded ITV audience differ from the primary audience?
- Where are the students located?
- Do all students have access to a satellite downlink site?
- Will TDY to a downlink site be required for some students?
- Will overseas students participate, and if so, how?
- Will there be a studio audience at the uplink site in addition to the remote students at the downlink sites?
- How large an audience will the uplink and downlink sites accommodate?
- Are there special training conditions such as weekend broadcasts for the ANG and AFRC?

Learning Objective Analysis

Review learning objectives

Individual course KSA learning objectives must be developed based on the:

- Educational and training requirements previously defined.
- Audience analysis previously conducted.

Well-developed KSA learning objectives will ensure that the course topics are instructed in a logical and sequential order. When reviewing learning objectives:

- Note whether any objectives require special laboratory or research facilities, or equipment. Identify alternate sources at remote sites. If alternatives do not exist, the learning objectives may need revision.
- Note whether any objectives require instructor observation of student performance. The objectives may require special two-way video or use of a facilitator.

One of the goals is to select instructional strategies that will enhance the learning objectives.

Instructional strategies

There are several important instructional strategies to keep in mind:

- ITV is a visual medium that should be fully exploited for effective instruction.
- Subject matter facilitators may be used to enable mastery of performance and group activities at the remote sites.
- Interactivity must be planned to ensure student involvement in the learning process. Design some type of interactive event every 7-10 minutes.

Student familiarity and comfort in the DL environment must be maintained.

Scheduling and resource considerations

Consider the following items for determining the scope and sequencing of lessons in a course of instruction:

Availability of instructors and guest speakers.
Availability of students and attendees.
Schedule students by ability or experience groups.
Consider student fatigue factor for viewing video presentations.
Ensure access to rooms equipped for video/audio reception.
Determine the estimated number of students to receive instruction. Repeated deliveries of lessons may be required.
Determine the number of sites for delivery of instruction. Repeated deliveries of lessons to remote sites may be required.
Determine the difficulty of lesson content. Allow enough time for the lesson knowledge, skills, and attitudes to be absorbed by the students.

Summary

Summary of ITV analysis

Perform the following steps during ITV Analysis:

Review the reason for using the ITV mode of instruction.
Review who the target audience is.
Review the learning objectives.
Review whether the ITV lessons are to be used for initial instruction, remedial instruction, refresher instruction, job certification, or job upgrade instruction.
Review the lessons that are to be taught using other media.
Review the satellite broadcast timing limitations and any resource limitations.
Determine the type of broadcast setup (studio production or instructor controlled approach)
Select an instructor to deliver the instruction and provide training in effective communications skills for ITV.
Identify scope and sequence of material and generate a tentative schedule.
Determine whether to deliver the material over a series of short broadcasts (i.e., for 2 hours on Monday, Wednesday, and Friday) or to present the instruction in one large block (i.e., 6 hours on Monday).

Design

Designing instructional protocols for the ITV environment

There are several instructional protocols for ITV that must be considered during the design phase, and firmly established at the beginning of each course. These protocols may need to be incorporated in the script:

Schedule Protocols: Identify the dates and times for ITV classes. Delineate live broadcast hours from other activities at the remote sites.

Attendance Protocols: Establish a system to take attendance, and to ensure students attend class. Determine if the presenter will do a roll call from the host or uplink facility.

Break Protocols: Plan breaks in advance. Determine break time and frequency.

- Consider different time zones, and adjust break schedule accordingly.
- Schedule frequent breaks to avoid student fatigue.

Student Interaction Protocols: Determine if students can ask questions at any time or only at specific times.

- Determine how questions will be asked and answered.
- Determine if questions will be generated and answered using audio, computer-generated text, E-mail, or Fax.
- Establish protocols for asking questions and response times to deal with questions.

Response Systems Protocols: Decide when students will receive instruction on the use of response systems at the downlink sites.

- Ensure students know how to use response systems.
- Establish protocols for use of audio, computer-generated text, E-mail, or Fax communication.

Student Project Reporting Protocols: Determine how students will make reports using audio, computer-generated text, E-mail, or fax transmissions.

- Determine how students will share information between remote sites.

Continued on next page

Designing instructional protocols for the ITV environment (Continued)

Determine if reports are to be sent to the host site and then transmitted to all remote sites.

Student Assessment Protocols: Establish the protocols for formative and summative evaluation of each lesson and the course during the design phase. Determine how tests are to be proctored and administered at the downlink sites. Determine grading protocols.

Summary of ITV design

Include the following steps during ITV Design:

Plan It

Incorporate appropriate instructional strategies and methodologies.
Design appropriate protocols into each lesson.
Translate verbal teaching points into relevant audio and visual video images. Include the types of video shots that are required.
Translate verbal teaching points into relevant graphic, video, photographic, text, animation, or simulation images. Specify exactly what images are required, and exactly how the images are to be incorporated and distributed in the ITV lesson.
Use common cues in the script to prompt the director for all movements, transitions, visuals, etc. that the instructor wants to present.

Write It

Use a topical, chronological, space, pro/con, or cause-effect pattern for the body.
List the main and supporting teaching points. Use a combination of the Outline and Verbatim script formats.
Write the body portion of the script first.
Include questions, interim summaries, and transitions.
Add the introduction and conclusion after developing the body.

Final scheduling actions

Work with schedulers to complete the following steps after the audience has been identified, the scope and sequence of the course of instruction has been determined, a development / conversion timeline has been established, and a delivery date has been determined:

- Determine the dates and times of broadcast and confirm the schedule.
- Identify and confirm downlink sites.
- Schedule facilities and satellite time.
- Implement marketing strategies to ensure student notification of course dates and times, and how to register.
- Call ATN Program Management Office to find how to connect to other Service networks, if required.
- Refer to the AFIADL Home Page Web Site for the current listing of GETN downlink sites and locations: http://www.maxwell.af.mil/afiadl/

Section B
ITV Development

Developing the Lesson Plan

Steps for completing lesson plan development

Complete the following steps to develop lesson plan scripts and storyboards after the audience has been identified, and the scope and sequence of the course of instruction has been determined.

Determine the type of script format and the script elements to include.
Prepare the script with appropriate markings and proof it carefully.
Develop storyboards for each teaching point to include visuals, production notes, and narration. Include instructional protocols, questions, transitions, and summaries.
Follow all guidelines related to the use of copyright material.

Script purposes

A well-written script will provide the ITV instructor with information that is required to conduct and guide an instructional lesson. The script will:

Sequence the primary lesson topics.
Provide guidance to the entire studio crew.
Be incorporated into a teleprompter, as desired.

Script types

There are four types of scripts described below:

1. Verbatim Script
2. Outline Script
3. Keyword Script
4. Combination Script

1. Verbatim script

The characteristics are:
Every word spoken by the instructor is written down.
Contains specific cues for graphics, wording, movement, questions, etc.

Continued on next page

1. Verbatim script (Continued)	Customarily used with a teleprompter. Beneficial if specific key wording is to be used. Useful for new Interactive Video Teletraining (ITV) instructors. Interpretive reading (conversational dialog) of the script is required to avoid uninteresting presentations. A true verbatim script does not allow for much spontaneous discussion or development of ideas. The instructor should include time for interactive discussion periods. Minimal coordination between instructor and studio production crew.
2. Outline script	The characteristics are: Each specific word is not written down. Usually, only the opening and closing remarks are listed. The rest of the script is in an outline format. The sequence of information is pre-established. The instructor is free to develop sentence structure to support teaching points. Require the instructor to be very knowledgeable of the subject being taught. Close coordination with the director and studio production crew is required.
3. Keyword script	The characteristics are: Not a good type of script for the instructor to use. Requires the instructor to be extremely knowledgeable of subject matter. Primary use is for studio technicians who can use instructor-generated key words as cues for performing actions, or presenting graphics, etc. Extensive coordination between the instructor and studio production crew prior to rehearsing lesson presentation is required. Adequate for broadcasting studio setup. More effective if combined with other script formats to achieve maximum instructor performance.

4. Combination script

The characteristics are:

- Closely resembles a typical lesson plan.
- Combines Verbatim, Keyword, and Outline formats, and enables the instructor to present a thoroughly planned lesson.
- Most versatile script type.
- Coordination between the instructor and studio production crew prior to rehearsing lesson presentation may be greatly reduced.
- Requires more instructor planning time than the other types of scripts.

Script characteristics

A lesson script should contain everything that a well-designed resident lesson plan contains, and more. Ensure that the following elements are included:

- Learning objectives and methods for communicating them.
- An *Introduction*, *Body*, and *Conclusion*.
  - The Introduction contains motivational statements, visual images, and usually a Verbatim Script.
  - The Body lists the main and supporting teaching points, and contains both Outline and Verbatim Scripts.
  - The Conclusion repeats the major teaching points, and emphasizes the teaching points that are most difficult for the students.
- *Interim Summaries* that are a mini conclusion of teaching points inserted in the lesson where appropriate, using Outline Scripts and visual media.
- *Transitions* to inform the students at remote sites of the continuance of new information, and to enable the students to acknowledge the changes in lesson events.
- Scripted *Questions* that require and encourage student interaction with the instructor.

Remember to build in adequate time for student questions.

ITV script development

Script Marking:

Use symbols or cues to highlight important teaching points in the script.
Use lines to separate different topics.
Use clear, precise, and consistent marking throughout the script.

Script Proofing:

Print a hardcopy of the script and proofread it for intent and effective topical coverage.
Rework the script as required.

Developing Storyboards

Storyboard use

Storyboards are used to convey visual ideas and concepts.

Coordinate the lesson plan text with associated visuals.
Cards or sheets can be organized into different sequences.
Usually setup on videotape or on a computer, which allows the storyboard to be scrolled up or down, highlighted.
Storyboard images setup on a videotape must allow minimum viewing times for each image.

Storyboard composition

The three main sections of the storyboard to consider when developing ITV lesson plans are:

Visual Section:

Visualize the teaching points by drawing, sketching or illustrating the visual images that will be seen in the final screens.
Usually accomplished using a graphic format.

Production Notes:

Describe where, when, what, and how the visual subject teaching points will be used.
Contain the name of the visual subject teaching points.
Contains the video shooting, timing, and display requirements, audio production and timing requirements for each visual subject teaching point.

Narration: The narration supports, and is secondary to the visual images.

Describe and enhance the teaching points.
ITV storyboards may not contain the complete lesson plan narration.
Teleprompter scripts, verbatim scripts, content outline scripts, or keyword scripts may be used.

Develop visual materials

Visual materials should have the following characteristics:

Visual materials should fit the setting, support the message, and heighten audience attention.
Visual materials should be pictorial. Key points and supporting materials should be expressed using expressive or vivid photos, graphs, charts, illustrations, animations, and simulations.
Visual materials should be colorful. Color induces responses and appeals to emotions. Colors can promote attention, evoke moods, create desire, and generate a favorable response.
Visual materials should be creative. Creative visuals will have more impact, and gain more attention.

Visual materials tests

ITV visuals must pass three tests:

Aspect Ratio: A television monitor screen has an aspect ratio that is three units high and four units wide. Visuals displayed on the screen must correspond to this aspect ratio.
Safe Area: Visuals in the correct three by four aspect ratio, with a one-to-one pixel aspect ratio (i.e., computer graphics), will require additional space when presented on a television monitor. A television monitor has a one-to three pixel aspect ratio that makes a one-to-one pixel aspect ratio image bleed off the television screen unless the image is sized correctly for display on a television monitor.
Contrast: Television cameras handle colors in the middle of the spectrum better than colors at the ends of the spectrum, such as black and white.

ITV visual materials preparation

Use the following general rules for designing effective visuals:

Write the Words First. Develop the message, the headlines, and the outline with key points. Consider the key points in the outline that need special emphasis.
Keep It Short and Simple (KISS). Design no more than one main idea per visual.
Keep It Large and Legible (KILL). Use only 7 lines per visual, including the title.

Continued on next page

ITV visual materials preparation (Continued)

Use the Six by Six Rule: 6 lines per visual; 6 words per line. Use a simple typeface no smaller than 18 points for transparencies.
Use Descriptive Titles. Visual titles should summarize the points to be made on the visual.
Decide on a Basic Design. Use the same colors, type styles, and graphics throughout a presentation to show a continuing relationship.
Proof the Visuals. Use others to proof for incorrect data or spelling errors.
Proof received visuals. Proof as they will appear at receive sites. Visuals sometimes take on a different appearance after conversion from digital to analog. If this is not possible, view videotape of broadcast.
Allow Enough Time. Good, quality graphics take time to develop.

Using color

Tips for using color:

Color combinations that look good on a computer monitor will not always look good on a television monitor.
Use different background colors to introduce new sections of the presentation, to change a mood, or to call attention to important transitions.
Use light colors against dark backgrounds and vice versa.
Avoid bright red, magenta, and some blue colors that tend to get lost in the background.
A solid background will enable text, graphics, and graphs to stand out. Special effects can add visual appeal.
Use visuals with more images, and less words.
Use words to label, highlight, and summarize.
Yellow and white text bold with shading work well.

Types of ITV visual materials

Types of ITV visual materials include:
Camera Art or Hard Graphics. Must be large enough, and pass the contrast and aspect ratio tests. Are usually prepared prior to the live presentation, rather than using a camera to shoot them “live” during the presentation. May also be shown during the broadcast using a visualizer.

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Types of ITV visual materials (Continued)

Computer-Generated Graphics. Computers are used to create animated, still, and modeled images and text using templates with correct aspect ratios and safe areas.

Character Generator (CG). Used to create words and numbers in a variety of sizes and colors for display on the television monitor. Can be a stand-alone device, or a component of a computer graphics system.

Full Animation Systems. Sophisticated computers that can reproduce any type of animated, still, or modeled image; create unlimited motion; add shading; specify the angle and intensity of the light source; and give a two-dimensional drawing depth and three-dimensional effects.

Still-Store. Captures a still image from any type of video source and stores the image as a still image. Provides random access to still images, with numbered frames. Images are displayed on the television monitor by calling up the frame number.

Ultimatte or Chroma Key. Allows the presenter to interact with the displayed images. Electronically finds a particular color frequency in the television picture, usually green or blue, and removes it from the image being broadcast. Anything green or blue becomes invisible. For example, if the wall behind the presenter is green, Ultimatte removes the wall. The wall can be replaced in the broadcast image with another background video image. The presenter (who cannot be wearing green) is visible in front of the new image.

Roll-Ins (video clips). Pre-produced videotapes that are shot to videotape by a live camera and edited for desired scenes and length of display prior to the live broadcast.

Section C
ITV Implementation

The TV studio

ITV classes may take place in a video production facility (TV studio), or in an ITV broadcast classroom. The TV studio should be equipped with:

Room Features

Metal framework on the ceiling, from which lights can be suspended for illumination of the set below.
Curved wall painted in a solid color that can also be used as a backdrop.
Studio doors large enough to provide access for large training support equipment.
Draperies in a solid color, that can be used as a backdrop.
Clocks. Timing is important and instructors must avoid dead time while on-the-air.

Equipment

One to four analog or digital TV cameras on wheels or wall-mounted.
Analog or digital television monitors.
Computers with monitors and Internet access.
Projection or digitizing systems for transparencies, slides, graphics, solid objects, etc., capable of projecting images on screens or monitors.
Fax machine for student roster, submitting questions or course materials, etc.
Furniture for use in sets.

The production facility should be staffed with production personnel such as camera operators, stage manager, technical assistants, etc. as may be necessary for the production.

The control room

The control room is the heart of the ITV production facility and should normally contain:

All equipment for transmission of ITV broadcast and the appropriate crew to ensure a successful broadcast.

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The control room (Continued)

A director or videographer, linked to a key personnel instructor by microphones, headsets, and earphones.
Several analog or digital TV monitors.
Large electronic control panels for management of equipment and personnel.
Videotape and audiotape players.

Each of the television monitors in the control room displays a specific video output. Each camera on the studio floor is tied electronically to the control room so that the director can monitor what each camera is recording. Other video or computer monitors are used to display:

Analog or digital graphics.
Scripts, animations, and computer simulations.
Digital and analog videotape lesson segments.
Prerecorded lesson segments.
The image that is being transmitted to students at remote sites.

ITV equipment

The following devices are commonly used during ITV production. Instructors should become familiar with all of the equipment/devices used during the production.

Microphones

Lavaliere or clip-on microphones: Designed to pick up the voice of one person, and clipped to the clothing of the presenter.
Tabletop microphones: These are important if students are present in a studio classroom. These microphones permit questions to be transmitted to students at the remote or downlink sites. Students at downlink sites often use "push-to-talk" tabletop microphones to talk to the instructor and to other sites.

Video Components

Cameras: Usually, three cameras are used.
One camera is used to shoot graphics. It can be mounted in the ceiling, in a lectern, or in a visualizer.

Continued on next page

ITV equipment (Continued)

Two cameras are mounted on movable bases to achieve different shooting angles.

Cameras in the broadcast classroom are mounted in the back of the room, and are operated by remote control from the control room.

Most studio cameras have red lights on top to indicate which camera is in use.

Teleprompter: Designed to display text within view of the on-camera presenter. The script is entered into a computer that is used to scroll pages of the script through the machine as the presenter reads them. May be controlled by the director or the instructor.

Monitors: Each ITV receiving site must have one or more analog or digital video monitors that enable the students to see the presentation.

Video cassette recorders (VCR): Required at the ITV receiving site if local videotapes (not a part of the broadcast) are to be presented to the students and for recording broadcasts for remediation or future reference.

Computer Components

Computers: Each ITV receiving site must have instructor and student computer stations that enable the presentation if Interactive Multimedia Instruction, computer simulations, and electronic testing (Internet access).

Voice/Data fax/Computer modem: Required at the ITV receiving site to provide text and voice interface between students and the instructor. Also used to control the transmission of test information test information.

Interactive presentation system (instructor controlled).

Other Equipment

Lighting: Spotlights are placed to eliminate shadows on the presenter, and to create appropriate shadows on the set and backdrop.

Whiteboard (Softboard™): Connects to a Windows©-based computer. Information written on the whiteboard is displayed on the computer monitor in color. Files can be created and saved.

Visualizer.

Preproduction Phase

Preproduction activities

The ITV preproduction phase involves the following activities:

- Conducting preproduction conferences.
- Developing television platform skills.
- Conducting rehearsals.
- Production preparations.

Preproduction conferences

The instructor, studio director, and graphics designer must meet to discuss and coordinate the sequencing of the various instructional media elements of the distance learning course.

- Decide whether, when, and how the ITV components are to be broadcast.
- Determine the development times and resources required to develop and integrate the ITV course.

Develop ITV skills

ITV is a visual medium, and instructor presentation skills are very important aspects of instructing using this medium. It is strongly recommended that instructors and developers attend a course to learn ITV techniques. Rehearsals and “dry-runs” should be accomplished by the instructor to hone verbal and nonverbal presentation skills, and practice using the equipment.

Conduct rehearsals

Rehearsals will allow the instructor and production team to work out the broadcast details to include the exact presentation sequence/timing, camera shots, supporting graphics/display requirements, etc. Videotape rehearsals for review.

Production preparations

Below are just a few of the considerations and preparations that may need to be accomplished prior to the actual production (use checklist if available).

- Ensure the production and remote site facilities have been reserved and are still available.
- Ensure the remote sites have all the necessary instructional materials.

Continued on next page

Production preparations (Continued)	Ensure site monitors are trained. Ensure the facilitators are aware of their responsibilities/roles. Ensure the telephone link/audio bridge is operating properly. Conduct last minute checks on equipment, instructional materials, etc. Confirm satellite connection with downlink sites and ensure all remote classroom sites are up and operating on production day.

Production Phase

The broadcast

The Production phase is actual on-air time, when the lesson is being broadcast by the instructor and received at all downlink sites. Videotape the broadcast and conduct a debriefing with the production team after the production.

Potential technical problems during production

Visual or audio problems may occur when conducting ITV live via satellite:

Visual difficulties include the loss of the transmitted uplink image due to:

- Studio cameras not relaying the image properly.
- Camera operators and switchers not being in sync with each other according to which image needs to be broadcast.
- Space satellite malfunctions.

Visual difficulties include the loss of the transmitted downlink image due to:

- Television monitor malfunctions in the ITV classroom.
- Satellite downlink dish not receiving signals properly.

Audio difficulties include the loss of the transmitted uplink signal due to:

- Instructor's microphone not functioning properly.
- Satellite may be sending the visual image but not the audio signal.

Audio difficulties include the loss of the transmitted downlink signal or audio return due to:

- Television monitor volume variations in the ITV classroom.
- Inoperative television monitor speakers.
- Student microphones problems.
- Telephone patch-in/audio bridge problems.

Have a backup plan

Develop a backup plan and coordinate it with the remote site facilitators in case of transmission problems or failures. This should include an alternate lesson plan at the remote sites that may include showing a previously taped ITV lesson if appropriate, or accomplishment of other instructional activities under the direction of the site facilitators.

Section D
ITV Evaluation

Overview

Evaluation usually refers to anything that occurs after implementation, such as evaluation of the effectiveness of the ITV course of instruction, including assessment of the learning outcomes, instructional skills, and studio services.

Evaluation is the last phase of the ISD process.
Effective evaluation requires a continuous feedback process.
Evaluation identifies both intended and unintended outcomes so that decision-makers can make necessary adjustments in the instructional program.
Evaluation usually involves formal and informal processes that measure the effectiveness of instruction and support functions.
There are unique evaluation requirements for ITV and distance learning courses of instruction.
The quality control procedures described in Chapter 2 are part of the evaluation process for ITV courses of instruction.
Evaluation of ITV, and the required documentation, is based on the distance learning metrics described in Chapter 2.

Formative and summative evaluation

The formative and summative evaluations provide a feedback mechanism that allows for adjustments and modifications of strategies being used to assure achievement of program goals and objectives. They include:

Evaluation of Internal Processes: Look at how well the process worked. Was ISD followed? Did the team work well? Were policies followed? Was required documentation maintained? Were general quality control (QC) procedures followed?

Design/Development Criteria for ITV: Were the proper procedures and design techniques followed? Did the team members follow the QC procedures in the design and development of the courseware?

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Formative and summative evaluation (Continued)

Validity and Beta Testing Prior to Release: This is to ensure instruction works prior to wholesale implementation. For ITV, this involves pre-production coordination, rehearsals, and feedback from the field for the initial broadcast.

Monitor Technical Production: The technical and studio production staff must continuously monitor the output signal as well as return audio during a production. Testing of equipment must occur prior to broadcast time and must be factored into the ITV schedule. The production crew must be able to work with site monitors or POCs to fix technical problems that occur during production.

Formative evaluation

Formative evaluation is a continuous feedback mechanism that includes:

Evaluation of Internal Processes
Design/Development Criteria for ITV
Validity and Beta Testing Prior to Release
Monitor Technical Production

Evaluation of internal processes

Evaluation of internal processes includes:

How well did the process work?
Was the ISD process followed?
Did the team work well together?
Were policies followed?
Was required documentation maintained?
Were Quality Control procedures followed?

Design / development criteria for ITV

Design / development criteria for ITV includes:

Were development procedures and design techniques followed?
Did team members follow Quality Control procedures in the design and development of courseware?

Validity and beta testing prior to release

Validity and beta testing prior to release includes:

Has beta testing been accomplished to measure the validity of the instruction?
Have pre-production coordination and rehearsals been accomplished?
Has feedback from the field for the initial broadcast been obtained?

Monitor technical production

Monitoring of the technical production includes:

Does the technical and studio staff continuously monitor the output signal and the return audio during a production?
Has testing of equipment prior to broadcast time been accomplished and factored into the ITV schedule?
Can the production crew work with site POCs to fix technical problems that occur during production?

Summative and operational evaluation

Summative Evaluation is based on data collected upon conclusion of a program. It indicates the initial level of success. The Operational Evaluation is conducted throughout the life cycle of the course. It indicates the on-going level of success. Operational evaluations will show trends over time and should help differentiate between an isolated incident and potential system/program failure. As with all DL programs, ITV Evaluation is based on DL Metrics in Chapter 2 and includes:

Instructional Effectiveness
Costs
Technical/System Reliability
Administrative Efficiency/Operational Effectiveness
Customer Satisfaction

Instructional effectiveness

Instructional effectiveness includes the following:

The instructor, along with the course director or training manager, is responsible for determining if students achieved the desired learning outcomes. This is usually accomplished through some form of testing or course completion data.

Continued on next page

Instructional effectiveness (Continued)

An important indicator of effectiveness is how well the instructor and any subject matter facilitators performed in the ITV environment. Measurement of the effectiveness of these people is usually accomplished through student critiques of the instructional program and feedback from peer or supervisory evaluations as well as site POCs. Also, ITV producers/directors are a source of feedback. Student critiques of ITV instructional effectiveness should provide feedback on:

- Content
- Relevancy of material.
- Level of student-instructor and student-student interactivity.
- Effectiveness of instructor presentation techniques.
- Instructor knowledge of subject matter.
- Overall technical quality of presentation.
- Quality of the learning environment at the remote sites.

Costs

Costs are kept in accordance with DL Metrics in Chapter 2.

Technical / system reliability

Technical / system reliability includes the following:

The production/engineering and ITV studio (uplink) crews are primarily responsible for monitoring technical and ITV system reliability.

Site POCs must report any technical difficulties at the remote sites. The production/engineering crew must determine if the problems are system or site related. These difficulties are documented and reported to the ATN program manager as directed. Documentation should include:

- System/studio utilization.
- Type of equipment failures.
- Percentage of downtime.
- Point of failure (cause and location of problem) .
- Requests for assistance from remote sites.
- Actions taken.

Usually a debriefing occurs at the end of each production to identify areas for improvement.

Administrative efficiency / operational effectiveness

This involves a review of the administrative procedures that support ITV to include:

Course notification.
Registration procedures.
Materials handling.
Student access to facilities.

This information can be obtained from students as part of the course critique as well as from site POCs. Problems should be reported to the appropriate support organization.

Customer satisfaction

Customers for ITV include all those listed for DL in Chapter 2 as well as all production/engineering and studio crews, and site POCs. Surveys are usually used to determine customer satisfaction.

Section E
Special Considerations for VTC

Overview

VTC versus ITV

The most significant difference between ITV and VTC is the two-way video capability of VTC instruction. A VTC system provides visual communications between the participating sites. Any VTC classrooms that are networked to ITV sites would still be limited to one-way (receive-only) video. Also, there are budgeting limitations for VTC systems, therefore, the number of sites that can be conferenced-in at one time is limited.

Much of the ISD process for VTC is the same as for ITV instruction. This section addresses some of the special considerations or processes involved in the analysis, design, development, implementation, and evaluation of a VTC course that is not covered under the ITV sections.

Analysis

Is two-way video required?

To help determine if two-way video instruction is required, the following questions can be asked as part of the decision process:

Is an instructor required to present the instruction?
Do the students need to see the instructor?
Is the desired learning objective a skill objective that requires the demonstration and performance of a task?
Does the instructor need to observe the students' actions, performance, progress, or interaction in the accomplishment of the task? If so, does the instructor need to observe the student in real-time?
Can student performance be adequately seen through a VTC camera?
Can subject matter facilitators at the local sites fulfill the requirement to observe student task performance?
Are there other instructors, SMEs, or guest speakers at any of the participating sites that are required to present some of the instruction?

Is VTC feasible?

If two-way video is determined to be required, then the following questions can be asked to determine if VTC is a viable option for delivery of instruction:

How many sites will be participating?
Is it required that all sites participate at same time? Can the instruction be presented to different sites at different times?
How will the fact that each participating site may only be able to view one other site affect the presentation and instruction?
How many students will be at each participating site?
Will each individual student be required to be observed?
Do all the participating sites have adequate equipment and trained personnel to operate the equipment?
Do all the participating sites have compatible connections/capability?
Are there any other delivery options or methods of instruction available to accomplish the desired learning objective?
Will VTC instruction be cost effective?

Design

How is VTC design different?

There will be some differences in the instructional design of VTC presentations since there will be more than one originating production site. It will be necessary to develop instructional strategies that incorporate and integrate the video capability at the other selected site(s).

- The production capabilities and limitations of the other sites must be considered in the instructional design process.
- Clearly define what actions or performance are required of the students.
- Determine what instruction or expertise is required from participating sites.
- Determine what is expected of the other site teams or POCs and ensure those expectations are communicated.

Development

Develop an integrated lesson plan	Develop an integrated lesson plan that includes the other participating site(s). Coordinate with the other site instructors/speakers in the development of the storyboards and script. They are part of the team. Determine how and when the video will be switched between participating sites if applicable. Determine who will produce the instructional materials for the other sites.

Implementation

Additional VTC considerations

Additional implementation considerations for VTC instruction include:

- Involve other participating production teams or POCs in the preproduction conference.
- Confirm other participating production sites have proper equipment/support.
- Ensure all participating site instructors have received the required training.
- Schedule and conduct rehearsals with other production sites.
- Ensure students at each site are familiar with the production equipment and presentations procedures as applicable.
- Conduct *two-way* video/audio checks with each site prior to VTC session.
- Ensure the backup plan covers the possibility of transmission problems or failures at one or more sites as applicable.
- Have the other sites videotape their productions.

Evaluation

Guidelines

Formative and summative evaluation for VTC media is the same as for ITV and IMI. Ensure the evaluation plan and process includes all participating sites. Detailed guidelines for IMI formative and summative evaluation are contained in MIL-PRF-29612 and the associated handbooks in this series.

Chapter 9
ISD CONSIDERATIONS FOR INTERNET-BASED INSTRUCTION

Overview

Introduction

This chapter describes ISD considerations for the analysis, design, development, implementation, and evaluation of Internet-Based Instruction (IBI).

What is IBI?

As described in Chapter 3, IBI encompasses the range of instruction and data provided *on-line* over the Internet/WWW – from simple text-based files and applications to interactive multimedia instruction.

Note: A stand-alone course that is downloaded via the Internet/WWW (from an FTP or web site) to an individual PC and accomplished solely *off-line* by learners, is not classified as IBI within the context of this chapter.

Where to read about it

This chapter contains five sections:

References

The material in this chapter is based on the following references:
- MIL-PRF-29612, *Training Data Products*
- MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
- MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*

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References (Continued)

MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*
MIL-HDBK-29612-4, *Department of Defense Handbook, Glossary of Training Terms*
Distance Learning Curriculum Analysis and Media Selection, Air University, Maxwell AFB, AL, 4 Feb 1994
AF Handbook 36-2235, *Information for Designers of Instructional Systems, Volume 4*
AF Manual 36-2234, *Instructional Systems Development*
AFIADL Home Page web site: http://www.maxwell.af.mil/afiadl/
WWW Virtual Library – Distance Education: http://www.cisnet.com/~cattales/Deducation.html
Online Delivery Software: http://www.ct.bc.ca/landonline/

Current capabilities

If learners are geographically separated so that distance and time zones are a barrier to using other alternatives (such as resident training, VTCs and audioconferences), and if learners have access to adequate computer equipment and the Internet, the instructional solution of choice may well be IBI. A skilled developer can change content on the Internet quickly, which means that IBI may be highly appropriate for dynamic course content. Depending on the structure of the course, learners can see which students are on line; they can converse in chat rooms or forums; they can communicate with instructional staff in both synchronous and asynchronous modes. Designers can employ a wide variety of techniques to lead learners through the course content, provide opportunities for interaction, and reinforce learning objectives. Special skills are required to design a quality IBI course, but authoring systems and instructional aids are available to facilitate IBI development.

The future capabilities and instructional potential of IBI are significant. Technology is revolutionizing IBI and is changing the way we look at distance learning. Advances in computer network technology, compression algorithms, streaming technologies, and improvements in bandwidth will permit virtually unrestricted access to instructional materials stored in various, non-centralized locations on demand, enabling learning to occur independent of time and distance.

Current constraints

Technical constraints such as the capabilities of learners' PCs (modem speed, etc.), bandwidth availability, and network interfaces limit the speed that data can be transmitted and received over the Internet/WWW. This equates to transmission delays and "slow-loading" web pages, particularly when the pages are complex in structure and/or content.

Bandwidth is an issue in three areas: on each Air Force base, between bases, and between the DoD Defense Information Services Network (DISN) backbone and the Internet.

Base blueprints are being enhanced to reflect the growing reliance on connectivity and to prepare for access to an upgraded DoD backbone.
Bandwidth impinges primarily on the level of technical sophistication one can employ from a central server that is accessed by the user community.
Vendors are offering audio and video streaming technologies to mitigate the bandwidth problem, but these typically employ small video windows at frame rates less than the rate at which somewhat smooth video is attained.
Many base LAN policies currently prohibit streaming; this impacts design considerations.

Before you begin

Using the latest development tools, course providers can develop and deploy web-based instruction with increasing speed. However, the potential for the proliferation of uncoordinated variations of web-based courses throughout the Air Force is a point of major concern.

Before initiating an IBI project, research current development tools and assess their applicability. In addition, consult the AFIADL homepage (http://www.maxwell.af.mil/afiadl/) for current guidance on the use of IBI, and for information concerning hardware and software standards, operating systems standards, and database management requirements.

Section A
IBI Analysis

Introduction

The analysis process for IBI is similar to the process described in Chapter 7 for IMI. Both of these instructional technologies can support self-paced and self-directed interactive instruction. IBI is also similar to CMC in that both can support instructor-led or group-paced conferencing and collaboration. The differences lie in their application and delivery method.

When to use IBI

Consider using IBI when:

- There are large numbers of learners distributed over diverse time zones and duty locations.
- Learners cannot travel to the training site or be absent from their duty station for extended periods.
- Availability of instructors with subject matter expertise is limited.
- "Hands-on" training is not required. IBI is good for knowledge and attitude objectives, but has limited application for motor skill objectives.
- "Just-in-time" training is needed.
- On-demand instruction is required.
- Instruction needs to be platform independent (not limited to Windows, Mac, Unix, etc., environment).
- Frequent updates or revisions are required in the course materials.

Other considerations

Other general considerations for IBI include:

Time for IBI course preparation:

- Some types of IBI can be set up quickly if required.
- On-line conferences require only the time it takes to inform participants.
- Simple WWW pages can be created in only slightly more time than text document. However, it may require an instructor to be on-line for an extended period of time once the conference begins.

Cost of IBI course preparation:

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Other considerations (Continued)

Some supporting IBI can be implemented at very little additional cost if pre-existing resources for E-mail, chat room, etc., are used.
Can also be costly if IBI applications require a high-end, server with a fast network connection in order to run.

Is IBI cost-effective?

The cost-effectiveness of any media is dependent on its fit with the instructional objectives and training environment. If the learner population is widely dispersed geographically so that several time zones are involved, the course content is fairly straight forward, and the objectives can be achieved without hands-on instruction, IBI can be a very cost-effective solution. If the material is complex, students are collocated, and/or hands-on training is required, IBI will not only not be the most cost-effective, but it is likely that the instructional objectives will not be realized.

Both direct and indirect costs must be considered in the analysis process. In addition, all constraints must be examined for cost impact. For example, if near term funding is extremely limited, a phased approach to training may be used, with IBI as the ultimate delivery media. Cost analysis will include:

Training cost/cost avoidance: Will the expected IBI cost savings offset the development costs?
Course life cycle cost: Will development and maintenance costs be offset during the expected life of the IBI course?
Return on Investment: Is the expected ROI acceptable? (Refer to Chapter 4.)

Defining the training development / delivery options

The three critical tasks of the analysis phase are the definition of the learning population, the definition of the instructional objectives, and the definition of the learning environment. Who is the target group? What is the learning environment? What are the objectives of the instruction? What tools do learners have available? The better these variables are defined, the more accurately the development/delivery options can be analyzed for suitability and cost-effectiveness.

IBI feasibility

The following table provides some considerations for determining the feasibility of IBI:

IBI feasibility

	A	B	C
	Type of Factor	**What to Examine**	**Impact on IBI Decision**
CONTENT			
1	Content characteristics	Learning objectives	Consider how best to match the technology to the objectives of the course. Will IBI be used to distribute course information (syllabus and notices), for supplementation (links to resources)? Will major course components be presented on the web? Or will the entire course be provided by means of the web? Will the instruction be synchronous or asynchronous?
2	Stability of Content	Supported instructional system data	Consider IBI if frequent updates or revisions are required.
3	Course life cycle	Supported instructional system data	Consider IBI if development and maintenance costs can be offset during the life of the course.
COST			
4	Training cost	Projected savings resulting from use of IBI – Return on Investment (ROI)	Consider IBI if the cost savings can offset development cost within a specified time period.
ORGANIZATIONAL			
5	Staff availability	Resources and commitments	Consider IBI if development/delivery/support staff is available.
6	Staff experience	Resumes	Plan time for learning curve if staff is inexperienced with distance learning instruction/ equipment. Include support personnel (e.g., help desk) in assessment.
7	Attitudes toward IBI	Staff meeting reports	Plan for IBI awareness training if resistance is high.

Continued on next page

IBI feasibility (Continued)

	A	B	C
	Type of Factor	**What to Examine**	**Impact on IBI Decision**
8	Support for IBI	Survey management attitudes	Plan for development of position paper if support is low – get buy-in.
STUDENT			
9	Computer literacy	Unit/student surveys or records	Consider IBI if student has previous computer-based and Internet learning experience. Plan for student training if computer/Internet literacy is low.
10	Attitude toward IBI	Unit/student surveys	Plan for IBI awareness training prior to actual instruction if resistance is high.
COMPUTER/NETWORK RESOURCES			
11	Instructional equipment	Equipment at all applicable sites	Consider IBI if required server/client hardware and software are available.
12	Network infrastructure	Existing and planned Internet / Intranet network system	Consider IBI if computer network connections/ infrastructure are, or will be, available to support instruction on a reliable basis.

Table 33 IBI Feasibility Determination

Develop the plan

Depending on the role IBI will play in the course (informational, supplemental, dependent, or fully webbed), define IBI resource requirements and constraints. Refer to Chapter 2 for planning and management factors to be considered. Depending on the requirements and constraints defined, consider options; define the alternatives for obtaining required resources (e.g., use of advanced development tools may eliminate the requirement for skilled programmer).

Consider the effort and all risks involved with the development of the planned instruction. Determine if:

In-house development is feasible.
The project scope, requirements, and/or schedule exceed in-house capabilities and require contract support.

Continued on next page

Develop the plan (Continued)

The recommended plan of action should reflect the most cost-effective solution to the instructional requirement. Obtain buy-in from senior management and the customer before beginning the design phase.

Section B
IBI Design

Introduction

The design of the IBI project is dependent on a host of issues that must be defined. Bandwidth availability, infrastructure, development and delivery tools and browsers, delivery standards, security issues, user configuration requirements, user access, student tracking, scalability requirements – these are some of the factors that must be examined. Some of these will have been defined during the analysis phase. Others will be defined as the design process begins. Be sure to contact the Base Network Communications Center (BNCC) and check the AFIADL Home Page (http://www.maxwell.af.mil/afiadl/) for the most up-to-date guidance.

This section discusses instructional strategies and methods, key design considerations, and constraints for IBI delivered in a synchronous and/or asynchronous mode.

Design the instructional strategy

During this phase, the instructional designers will refine the instructional approach and define the instructional design (organization and presentation of content to meet desired learning objectives).

It is useful to have a both a subject matter expert and a representative of the learner population participate in the design phase (refer to Chapter 2 for a list of IBI development team roles and responsibilities). As the instructional objectives are examined, each of these players can provide valuable insight on the optimum use of Internet resources. A few of the factors to consider:

- Hardware and software requirements for development and delivery.
- Whether and how chat rooms should be constructed.
- How instructor/learner and learner/learner discussions will be conducted.
- How and when learners will receive feedback.
- For a synchronous course, whether and which portions of the course should be asynchronous (and vice versa).
- How learner achievement will be assessed.

Continued on next page

Design the instructional strategy (Continued)

How frequently the course contents changes and how it will be updated.
Relative functions of the website, newsgroup, and e-mail.
What the contingency plans are for network failure (for synchronous instruction).

Design the IBI structure

The following table describes a few of the structural options associated with IBI design. Again, the designer must decide how best to use the technology – how best to draw or lead the learner through the instruction.

WWW Mode	Description
Linear Mode With Hierarchies Attached	This mode is best when the designer wants the learner to follow a particular path through one portion of the site. More than a single path can lead through a given portion of the site. Other portions of the site are not accessible within paths of a particular portion, though they are accessible from the uppermost page within that portion's hierarchy.
Hierarchical Mode	Very similar to the linear mode with hierarchies attached; access to different portions of the site is only possible from the upper most page in the hierarchy (e.g. the Home Page or the Administration page). This could, in effect, divide the site into four or five smaller sites such that they are independent of each other with access controlled by an administrator.

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Design the IBI structure (Continued)

WWW Mode	Description
Web Mode	This format is best for delivering student-centered instruction, allowing a multitude of paths interconnected with each other from which students can explore. Web mode is not effective for a testing situation, since in testing you would want the user to follow a particular path through a battery of tests, or when linear instruction is intended, progressing through a set of instructional modules from beginning to end.

Table 34 Structural Options Associated with IBI Design

Define structure and content of support media

IBI may include photographs, videos, audio tracks, and embedded graphics. The design phase is the time to define the role support media will play in the IBI program. This is also the time to do trade-offs among the support media alternatives to define the most cost-effective way of achieving the instructional objectives.

Technical considerations

Some technical information that will need to be obtained to identify limitations that may be placed on IBI design include:

Connectivity

What type of connection to the Internet does the delivery computer have? Is a dial-in provider, such as an Internet Service Provider (ISP) to be used?

Will a fast Ethernet connection, ISDN line, T-1 or ATM connection be available?

What are the connection data transfer rates upstream and downstream?

What standards and protocols apply (technical standards such as authoring software, file name conventions, connectivity protocols, bandwidth limitations, security and user access control, etc.)?

Continued on next page

Computer Capability

What type of computer will accommodate the delivery of the IBI based on the selected browsers?
What computer or server will house the courseware?
Which web browser, such as Internet Explorer or Netscape, will be used? Which version will the design be mapped to?
What plug-ins will be required?

Other Considerations

How many students will be accessing the IBI at a given time and for how long?
What security provisions are required for collection and management of Privacy Act data?

The design of IBI graphics and files will generally be limited by the lowest, or least capable, student access method and computer configuration (web browser version).

It is important to note that highly interactive multimedia IBI with extensive graphics, animations, simulations, and video is not yet a realistic option due primarily to available bandwidth limitations. Currently, IBI can only effectively imitate IMI through the use of HTML hyperlinks to other files and pages with limited graphics, sound, and motion video.

However, as network infrastructure, bandwidth, and hardware/software support capabilities continue to improve and expand, multimedia IBI (e.g., video, animation, audiographics) becomes more attractive as an instructional alternative. However, until transmission and bandwidth issues are resolved, the design process for IBI must factor its limitations into the instructional program.

Refine the plan

The project plan should be refined to reflect the decisions made and approved during the design phase. In addition, the instructional designers should have prepared a design document that will guide the development team through the next phase.

Section C
IBI Development

Introduction

The primary focus during the development phase should be on developing the instructional program based on the decision made during the design phase. During the development phase, the instructional developers must constantly evaluate the materials to ensure they are not building in technical complexity that could compromise the success of the program. That is, attention must always be paid to the both the technical capabilities and the limitations of IBI.

This section provides technical considerations and helpful hints for the development of IBI programs.

Development phase

The steps accomplished during the development phase include:

Preparing the Plan of Instruction and Course Control Document.
Preparing the Lesson Plan for the instructor.
Developing the instructional courseware/materials.
Lesson validation/evaluation.

Key project team activities

Key IBI project team actions and responsibilities for development of IBI include:

Instructional Development
Student Administration/Evaluation

Instructional development

Instructional development points include:
Determine if any existing materials can be used and delivered over the Web.
Determine who will develop and maintain the courseware.
Develop user-centered interface design or style guide (navigation features, metaphors, colors, graphics, etc.)
Design a template for presentation of the instruction (pre-positioned and coded navigation controls, repeating screen elements, etc.)

Continued on next page

Instructional development (Continued)

Determine what level of working knowledge of (HTML, VMRL, or CGI scripting, etc.) is required for designers or instructors.
Identify Web server support and database management / configuration control procedures.
Develop storyboards and obtain SME/client review and approval.
Create instructional media/content (text, still graphics, video, narration, etc.)

Student administration / evaluation:

Student Administration/Evaluation:

Establish procedures for officially registering and tracking students.
Define student access and password procedures.
Define technical support structure and requirements (e.g., help lines that are available for users who may not be familiar with this mode of instruction).
Establish evaluation strategies.
Develop tests and exams and define associated security and administration procedures.
Define metrics and data collection/tracking procedures (e.g., how to collect and track data via on-line methods).
Establish requirements and procedures for archiving student materials.

Basic IBI components

Regardless of the type of IBI, the following components should be part of an on-line IBI product: the Home page, Identifiers and Help, Critical course data, Tools, and Page features.

Home page

This is the first page that a student will see after accessing the course.

Home Page Design

It should be simple and should avoid large, complicated graphics.
At a minimum, it should display the course number and title, and name and location of the school/unit.
It may contain a main menu with all major sections listed with hyperlinks to each section, or you may choose a hierarchical menu in which the main menu leads to sub-menus with further links. Limit the number of sub-menus to three if possible.
Choose sequential pages in which the homepage scrolls down sequentially.
Choose the linear selection model in which buttons are marked on a line that represents different stages or time periods along a continuum.

Introduction: List on the home page any greetings, credits, date of last update, and other pertinent data.

Identifiers and Help

Air Force Disclaimer and Copyright Information: Be sure to check Air Force requirements for disclaimers on Web-sites and for copyright information.

Technical Requirements and Help: Use this page to indicate minimum computer configuration and software requirements, special procedures, on-line resource links, links for downloading web browser, and how to obtain technical help.

Critical course data

Depending on the size and purpose of your IBI project, list these things on separate pages:

Course Components

Course overview
Course objectives
Class syllabus and outlines
Course requirements and prerequisites
Course schedule

Assignments and Tests: Be sure to include a section that lists student assignments, required readings, criteria for grading, due dates, and penalties for late work. Include all information relating to tests and grading procedures. Give a sample test, and provide download capability.

Tools

How to Learn and Protocols: Include an explanation on how to learn on-line and how to navigate through the course.

Point out major differences associated with this new mode of learning.
Clearly state the roles and responsibilities of the instructor and students.
Clarify the rules of engagement for on-line communication.

Administrative Information: List any requirements and protocols relating to how students gain access to support personnel for information related to enrollments, completion dates, disenrollments, etc. Provide links to appropriate administrative officers and to relevant institutional policies.

Procedures for Student Advising and E-mail Addresses of Instructional Personnel: Be sure to tell students how they can get advice and instructional help.

Glossary of New Terminology: Define all new terms. Key words can be linked to these definitions throughout the course via hypertext.

Supplemental Resources List: List relevant resources and where to locate them.

Page features

Biographical Sketches of Instructional Personnel: Include biographies of all key personnel who may be interacting with the students. Invite learners to include brief biographical sketches; provide instructions on how to do this. (Note: It is better to have learners enter their own information to protect Privacy Act information.)

Frequently Asked Questions (FAQ) Pages: Posting frequently asked questions and their answers will cut down on the number of spontaneous questions asked.

Course Evaluation and Feedback Forms: Give students an opportunity to evaluate the course and to give feedback during the course.

Size of Text/Audio/Video/Graphic Files: Inform users of the approximate file size, and how long downloads will take.

Time of Day/Traffic on Net: Inform users of the best time of day (least traffic) to use the Internet.

Additional IBI components

In addition to the basic IBI components, other on-line features might be incorporated into a virtual "classroom". Procedures need to be established during the development phase.

On-line Interaction: Make sure students have a way to communicate on-line. The following modes can be used:

One-to-one can be used for confidential communications between individual students and the instructor or when two students need to have a private conversation.
One-to-many is similar to the traditional lecture approach and works for lecture style presentation.
Many-to-one is a special feature that allows students to access experts around the world in a conferencing session, or by posting their questions.
Many-to-many is a discussion group forum such as bulletin boards or conferencing areas and is described below. Asynchronous conferencing can become difficult to follow if too many people are interacting.

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Additional IBI components (Continued)

Conferencing: Chat room, bulletin board, E-mail and several COTS products provide mechanisms to features for students to post information and to raise or respond to topic-related questions.

Software used for this will list the date and time of each comment, the name (or cyber nickname) of the student making each comment.
Chat room or bulletin board discussions can be threaded (i.e., tied to each other electronically so that related conversations are linked), electronically archived for analysis, and printed.
If synchronous on-line conferencing is used, the software will indicate when a student enters the conference so all participants can see who is present in the forum.
Limit the number of people who can participate in a synchronous conference so that the discussions do not become unruly.

On-line Library and Web Resources for Reference Materials: Include electronic or on-line access to topical areas and hyperlinks to relevant on-line resources.

Directory of Other Students: Because these methods of IBI involve student-to-student interaction, each student should know who is registered for the course and how to get in touch with other students.

Student Evaluation/Testing: Any IBI course should incorporate some form of knowledge testing. On-line testing using Web page forms to provide fill-in-the-blank, short answer, multiple-choice, and true-false questions is one possible method for evaluating students. However, security of test material and test results, and student authentication are issues that would need to be addressed if a proctor is not available to monitor the student testing.

Helpful hints for instructional designers

The following helpful hints and support strategies are provided for IBI instructional designers/developers:

Design Issues

Divide the learning event into smaller segments and use various types of technology to meet the different learning goals.
Design instructional content for readability, navigability, and interaction, all of which affect learner retention.
Use frames only if necessary since they increase complexity and apparent load time.
Image maps provide a graphical interface for navigation/hyperlinks, but they must be used wisely since the transfer/load time is longer.

Development Techniques

Use standardized templates, and keep screens simple and uncluttered.
Use forms creatively to provide active learning and interaction (feedback, quizzes/testing, interface to databases, etc.)
Avoid using fixed width tables.
Make documents easy to print (consider distributing lengthy documents in printed format to avoid shifting the cost and burden of printing to the user/unit).
Check all URLs to ensure they are current and that they do not contain any objectionable material.
TEST EVERYTHING!!!!

Use of color

Tips for using color:

Use color sparingly and consistently.
Use color for contrast and to highlight specific words.
Avoid clashing colors. Soft backgrounds with sharp contrasting text usually work best.
Select a text color that will be legible when printed. Then test it.

Use of text

Tips for text:

Use no more than three different font sizes on a page.
Flush left margins are better than centered text.
Do not display text that disappears after a certain amount of time.
Use lists instead of paragraphs to cut down on text.
Avoid special effects (blinking, flashing, or moving text) unless desired for emphasis, or to gain attention.
Use natural dialogue and a spell checker.

Use of graphics / images

Tips for graphics/images:

For optimization, use the JPEG file format for high color photographs and the GIF file format for 8-bit images, if possible.
Use thumbnail images with links to larger files, if possible.
Use images for functional reasons such as for navigation, clarification, or identification, not to entertain the learner.
Use smaller graphics when possible to speed up download time.

Use of video

Some tips for producing quality video files or streaming video for the Internet are:

Do not indiscriminately use videos produced for TV monitors. Net video reduces resolution significantly. What looks good on a TV may look bad on the net. Produce or re-edit Net videos from scratch. Test them prior to use to ensure quality.
Make titles big. Avoid shots with small details. Type is difficult to read with low resolution and small frame sizes.
Use close-ups to enhance detail in important areas.
Avoid lengthy headshots. Lip synchronization may be a problem. Avoid tight close-ups. Text may obscure part of the image.
Use smaller frame sizes for video to enable as fast a frame-per-second rate as possible.
Make video sequences as short as possible.
Open and close video sequences with high quality still frames.
Use many illustrative cutaways. If the video slows down, the cutaways will look like still frames instead of long dissolves or wipes.
Use fewer colors in video graphic screens and animations. For graphics, use a 16-color palette and avoid shading, transparencies, and textures.
Use the highest quality camera available, preferably a digital video camcorder, and edit digitally (digital in, and digital out). The better the source, the better the end result.
When creating primary .AVI or MPEG files from videotape masters, create several versions with different audio bit rates prior to recording for the Web. This will help in the selection of that format for the .AVI file that provides the best compromise between music and voice.
Most streaming video encoders work best with uncompressed .AVI source files.

Test and retest everything – there is no substitute for quality.

Section D
IBI Implementation

Introduction

Once the IBI course is on-line and operational, it is important to ensure that the instructional system continues to receive the necessary support and maintenance. Both internal and external evaluations should be conducted regularly to ensure effective instruction and cost-efficient operations are maintained.

Implementation functions include:

- Management
- Administration
- Support
- Delivery
- Conduct of Instruction

Management function

Management of the instructional system does not end with the implementation of the IBI course of instruction. The continued planning, organizing, coordinating, evaluating, and reporting activities are the shared responsibility of all the individuals directly involved with the IBI course. Active management of a distance learning course versus a traditional resident course is more critical because of the distributed and dynamic nature of the instruction and resources.

Administration function

Administrative support is an essential component of a successful IBI program. The support staff (at both individual DL sites and at the IBI administrative center) performs this function. The development of the administrative processes and procedures was accomplished during the development phase. Implementation requires the careful coordination of those processes and procedures, including:

- Student management (registration, processing, data tracking, etc.)
- Administrative records and reports
- Personnel support (personnel records, processing, etc.)

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Administration function (Continued)

Resource scheduling and tracking (students, equipment utilization, etc.)
Database management.

Note: Course administration takes on new dimensions when delivering courses over the Internet. Developers are advised to contact AFDLO for guidance on establishing appropriate processes and procedures on this subject.

Support function

An IBI course cannot be effectively delivered or maintained unless technical, maintenance, and training support are available. As stated in the previous section, the requirements, processes, and procedures should have been developed and tested during the development phase. The support functions include:

Maintaining facilities and equipment.
Supplying equipment and instructional course materials.
Providing services such as network engineering, courseware revision and maintenance, publication, etc.

Helpful hints for instructors

The following are helpful hints and support strategies for IBI instructors:

Planning

Be aware that students have different learning and communication styles.
Remember that students must take responsibility and an active role in the learning process.
Plan to introduce the students to the IBI process. Make sure they understand how the course will be administered and what protocols will be used.
To compensate for the lack of cues that indicate feelings and emotions, adopt a set of symbols to convey emotions.
Establish electronic and telephone office hours as required to assist students.

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Helpful hints for instructors (Continued)

Materials

Distribute class announcements through E-mail or post in a special area on the bulletin board.
Use pre-class study assignments, questions, and guides to prepare students for interactive or collaborative on-line lessons. Encourage discussion and interaction.
Put lecture notes on-line for student reference.
Provide a range of approved universal resource locators (URLs) or hot links for supplemental reading and research.
Prepare case studies and make separate pages for each.
Use a traditional case study with open-ended questions built into the body. Students would answer the questions by filling in blanks in scrolling text files. Both the questions and the answers would appear within the case file.

Interactivity

Divide students into groups and have them discuss case studies, a conference, and publish on-line reports.
Set up a student group to serve the function of the "student lounge". On-line students can interact without the instructor looking in.
Encourage brainstorming in a small-group setting by opening up a separate conference area and invite students to come up with solutions to particular problems or to generate ideas and proposals.
For on-line collaboration among members of a large group, it is important to focus the group (and keep them focused) on a particular problem or set of issues.
Humanize the process. Make sure students have access to a real live human tutor. Personally, welcome each student to the on-line class.
Assign specific research tasks to students either individually or in groups. Students can present reports online or publish their reports on their own web pages.
Provide timely feedback via E-mail, fax, phone, etc., regarding performance on tests, assignments, and projects to help motivate the student.
Recruit other SMEs and interesting personalities to lecture on-line or to have discussions with the students.

Delivery function

Instructors. The effectiveness and success of a distance learning program are dependent primarily upon the instructors who manage and deliver the instruction. The instructors must adapt to a learner-centered instructional environment and change from their traditional role as a teacher to become more of a facilitator, guide, consultant, resource provider, and learning team member. Therefore, instructors must be able to:

- Understand the needs of the remotely located students.
- Be sensitive to the different learning styles and adapt the instruction.
- Effectively function as a facilitator and content provider.
- Understand the delivery technology and effectively use the equipment.
- Be prepared to spend more time on learner support that one would for a traditional course; responding to learners' e-mails, participating in chat rooms, and providing individualized guidance can consume a great deal of time.

Delivery System. Operating and maintaining the instructional delivery system is another key function. The most critical component is the computer network system, which is the primary instructional link or bridge to the student.

The student (and instructor) must be proficient with the computer equipment, and have reliable network access and connections. If required, computer training must be provided to minimize the occurrence of "operator errors."

Note: Technological advances now permit access to the Internet by means of television that is PC independent. As technology evolves, the impact of interface and capacity issues will decrease.

Section E
IBI Evaluation

Introduction

Evaluation is the last phase in the ISD process. As with other instructional technologies, the evaluation process for IBI consists of a formative, summative, and operational evaluation (refer to Chapter 2). This section addresses the special considerations for conducting IBI evaluations.

Formative evaluation

The formative evaluation begins in the analysis phase and continues through the development phase of the ISD process. Because IBI learners are usually remote from any direct support structure, formative evaluation of the course takes on absolutely critical importance.

The rule is: test and retest. ***And then test again.***

Summative evaluation

The primary purpose of the summative evaluation is to determine whether the IBI course achieves the established objectives. In the case of IBI, this assessment also includes an evaluation of the effectiveness of the delivery system and support processes.

It must be noted that IBI courses present unique challenges for those preparing a summative evaluation program. A limited access site should be established so that impartial representatives of the learner population can access the course and perform the required activities. Structured feed back forms can be developed to help the sample learners focus and comment on specific aspects of the course. The feedback received from the sample learners is used to identify problems and take corrective actions prior to implementation of the course.

Operational evaluation

Operational evaluation is an ongoing process that accomplished after the formative and summative evaluations. This evaluation is based on internal and external feedback data such as:

Instructor/facilitator comments (internal)
Student critiques (internal)

Continued on next page

Operational evaluation (Continued)

Results of embedded data collection systems (metrics to assess reliability of hardware/software, and to collect data such as student connect time, time spent in course-established chat rooms, etc.)
Test results (internal)
Inspection and evaluation reports (external)

Results of such assessments are considered during course update cycles.

Areas of evaluation

Design the evaluations to get both positive and negative feedback. Some general areas to consider in evaluating the delivery of the IBI course are:

Course content – organization, relevancy, clarity, quality, currency, etc.
Course materials – adequacy, availability, effectiveness, currency, etc.
Instructional methods/media – effectiveness, interaction quantity/quality, etc.
Instructional equipment – availability, reliability, ease of use, etc.
Internet/Intranet network – access, speed, reliability, etc.
Instructor support – necessity, availability, effectiveness, etc.
Technical support – access, availability, timeliness, effectiveness, etc.
Administrative support – usefulness, adequacy, availability, etc.

Evaluation strategies

Various collection strategies can be employed to gather IBI evaluation data:

Written questionnaires/critiques/tests that can be mailed or faxed.
Electronic questionnaires/critiques/tests that can be accomplished on-line.
E-mail/bulletin board correspondence.
Audio conferences.
Telephone interviews.

Chapter 10
SUPPORT TECHNOLOGY

Introduction

This chapter provides general considerations for the incorporation of support technologies into IMI, IBI, and IVT instruction. These support technologies can be used in conjunction with the other instructional media to enhance instruction.

The ISD process for IMI, IBI, and IVT resident and non-resident instruction should include the selection and application of these supporting instructional technologies.

Where to read about it

This chapter contains six sections:

References

The material in this chapter is based on the following references:

MIL-PRF-29612, *Training Data Products*
MIL-HDBK-29612-1, *Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services*
MIL-HDBK-29612-2, *Department of Defense Handbook, Instructional Systems Development/Systems Approach to Training and Education*
MIL-HDBK-29612-3, *Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)*
MIL-HDBK-29612-4, *Department of Defense Handbook, Glossary of Training Terms*

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Distance Learning Curriculum Analysis and Media Selection, Air University, Maxwell AFB, AL, 4 Feb 1994
AF Handbook 36-2235, *Information for Designers of Instructional Systems, Volume 4*
AF Manual 36-2234, *Instructional Systems Development*
AFDLO Home Page web site:
http://www.maxwell.af.mil/afiadl/

Section A
Electronic Testing

Electronic testing

Electronic testing is a support technology for IMI, IBI, and IVT that can be used to gather information from learners and assess their progress before, during, and after the learning process. By considering electronic testing during the ISD process, instructional designers can add electronic testing to find out what learners know, how well are they learning during the course, and assess what they have learned. These tests can be embedded within the instructional material and/or distributed electronically via email, bulletin boards, student response units, an intranet, or the Internet/WWW.

Applications for electronic testing can be used to:

Access Learning

Distribute quizzes, tests, and surveys for study aids, diagnostic tests, pre-course skills assessments, and course evaluations.
Administer practice, pre-configured, and competency testing
Administer equipment and system knowledge exams and certifications
Determine learner needs and attitudes through questionnaires
Assess staff members' readiness for certain courses.

Provide Feedback

Provide interactive and instant feedback and responses to learners
Show learners an analysis of all answers with the percentage of learners choosing each answer.
Show test scores for all learners who have taken the test
Create self-administered teaching materials
Arrange jumps or links to other tests

Types of questions

Instructional designers can create and design various types of questions electronically. Some of these formats include:

Multiple choice, in which the learners select one choice from multiple answers.
Multiple response, which is similar to multiple choice, except learners are not limited to choosing one response; they can select none, one, or more of the choices offered.
Text questions, where the learner answers by typing a designated amount of text. The instructional designer should define what is right or wrong in advance by entering a list of acceptable answers. Text questions allow learners to ask questions without prompting possible solutions. This question type also works well when soliciting short opinions or suggestions on a particular subject.
Selection questions, where a series of statements are presented and the learners can select from a number of items and answers. This question type is ideal for designing matching questions, ranking questions, or to present a series of yes/no, true/false, or other simple multiple choice questions on the same screen.

Security

Special consideration should be given to security issues for electronic testing.

Questions and answers should be password protected. Answers should only be accepted if a password is entered correctly. When using web-based testing, these answers should be held in map files separate from the HTML files the learners see.

Section B
Electronic Management Tools

Electronic management tools

Electronic management tools are computer programs that can aid in the instructional process. These tools can be used as:

- Decision support aids.
- Job aids.
- Tools to support the conduct and administration of instruction.

Two specific types of electronic management tools used to support courses are:

- Computer-Managed Instruction (CMI)
- Computer-Assisted Instruction (CAI)

Integration of CMI

CMI can be integrated in IMI and IBI courseware and perform the following course administration and management functions:

- Scheduling of training.
- Recording and tracking individual and group performance data.
- Providing information on performance trends over time.

Automated CMI functions assist the instructor in managing instruction:

- Manage the development of course structures and curricula rapidly and flexibly.
- Provide for management of testing and evaluation of student performance and progress.
- Register and enroll large numbers of learners easily with their associated demographic data.
- Administer and track student progress in curricula for training administrators.
- Ease the difficulty of student access, enrollment, and monitoring of their personal training.
- Provide for automatically collecting and managing student data and eliminating the need for manual data entry.
- Allow user choice and flexibility through system openness.
- Provide rapid and direct feedback to learners, administrators, operating managers.

Integration of CAI

CAI can be developed to aid in the delivery of classroom instruction, and can provide for the storage and retrieval of information for both the instructor and student.

When integrated with a network system of instructor and student stations in a classroom, the instructor can manage and control the training environment by:

- Observing each student station, and the performance of individual learners. For example, student responses to instructor-generated questions, questions from individual learners to the instructor, student performance on collective exercises, student performance on individual tests, exercises, and problem scenarios, etc.
- Controlling student functions, such as access to courseware, tests, other student stations, access to reference materials, etc.
- Providing assistance to learners from the instructor station. For example, providing real-time help, remediation courseware, tutorial instruction, etc.
- Accessing other electronic media for display in the classroom environment such as Electronic Performance Support Systems (EPSS), and Interactive Electronic Technical Manuals (IETM).

CAI systems can be used to provide:

- Automated instructor guides for directing activities.
- Automated trainee guides that provide learners additional course information and exercises for practice and study.
- Interconnected student and instructor workstations.
- Student response monitoring for summarizing student responses and assignments.
- Instructor controlled multimedia presentations in the classroom using a variety of media formats.

Benefits of CAI integration

Information technology advances are changing the way DoD personnel operate and maintain equipment. For example:

- IETMs are beginning to be used in the operational environment.

Continued on next page

Benefits of CAI integration (Continued)

The same technical manuals are used for classroom training. Therefore, DoD schoolhouses must incorporate IETMs into their training curricula to prepare personnel before they are assigned to operating activities.
CAI can provide an instructor with the capability to access IETMs, and other forms of digital instructional materials.

CAI may consist of only an instructor workstation that supports automated development and delivery, or may be a full suite of student workstations networked to the instructor station.

CAI provides the instructor with an efficient means for developing and displaying personal course annotations, including related graphics, videos, and other multimedia. Instructional treatments for instructor-student interaction, presentation of the course materials, student study, and monitoring student activities are controlled from the instructor workstation.

Section C
Electronic Help Desk

How electronic help desks can be used

Electronic help desks can be established to provide:

Information

Student schedules and activities.
A source for student access of ancillary text, graphic, or video course materials.
A source of electronic reference materials for student downloads.
Answers to frequently asked questions (FAQ) for student review.
Technical support capabilities as required.
Links to other web sites and reference materials.

Interaction

The capability for a student to send E-mail to the instructor.
The capability for student to chat with the instructor.
The capability for the student to share files with the instructor.
A bulletin board capability for learners to post messages.

Section D
Electronic Publications

Electronic publications

An electronic publication is a document prepared in a digital form for display to an end user. Two examples of electronic publications are electronic guides and Interactive Electronic Technical Manuals (IETM).

Electronic Guides. Electronic Guides are automated electronic versions of training guides that can be developed to replace the traditional paper-based training guides. Electronic guides can be maintained in a computer-based file, or on a CD-ROM, on the Web, or other electronic medium.

- Data can be retrieved for instruction in the classroom, in a learning center, or during on-the job training.
- Data can be provided during performance of a job as an Electronic Job Aid.

To develop an automated guide to aid instruction, ask the following questions:

- What guides are appropriate for automation of instructional presentations?
- How can the materials be automated most effectively and efficiently?
- Are there software tools available to support the development?
- What are the anticipated benefits of this development?
- What impact will this development have on student performance?
- What are the requirements for staff support and training?

Interactive Electronic Technical Manual (IETM)

An IETM is a technical manual delivered electronically. An IETM possesses the following three characteristics:

- An IETM can be presented either on a desktop workstation or a Portable Electronic Display Device (PEDD).
- The elements of technical data constituting the IETM are so interrelated that a user's access to the information is achievable by a variety of paths.

Continued on next page

Interactive Electronic Technical Manual (IETM) (Continued)	The IETM can function to provide procedural guidance, navigational directions, and other technical information required by the user. Interaction with the surrounding environment is often a critical part of a task that must be trained. For real-time interactive training environments must sometimes be simulated. Typical applications include aircraft piloting, air traffic control, ship navigation, driving a tank, gunnery, missile control.
Portable electronic display device (PEDD)	A PEDD is a small electronic device that has been designed and engineered to facilitate the presentation of an IETM to a technician during maintenance procedures.

Section E
E-Mail, Bulletin Boards, and Fax Conferencing

E-mail

E-mail can be used as both an asynchronous and synchronous support technology. Examples include the following:

Transmit/receive text, graphic, audio, and video files.
Send instructional materials to learners.
Provide tests and test results via secure or authenticated mail.
Correspond with the instructor, ask questions, and provide feedback.
Submit reports and papers to the instructor.
Response tool for live courses.

Bulletin boards

Bulletin boards can be used as both an asynchronous and synchronous support technology.

Learners and instructors can use bulletin boards to post messages, and participate in or instigate class "discussions."
Messages can be sent to a designated location on a bulletin board, allowing designated class or group members to easily locate them.
Instructors can use bulletin boards to post schedules and assignments, and notify learners of any changes.
Information can be provided about the organization and staff.
Learners can download files containing the most current instructional materials.

Facsimile (Fax) conferencing

Fax conferencing is an asynchronous support technology that can be used during the course to:

Correspond with other learners/instructors via faxed text and graphics documents.
Fax copies of written tests and test results.
Fax attendance rosters for DL courses, seminars, and conferences.

Section F
Student Response Units and Audioconferencing Units

Student Response Units (SRUs) and Audioconferencing Units (ACUs)

Incorporation of SRUs in classrooms can enhance the interactivity between the student and the instructor and provide enhanced instructor control of the instruction. SRUs can enhance instructor-based presentations by:

- Providing individual interaction with privacy of response; the ACU, however, is an open microphone with no expectation of privacy.
- Providing the instructor with the capability to provide immediate feedback to student responses.
- Providing the instructor with the capability to track individual progress as well as trends.
- Provide instructors with immediate feedback on student performance and ACUs.

SRUs are not a stand-alone medium, and are used in conjunction with other media for presentation of instruction to provide two-way audio or data exchange between the instructor and learners.

Chapter 11
THE ADVANCED DISTRIBUTED LEARNING (ADL) INITIATIVE

Overview

Introduction

This chapter discusses the implications of the ADL initiative for design, development, and deployment of instruction.

What is Advanced Distributed Learning (ADL)?

ADL is an initiative launched in November, 1997, by the Department of Defense (DoD) and the White House Office of Science and Technology Policy (OSTP). The purpose of the Initiative is to provide access to high quality cost-effective training and education that can be tailored to the individual, and made available anywhere and any time it is required.

ADL is a collaborative public/private partnership involving the broader education and training community. It provides a common framework for developing, administering, and using distributed learning content and tools.

While ADL does involve a form of Distance Learning (DL), it is more narrowly focused on technology-based methods for enabling access to content on-demand, and developing standards for reusable learning objects that are interoperable across Learning Management System (LMS) platforms.

Although ADL is not restricted to IBI, the Internet and networks based on Internet/WWW standards are envisioned as the primary means for providing access to ADL instructional content. Therefor, the information presented in Chapter 9 applies generally to ADL as well.

This Chapter will focus on the key ADL concept of reusable learning objects and the implications of that concept for instructional analysis, design, development, and deployment.

Where to read about it

This chapter contains three sections:

References

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Current capabilities

The ADL Initiative has produced as its first product the Shareable Courseware Object Reference Model (SCORM). SCORM is a set of specifications and guidelines for instructional content and Learning Management Systems that are designed to provide:

Small, reusable, sharable course content;
Discoverable and interoperable learning content repositories;
Ability to locate and move entire courses;
Vendor support for Commercial off-the-shelf (COTS) products that support SCORM; and ,
A framework for the development of adaptive learning systems that can dynamically assemble content to meet individual needs.

Current constraints

COTS development tools and LMS products are only beginning to implement the SCORM guidelines. Some lower-level technical issues affecting interoperability remain to be fully resolved.

Before you begin

Search the ADL Home Page and related DoD and Air Force links to discover the current state of ADL implementation. This is a rapidly changing environment. New Internet/WWW standards and advances in technology will affect the direction of ADL-related development.

Section A
ADL Background

ADL Sharable Courseware Object Reference Model (SCORM)

The ADL Initiative Partnership has published the Sharable Courseware Object Reference Model (SCORM). SCORM presents a set of guidelines that describe an approach to developing instruction based on sharable courseware objects. These interrelated specifications define a Web-based (IBI) learning content model that meets DoD's high level requirements for ADL:

Accessibility: the ability to access instructional components from one remote location and deliver them to many other locations;
Interoperability: the ability to use instructional components developed in one location with one set of tools or platform in another location with a different set of tools or platform (note: there are multiple levels of interoperability);
Durability: instructional components that do not require redesign or re-coding to operate when base technology changes;
Reusability: the design of instructional components so that it can be incorporated into multiple applications.

To meet these requirements, ADL assumes an Internet/WWW-based infrastructure where content is delivered to a platform-neutral browser. The reference model defines a generalized Learning Management System (LMS) that is capable of launching and communicating with courseware objects, and transferring whole courses from one LMS environment to another.

SCORM defines a course as consisting of the following elements:

Shareable Courseware Objects (SCOs): Content consists of collections of SCOs. The lowest level (atomic) SCO is called an Assignable Unit (AU). An AU is an executable "chunk" of instruction that can be launched by a LMS and exchange data with it. AUs are organized into Block of various levels (module, unit, lesson, etc.), and can be of any size, but smaller is better.

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ADL Sharable Courseware Object Reference Model (SCORM) (Continued)

Course Structure Format (CSF): The CSF consists of an Extensible Markup Language (XML) representation of course structure (relationships and sequencing of AUs and Block), and references to all the course elements (content, metadata records, and raw media) required to move an entire course in-tact from one LMS to another.

Run Time Environment (RTE): The SCORM RTE specifies the launch protocol used by a LMS to execute an AU, and a common application programming interface (API) and data model to enable data exchange between the LMS and AU. Within the RTE, an LMS can provide student history and profile data to any SCORM-compliant learning application (AU), and an AU can move student-tracking data to any compliant LMS during execution.

Metadata: As the SCORM guidelines are implemented in both the public and private sectors, very large and continually growing repositories of courses, content (AUs and Block), and raw media will rapidly develop. Locating the specific learning resources needed among these widely distributed databases could be a real challenge. The solution is to “wrap metadata around” (i.e. associate with) all these objects. In this context, metadata provides standardized descriptions of entire course “packages,” content objects, and raw media. SCORM incorporates the IEEE Learning Technology Standardization Committee Learning Object Metadata (P-1484-12) standard along with the EDUCAUSE Instructional Management System (IMS) metadata implementation in XML.

The RTE insures data interchange and interoperability among content objects and LMSs. The CSF provides interoperability for entire courses across all compliant LMSs. Metadata records facilitate the identification and location of specific learning resources regardless of where they reside on the network, and contribute greatly to the reusability of the objects they describe.

By searching on metadata, developers can locate existing media to re-purpose into new content. Training managers and even learners can locate individual “chunks” of content that can be used for performance support or refresher training, or put together into a personalized course tailored to the learners needs. This capability will enable the development of adaptive learning systems that can assemble tailored courses on the fly.

Section B
ADL Implications for Design

Introduction

The intention of the ADL Initiative is to break full instructional courses down into smaller components known as Assignable Units (AUs). AUs then become self-contained units of information that are given keyword and search information known as metadata tags. The AUs are then placed in a large digital repository, or database, that will be made available to instructional developers. Developers can then search the information, read metadata tag descriptions, and construct lessons using available AUs.

Ideally, AUs should be small, self-contained units of instruction. Each AU should cover no more than one or two clearly stated objectives. The instructional design process should analyze content into these individual components. The Course Structure Format (CSF) specifies the intended course-level relationships among AUs. This approach results in maximum reusability, and supports the flexible use of content for providing on-demand performance support and personalized courses.

Benefits

The primary benefits of Assignable Units are:

Reusability. The greatest benefit of breaking down instructional information into AUs is the ability of instructional designers and developers to reuse information. Information that has been previously developed can be captured and included in new courses where applicable. This eliminates the need for designers to research and develop instruction that already exists. This not only reduces development time, but development costs as well.

Just-In-Time Training. When full libraries of AUs have been developed, designers can create timely instruction for unexpected military contingencies. Because of the dynamic nature of world military operations, military personnel may need training for operations with which they are unfamiliar. Operations specific instruction can be quickly developed and delivered to military personnel for just-in-time training.

Continued on next page

Benefits (Continued)

Differing Learning Styles. Learners possess varying learning styles that may necessitate different presentation strategies. Using AUs, lessons can be developed that present information in different sequences, in greater or less detail, and with more or fewer examples. This allows users with different learning styles receive the most efficient and effective instruction available.

Self-Structured Learning. With AUs available to learners, students, where applicable, can have the opportunity to pick and choose what instructional segments they can skip and what instructional segments they need to cover. This allows learners to maximize their training time by examining only the information they haven't learned and not the information they already possess.

Assignable Unit (AU) Composition

According to Robert Gagné, effective lessons can be constructed if the following nine events are followed:

1. Gain Attention
2. Inform Learner of Objectives
3. Stimulate Recall of prior learning
4. Present Stimulus Material
5. Provide Learner Guidance
6. Elicit Performance
7. Provide Feedback
8. Assess Performance
9. Enhance Retention and Transfer

With the advent of Assignable Units, information cannot be chunked in such a grandiose way. However, lessons that follow this general structure can be constructed from AUs. Examining Gagné's nine events, it is discovered that certain events logically coincide. By combining events, three categories of AUs can be created.

Categories of AUs The following table describes the combined instructional events.

Assignable Unit	Gagné's Event	Explanation
Informational	2. Inform Learner of Objectives 4. Present Stimulus Material 8. Assess Performance	Informational Assignable Units contain the bulk of the presentation information necessary for instruction. The objective is directly linked to the information that supports the objective, which, in turn, is directly linked to the assessment that evaluates mastery of the objective. It is important that these events remain connected. Without a direct link between the three events, information presented may not match the objective, making objective mastery impossible to correctly assess. Informational AUs may be further categorized (see the following table).
Example	5. Provide Learner Guidance	Example Assignable Units contain all illustrative examples and non-examples. Although examples and non-examples are directly linked to the presentation information, the Example AU is kept separate because different presentation and learning styles may necessitate more or fewer examples and non-examples.
Practice	6. Elicit Performance 7. Provide Feedback	Practice Assignable Units contain the practice items and the feedback given to the student during or after the delivery of the practice item. Similar to Example AUs, Practice AUs are directly linked to their corresponding Informational AUs. Practice AUs are kept separate for the same reason Example AUs are kept separate; different presentation and learning styles may necessitate more or less practice and feedback.

Table 35. Combined Instructional Events for AU Design.

Informational AUs

Informational AUs can be further broken down by information type. The following table presents the Informational AU types using established Instructional Design terms.

Informational Type	Definition	Example Objective
Verbal Information	The learner is asked to state or list very specific information.	Given an American state, the learner will name the state's capitol with 100% accuracy.
Intellectual Skills	The learner is asked to solve a problem or perform an activity. The four most common types of intellectual skills are discrimination, concept formation, rule application, and problem solving.	Given a list of American States, the learner will classify the states as east coast or west coast states with 100% accuracy.
Psychomotor Skills	The learner is asked to perform a motor skill to achieve a required result.	Given a pen and paper, the learner will draw the state of Kansas with 80% accuracy.
Attitudinal Skills	The learner is asked to make a particular choice in a particular circumstance.	Given list of American states, the learner will choose to vacation at an east coast state.

Table 36. Informational AU Types.

Additional events

Not all of Gagné's nine events have been covered this AU classification system. This is not because these steps have been deemed useless. This is because these steps are unique to each assembly of Assignable Units and most likely will not be reused. Therefore, these steps cannot be classified as Assignable Units. They are, however, extremely important in the development of instruction. These three remaining steps are presented in the table on the following page. It is recommended that after a developer has compiled Assignable Units into a lesson or lessons, the developer author these events as necessary.

Gagné's Event	Explanation
1. Gain Attention	This step is presented to focus the learners' attention. Although it may seem that this step is specific to the Informational AU, it is, in fact, unique to the lesson. The lesson flow may dictate a specific attention-gaining device. Also, a thematic approach may be used when more than one lesson is constructed. In this case, attention-gaining devises should be similar from lesson to lesson.
3. Stimulate Recall of Prior Learning	This step is presented so learners may construct an informational schema; the information they are about to receive is in some way linked to the information they have already received. Because Informational AUs can be grouped in any order and in any fashion, the transitions between AUs will differ. Transitions must be created for each unique grouping of AUs and lessons.
9. Enhance Learning and Transfer	This step is also presented in the effort to build an informational schema. Similar to step 3, this step will be unique to particular lesson groupings.

Table 37. Remaining Events to Design and Author.

Section C
ADL Implications for Development

Introduction

The development process for ADL courseware involves:

Building each AU, either as an encapsulated executable or XML structure that links to each media object;

Defining all the metadata elements that describe that AU;

Implementing the RTE APIs and data model to communicate with a LMS; and,

Defining the course-level relationships among AUs, and links all the related course elements.

Aspects of this process unique to ADL SCORM are described below.

Metadata composition

Metadata is the information that describes and labels Assignable Units. It allows developers to quickly search and locate pertinent, existing AUs for use in new instruction. It is recommended that developers use the Information Management System (IMS) standards for metadata creation. The following describes the major groups of metadata tags.

General
General metadata includes the AU title, language, description, and keywords.

Lifecycle
Lifecycle metadata includes the AU version number, build status, and build date.

MetaMetadata
MetaMetadata includes the AU catalog entry and contributors.

Technical
Technical metadata includes the AU file format, size, location, and requirements.

Continued on next page

Metadata composition (Continued)

Educational
Educational metadata includes the AU interactivity type and level, learning resource type, context, and target audience information.

Rights
Rights metadata includes the AU copyright information.

Relation
Relation metadata includes the relationship between this resource and other targeted resources, if any.

Annotation
Annotation metadata includes the AU author and publish date.

Classification
Classification metadata includes the AU purpose and taxonomy.

AU construction

Extensible Markup Language (XML) is the construction tool of choice for implementing AUs and CMI systems. XML is a standard mark-up language that uses tags that represent elements to which attributes can be applied. The instructional content is linked from a database and placed between the attribute tags. The attributes specified by the tags are then applied to the content for visual and organizational purposes.

The XML language also gives developers the ability to nest attribute tags within other attribute tags. This allows multiple attributes to be applied to the content. This also allows separate AUs to be placed and organized in the same document. XML files can then be imported from and exported to other CMI systems. This allows developers to keep the organization of the lesson the same, regardless of the CMI system used. The XML code will also contain the metadata tags that help describe and organize content information as well as define course structure and ensure interoperability.

SCORM Course Structure Format (CSF)

The purpose of an XML document is to lay out the design and structure of course content as well as modularize segments of content. The SCORM Course Structure Format is an XML

Continued on next page

SCORM Course Structure Format (CSF) (Continued)

document that defines course structure and points to all the course elements, AUs, metadata, and raw media. Once the XML document segments the information, the AUs can be stored in a database for later use. By using the XML language, the course material becomes interoperable, allowing AUs to be combined with other AUs regardless of operating system.

The XML code does not contain any instruction in itself. Instead, it points the way to specific AUs and defines the relationships among them. The following is and example of XML code that points to an AU.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE course SYSTEM "file:scormcsf(1.0).dtd " >
<course>
  <!--*** Descriptive Comment-->
  <block>
    <au id="A1">
      <identification>
        <title>Title of AU</title>
      </identification>
      <launch>
        <location>http://www.AU_location.mil/AU_1.html</location>
      </launch>
    </au>
  </block>
</course>
```

AUs in an Learning Management System (LMS)

The implementation for the interchange between AUs and a LMS doesn't deviate from the model that AICC/IEEE have already established in the figure below.

The LMS allows access to the databases, repositories and servers that house the course content and can be implemented numerous ways. The standards of ODBC are encouraged for database implementation and allow for LMS systems to be swapped using the same databases.

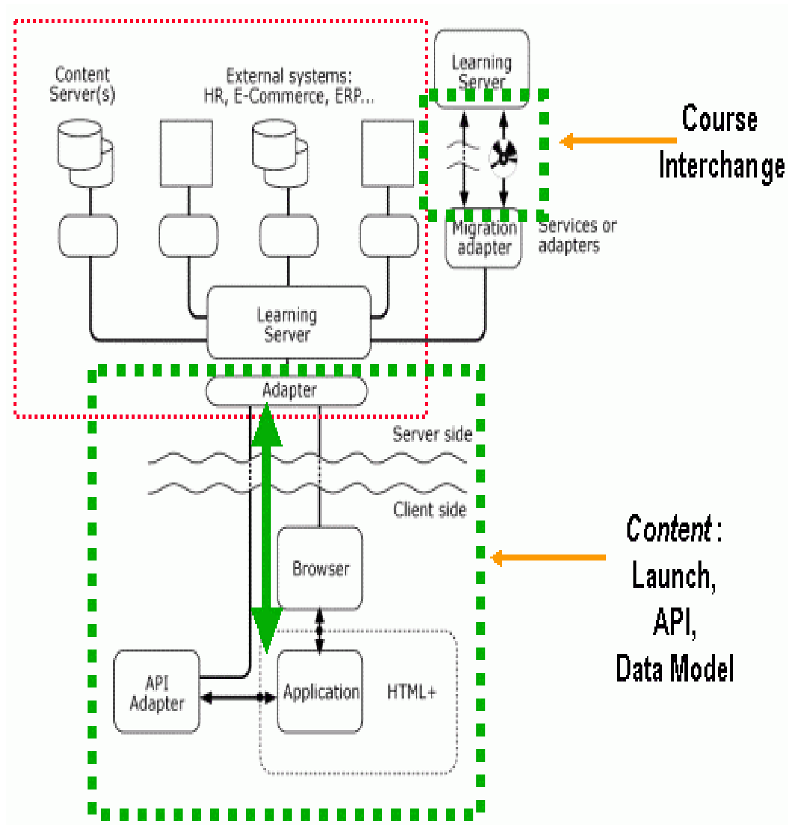
When the AU is incorporated into a Computer Managed Instruction (CMI) system, the AU must accept and deliver values and identifiers. An AU is presented with "public" functions that

Continued on next page

AUs in an Learning Management System (LMS) (Continued)

pass and receive CMI values, informing the CMI of student interaction. The following chart illustrates data flow between the CMI system and the learner.

Figure 7 Data flow between CMI system and learner



The chart shows the content server on the top interacting with the student computer on the bottom. Content information is passed from the server to the student machine through a Web browser. Any student input is collected through the API adapter and delivered to learning server. The adapter facilitates the communication between the CMI and the learner and has two potential approaches for implementation:

HTTP based Protocol

The CMI launches the AU sending it two important values: A Session ID and URL to a CGI/ASP/Servelet that will receive tracking data from the AU.

Continued on next page

AUs in an Learning Management System (LMS) (Continued)

The AU will use this session ID to return student-tracking data directly to the URL of the adapter and will continue to send information until an Exit command is encountered.

API Based Communication

AUs are armed with standard JavaScript functions that “find” the CMI API. All communication with the CMI continues through a series of JavaScript functions embedded in the AU content

The API, defined as part of the SCORM Run Time Environment, is the meat of the implementation and commonly uses Java servelets to implement the persistent communication with the server.

RICHARD E. BROWN III, Lt General, USAF
DCS/Personnel

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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AFI 36-2201	Developing, Managing and Conducting Military Training
AFI 36-2301	Professional Military Education
AFMAN 36-2234	Instructional System Development
AFMAN 36-2236	Handbook for Air Force Instructors
MIL-PRF-29612	Training Data Products
MIL-HDBK-29612-1	Department of Defense Handbook, Guide for Acquisition of Training Data Products and Services
MIL-HDBK-29612-2	Department of Defense Handbook, Instructional Systems Development/ Systems Approach to Training and Education
MIL-HDBK-29612-3	Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI)
MIL-HDBK-29612-4	Department of Defense Handbook, Glossary of Training Terms
AFH 36-2235	Information for Designers of Instructional Systems (12 Volumes)
Vol 1	ISD Executive Summary for Commanders and Managers
Vol 2	ISD Automated Tools/What Works
Vol 3	Application to Acquisition
Vol 4	Manager's Guide to New Education and Training Technologies
Vol 5	Advanced Distributed Learning: Instructional Technology and Distance Learning
Vol 6	Guide to Needs Assessment
Vol 7	Design Guide for Device-based Aircrew Training
Vol 8	Application to Aircrew Training
Vol 9	Application to Technical Training
Vol 10	Application to Education
Vol 11	Application to Unit Training
Vol 12	Test and Measurement Handbook

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Acronyms and Abbreviations

2 AF	Second Air Force
ADL	Advanced Distributed Learning
ADS	Advanced Distributed Simulation
AFCAT	Air Force Catalog
AFCFM	Air Force Career Field Manager
AFIADL	Air Force Institute for Advanced Distributed Learning
AFPATS	Air Force Primary Aircrew Training System
AFRC	Air Force Reserves Command
AFTMS	Air Force Training Management System
AI	Artificial Intelligence
AIV	Analog Interactive Video
ANG	Air National Guard
ASCII	American Standard Code for Information Exchange
ASE	Advanced Synthetic Environments
ATN	Air Technology Network
AU	Air University
AV	Audiovisual
BNCC	Base Network Communications Center
CAI	Computer-Assisted Instruction
CAT	Computer Adaptive Testing
CBI	Computer-Based Instruction
CBT	Computer-Based Training
CD-I	Compact Disc Interactive
CD-ROM	Compact Disc-Read-Only Memory
CMC	Computer-Mediated Communication
CMI	Computer Managed Instruction
CODEC	COder/DECoder
COTS	Commercial Off-the-Shelf
CPU	Central Processing Unit
DAVIS	Defense Audio Visual Information System
DFAD	Digital Feature Analysis Data
DHTML	Dynamic Hyper Text Markup Language
DIS	Distributed Interactive Simulation
DISN	Defense Information Services Network
DIV	Digital Interactive Video
DL	Distance Learning
DoD	Department of Defense
DOS	Disk Operating System
DTIS	Defense Technical Information Service
DVD	Digital Video Disc

DVI	Digital Video Interactive
EBB	Electronic Bulletin Board
EC	Electronic Classroom
ECI	Extension Course Institute
EPME	Enlisted Professional Military Education
EPSS	Electronic Performance Support System
ET	Embedded Training
FEA	Front-End Analysis
GETN	Government Education and Training Network
GMT	General Military Training
IBI	Internet-Based Instruction
IBT	Internet-Based Training
ICAI	Intelligent Computer-Assisted Instruction
ICW	Interactive Courseware
IETM	Interactive Electronic Technical Manual
IGR	Instructor-Guided Review
IMI	Interactive Multimedia Instruction
IMS	Instructional Management System
IOE	Integrated Operational Environment
IPR	In-Process Review
IPS	Interactive Performance Systems
ISD	Instructional Systems Development
ISP	Internet Service Provider
IT	Instructional Technology
ITS	Intelligent Tutoring Systems
ITV	Interactive Television
IVT	Interactive Video Teletraining
JPA	Job Performance Aid
JPEG	Joint Picture Expert Group
KSA	Knowledge, Skills, and Attitudes
LAN	Local Area Network
LC	Learning Center
M&S	Modeling and Simulation
Mb	Megabyte
Mbps	Megabits per second
MHz	Megahertz
MIL	Mediated Interactive Lecture
MOA	Memorandum of Agreement

MOU	Memorandum of Understanding
OJT	On-the-Job Training
OMT	On-Board Maintenance Training
PDU	Packet Data Unit
PEDD	Portable Electronic Display Device
PLV	Production Level Video
POA&M	Plan of Action and Milestones
PQS	Personal Qualification Standards
PSS	Performance Support System
PST	Performance Support Tools
QC	Quality Control
ROI	Return On Investment
RTV	Real Time Video
SEN	Satellite Education Network
SME	Subject Matter Expert
SRU	Student Response Unit
SSS	Staff Summary Sheet
SVGA	Super Video Graphics Adapter
TRADOC	Training and Doctrine Command
VRML	Virtual Reality Markup Language
VRAM	Virtual Random Access Memory
VTC	Video Teleconferencing
VTT	Video Teletraining
WAN	Wide Area Network
WBI	Web Based Instruction (Browser Based)
WWW	World Wide Web
XML	Extensible Markup Language

Terms

Advanced Distributed Learning A DoD initiative to promote widespread collaboration, exploit Internet technologies, develop next generation learning technologies and create reusable content, and lower costs, with object-based tools.

Air Force Catalog of Formal Schools (AFCAT) The AFCAT is a listing of nearly all formal courses offered within the AF. The AFCAT is a formal publication that is updated semiannually. Its publication number is AFCAT 36-2223.

Air Force Institute for Advanced Distributed Learning The focal point for implementation of distance learning policy and emerging distance learning technologies within the Air Force. It is located at Maxwell Air Force Base – Gunter Annex.

Air National Guard (ANG) A wartime mobilization force providing personnel and aircraft to augment the active duty forces.

Air Technology Network (ATN) The Air Force education and training interactive TV network. Created in 1992 to broadcast the newly-required acquisition courses, ATN has expanded to four uplink sites at Wright-Patterson, Maxwell, Sheppard, and Keesler Air Force bases with more than 80 downlink receive sites typically located at base education offices and 5 sites within AFRC. The system uses 1-way video, 2-way audio over a compressed digital video signal, along with a terrestrial audioconferencing system that permits interaction with all participants. Combined with ANG's Warrior Network, the Air Force can reach almost 300 sites within the US and Europe.

Analog Information, such as video and audio, that is recorded and stored in a continuously variable form similar to its source: information that is not digital.

Appended Systems Embedded Training systems appended, or strapped on to operational equipment.

Asynchronous Transmission that does not occur simultaneously with the audio and video associated with the broadcast. Computer Based Training (CBT) and traditional correspondence courses would be considered to operate in the asynchronous mode.

Audio Bridge Specialized equipment that permits several telephone lines to be joined together in a conference call.

Audioconferencing Instruction delivered by two-way voice communication.

Audioconferencing Unit A stand-alone microphone that provides a means for students to provide verbal feedback to the instructor.

Audio Conferencing System (ACS) ACS uses ordinary phone lines for transmitting voice for multi-point, synchronous interaction. It allows for a free and open exchange instructor-to-student and student-to-student. The ACS includes microphones, and a speaker and sound mixer unit, and is the interactive part of interactive video teletraining.

Audiographics Two-way audio and two-way computer data exchange.

Bandwidth Capacity of a communications channel. The frequency width needed to transmit a communications signal without excessive distortion. The more information contained in a signal, the more bandwidth it requires for distortion-free transmission. For digital transmission, generally measured in kilobits (Kbps) or megabits per second (Mbps). The higher the compression, the greater the loss of resolution and fluidity of motion. But, the higher the compression, the lower the bandwidth requirements, and consequently, the lower the cost of transmission.

C-Band A type of satellite transmission with less path loss than other satellite standards such as Ku-Band. C-Band, however, requires a relatively large antenna. C-Band frequencies are shared with terrestrial microwave transmissions, which cause interference with weaker satellite signals.

Coaxial Cable System Thinnet (10 Base T2) cable, similar to TV cable. 10 Base T-5 is a thicker cable that permits computers to be farther apart.

CODEC Coding-decoding equipment used to convert and compress analog video signals into a digital format for two-way video transmission, then convert them back to analog signal upon reaching their destination. CODECs may also be configured as send-only and receive-only, and be used to transfer a terrestrial signal to a broadcast satellite, or vice versa.

Collective Training Training conducted with a team, crew, or group.

Compressed Digital Video (CDV) Compressed Digital Video (CDV) is a signal coding technology used to compress the bandwidth required for the transmission of video images by eliminating redundant information within or between video frames; also called data compression, bandwidth compression, or bit rate reduction. The higher the compression, the lower the bit transmission rate. Terrestrial VTC network (desktop to large-screen monitors) use a variety of compression rates beginning at 56 Kbps (low resolution, less than full motion) to 1.5Mbps (intermittently full-motion, broadcast-quality video. Satellite broadcast systems allow for the use of full-motion, broadcast-quality video. It is common to see rates of transmission of 3 to 20 Mbps. ATN uses 3.3 or 6.6 Mbps. This compression rate gives full-motion with a resolution quality that is very nearly that of normal analog broadcasting. At 3.3 Mbps, you may notice some image skipping when there is a lot of motion. While most ATN broadcasting is done at 3.3 Mbps, ATN can broadcast at 6.6 Mbps when it is necessary to eliminate all such skipping. The costs of transmission, however, double for 6.6 Mbps.

Computer Assisted Instruction (CAI) A term referring to courses delivered using a personal computer and includes floppy disks, CD-ROMs, and Internet-delivered courseware.

Computer Based Instruction (CBI) The same as computer assisted instruction.

Computer Based Training (CBT) The same as computer assisted instruction.

Compact Disk-Read Only Memory (CD-ROM) A disc designed to hold up to 600 MB of data in a digitized format. Because it is "read only," users cannot alter or write over the data on the CD making it very popular with courseware developers.

Compression Rate The figure used to estimate the number of hours of instruction required to conduct an existing resident course if converted to the given technology.

Compression Software Compresses digital video for storage and transfer using CODECs (COder/DECoder) algorithms.

Computer-Managed Instruction (CMI) Interactive Courseware (ICW) component that enables student record-keeping.

Computer-Mediated Conferencing (CMC) Another way of conferencing using the personal computer and telephone lines as the communication vehicles. It provides instructor-student and student-student interaction in both an asynchronous and synchronous mode.

Constructed Model or Simulation Models and simulations that involve simulated people operating real systems.

Course Director/Manager The person responsible for the development of an instructional sequence. This person often serves as the primary presenter.

Digital The representation of information as discrete numbers; in contrast with analog information, represented as a continuously variable signal.

Digital Video Disc (DVD) An electronic storage and read-only medium with 5 to 50 gigabits of storage space.

Distance Learning (DL) Distance learning is defined as "Structured learning that takes place without the physical presence of the instructor." With this definition, the Air Force includes correspondence courses, satellite broadcasts, videotape and computer-based instruction or any combination thereof.

Distance Learning Classroom; same as Electronic Classroom (EC) Any location where learners can receive instruction electronically from a remote or local instructor. An EC can include Student Stations, Instructor Stations, Presentation Monitors, Audiovisual Equipment, and Telecommunications Equipment. Electronic communication with the EC can include Television, Satellite, Internet, Commercial Education and Training Networks, and Military Education and Training Networks.

Distance Learning Office POC The term used by MAJCOMs and others to describe the individual responsible for administering distance learning programs within an organization.

Downlink A location where equipment receives a satellite or ground based signal(s) for display on video, audio, or data receiving equipment. Normally, a downlink includes a room equipped for display of satellite signal(s) through a TV monitor and permits occupancy by 15 to 50 people.

E-Mail An electronic delivery system used to send digital messages over the Internet/Intranet to contact and collaborate with other individuals.

Electronic Classroom (EC); same as Distance Learning Classroom Any location where learners can receive instruction electronically from a remote or local instructor. An EC can include Student Stations, Instructor Stations, Presentation Monitors, Audiovisual Equipment, and Telecommunications Equipment. Electronic communication with the EC can include Television, Satellite, Internet, Commercial Education and Training Networks, and Military Education and Training Networks.

Electronic Management Tools Computer programs that can aid in the instructional process.

Electronic Performance Support System (EPSS) Just-in time ICW designed to enable learners to gain access to large amounts of information, provide tutorial ICW and ICAI, and provide advice and coaching through a user-friendly interface.

Electronic Testing A general term used to encompass all methods for applying computers in the assessment and reporting of human knowledge, skills, and attitudes. It is also known as Computer Adaptive Testing (CAT).

Embedded Training A training capability which is designed into or added onto operational equipment.

Encoder A hardware device that transforms analog video signal into digital form. One encoder is used for each channel broadcast. ATN, as well as the rest of GETN, uses the CLI Spectrum Saver encoder; as many as 6 can be used simultaneously on a single uplink.

Exportable Training Training that is sent out or 'exported' to a field location; also referred to as Type 6 training. See Distance Learning.

Extension Course Institute (ECI) Formerly the Air Force's correspondence school for military subjects ranging from general courses to specific career areas. Combined with the Air Force Distance Learning Office (AFDLO) to form the Air Force Institute for Advanced Distributed Learning (AFIADL).

Facilitator (See instructional facilitator)

Fax Conferencing Electronic data transfers between individuals over telephone networks using facsimile equipment or over the Internet using fax modems.

Fiber Optic Cable System Consists of fine fibers of glass. Conducts light (photons) instead of electricity (electrons). Able to transmit audio, video, and data signals on the same cable.

Formative Evaluation Provides information about the effectiveness of products and processes as they are being developed. Performed periodically from initial ISD planning throughout the development phase; can include small-group tryouts of instructional components; used to validate design of individual components of the instructional system for integration. Objective is to identify deficiencies early, when revision is least expensive.

Government Education & Television Network (GETN) GETN is a network of Government networks. It was conceived by AFIT in the interest in interagency distance learning. AFIT had its digital network added to the GSA and Defense Information Systems Agency (DISA) contracts. Now, all agencies using the FTS2000-DSCF contract can join the Air Force on a single, interoperable satellite network. Currently, GETN includes 17 Federal agencies that reach over 950 sites within CONUS. Among these are the Dept of Energy, the Federal Aviation Administration, the Environmental Protection Agency, the Internal Revenue Service and the Social Security Administration. The Army Satellite Education Network and the Air National Guard Warrior Network were among the first to join GETN.

Hypertext Mark-up Language (HTML) A language of Internet Web Pages (WWW), allowing authors to create text and graphics, and link to other Web pages.

Instructional Management System (IMS) A non-proprietary, Internet-based Instructional Management System that provides the means to customize and manage the instructional process and to integrate content from multiple publishers in distributed or virtual learning environments.

Instructional Systems Development An adaptation of the systems engineering process to the process of curriculum development.
Instructor Guided Review (IGR) Remote or local instructor presentations in an electronic classroom using a seminar or review format.

Instructional Facilitator A content-knowledgeable person, not an instructor, at a downlink site who assists the content provider (normally at the uplink site) to conduct instruction using the satellite system.

Intelligent Computer Assisted Instruction (ICAI) Interactive Courseware (ICW) component that includes an intelligent tutor that diagnoses student performance and individualizes instruction.

Internet-Based Instruction (IBI) Instruction that makes use of Internet technologies and provides a platform for the integration and distribution of multimedia instructional components.

Internet-Based Training (IBT) A term referring to courses delivered via the Internet.

Interactive Courseware (ICW) Any type of computer-controlled education or training that relies on student inputs to determine pace, sequence and content of training delivery using more than one type of medium to convey the cost of instruction.

Integrated Electronic Technical Manual (IETM) A type of Interactive Courseware (ICW) job aid that incorporates graphics, photographs, video, simulations, text, and access to database information.

Integrated Operational Environment (IOE) Merges real-world and synthetic operations to support all aspects of training and education, weapons systems deployment, strategic and tactical strategies and analysis, Joint theater-level operations, mission planning, mission rehearsal, etc.

Integrated Receiver Decoder (IRD) A hardware device that reconstructs a video signal from a compressed digital format. It is located at each downlink receiving site. One IRD decodes one selectable channel. ATN, as well as the rest of GETN, uses the CLI Spectrum Saver IRD.

Interactive Multimedia Instruction (IMI) IMI is a group of computer-based training and training support products. IMI includes source materials that are commonly used in IMI products, electronic products used in the delivery of or supporting the delivery of instruction, and software management tools used to support instructional programs.

Interactive Television (ITV) An interactive means of instructing learners at a distance through the use of one-way video and audio over a satellite communication link with interactive return audio via phone lines. Also referred to as Teleseminar.

Interactive Video Teletraining (IVT) Describes video-based instruction over broadcast television networks (satellite and/or terrestrial). Composed of Video Teleconferencing (VTC) and Interactive Television (ITV).

Job Site Training (JST) Training delivered to learners at their base of assignment without an instructor physically present. The training media can take the form of interactive courseware, interactive video teletraining, videotape, paper, or some combination of these. Does not include mobile training teams or CDCs.

Job Site Training POC Organization or person at base-level responsible for all aspect of training administration.

Ku-Band A type of satellite transmission of a higher frequency that C-Band transmission, requiring smaller antennas.

Live Simulation A simulation involving real people operating real systems.

Local Area Network (LAN) A system that connects computers, printers and other office equipment together within a defined area (like your office building).

Mediated Interactive Lecture (MIL) Remote or local instructor presentations in an Electronic Classroom using a lecture format.

Mobile Training Team Any group of personnel and training equipment gathered together to provide instruction on some subject or in some area of endeavor, available for movement from place to place in order to provide instruction at the various locations concerned.

Model A physical, mathematical, or otherwise logical representation of a real-world system, entity, phenomenon, or process.

Modeling and Simulation (M&S) The use of models, including emulations, prototypes, simulations, and stimulations, either statistically or over time to validate a physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process.

Multimedia In its strictest definition is anything that includes or involves the use of several media; mixed media. Within communications, the term has evolved to refer to any system or strategy that uses a combination of data, graphics, video, and sound. Common storage systems include CD-ROM devices. Combined with hypertext or computer-based instruction, it becomes interactive multimedia.

Operational Evaluation Includes periodic internal and external evaluation of the instructional program to ensure graduates meet established education and training requirements. Performed periodically from completion of the operational tryout throughout the life of the instructional system. Objective is continuous improvement and maintenance of instructional effectiveness.

Originating Facility The site location from which transmissions originate.

Portable Electronic Display Device A small electronic device that has been designed and engineered to facilitate the presentation of an IETM to a technician during maintenance procedures.

Professional Continuing Education (PCE) Provides short course instruction in a broad range of essential educational programs to meet specific skills and functional competencies required in designated career fields. PCE courses provide learners with the opportunity to think critically, plan strategically, and give them the ability to apply those skills and knowledge to undefined future programs and challenges.

Professional Military Education (PME) Education in the profession of arms and the employment of forces. It provides and develops the skills, knowledge, understanding and appreciation of leaders in the nation’s armed forces.

Redundant Arrays of Inexpensive Disks (RAID) Two or more hard drives or optical storage devices working together in a file server.

Remote Site Training Any training or education conducted in other than a formal schoolhouse setting.

Satellite Education Network (SEN) The transmission system operated by the Army from Ft Lee, VA. This network serves more than 60 downlinks located at Army posts throughout the US. The SEN is compatible with ATN.

Senior Non Commissioned Officer Academy (SNCOA) Formed to help the Air Force improve leadership and management within senior noncommissioned (NCO) officer grades. Designed for professional managers, the curriculum focuses on leadership and management, communication skills and military studies. The academy uses case studies and group problem solving as well as lectures and small-group activities to promote the exchange of ideas.

Simulation A method of implementing a model over time.

Site Coordinator/Monitor An individual at a downlink site who is responsible for having the site ready for use, who assists learners and instructional facilitators or Job Site Training POCs in using the equipment in the classroom, and who often has other minor administrative support responsibilities. Often referred to as site monitor.

Student Response Units (SRU) Provide voice, text, and data links from each student to the remote instructor.
Subject Matter Expert (SME) (a) An individual who has thorough knowledge of a job, duties/tasks, or a particular topic, which qualifies him/her to assist in the training development process (for example, to consult, review, analyze, advise, or critique). (b) A person who has high-level knowledge and skill in the performance of a job.

Summative Evaluation Provides information to determine the “summed effect” of instruction under operational conditions. Used to assess full system integration and effectiveness of the individual components; based on an operational tryout of the program (normally 2 or 3 classes) using real student throughput and full instructional system operation. Objective is to ensure that the instructional system is fully integrated and achieves desired outcomes.

Synthetic Environments (SE) Intermitted simulations that represent real-world activities at a high level of realism.

T-Net A two-way video, two-way audio, low-bit rate video system currently used by the AFRC through a contract with Army's TRADOC. ATN can connect to and transmit over T-Net using special arrangements through the Army's Satellite Education Network at Ft Lee. Due to the difference in system configuration and transmission rates, receive locations may experience some difficulties in receiving clear video and audio signals.

Technology Insertion Use of appropriate instructional technology in resident instructional programs.

Teleconferencing (Video Teleconferencing: VTC) Two-way video and two-way audio exchange.

Telecourse Instruction delivered by Telecommunications instructional delivery technology.

Teleseminar See Interactive Television

10 BaseT Cable System A pair of unshielded wires with higher wiring standards than standard telephone systems.

Test Administrator Person at a downlink who has responsibility for the acceptance, secure storage, distribution, control and return of assessment items.

Uniform Resource Locator (URL) An engineer's way of saying "Homepage address." It tells your browser where the file is located on the Internet and the type of file it is.

Umbilical Systems Embedded training systems with a physical umbilical connection to operational equipment.

Uplink The location where equipment permits the transmission of video, audio, and data signal to a satellite. Uplinks can have multiple channels for transmission purposes. An uplink normally has the capability to function as a downlink.

Video Teletraining (VTT) Job site training using one-way video, two-way audio instructional technology delivered to learners at their base of assignment via the Air Technology Network. Also known as interactive television (ITV).

Video Teleconferencing (VTC) Job site training using audio and video instructional delivery technology delivered to learners at their base of assignment via satellite.

Virtual Classroom An Electronic Classroom where learners and instructors are not physically collocated.

Virtual Simulation Models and simulations that involve real people operating simulated systems.

Virtual Stimulation Models and simulations that involve simulated people operating real systems.

Virtual Reality Mark-up Language (VRML) A language of Internet Web Pages (WWW), allowing authors to create animated graphics and simulations.

Warrior Network The Air National Guard's interactive TV network. Created in 1993, the ANG designed the system to be received by every flying unit, geographically separated unit, state headquarters and combat readiness training center. The ANG currently broadcasts from McGhee-Tyson ANG base in Knoxville, Tennessee. They are also building broadcast facilities at Andrews AFB in Maryland and at Tyndall AFB in Florida. Warrior Network is part of the Government Education and Training Network.

Web Based Instruction (WBI) Term referring to courses delivered via the World Wide Web (WWW), through a Web Browser and using TCP/IP network protocols.

Wide Area Network (WAN) Used to connect two or more LANs to designated host computers.

Wireless LAN Use of radio waves of infrared light beams to transmit data between a file server and the network computers.

World Wide Web (WWW) A system for sharing many different kinds of information over the Internet. Designed in 1989 by researchers at CERN in Switzerland, the Web is accessed by Web Browsers like Netscape Navigator™ or Microsoft Internet Explorer™.