

AD-A197 083

Research Product 88-11

User's Manual: Distributed Training
Technology Selection Advisor
(TECHSELECT)

Boise Scientific Coordination Office
Training Research Laboratory

April 1988

DTIC
ELECTE
JUL 1 1 1988
S H D



88 11 11

U. S. Army Research Institute for the Behavioral and Social Sciences

Approved for public release; distribution unlimited.

U. S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the
Deputy Chief of Staff for Personnel

EDGAR M. JOHNSON
Technical Director

WM. DARRYL HENDERSON
COL, IN
Commanding

Research accomplished under contract
for the Department of the Army

Boise State University

Technical review by

Douglas A. Ramsay
Paul J. Tremont

NOTICES

FINAL DISPOSITION: This Research Product may be destroyed when it is no longer needed. Please do not return it to the U.S. Army Research Institute for the Behavioral and Social Sciences.

NOTE: This Research Product is not to be construed as an official Department of the Army document in its present form.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ARI Research Product 88-11	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) User's Manual: Distributed Training Technology Selection Advisor (TECHSELECT)		5. TYPE OF REPORT & PERIOD COVERED Final Report February 1987-March 1988
		6. PERFORMING ORG. REPORT NUMBER ---
7. AUTHOR(s) Joseph D. Hagman (Army Research Institute) and Dewey I. Dykstra, Jr. (Boise State University)		8. CONTRACT OR GRANT NUMBER(s) DE-AC07-76ID01570
9. PERFORMING ORGANIZATION NAME AND ADDRESS Boise State University 1910 University Drive Boise, ID 83725		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2Q263743A794
11. CONTROLLING OFFICE NAME AND ADDRESS Idaho National Engineering Laboratory 785 DOE Place Idaho Falls, ID 83402		12. REPORT DATE April 1988
		13. NUMBER OF PAGES 61
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) U.S. Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Avenue Alexandria, VA 22333-5600		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE ---
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) --		
18. SUPPLEMENTARY NOTES Copies of the TECHSELECT software can be obtained from the following address: Chief, Army Research Institute SCO, Boise State University, ATTN: PERI-IKD (Dr. Hagman), 1910 University Drive, Boise, ID 83725.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Computer-based training, Training technology, Distributed training, Distance learning. (SDW) ← Remote training delivery, Software,		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) → This manual guides you through the use of a two-part computer program called TECHSELECT, designed to help with the selection of appropriate technology for distributed training. Part A will help you choose a suitable delivery method for training while Part B will help you identify the equipment configuration required for your particular application. Although TECHSELECT was developed to address the distributed training requirements of the U.S. Army National Guard and Reserve, its fundamental (Continued)		

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

ARI Research Product 88-11

20. Abstract (Continued)

recommendations apply generally to any situation where trainees or students are geographically distributed and cannot meet conventionally at the same place for training. These recommendations will therefore help military, as well as other, training program managers decide the technology that best satisfies their specific needs. *Keywords:*



Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

Research Product 88-11

**User's Manual: Distributed Training
Technology Selection Advisor
(TECHSELECT)**

Joseph D. Hagman

Army Research Institute

Dewey I. Dykstra, Jr.

Boise State University

Boise Scientific Coordination Office

Ruth H. Phelps, Chief

Training Research Laboratory

Jack H. Hiller, Director

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

Office, Deputy Chief of Staff for Personnel

Department of the Army

April 1988

Army Project Number
2Q263743A794

Education and Training

Approved for public release; distribution unlimited.

FOREWORD

Limited time and wide geographical dispersion of units are two of the major training constraints encountered by the Army National Guard and Reserve, i.e., the Reserve Component (RC). In response to these constraints, the RC is considering using technology to deliver training to the soldier at convenient times and places, thereby reducing the effect of unit dispersion and ensuring that available training time is used effectively and efficiently to achieve maximum performance benefits.

This report is designed to assist the RC to select appropriate technology for delivering training and was developed by the Training Technology Field Activity-Gowen Field (TTFA-GF), whose mission is to improve the effectiveness and efficiency of RC training through the testing and application of training technology. The research task supporting this mission is entitled "Application of Technology to Meet Reserve Component Needs" and is organized under the "Maintain the Force" program area. The National Guard Bureau (NGB) and the Idaho Army National Guard (IDARNG) sponsored this project under the Memorandum of Understanding signed 12 June 1985 that established the TTFA-GF. Project results have been signed to Chief, Training Support Branch, NGB, and the Assistant Adjutant General of Idaho.



EDGAR M. JOHNSON
Technical Director

USER'S MANUAL: DISTRIBUTED TRAINING TECHNOLOGY SELECTION ADVISOR
(TECHSELECT)

CONTENTS

	Page
Chapter 1. ABOUT THIS MANUAL	1
Chapter 2. ABOUT TECHSELECT	2
What it is	2
How it is Organized	2
How to Use it	2
What it Does	2
Chapter 3. GETTING STARTED	3
What You Need	3
Copying	3
How to Start	3
Chapter 4. USING TECHSELECT	4
Initial Questions	4
Defining Your Distributed Training Requirements	4
Recommendations	7
Interpreting Recommendations	8
Chapter 5. PRINTING RESULTS	10
Chapter 6. CHANGE AND RERUN	11
Chapter 7. EXITING	12
Chapter 8. USING TECHSELECT: SOME FINER POINTS	13
TECHSELECT's Initial Questions	13
Preparing Your Answers	13
Chapter 9. MORE ABOUT INTERPRETING RECOMMENDATIONS	14
Part A	14
Part B	15
Chapter 10. TECHSELECT'S ADDITIONAL COMMENTS	16
Part A	16
Part B	20

CONTENTS (Continued)

	Page
REFERENCES	23
APPENDIX A. CANDIDATE DISTRIBUTED TRAINING TECHNOLOGIES	A-1
B. QUESTIONS	B-1
C. RULES	C-1
D. QUESTION/RULE MAPPING	D-1

LIST OF FIGURES

Figure 1. Candidate distributed training technologies	A-1
---	-----

USER'S MANUAL: DISTRIBUTED TRAINING TECHNOLOGY SELECTION ADVISOR
(TECHSELECT)

Chapter 1

ABOUT THIS MANUAL

This manual guides you through the use of a two-part computer program, called TECHSELECT, designed to help with the selection of appropriate technology for distributed training. Part A of TECHSELECT will help you select a suitable method for delivering distributed training while Part B will help you identify the kind of equipment or hardware configuration required for your particular application.

The manual contains 10 Chapters. The present chapter is about the manual while Chapter 2 describes how the TECHSELECT program is organized and how it works. Chapter 3 lists the hardware and software needed to run the program as well as the basic steps to follow in getting started. Chapter 4 provides step-by-step guidance on how to use the program. Chapter 5 describes how to rerun the program with a different set of input. Chapters 6 and 7 tell how to print your results and exit. Chapter 8 suggests some points to consider when using the program while Chapters 9 and 10 help you interpret TECHSELECT's recommendations and comments concerning the delivery method and equipment configuration proposed for your particular distributed training application.

Although TECHSELECT was developed to address the distributed training requirements of the U.S. Army National Guard and Reserve, it applies generally to any situation where trainees or students are geographically distributed and cannot meet conveniently at the same place for training. The fundamental recommendations provided by TECHSELECT will therefore help military, as well as other, training program managers decide what distributed training technology best satisfies their particular needs.

ABOUT TECHSELECT

What it is

TECHSELECT is an expert-system-based, computer program designed to help you determine how to deliver training to distributed locations as well as what kind of equipment or hardware is required; two decisions that are essential for planning initial, refresher (sustainment), advancement, or new equipment training requiring remote delivery to distributed sites.

How it is Organized

TECHSELECT contains two parts:

Part A will help you decide whether a synchronous or asynchronous delivery method is most appropriate for your particular distributed training requirements. Synchronous delivery requires simultaneous "live" or "real-time" interaction between trainer (instructor) and trainee (student), whereas asynchronous delivery does not (see Appendix A for a list of candidate technologies appropriate for each method of delivery).

Part B will help you identify the equipment required to support your distributed training needs, given selection of a delivery method in Part A.

How to Use it

You describe your particular distributed training requirements by answering a series of multiple-choice questions. Based on your answers, TECHSELECT will recommend a delivery method and equipment configuration that satisfy your requirements. If these requirements change or if you would like to explore different options, you can change your answers accordingly and TECHSELECT will generate a new set of recommendations. Thus, TECHSELECT's recommendations can apply to your particular delivery method and equipment requirements as well as any alternative or "what if" requirements you might wish to explore.

What it Does

TECHSELECT is an expert system developed in part from principles stated by Harmon (1985). It derives its recommendations through analysis of answers you provide to a series of multiple-choice questions (see Appendix B). Your answers are then inserted into "If..., Then..." rules (see Appendix C) that are tested for "truth" with the results integrated to derive specific recommendations. This integration process is performed by the part of TECHSELECT's "shell" called EXSYS*. Although no knowledge of EXSYS is required to run TECHSELECT, consult (EXSYS Inc., 1985) if you would like more information about how EXSYS works.

* EXSYS is a registered trademark of EXSYS, Inc.

GETTING STARTED

What You Need

You need the following to use TECHSELECT:

- o The TECHSELECT program diskette
- o An IBM PC*, XT*, AT* or compatible computer with at least 256KB of random access memory (RAM) and one double-sided drive for 360KB diskettes
- o MS-DOS Version 2.0 or higher
- o An 80-column monochrome or color video monitor
- o A printer (optional)
- o Either a hard disk or a blank, double-sided, double-density diskette already formatted.

Copying

Before using TECHSELECT, make at least one backup copy of the program on a formatted, blank diskette using the instructions provided in your DOS manual. Put the original program diskette away and work with the copy. For hard disk users, TECHSELECT can be loaded into a single directory.

How To Start

1. To start TECHSELECT, you must first have the computer turned on with the DOS command prompt, e.g., A>, showing on the screen. If you are unfamiliar with this process, consult your DOS manual for instructions.
2. Put the TECHSELECT program diskette in Drive A, making sure the diskette is not write-protected.
3. Type TECHSELECT (upper or lower case letters) and press <Enter>.
4. The title screen will then appear and remain on until you press any letter key.
5. The next screen provides a brief introduction to TECHSELECT. At the bottom, you have the option of where to go next. Press the letter of your choice then <Enter>.

*IBM PC, XT, AT are registered trademarks of the International Business Machines Corporation

USING TECHSELECT

Initial Questions

1. Assuming you have chosen to proceed to either Part A or Part B (both start the same way), you will see:

"Do you wish instruction on running the program? (Y/N):"

with a flashing cursor. For now, press N to move to the next screen.

Note: Pressing Y would take you to a series of text screens describing what EXSYS is and how it works. You can do this later after using TECHSELECT for awhile.

2. On the next screen you will see:

"Do you wish to have the rules displayed as they are used? (Y/N) (Default=N):"

with the flashing cursor. For now, press N or <Enter>.

Note: EXSYS has been given a series of rules which it uses to make TECHSELECT's recommendations. Operation of TECHSELECT will be clearer if these rules are not displayed during the first few trials.

3. The next screen displays the Part (A or B) of TECHSELECT that is about to run. Press any key to begin using TECHSELECT.

Defining Your Distributed Training Requirements

You will now see the first of a series of questions that you will be asked to answer about your training requirements (see samples).

PART A: SAMPLE QUESTION SCREEN

The training will be offered

- 1 only at scheduled times.
- 2 on demand.

Enter number(s) of value(s), WHY for information on the rule, <?> for more details, QUIT to save data entered or <H> for help

PART B: SAMPLE QUESTION SCREEN

The training will be offered

- 1 at armory/training centers
- 2 in the field
- 3 at home
- 4 at school

Enter number(s) of value(s), WHY for information on the rule, <?> for more details, QUIT to save data entered or <H> for help

At the bottom every question screen, are the following options (try each as you read through its explanation):

a. Type WHY <Enter> (upper or lower case), to see the rule currently being tested plus a brief note of explanation.

Rule screens (see samples) have their own set of options displayed at the bottom. Each is described in the text screens displayed by pressing H.

- o After typing WHY <Enter>, press K at any rule screen to see a list of your answers.

Note: Because you have not answered any questions yet, you will not see any answers listed. Once you have answered at least one question, however, you can type the answer's Line # <Enter> to have TECHSELECT tell you how it derived the answer. Typing the Line # <Enter> shown at the left of a rule screen will also have the same effect.

- o Press ↑ or ↓ at any rule screen to see the previous or next rule, respectively.
- o Press J at any rule screen to view a specific rule number.
- o Press <Enter> at any rule screen to return to the question screen.

PART A: SAMPLE RULE SCREEN

RULE NUMBER: 1

IF:

- (1) The training will be offered only at scheduled times

THEN:

Consider synchronous delivery - Probability=10/100

NOTE: With synchronous delivery, trainer and trainee(s) must meet at specific times to communicate directly.

If line # for derivation, <K>-known data, <C>-choices, or -prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

PART B: SAMPLE RULE SCREEN

RULE NUMBER: 6

IF:

- (1) You have decided to use an(a) synchronous delivery approach for distributed training
- and (2) The training will be offered at home

THEN:

- Portable microcomputers with graphics capabilities - Probability=1
- and Modems and communications software - Probability=1

NOTE: This additional equipment is needed to provide computer-based training designed for home delivery. The portable computer could be checked out from an armory or training center.

IF line # for derivation, <K>-known data, <C>-choices, [↑]or _↓-prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

b. Press ? <Enter> at any question screen to receive an explanation of the answer choices (qualifiers) available for selection (see samples). Options at the bottom of a ? screen tell how to move around within the text and how to return to the associated question screen.

PART A: SAMPLE ? (CHOICE EXPLANATION) SCREEN

Training will be offered...

only at scheduled times: Specific times when trainer and trainee(s) must be present at the same time.

on demand: Individual trainees can receive the training at any time.

TO RETURN TO PROGRAM PRESS <SPACE>

PART B: SAMPLE ? (CHOICE EXPLANATION) SCREEN

armory/training center: home station

in the field: range or maneuver area

at home: personal residence

at school: Active Component, Reserve Forces, State schools; Regional Training Centers

TO RETURN TO PROGRAM PRESS <SPACE>

c. Press H <Enter> at any question screen to receive further

explanation of the WHY, ?, and QUIT options. Return to the question screen by pressing the <Space Bar>.

d. Once back to the initial question screen, enter the number value corresponding to your answer choice. You can enter more than one value provided each is separated by a space or comma. Press <Enter> to indicate that you have finished selecting your number values. This will also move you on to the next question screen.

e. Typing QUIT <Enter> at any question screen, will let you terminate the session with TECHSELECT, saving your inputs if desired (Note: Wait until later to try the QUIT option). The SAVE option is described in the text screens displayed when you press H <Enter> like you did in c above.

Continue describing your training requirements by choosing from among the answer choices provided on the next question screens. If you have second thoughts about your answers, don't worry because you can change them later.

After you have answered all the questions, a text screen will appear explaining how the results will be displayed on the next screen and reminding you of the option to change your answers. Press the <Space Bar> or any letter key to continue.

Recommendations

The next screen displays TECHSELECT's recommendations about delivery method (if you're in Part A) or equipment (if you are in Part B) and is referred to hereafter as the results screen.

Three kinds of recommendations are possible in Part A: .

- o Consider Asynchronous Delivery
- o Consider Synchronous Delivery
- o Consider Redefining Your Training Delivery Plans

Depending on the answers you have chosen, one or more of these recommendations will appear on the results screen (see samples).

PART A: SAMPLE RESULTS SCREEN

Values based on -100 to +100 system

	VALUE
--	-------

1	Consider asynchronous delivery	43
2	Consider synchronous delivery	28
3	Consider redefining your training delivery plans	20
4	Plan to offer training as close to home station (e.g., armory/training center) as possible	

All choices <A>, only is value>I <G>, Print <P>, Change and rerun (C), New sort type <S>, rules used <line#>, Quit/save <Q>, Help <H>, Done <D>:

PART B: SAMPLE RESULTS SCREEN
Values based on O/I system

	VALUE
1 Asynchronous delivery	1
2 Microcomputers with color graphics	1
3 Printers	1
4 Modems and communications software	1
5 Modems allow courseware to be distributed to multiple sites over commercial telephone lines and training data to be collected by central computer.	

All choices <A>, only if value>1 <G>, Print <P>, Change and rerun <C>, rules used <line #>, Quit/save <Q>, Help <H>, Done <D>:

Interpreting Recommendations

Part A. Recommendations in Part A are listed in rank order with numbers appearing in the VALUE column at the right of the screen reflecting relative weight, i.e., the greater the numerical difference separating recommendations, the more the higher-numbered recommendation is favored for your specific distributed training requirements (see Chapter 9 for further discussion of how to interpret recommendations).

The results screen will also frequently display additional comments relating to your recommendations, especially the recommendation "Consider redefining your training delivery plans" (see Chapter 10 for further discussion of these additional comments).

Part B. Recommendations in Part B reflect the equipment necessary to deliver the training given the requirements indicated by your answers. All items listed with a value of "1" are required. Recommendations are often accompanied by comments (see Chapter 10 for discussion of these comments).

a. Press H (without <Enter>) at the results screen to receive an explanation of the options listed at the bottom of the results screen. Note: The <A>, <G>, and <S> options do not apply to TECHSELECT, and should not be used.

b. If you type a line # depicted at the left of the screen, the rule or series of rules associated with the recommendation on that line will be displayed. Pressing <Enter> repeatedly will step you through each rule and return you to the results screen.

c. If you press D at the results screen, you will see:

"Run Again (Y/N) (Default=N):"

Pressing Y will take you to the beginning of TECHSELECT, while Pressing N or <Enter> will display information about motivational factors that influence the successful implementation of any new distributed training technology, along with a list of options on where to go next

within the program.

- o Press A <Enter> to restart Part A.
- o Press B <Enter> to go to Part B.
- o Press C <Enter> to exit TECHSELECT and return to the DOS,
e.g., A>, prompt.

PRINTING RESULTS

You can print your results in either of two ways:

1. Make sure that you are currently viewing the results screen and press <Print Screen>. The printout for this and any other screen will be a duplicate of what you see on your monitor.

2. Pressing P at the results screen will also give you a printout of the results, but in a different format than that displayed on your monitor. Pressing P first leads to the question:

"Do you wish to also print the data you input? (Y/N) (Default=Y):"

Press Y or <Enter> to print both your results and your answers (input) that generated them.

Press N to print the results alone.

CHANGE AND RERUN

You can change your answers (input) and rerun the program by doing the following:

1. At the results screen, press C
2. You will be asked:

"Do you wish to store the current results for comparison with the results you will be calculating? (Y/N) (Default=Y):"

Although either option is appropriate, pressing Y or <Enter> lets you see recommendation values for both old and new answers side by side on the same results screen. So, for now, press <Enter> to store the previous (old) results for comparison purposes.

3. The next screen lists your previous or old answers. Pressing the line # of the answer you wish to change, and then <Enter>, causes the associated question screen to reappear. Make your new selection, press <ENTER>, and a revised answer list will appear. This process can be repeated as often as you wish, but must be done one answer at a time, as described.

4. Pressing R tells TECHSELECT to reanalyze your answers and display the ending text screen followed by a new results screen when you press <ENTER>. Because you already told TECHSELECT to store previous results for comparison purposes, you will see the previous recommendations next to the new recommendations resulting from your revised answer(s). You can press C and start the reanalysis process over again as often as you wish.

EXITING

Exiting from Part A or B of TECHSELECT is the same.

1. Begin by pressing Q at the results screen or typing QUIT at any question screen.

2. In both cases, you will be given a chance to save your results (data) and will see:

"Input name of file to store data in or <Enter> to cancel
File to save data in:"

a. To save the data (results), type a filename (a maximum of 8 characters) accompanied by a disk drive identifier, e.g., A:filename, then <ENTER>. Make sure not to use names from the following list so that vital TECHSELECT program files are not destroyed.

TECHSELECT	TRATECH1	TRATECH2
STSCRN	EX1 - EX6	SCRN2
A	B	C
ACHOICE	BCHOICE	INST

Note: If you accidentally assign your data to any of these filenames, just make a fresh copy of TECHSELECT from the original diskette provided.

b. If you do not wish to save your data, press <Enter>.

c. The next screen will display:

"Exit Program? (Y/N) (Default=N):"

o Press Y.

d. The next screen provides information about motivational factors that should be considered before implementation of any kind of distributed training technology is attempted. To completely exit from TECHSELECT, press C <Enter>. This will terminate the session, clear the screen, and return you to the DOS prompt.

Note: You can also exit TECHSELECT by pressing D at the results screen (see Chapter 4). In this case, however, you will not be given an opportunity to save your data.

e. Use the DOS instruction manual to backup your saved data on another diskette.

USING TECHSELECT: SOME FINER POINTS

TECHSELECT's Initial Questions

In "Getting Started" (Chapter 3), you were asked to skip over the two initial questions asked by TECHSELECT before it displayed questions relating to your distributed training requirements.

The first question asks if you want instructions on running the program. Now that you have gone through TECHSELECT at least once, you might want to read these instructions. They should increase your understanding of TECHSELECT and its EXSYS shell.

The second question asks if you wish to see the rules as they are tested or used (see Appendix C for a list of these rules). If you answer "yes," rule screens will be interwoven among the questions screens. This will slow you down a bit, but it might also help you learn the process used by TECHSELECT to generate its recommendations. Remember that rules can always be viewed even when you answer "no" to this second question because the WHY option is always available at each question screen.

Preparing Your Answers

As you have seen in "Getting Started" (Chapter 3), TECHSELECT asks you a series of questions about your distributed training requirements. Your can use either of two approaches in answering these questions. On the one hand, you may want to simply answer each question in a serial fashion as TECHSELECT presents it, review the recommendations, and revise your answers as desired. On the other hand, you may wish to prepare all your answers in advance. Appendix B contains a list of all questions asked by TECHSELECT in Parts A and B to make it easier for you to use this second approach if you wish.

MORE ABOUT INTERPRETING RECOMMENDATIONS

After analyzing your answers, TECHSELECT displays a results screen containing recommendations about delivery method (Part A) or equipment (Part B) along with comments pertaining to your answers.

Part A

Three recommendations are possible in Part A:

- o Consider asynchronous delivery
- o Consider synchronous delivery
- o Consider redefining your training delivery plans

Each has a value number located to the right. This number has a maximum value of 60 for TECHSELECT (although the results screen indicates +/-100) and is calculated by EXSYS from the cumulated individual probabilities (set by the author) associated with the rule(s) pertaining to the question(s)/ answer(s) from which the recommendation was derived (see Appendix D for question/rule mapping). Note that the individual probabilities listed on rule screens simply indicated that a particular answer favors a certain delivery method or type of equipment and should not be interpreted as true probabilities in the usual sense.

For example, a higher value number for an asynchronous delivery recommendation relative to a synchronous delivery recommendation means that a greater proportion of your answers was consistent with asynchronous delivery requirements than with synchronous delivery requirements. Thus, value numbers in Part A reflect the rank order of recommendations.

Depending on your answers, one or more recommendations will be displayed concurrently on the results screen. If you see either "Consider asynchronous delivery" or "Consider synchronous delivery" alone, then all your answers are consistent with one of these two distributed training delivery methods and the chances for effective delivery under the recommended method are good. If you see both of these recommendations displayed on the results screen, then the one with the higher value number is consistent with the majority of your answers. In addition, the larger the difference between the two value numbers, the stronger the recommendation is for the higher-valued delivery method.

Lastly, you may see the recommendation "Consider redefining your training delivery plans" along with an associated value number. This means your stated training requirements are to some degree inconsistent with one another in terms of supporting either an asynchronous or synchronous delivery approach. To achieve effective delivery, you should revise your answers to avoid this recommendation, or at least to reduce its associated value. Comments displayed under the recommendations on the results screen will help in this regard (see Chapter 10 for further discussion of these comments).

Part B

In Part B, the results screen displays a recommended equipment list for your specific requirements based on your answers regarding the characteristics of the intended training as well as input from Part A regarding the recommended delivery method. Each item with a value number of "1" is considered necessary to fulfill your particular distributed training requirements. Comments regarding the equipment are also provided on the results screen below the recommendations (see Chapter 10 for further discussion of these comments).

TECHSELECT's ADDITIONAL COMMENTS

Results screens will frequently provide one or more comments in addition to recommendations. Comments are listed below the recommendations and can be recognized by their lack of an associated number value.

Part A

Part A comments are generated by TECHSELECT in response to answers that contradict each other in terms of the training delivery method(s) recommended. You should reconsider your training requirements and revise the answers triggering these comments. By changing your answers and rerunning Part A, you can reduce the number of comments and automatically change the value number associated with the recommendation "Consider redefining your training delivery plans" when you rerun your analysis.

Although it is best to design your training so all comments are eliminated, this is not always possible. For example, it may not be advisable to synchronously deliver training over widely spread time zones because some trainees will invariably have their meal and rest times disrupted. TECHSELECT will comment on this problem if it is reflected in your answers. There may, however, be constraints that prevent avoidance of this requirement. It might be necessary, for example, to simulate realistic situations involving performance of tasks at night or at all times during waking hours. Alternatively, you may need a wide time zone spread to gain access to enough trainees so that equipment costs can be amortized within a reasonable amount of time. In either case, it would be appropriate to reflect upon TECHSELECT's advice, but not necessarily change your requirements in response.

Interpreting Comments. Each Part A comment, its rationale, and the method for triggering the answer leading to the comment are listed below.

1. Training at scheduled times AND on demand should not both be selected.

This comment means that your answers indicate plans to conduct training both at scheduled times and on demand. To do this, it is likely that two different kinds of training courses, and probably delivery methods, would have to be developed. On the one hand, training that can be taken on demand is usually dependent upon some sort of automated (e.g., computer-based) system capable of functioning without the physical presence of a trainer. Training at scheduled times, on the other hand, is usually conducted with a trainer physically present, especially if a synchronous delivery method is adopted. Training under these two sets of circumstances is often quite different and TECHSELECT will not be able to give the best advice under this situation. Because separate training courses would probably have to be developed for each schedule, you might want to choose only one at a time and examine TECHSELECT's recommendations for each.

If you wish to see TECHSELECT's recommendations when only one of these schedules is selected, press <C> at the results screen to first view your answers. To change your answer, select the statement:

"The training will be offered...."

by typing its line # as it appears on the screen. TECHSELECT will then ask you the question again. When you have revised your answer, press <R> to view the resulting changes. Notice that the value assigned to the recommendation "Consider redefining your training delivery plans" is reduced and that the value for one or both delivery method recommendations has increased.

2. Avoid scheduling training simultaneously across 3 or more time zones.

Your answers indicate that you plan to deliver training simultaneously, e.g., synchronously, to training sites that are geographically distributed over 3 or more time zones. Distributed training programs that have tried to do this in the past have fallen into disuse because they have disrupted meal times and/or rest periods for at least some of the trainees involved (Allen Corporation of America, 1986). Two alternatives would be to either reduce the distance over which training will be delivered or consider multiple, or tape-delayed, broadcasts.

To reduce the value of the recommendation "Consider redefining your training delivery plans" and eliminate this comment, use the <C> option at the results screen to change the statements:

"The training will be offered..."
and

"The training will be offered only at scheduled times..."

3. Plan to offer training as close to home station (e.g., armory/training center) as possible.

A major problem associated with training in the Reserve Component is the cost in resources required to bring trainees to the training site (Smith & Hagman, 1986). Time, in particular, is a scarce commodity, and thus, even a 1-way, 2-hour trip to the training site should be avoided if possible. It might be better to consider bringing the training to the trainee, rather than vice versa, in an effort to derive maximum performance benefits from the training time available.

To reduce the value of the recommendation "Consider redefining your training delivery plans" and eliminate the above comment, use the <C> option at the results screen to change the statement:

"Travel time to the training site will be..."

4. Planning for efficient training is difficult when the number of trainees per training site varies widely.

Your answers indicate that training will be delivered to both small (less than 10 members) and large (more than 10 members) trainee groups

located across multiple training sites. In general, difficulties arise when a single delivery method is applied under both situations. For small groups, computer-based training might be the most cost-effective method because it would not be necessary to have a large number of computer workstations at each training site. Furthermore, in some cases it might even be possible to train more than one trainee at a time per workstation (Schlecter, 1986, in press), thereby increasing functional group size without adding hardware costs.

With large groups, one might consider synchronously delivering training via satellite or land-based microwave transmission. Synchronous delivery, however, becomes expensive in terms of dollars spent per trainee per hour when few trainees are involved per site.

Thus, to cover the possibility of having to train both small and large groups, two training delivery methods might have to be developed; one suited for use with small groups (e.g., computer-based), another suited for use with large groups (e.g., telecommunications-based). The costs for this dual development might be prohibitively expensive.

To reduce the value of the recommendation "Consider redefining your training delivery plans" and eliminate the above comment, use <C> at the results screen and change your answers to the statement:

"The training will be delivered to..."

5. Without a sufficient number of trainees per site, training only at scheduled times is often very expensive.

This comment is related to the previous one. Your answers indicate that training would be delivered at scheduled times and to a relatively small group, i.e., less than 10 members, of trainees at each training site. It is difficult to provide cost-effective training to small groups of trainees at only scheduled times using synchronous delivery.

To reduce the value of the recommendation "Consider redefining your training delivery plans" and eliminate the above comment, use the <C> option at the results screen to change the statements:

"The training will be offered..."

and

"The training will be delivered to..."

6. It would be difficult to provide frequent corrective feedback in a distributed training environment without at least some degree of automation.

Your answers indicate the requirement for nonautomated delivery along with frequent corrective feedback. Without some sort of computer assistance, the trainer might become overburdened if required to provide frequent feedback. For example, he or she would have to provide frequent feedback as well as fulfill all other course-related requirements, e.g., actual delivery of material, performance assessment, record keeping, etc. Given these other requirements, it seems likely that the amount of feedback

provided by the trainer during training might be less frequent than that required by trainees for effective learning. This would especially be true for synchronous delivery methods (see Appendix A) which typically rely on a minimum amount of automation to assist the trainer with course management and administrative responsibilities.

To reduce the value of the recommendation "Consider redefining your training delivery plans" and eliminate the above comment, use the <C> option at the results screen and change the statements:

"Training (including feedback, evaluation, and sequencing of materials).."

and

"Feedback during training will be given..."

7. Providing feedback on individual trainee performance would be difficult without automated assistance.

Your answers indicate that training will not be automated, but that individual feedback will be required. Because of the lack of automated (computer) assistance, training will most likely be delivered via some sort of synchronous method and involve large groups of trainees (more than 10 trainees per group) at each training site. It would be difficult for a trainer to provide feedback specific to the needs of individual trainees under this kind of situation because of the time and associated communications expenses that would be involved. Automated assistance to support an asynchronous delivery method would seem to be a more effective means of providing the required individualized feedback.

To reduce the value of the recommendation "Consider redefining your training delivery plans" and eliminate the above comment, use the <C> option at the results screen and change the statements:

"Training (including feedback, evaluation, and sequencing..."

and

"Corrective feedback will be given"

8. Adjusting the sequence of training to suit individual trainee needs would be difficult without automated assistance.

Your answers indicate that training will not be automated, but that it will be sequenced to adjust to individual trainee needs. Adjusting the presentation sequence of training materials is almost impossible under synchronous methods because training is normally delivered to groups of trainees simultaneously. Thus, sequence is usually determined beforehand by the trainer and not modifiable to any great extent by individual trainee needs. The presentation sequence of materials can be adjusted better to meet individual trainee needs under an asynchronous, computer-based delivery method.

To reduce the value of the recommendation "Consider redefining your training delivery plans" and eliminate the above comment, use the <C> option at the results screen and change the statements:

"Training (including feedback, evaluation, and sequencing..."
and

"The training sequence will be..."

9. It would be difficult to have different aspects of training under individual trainee control without some sort of automated assistance.

Your answers indicate that training will not be automated, but paced to meet individual trainee needs. The same comments made above regarding feedback frequency (see Comment 6), individualization of feedback (see Comment 7), and sequencing (see Comment 8), also pertain to pacing. Without automated support and asynchronous delivery, adjusting the pace of training to meet individual trainee needs is difficult.

To reduce the value of the recommendation "Consider redefining your training delivery plans" and eliminate the above comment, use the <C> option at the results screen and change the statements:

"Training (including feedback, evaluation, and sequencing..."
and

"The pace at which training material is delivered will be controlled by the"

Part B

While comments in Part A point out inconsistencies among planned training requirements, comments in Part B merely attempt to provide additional rationale. Except for Comment 7, comments in Part B are not designed to elicit a change in your previous input (answers).

Interpreting Comments. Each Part B comment and its rationale are listed below.

1. The collection and management of trainee performance data are best accomplished through networking of microcomputers used for computer-based training.

Networking allows the sharing of software and performance data with a central storage device usually resident within a host computer. The advantages of networking are easy access to large amounts of software/courseware (more than could be stored at an individual microcomputer workstation), and efficient management of training performance data (Kearsley, 1985). Of course, additional equipment would be required to support networking (see Appendix A).

2. Access to a mainframe computer is usually needed to support asynchronous computer conferencing.

Asynchronous computer conferencing is a technique that enables trainees to communicate with a trainer (and one another) at different times, i.e., asynchronously, and from different locations via computer over existing telephone networks. The concept is similar to an elaborate electronic mail system whereby participants enter their communications on

computers or terminals that are connected to a host or central computer. The host computer, usually, but not necessarily (Babcock, 1985), a mainframe or mini-computer, is needed for purposes of storing and retrieving the typical high volume of messages, organizing messages into topical areas for ease of use, delivering tests, and managing performance evaluation.

3. Equipment must be conditioned for field service.

Equipment used for distributed training is usually not intended for field use and must, therefore, be specially designed to ensure reliable operation in the field environment.

4. The authoring system should be flexible enough to design training that is responsive to a range of input.

The authoring process involves the creation, programming, debugging, and testing of courseware. The process can be done through the use of general programming languages (e.g., BASIC), system-specific authoring languages (e.g., TUTOR designed for PLATO), system-independent authoring languages (e.g., PILOT), and finally, authoring systems (e.g., PLM) that go beyond the capabilities of the above. At a minimum, authoring systems provide a high-level interface for the creation and editing of content. Such interfaces usually perform error checking on all input so that relatively little debugging is needed when the authoring session is complete. They also allow for the wide selection of response alternatives and the selection or specification of particular training strategies (i.e., drill and practice, tutorials, etc.). In addition, they make the development and integration of multi-media materials (e.g., video, slide/tape) easier while including features for storing and retrieving trainee performance records. Because you have indicated that trainee responses can be varied and still be acceptable, and for other reasons related to flexibility, the use of an authoring system is preferred over that of general-purpose or authoring languages (Kearsley, 1983).

5. Portable computers could be checked out from the trainee's armory or reserve center for use at home.

This comment is offered as a possible way of providing trainees with computers for use in their homes. This would also require the use of portable or laptop computers with modems and "800" numbers for network communication.

6. Modems allow software/courseware to be distributed to distributed sites over commercial telephone lines and training data to be collected by central computer.

Modems (modulation/demodulation devices) are essential equipment when training requires the establishment of a computer network to link distributed training sites. Modems support the transmission of audible tones through standard, commercial telephone lines, and vary in terms of the rate at which they transmit this information. Transmission rate is measured in binary signals or bits per second, called the BAUD rate (Shenton & Landsbug, 1981). At least a 1200 BAUD modem is recommended for

most training applications to ensure ease of use and minimum on-line communications costs.

7. Because the goal is to distribute the training, consider redefining your training delivery plans in order to make training available at locations convenient to the trainee.

This comment is designed to remind you that distributed training benefits should increase as training is made more and more convenient for the trainee to attend.

This is the only comment in Part B that is intended to elicit change in your input (answers). If your plans allow, offer the training in a form that can be delivered effectively to distributed sites.

To eliminate the above comment, use the <C> option at the results screen and change the statement:

"The training will be offered"

REFERENCES

- Allen Corporation of America. (1986). Final Report: Evaluation of the Army School of the Air (Contract No. OPM-41-83). Washington, DC: Office of Personnel Management.
- Babcock, C. (1985, October). Remote mirrors connect for electronic meetings. Computerworld, pp. 231-236.
- Brewer, B. (1987, April). Ready when you are, CD-I. PC World, pp. 252-255.
- Cross, T. B. (1982). Computer teleconferencing-virtual networking. Proceedings of the Computer Networking Symposium, pp. 3-7. (IEEE Service Center, Catalog No. 82CH1811-9)
- Dean, J. W. (1986). The long-term effects of distance education. Vocational Education Journal, 61(6), 28-30.
- EXSYS Inc. (1985). EXSYS expert system development package. Albuquerque, New Mexico.
- Fowler, G. P., & Wackerbarth, M. E. (1980). Audio teleconferencing versus face-to-face conferencing: A synthesis of the literature. Western Journal of Speech Communication, 44, 236-252.
- Harmon, P. (1985). Expert systems. New York: John Wiley and Sons.
- Johnston, J. (1985). Computers and the schools: The next decade. Washington, DC: The National Institute of Education.
- Kearsley, G. (1983). Computer-based training: A guide to selection and implementation. Reading, Massachusetts: Addison-Wesley.
- Kearsley, G. (1985). Training for tomorrow: Distributed learning through computer and communications technology. Reading, Massachusetts: Addison-Wesley.
- Parker, L. H. (1983). Teleconferencing in education. ERIC Digest, pp. 2-3. (ED 254 214)
- Shlechter, T. M. (1986). Grouped versus individualized computer-based instruction (CBI) training for military communications (Research Report T438). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A182 171)
- Shlechter, T. M. (in preparation). Effects of group computer-based instruction upon soldiers' retention and ability levels. (Research Report). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Shenton, K. E., & Landsbug, M. K. (January, 1981). Conference searching at 1200 baud. Online, pp. 42-43.

Smith, G. W., & Hagman, J. D., (1986). The Reserve Component Training Technology Field Activity-Boise Idaho. Proceedings of the 8th Interservice/Industry Training Systems Conference (pp. 245-249). Salt Lake City, Utah.

APPENDIX A

CANDIDATE DISTRIBUTED TRAINING TECHNOLOGIES

Various technologies are available for delivering training to distributed locations. The following provides a description of those typically used to support synchronous and asynchronous delivery.

SYNCHRONOUS VS ASYNCHRONOUS DELIVERY

The first question to be answered when considering the use of distributed training technologies is whether trainer and trainee(s) must be present during training to ensure success. Synchronous delivery requires that both trainer and trainee physically meet at the same time to communicate (i.e., to "extend" the classroom) while asynchronous delivery does not. In most distributed training situations, a decision about whether delivery will be synchronous or asynchronous is fundamental to determining the cost of supporting technologies.

In general, to deliver training synchronously one must rely heavily on communications technologies to support the long-distance concurrent interactions that typically take place between trainer (i.e., at the origination site) and trainee (i.e., at the reception site). To deliver training asynchronously, in contrast, communications technologies may or may not be necessary, but usually computer-based (Kearsley, 1983) or "intelligent" technologies are required to make pedagogical decisions (i.e., instructional decisions traditionally made by the trainer). Figure 1 lists the various technologies typically used for synchronous and asynchronous delivery. Each is described below.

<u>Technologies</u>	
<u>Synchronous</u>	<u>Asynchronous</u>
Audio Conferencing	Stand-alone CBT
Augmented Audio Conferencing	Portable
Video Conferencing	Interactive Videodisc
	Networked CBT
	Time-Sharing Systems Distributed Systems
	Computer Conferencing

Figure 1. Candidate distributed training technologies.

Synchronous Technologies

In general, synchronous technologies involve group- rather than individual-paced learning and rely heavily on communications technology.

Audio Conferencing. With audio conferencing, two or more remote sites are linked together by telephone. This allows a person at one site to be heard by those at others. Any verbal interaction or sound, subject to the

limitations of telephonic transmission, can be delivered with this technology. Thus, training that involves lecture, discussion, question and answer sessions, and so forth, can be conducted via audio conferencing provided no visual information is required [see Fowler & Wackerbarth (1980) for more on the pro's and con's of audio conferencing].

Audio conferencing equipment is relatively common and inexpensive. If only one trainee per site is to be trained, a standard telephone at each location would suffice. If there is more than one trainee per site, then a speaker phone with microphone is required so that all trainees can participate. The multiple connection of several telephone lines is made possible by a "bridging" device located at one of the sites or at the main switching computer of the telephone company. The bridge answers calls from each distributed site, connects them, and maintains the connection until the individual calls are terminated (Kearsley, 1985).

Augmented Audio Conferencing. Perhaps the most serious shortcoming of audio conferencing is its lack of visual capabilities. This limitation, however, can be overcome by augmentations in the form of visual adjuncts such as pictures, slides, movies, books, videotapes, etc., sent to the delivery sites in advance of the conference. More sophisticated forms of visual augmentation use computers to exchange line drawings or graphics, much like the way in which a trainer might use a blackboard. Naturally, the kind of visual augmentation to be used determines the delivery requirements. Static form visual adjuncts sent in advance via mail or facsimile machine are less powerful because trainer and trainee are still limited to audio interaction (Parker, 1983). In contrast, dynamic, computer-supported video technology allows visual as well as audio interactions.

Static forms of augmentation merely require the equipment to produce these visuals and the ability to send them in advance of each training session. Dynamic forms require a computer and modem at each site. To support computer graphics capabilities, an input device (e.g., mouse, light pen), as well as software to coordinate data transfers are also required.

Video Conferencing. This technology allows both unidirectional (i.e., from origination to reception site) and more costly bidirectional transmission (Cross, 1982) of high-fidelity, video information ranging from freeze-frame to full-motion video. Full-motion video is capable of concurrent audio transmission, whereas less than full-motion technologies enable two-way video but no audio transmission because the specialized equipment designed for less than full-motion video transmission does not carry both audio and visual information concurrently. If sound is required, then audio conferencing must be used in conjunction with less than full-motion video conferencing.

Freeze-frame video transmission requires special equipment at both the origination and reception sites. This equipment codes video camera output at the origination site into signals appropriate for transmission over commercial telephone lines, and then decodes these signals at the reception site. As an alternative, freeze-frame video equipment can be replaced by a microcomputer with video digitizer that will do about the same job.

Full-motion video is usually transmitted via television or microwave broadcast antenna. The signal is directly beamed or beamed up to satellite and back down again to the reception site. At this site, an antenna or dish with receive circuitry is required to generate a signal which is fed to a television set or monitor being viewed by the trainee. Full-motion video has the advantage of the highest quality visual transmission in real time, but suffers from the high costs and limitations in linking multiple sites (Parker, 1983). Freeze-frame video involves less cost, but requires more time for picture transmission (about 30-60 seconds per frame) than that required for full-motion video (Kearsley, 1985).

Asynchronous Technologies

Unlike synchronous delivery, asynchronous delivery does not require trainer and trainee to interact concurrently. In most settings, the technologies used for asynchronous delivery are computer-based and substitute for the trainer. Thus, equipment configurations supporting an asynchronous delivery function are typically classified as "intelligent" systems.

Stand-Alone CBT. With stand-alone CBT, an individual trainee interacts with a microcomputer workstation. The workstation is not connected to other workstations or to a central computer. Software for training (i.e., courseware) and performance data management is stored in magnetic form on either floppy or hard disk.

The basic equipment necessary for stand-alone CBT consists of a standard microcomputer system (i.e., microcomputer, monitor, and printer) capable of processing, displaying, and printing textual and numerical information. Depending on additional requirements, the system might also include peripheral hardware accessories and accompanying software to support the processing of both acoustical (e.g., speech) and graphic information, with the latter received through an input device such as a mouse, lightpen, or touch screen. Stand-alone systems, therefore, provide flexibility because each workstation can be equipped with the specific features or capabilities needed for a particular application.

Two common variations of stand-alone CBT are:

1. Portable CBT. The main feature of this variation is that the microcomputer is portable, and therefore, can be used at a variety of locations. Typically the peripheral devices are held to a minimum to increase the portability of the equipment package. The monitor is usually built in, while a printer and extra disk drives are either built in, attached peripherally, or omitted altogether.

2. Interactive Videodisc-Based CBT. Although interactive videodisc is just peripheral equipment added to basic stand-alone CBT, its substantial capabilities deserve special mention. With interactive videodisc technology, high-fidelity video images or motion sequences can be displayed and then augmented by superimposed computer text and graphics, thereby increasing the realism of the CBT environment.

Equipment requirements include a videodisc controller interface for

the computer and a videodisc player with an interface of its own. About an hour of continuous video or 50,000 single frame pictures can be stored in analog or digital form on one 12-in videodisc. Currently, the cost of developing and producing a videodisc ranges from \$35,000 to \$100,000 per hour of instruction (Johnston, 1985).

Two soon to be realized alternatives to the standard 12-in videodisc is the 5.25-in Compact Disc-Read Only Memory (CD-ROM) and the Compact Disc-Interactive (CD-I). Besides being smaller in size than the standard videodisc, both CD-ROM and CD-I can store larger quantities of information, e.g., whole encyclopedias on a single disk, in digitized format which, in turn, can be read by a CD player similar to that used for playing stereo music. While both kinds of discs have tremendous storage capabilities, CD-I will have a greater range of training applications because of its ability to display video stills and animated graphics (Brewer, 1987).

Networked CBT. This variation can occur wherever individual workstations are linked with each other and/or a central mainframe or mini-computer to form a network.

Basically two forms of networked CBT exist.

1. Time-Sharing Systems. Historically, CBT systems have been based on time-sharing configurations involving large central mainframe computers and "nonintelligent" terminals that share the processing, offline storage (i.e., disk drives), and input/output peripherals (e.g., printers) possessed by the mainframe. Sharing takes place via a communications network that may require remote transmissions over long distances (e.g., via telephone lines) or local transmissions using coaxial or fiber optic cables (Dean, 1986).

Because of the presence of a mainframe computer, and its powerful processing and storage capabilities, relatively simple and inexpensive terminals (i.e., "nonintelligent" terminals) can be used to perform highly sophisticated tasks and can be added to the system at a relatively low per-terminal cost. Of course, more equipment is also required by a time-sharing system than by a stand-alone system. Additional equipment includes a mainframe or mini-computer for storage and information processing, communications interfaces for the terminals, and cables or telephone lines to connect terminals with the central computer.

Aside from the attractive features of time-sharing systems, they have limitations related to saturation and reliability that do not apply to stand-alone systems. Saturation occurs when too many terminals are in use simultaneously, thereby degrading system performance in terms of unacceptable response delays. Reliability can also be a problem, because when the mainframe fails for any reason the entire terminal network it supports is affected (Kearsley, 1983).

2. Distributed Systems. The distributed CBT system represents a marriage of time-sharing and stand-alone capabilities. With a distributed system, microcomputer workstations are networked together as well as to a central mainframe or mini-computer. Because individual workstations contain their own microcomputer, they can function in a stand-alone mode as

well as share the processing or storage capabilities of other workstations or the central computer. Unlike time-sharing systems, the failure of one workstation or the mainframe does not prevent the functioning of the other workstations in the network.

The equipment required for distributed systems is similar to that required for time-sharing systems except that the former requires more expensive workstations, i.e., microcomputers rather than "nonintelligent" terminals. The extra cost, however, provides the flexibility that is sometimes needed.

Asynchronous Computer Conferencing. Asynchronous computer conferencing is unlike the other asynchronous technologies in that it enables trainees to communicate with a human trainer, and one another, at different times and from different locations via computer and existing telephone networks. The concept is similar to an elaborate electronic mail system whereby participants enter their communications on computers that are connected by telephone to a host or central computer which stores, retrieves, and organizes the messages.

The system is set up such that each participant can access communications sent by all other participants of the network, thereby simulating actual real-time or delayed discussion. Asynchronous computer conferencing, therefore, provides a mechanism for establishing a simulated, long-distance, electronic classroom wherein the trainer can conduct discussion, assign and correct homework, answer questions, give tests, and provide the feedback necessary for effective learning. Trainees participate at their own pace and at times and locations convenient to them. Unlike other computer-based delivery technologies mentioned above, asynchronous computer conferencing uses the computer primarily for communication and management purposes and leaves pedagogical decision making in the hands of the trainer.

In addition to the need for a central computer with a sufficient number of input ports, modems and software to manage message traffic, the trainer and each trainee must have their own microcomputer (portable or desktop), monitor, modem and software to effect connection with the main computer. The central computer can be located anywhere that a telephone connection can be established between it and the other computers.

APPENDIX B

PART A: QUESTIONS

QUESTION 1: The training will be offered

- 1 only at scheduled times.
- 2 on demand.

QUESTION 2: The training will be offered only at scheduled times

- 1 internationally.
- 2 across the continental U.S.
- 3 across 3 or more time zones.
- 4 within 1 or 2 times zones.

QUESTION 3: Travel time to the training site will be

- 1 less than 2 hours.
- 2 greater than 2 hours.
- 3 none.

QUESTION 4: The training will be delivered to

- 1 less than 10 trainees at a time per training site.
- 2 more than 10 trainees at a time per training site.

QUESTION 5: The pace at which training material is delivered will be controlled by

- 1 the individual trainee.
- 2 trainer or trainees as a group.

QUESTION 6: Feedback during training will be given

- 1 frequently.
- 2 infrequently.

QUESTION 7: Corrective feedback will be given

- 1 to individual trainees.
- 2 on a group basis.

QUESTION 8: The training sequence will be

- 1 flexible.
- 2 fixed.

QUESTION 9: Training (including feedback, evaluation, and sequencing of material) will

- 1 not be automated.
- 2 involve some degree of automation.

APPENDIX B

PART A: QUESTIONS

QUESTION 1: The training will be offered

- 1 only at scheduled times.
- 2 on demand.

QUESTION 2: The training will be offered only at scheduled times

- 1 internationally.
- 2 across the continental U.S.
- 3 across 3 or more time zones.
- 4 within 1 or 2 times zones.

QUESTION 3: Travel time to the training site will be

- 1 less than 2 hours.
- 2 greater than 2 hours.
- 3 none.

QUESTION 4: The training will be delivered to

- 1 less than 10 trainees at a time per training site.
- 2 more than 10 trainees at a time per training site.

QUESTION 5: The pace at which training material is delivered will be controlled by

- 1 the individual trainee.
- 2 trainer or trainees as a group.

QUESTION 6: Feedback during training will be given

- 1 frequently.
- 2 infrequently.

QUESTION 7: Corrective feedback will be given

- 1 to individual trainees.
- 2 on a group basis.

QUESTION 8: The training sequence will be

- 1 flexible.
- 2 fixed.

QUESTION 9: Training (including feedback, evaluation, and sequencing of material) will

- 1 not be automated.
- 2 involve some degree of automation.

QUESTION 7: If responses are constructed, what form will they take?

- 1 vocal
- 2 written word
- 3 graphic
- 4 motor

QUESTION 8: Trainee responses will

- 1 be narrowly defined
- 2 have allowable variations

QUESTIONS 9: Training delivery plans _____ discussion between trainee(s) and the trainer.

- 1 include
- 2 exclude

APPENDIX C

PART A: RULES

RULE: 1

IF: The training will be offered only at scheduled times.

THEN: Consider synchronous delivery - Probability=10/100

NOTE:
With synchronous delivery, trainer and trainee(s) must meet at specific times to communicate directly.

RULE: 2

IF: The training will be offered on demand.

THEN: Consider asynchronous delivery - Probability=10/100

NOTE:
Asynchronous delivery allows training to be conducted without the physical presence of the trainer, thereby, making "on demand" training possible.

RULE: 3

IF: The training will be offered only at scheduled times.
and The training will be offered on demand.

THEN: Training at scheduled times AND on demand should not both be selected.
and Consider redefining your training delivery plans -
Probability=10/100

NOTE:
Training under both delivery approaches would require up to twice the development costs, and thus, would not be cost effective.

RULE: 4

IF: The training will be offered only at scheduled times.
and The training will be offered only at scheduled times
internationally or across the continental U.S. or across 3 or more

time zones.

THEN:

Consider redefining your training delivery plans -Probability=10/100
and Avoid scheduling training simultaneously across 3 or more time zones.

NOTE:

Past efforts to schedule distributed training during normal meal and rest periods have met with only limited success.

RULE: 5

IF:

The training will be offered only at scheduled times.
and The training will be offered only at scheduled times within 1 or 2 time zones.

THEN:

Consider synchronous delivery - Probability=10/100

NOTE:

Past distributed training programs that have avoided conflicting with meal and rest periods by staying within one or two time zones or having multiple broadcasts have been those most successful.

RULE: 6

IF:

Travel time to the training site will be greater than 2 hours.

THEN:

Consider redefining your training delivery plans -Probability=10/100
and Plan to offer training as close to home station (e.g., armory/training center) as possible.

NOTE:

Travel time should be kept to a minimum so as to take full advantage of available training time and avoid related costs that do not directly contribute to training.

RULE: 7

IF:

The training will be delivered to less than 10 trainees at a time per training site.

THEN:

Consider asynchronous delivery - Probability=10/100

NOTE:

Asynchronous delivery tends to be more cost effective than synchronous

delivery when less than ten trainees are present at each training site.

RULE: 8

IF:

The training will be delivered to more than 10 trainees at a time per training site.

THEN:

Consider synchronous delivery - Probability=10/100

NOTE:

Synchronous delivery methods become increasingly cost effective as trainee group size increases beyond ten members.

RULE: 9

IF:

The training will be delivered to less than 10 trainees at a time per training site.

and The training will be delivered to more than 10 trainees at a time per training site.

THEN:

Consider redefining your training delivery plans -Probability=10/100
and Planning for efficient training is difficult when the number of trainees per training site varies widely.

NOTE:

Training delivery in both extremes might require different sets of hardware/courseware and thus, might prove costly.

RULE: 10

IF:

The training will be offered only at scheduled times.

and The training will be delivered to less than 10 trainees at a time per training site.

THEN:

Without a sufficient number of trainees per site, training only at scheduled times can be very expensive.

and Consider redefining your training delivery plans -
Probability=10/100

NOTE:

These two conditions suggest different training delivery approaches.

RULE: 11

IF:

The pace at which training material is delivered will be controlled by individual trainee.

THEN:

Consider asynchronous delivery - Probability=10/100

NOTE:

Training under asynchronous delivery is usually self-paced, whereas training under synchronous delivery is usually group-paced or trainer-paced (usually because of communication constraints.)

RULE: 12

IF:

The pace at which training material is delivered will be controlled by trainer or trainees as a group.

THEN:

Consider synchronous delivery - Probability=10/100

NOTE:

Under synchronous delivery approaches, training is usually provided simultaneously to groups of trainees, and thus, the pace of training is determined by the group or by the trainer (usually because of communication constraints.)

RULE: 13

IF:

Feedback during training will be given frequently.

THEN:

Consider asynchronous delivery - Probability=10/100

NOTE:

Asynchronous delivery approaches are designed to accommodate the needs of individual trainees, making it possible to give frequent, corrective feedback.

RULE: 14

IF:

Corrective feedback will be given to individual trainees.

THEN:

Consider asynchronous delivery - Probability=10/100

NOTE:

Asynchronous delivery approaches are better suited than synchronous delivery approaches for providing corrective feedback on an individual

trainee basis.

RULE: 15

IF:
Corrective feedback will be given on a group basis.

THEN:
Consider synchronous delivery - Probability=10/100

NOTE:
Synchronous delivery approaches are better suited than asynchronous delivery approaches for providing corrective feedback to trainees on a group basis.

RULE: 16

IF:
The training sequence will be inflexible.

THEN:
Consider asynchronous delivery - Probability=10/100

NOTE:
Asynchronous delivery approaches are capable of keeping track of individual trainee performance, and thus, can support changes in the sequence of training content based on the demonstrated competency of each trainee.

RULE: 17

IF:
The training sequence will be fixed.

THEN:
Consider synchronous delivery - Probability=10/100

NOTE:
Because synchronous delivery approaches are usually used to train groups of trainees, they tend to follow a content sequence suited for a group and predetermined by the trainer.

RULE: 18

IF:
Training (including feedback, evaluation, and sequencing of material) will not be automated.

THEN:
Consider synchronous delivery - Probability=10/100

NOTE:

With synchronous delivery approaches, all aspects of training can be performed by the trainer without automated assistance.

RULE: 19

IF:

Training (including feedback, evaluation, and sequencing of material) will be highly automated.

THEN:

Consider asynchronous delivery - Probability=10/100

NOTE:

With most asynchronous delivery approaches, training is usually computer based and highly automated.

RULE: 20

IF:

Training (including feedback, evaluation, and sequencing of material) will not be automated.

and The pace at which training material is delivered will be controlled by the individual trainee.

THEN:

Consider redefining your training delivery plans -Probability=10/100

and It would be difficult to have different aspects of training under individual trainee control without some sort of automated assistance.

RULE: 21

IF:

Training (including feedback, evaluation, and sequencing of material) will not be automated.

and Feedback during training will be given frequently.

THEN:

Consider redefining your training delivery plans -Probability=10/100

and It would be difficult to provide frequent corrective feedback in a distributed training environment without at least some degree of automation.

NOTE:

It would be difficult for a trainer to provide frequent corrective feedback while managing all other aspects of training.

RULE: 22

IF:

Training (including feedback, evaluation, and sequencing of material) will not be automated.

and Corrective feedback will be given to individual trainees.

THEN:

Consider redefining your training delivery plans -Probability=10/100
and Providing feedback on individual trainee performance would be difficult without automated assistance.

NOTE:

Individual trainee feedback is best provided when training is automated.

RULE: 23

IF:

Training (including feedback, evaluation, and sequencing of material) will not be automated.

and The training sequence will be flexible.

THEN:

Consider redefining your training delivery plans -Probability=10/100
and Adjusting the sequence of training to suit individual trainee needs would be difficult without automated assistance.

RULE: 24

IF:

The training strategy will include Drill & Practice or Tutorial or Simulation

THEN:

Consider asynchronous delivery - Probability=10/100

RULE: 25

IF:

The training strategy will include Lecture

THEN:

Consider synchronous delivery - Probability=10/100

PART B: RULES

RULE: 1

IF:

You have decided to use an(a) asynchronous delivery approach for distributing training.

THEN:

Asynchronous Delivery - Probability=1

ELSE:

Asynchronous Delivery - Probability=0

NOTE:

By establishing the delivery approach, TECHSELECT can now make recommendations about the equipment or hardware needed to carry out the training that you will be describing.

RULE: 2

IF:

You have decided to use an(a) synchronous delivery approach for distributing training.

THEN:

Synchronous Delivery - Probability=1
and Two-Way Audio Conferencing - Probability=1

ELSE:

Synchronous Delivery - Probability=0
and Two-Way Audio Conferencing - Probability=0

NOTE:

By establishing the delivery approach, TECHSELECT can now make conclusions about the equipment or hardware needed to carry out the training that you will be describing.

RULE: 3

IF:

You have decided to use an(a) synchronous delivery approach for distributing training.

THEN:

Portable microcomputers with graphics capabilities -Probability=0
and Computer-Based Training - Probability=0

NOTE:

Typically, neither computer-based training nor portable computers are needed with synchronous delivery.

RULE: 4

IF:

You have decided to use an(a) asynchronous delivery approach for

distributing training.
and Training delivery plans include discussion between trainee(s) and the trainer.

THEN:

Asynchronous Computer Conferencing - Probability=1
and Computer-Based Training - Probability=0

ELSE:

Asynchronous Computer Conferencing - Probability=0
and Computer-Based Training - Probability=1

NOTE:

Asynchronous computer conferencing (ACC) is a training technique that enables trainees to communicate with the trainer (and one another) at different times (i.e., asynchronously) and from different locations via computer over existing telephone networks. The concept is similar to an elaborate electronic mail system whereby participants enter their communications on computers that are connected to a host or central computer which stores and organizes the messages. The system is set up such that each participant can read communications sent by all members of the network, thereby simulating actual real-time or delayed discussion. ACC, therefore, provides a mechanism for establishing a simulated, long-distance, electronic classroom.

RULE: 5

IF:

Computer-Based Training = 1

THEN:

Microcomputers with color graphics - Probability=1
and Printers - Probability=1
and Modems and communications software - Probability=1
and Authoring system software - Probability=1
and The collection and management of trainee performance data are best accomplished through networking of microcomputers used for computer-based training.

NOTE:

This is the basic equipment needed for distributed computer-based training (CBT). Under CBT, the computer is used to deliver the training material, provide feedback, manage trainee progress, and administer, analyze, and score tests.

RULE: 6

IF:

Asynchronous Computer Conferencing = 1

THEN:

Portable microcomputers with graphics capabilities -Probability=1

- and Modems and communications software - Probability=1 and Printers - Probability=1
- and Access to a mainframe computer is usually needed to support asynchronous computer conferencing.

NOTE:

This is the basic equipment needed for asynchronous computer conferencing.

RULE: 7

IF:

- You have decided to use an(a) asynchronous delivery approach for distributing training.
- and The training will be offered at home

THEN:

- Portable microcomputers with graphics capabilities - Probability=1
- and Modems and communications software - Probability=1

NOTE:

This additional equipment is needed to provide computer-based training designed for home delivery. The portable computer could be checked out from an armory or training center.

RULE: 8

IF:

- You have decided to use an(a) asynchronous delivery approach for distributing training.
- and The training will be offered in the field

THEN:

Equipment must be conditioned for field service.

RULE: 9

IF:

- You have decided to use an(a) synchronous delivery approach for distributing training.
- and Synchronous delivery of training will be carried out across 3 or more time zones
- and During training, the trainee will be expected to respond to situations involving: appearances of real objects or diagrams or symbols or motion of objects

THEN:

Video Conferencing via satellite-based microwave transmission - Probability=1

NOTE:

Synchronous training involving the delivery of pictorial representations of

real objects and possibly their motion requires some kind of video capability. When video information is delivered over 3 or more time zones, satellite transmission is preferred over land-based transmission methods. If few trainees are involved however, land-based transmission may be more cost effective, especially if the transmission equipment is already in place.

RULE: 10

IF:

- You have decided to use an(a) synchronous delivery approach for distributing training.
- and Synchronous delivery of training will be carried out within 1 or 2 time zones
- and During training, the trainee will be expected to respond to situations involving: appearances of real objects or diagrams or symbols or motion of objects

THEN:

Video Conferencing via land-based microwave transmission -
Probability=1

NOTE:

Synchronous training involving the delivery of pictorial representations of real objects and possibly their motion requires some kind of video capability. If training will typically be delivered over 1 or 2 time zones, then land-based microwave transmission would be a good choice, especially if transmission equipment is already in place.

RULE: 11

IF:

- You have decided to use an(a) asynchronous delivery approach for distributing training.
- and During training, the trainee will be expected to respond to situations involving: appearances of real objects or motion of objects

THEN:

Video sources (videodisc, compact disk, videotape) -Probability=1

NOTE:

Asynchronous delivery, usually via computer-based training, has the capability to generate graphic representation of objects, but when pictures of real objects or objects in motion are necessary, additional video capabilities are needed. The peripherals indicated can add these capabilities.

RULE: 12

IF:

You have decided to use an(a) asynchronous delivery approach for distributing training.
and During training, the trainee will be expected to respond to situations involving: spoken words or sounds

THEN:

Audio output (digital to analog conversion board and speakers or earphones) - Probability=1

NOTE:

While most microcomputers and terminals have some sound generation capability, it is usually limited to various beeps. Any more than this in the way of sound generation requires additional equipment. This problem is overcome by adding digital to analog (DAC) boards to the computers.

RULE: 13

IF:

You have decided to use an(a) asynchronous delivery approach for distributing training.
and During training, the trainee will be expected to respond to situations involving: diagrams

THEN:

Microcomputers with color graphics - Probability=1

NOTE:

To display anything other than text, the computer or terminal must have graphics capabilities.

RULE: 14

IF:

During training, the trainee will be expected to respond to situations involving: manipulation of real objects

THEN:

Low-fidelity simulation - Probability=1

NOTE:

Special purpose or high-fidelity simulators are usually expensive. Less expensive, low-fidelity simulations that can be presented on a general purpose microcomputer should be considered before adopting the use of high-fidelity simulators.

RULE: 15

IF:

You have decided to use an(a) asynchronous delivery approach for distributing training.
and Trainee responses will be selective and If responses are selected,

then which condition applies? Selection between alternatives
constructed by the trainee
and If responses are constructed, what form will they take? Vocal

THEN:

Audio input (analog to digital conversion board and microphone) -
Probability=1

NOTE:

In order for a computer to interpret voice input, acoustical input devices
(analog to digital converters - ADCs) must be added.

RULE: 16

IF:

You have decided to use an(a) asynchronous delivery approach for
distributing training.
and Trainee responses will be selective and If responses are selected,
then which condition applies? Selection between alternatives
constructed by the trainee
and If responses are constructed, what form will they take? Graphic

THEN:

Graphic input devices (mouse, light pen, touch screen, or digitizing
board) - Probability=1

NOTE:

In order for the computer to interpret drawings or other kinds of graphic
input, it must have graphic input devices.

RULE: 17

IF:

You have decided to use an(a) asynchronous delivery approach for
distributing training.
and Trainee responses will be selective and If responses are selected,
then which condition applies? Selection between alternatives
constructed by the trainee
and If responses are constructed, what form will they take? Motor

THEN:

Specially developed transducer - Probability=1

NOTE:

In order for the computer to understand special kinds of motor inputs,
special transducers must be added.

RULE: 18

IF:

You have decided to use an(a) asynchronous delivery approach for

distributing training.
and Trainee responses will be constructed and If responses are constructed, what form will they take? Vocal

THEN:

Audio input (analog to digital conversion board and microphone) -
Probability=1

NOTE:

In order for a computer to interpret voice input, acoustical input devices (analog to digital converters - ADC) must be added.

RULE: 19

IF:

You have decided to use an(a) asynchronous delivery approach for distributing training.
and Trainee responses will be constructed and If responses are constructed, what form will they take? Graphic

THEN:

Graphic input devices (mouse, light pen, touch screen, or digitizing board) - Probability=1

NOTE:

In order for the computer to interpret drawings or other kinds of graphic input, it must have some sort of graphic input device.

RULE: 20

IF:

You have decided to use an(a) asynchronous delivery approach for distributing training.
and Trainee responses will be constructed and If responses are constructed, what form will they take? Motor

THEN:

Specially developed transducer - Probability=1

NOTE:

In order for the computer to understand special motor input, it must have specially developed transducers to assist it.

RULE: 21

IF:

You have decided to use an(a) asynchronous delivery approach for distributing training.
and Trainee responses will have allowable variations and Asynchronous Computer Conferencing <> 1

THEN:

The authoring system should be flexible enough to design training that is responsive to a range of input.

NOTE:

If the trainee will be responsible for producing responses that are context sensitive, then the training system must allow for this variation and be able to determine the correctness of the responses. An authoring system will facilitate the development of this capability.

RULE: 22

IF:

You have decided to use an(a) synchronous delivery approach for distributing training.

and If responses are constructed, what form will they take? Graphic

THEN:

Add two-way computer supported graphics to conferencing -
Probability=1

and Modems and communications software - Probability=1

NOTE:

Generally speaking, synchronous delivery methods do not involve two-way interaction with graphics or video. If this capability is needed, it is best to communicate via microcomputer over telephone lines which also support two-way vocal interactions.

RULE: 23

IF:

Portable microcomputers with graphics capabilities = 1

THEN:

Portable computers could be checked out from the trainee's armory or reserve center for use at home.

NOTE:

Because it cannot be assumed that all reserve component trainees already own microcomputers, provisions should be made for loaning this equipment out, possibly from an armory or training center.

RULE: 24

IF:

You have decided to use an(a) asynchronous delivery approach for distributing training.

and Modems and communications software = 1

THEN:

Modems allow courseware to be distributed to multiple sites over

commercial telephone lines and training data to be collected by central computer.

NOTE:

This helps make hardware more cost effective and generally facilitates training delivery and data management.

RULE: 25

IF:

The training will be offered at schools
and The training will be offered NOT at armory/reserve centers or in the field or at home

THEN:

Because the goal is to distribute the training, consider redefining your training delivery plans in order to make training available at locations convenient to the trainee.

APPENDIX D

PART A: QUESTION/RULE MAPPING

QUESTION 1: The training will be offered

- 1 only at scheduled times.
- 2 on demand.

Used in Rule(s): 1, 2, 3, 4, 10

QUESTION 2: The training will be offered only at scheduled times

- 1 internationally.
- 2 across the continental U.S.
- 3 across 3 or more time zones.
- 4 within 1 or 2 time zones.

Used in Rule(s): 4, 5

QUESTION 3: Travel time to the training site will be

- 1 less than 2 hours.
- 2 greater than 2 hours.
- 3 none.

Used in Rule(s): 6

QUESTION 4: The training will be delivered to

- 1 less than 10 trainees at a time per training site.
- 2 more than 10 trainees at a time per training site.

Used in Rule(s): 7, 8, 9, 10

QUESTION 5: The pace at which training material is delivered will be controlled by

- 1 individual trainee.
- 2 trainer or trainees as a group.

Used in Rule(s): 11, 12, 20

QUESTION 6: Feedback during training will be given

- 1 frequently.
- 2 infrequently.

Used in Rule(s): 13, 21

QUESTION 7: Corrective feedback will be given

- 1 to individual trainees.
- 2 on a group basis.

Used in Rule(s): 14, 15, 22

QUESTION 8: The training sequence will be

- 1 flexible.
- 2 fixed.

Used in Rule(s): 16, 17, 23

QUESTION 9: Training (including feedback, evaluation, and sequencing of material) will

- 1 not be automated.
- 2 involve some degree of automation.
- 3 be highly automated.

Used in Rule(s): 18, 19, 20, 21, 22, 23

QUESTION 10: The training strategy will include

- 1 Drill & Practice
- 2 Tutorial
- 3 Simulation
- 4 Problem Analysis
- 5 Lecture

Used in Rule(s): 24, 25

PART B: QUESTION/RULE MAPPING

QUESTION 1: You have decided to use an(a) _____ delivery approach for distributing training.

- 1 asynchronous
- 2 synchronous

Used in Rule(s): 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24

QUESTION 2: The training will be offered

- 1 at armory/reserve centers

- 2 in the field
- 3 at home
- 4 at schools

Used in Rule(s): 7, 8, 25

QUESTION 3: Synchronous delivery of training will be carried out

- 1 across 3 or more time zones
- 2 within 1 or 2 time zones

Used in Rule(s): 9, 10

QUESTION 4: During training, the trainee will be expected to respond to situations involving:

- 1 manipulation of real objects
- 2 appearances of real objects
- 3 diagrams
- 4 symbols
- 5 written words
- 6 spoken words
- 7 sounds
- 8 motion of objects

Used in Rule(s): 9, 10, 11, 12, 13, 14

QUESTION 5: Trainee responses will be

- 1 covert
- 2 selective
- 3 constructed
- 4 affective

Used in Rule(s): 15, 16, 17, 18, 19, 20

QUESTION 6: If responses are selected, then which condition applies?

- 1 Selection between provided alternatives
- 2 Selection between alternatives constructed by the trainee

Used in Rule(s): 15, 16, 17

QUESTION 7: If responses are constructed, what form will they take?

- 1 Vocal
- 2 Written word
- 3 Graphic
- 4 Motor

Used in Rule(s): 15, 16, 17, 18, 19, 20, 22

QUESTION 8: Trainee responses will

- 1 be narrowly defined
- 2 have allowable variations

Used in Rule(s): 21

QUESTION 9: Training delivery plans ____ discussion between trainee(s) and the trainer.

- 1 include
- 2 exclude

Used in Rule(s): 4