

## Chapter 7

# ISD CONSIDERATIONS FOR INTERACTIVE MULTIMEDIA INSTRUCTION

### Overview

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#### 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.

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#### 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
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#### Where To Read About It

This chapter contains five sections.

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### 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*
  - AFDLO Home Page web site: <http://www.au.af.mil/afdllo>
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### 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.

- *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.
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## Overview (continued)

### **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.

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### **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 all of the course content over the Internet/Intranet.
  - 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 which provides automatic file updates for the course as it is accomplished. These course content updates are “transparent” to the user.
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### **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.

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## Overview (continued)

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**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.

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## Section A

### Analysis Considerations

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**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."

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**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.
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## Analysis Considerations (continued)

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### 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.
- **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.

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**Analysis Considerations (continued)**

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**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.

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**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.

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## Section B

### Design Considerations

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**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.

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**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:
  - 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.

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## Design Considerations (continued)

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### 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 student 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?
  - 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.
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## Section C

### Development Considerations

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#### 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 which 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.
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## Section D

### Implementation Considerations

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**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.

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**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.

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**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.

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**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.

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## Section E

### Evaluation Considerations

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**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.

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**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.

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**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.

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## Evaluation Considerations (continued)

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### 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)

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.

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### 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.
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