A METHODOLOGY FOR SELECTION OF TRAINING TO APPLY COMPUTER-BASED INSTRUCTION

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ABSTRACT

The purpose of this paper is to present a methodology for identification of training that computer-based instruction can be applied to in order to maximize training effectiveness. The process described is being developed as part of the Advanced Research Projects Agency SIMITAR (Simulation in Training for Advanced Readiness) initiative.

The project objective was to develop prototype individual and leader training approach for Forward Support Battalions of the Army National Guard. The scope of the problem included fifty two separate Military Occupational Specialties, as well as six different career fields for officers. The goal is to achieve 200-300% improvement in training effectiveness in the available time.

A "Lane Training" approach was used to isolate hard to train, high payoff, tasks to be developed using Computer-based Instruction. Lanes are developed using a top down analysis of missions, critical collective sub-tasks, as well as supporting leader and individual tasks. This pyramidal approach allows subject matter experts to filter critical tasks from the myriad of knowledges, skills, and abilities which seemingly carry the same level of importance.

Although this methodology is being applied to a military organization, the lane training approach can be applied to any entity. It effectively focuses organizational training objectives by breaking down priority organizational goals and the critical management and individual knowledges, skills, and abilities that are essential to organizational success.

The results of this project include: a methodology for focusing training priorities from the organizational mission to every leader/manager, and soldier/employee; a methodology for selecting high payoff tasks for CBI development; and a Training Management System to track individual and organizational status of training.

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INTRODUCTION

The Advanced Research Projects Agency's SIMITAR (Simulation in Training for Advanced Readiness) Program was initiated by Congressionally added funds in FY92 "... to apply advanced technology to the training of National Guard Roundout Brigades.", in response to training readiness challenges identified during the Desert Storm mobilization.

The SIMITAR program is a six year project involving two National Guard Roundout Brigades as experimental units and culminates in their mobilization and movement to the National Training Center for rotations using experimental technologies and training strategies.

The objective of SIMITAR is to achieve training readiness levels 200-300% higher than those observed in the mobilization for Desert Storm. This is to be accomplished through the development and extensive use of leading edge information technologies and radical new training strategies.

One element of the SIMITAR program is focused on the Combat Service Support training strategy. This effort is being accomplished at Camp Dodge, Johnston, Iowa, the Headquarters of the Iowa National Guard.

To highlight the training challenge facing the Combat Service Support Commander, the Divisional Forward Support Battalion (FSB) is used as an example. The FSB commander has 52 different military occupational specialties (MOS's). Each MOS represents several hundred skills that are applicable to each soldier. In addition, current trends indicate consolidation of related MOS's which will increase the total number of tasks for each soldier to master. Considering the fact that TRADOC Schools training only a small percentage of the total number of tasks, the training challenge faced by the CSS Commander is significant.

This paper outlines a methodology for identifying critical tasks that are of the highest priority for training and applies an objective method for selecting from those critical tasks ones to apply computer-based instruction (CBI) in order to maximize training effectiveness. Although applied to a military organization, this methodology could be adapted to any organization.

BACKGROUND

Current Environment

Most companies in today's environment are recognizing the need for increased skills training among employees. Workers are expected not only to do more but to have a better understanding of the Corporation and the critical cross-functional requirements. Likewise, in the military it is becoming more critical for soldiers to understand the responsibilities for, and the linkage between, the collective mission-essential tasks of the unit as a whole, and the individual tasks that support them.

The problem with task identification in today's environment is not lack of information or lack of training materials. In fact, the problem may be magnified by the mountain of training materials and general information available. There seems to be something wrong with the picture of a soldier preparing to deploy "down range" adorned with a Kevelar helmet, load-bearing equipment, individual weapon and two large brief cases bulging with essential reference manuals. However, it is a picture frequently seen. The fact is that the Army promises to increase the volume of information that any one soldier is responsible for as a result of consolidation of occupational specialties. Consolidation of work requirements is also a trend in the civilian sector. Access to virtual mountains of information is seemingly critical to job performance.

The key to effective organizational and individual training is to identify work elements that are truly critical to success. In other words, define the job. What's important? What can I get by without? We must filter out non-critical tasks in order to focus training resources on mission-essential tasks. In reality, the truly critical skills are generally discovered by the employee/soldier on the job. They learn what skills are essential by using a trail and error process. After a significant amount of "time in the trenches" the core critical functions are identified and learned. Even more significant is the fact that the lessons are learned all over again by each new employee or soldier, and by the same trial and error process. That is inefficient. It also runs the risk of having some employees or soldiers in critical positions without having been successful at the trial and error learning.

METHOD

Defining the Mission

The Army provides a series of reference documents that generally do an adequate job of defining unit missions, mission essential tasks, and subordinate collective tasks. Some Mission Training Plans (MTP's) also identify related soldier and leader tasks. The problem with MTP's is that they are too compartmental in their design. The result is that leaders and soldiers learn their own specific role but do not understand their relationship with other activities, sections, or units. Individual to collective matrices identify tasks for one echelon and do not address the critical linkages between echelons. Lessons learned at the National Training Center indicate that the execution of critical missions tends to break down at the coordination points, the linkages between echelons on the battlefield.

The problem of developing a compartmentalized view of the mission is being addressed in another SIMITAR element at the Army Research Institute, Presideo of Monterey, California. BDM Federal is developing a series of documents outlining Critical Combat Functions (CCF's). Critical Combat Functions are defined as "The integration of related players and tasks that represent a source of combat power. The synchronization of critical combat functions provides maneuver commanders at any echelon with a definable outcome that materially affects the battle." Each CCF document contains a flowchart depicting the relationships between echelons, key participants by task, a critical task list, and lessons learned at the Combat Training Centers, relevant to the specific CCF.

Defining the organization's primary missions is an important first step in prioritizing training. As mentioned above, the unit's Mission Training Plan is the source document for accomplishing this step in the Army. For each mission the Critical Combat Functions (CCF's) outline the relationship between key people and units at all echelons. Lane Training expands the view of a particular collective mission by including training focus on the actions required at connecting echelons.

What is Lane Training?

The term "lane training" is a bit confusing in that it suggests many different things to different people. Lane training originated in Infantry units in the Army. Typical Infantry training lanes required squads, platoons, or even companies to negotiate over a designated piece of terrain in order to accomplish their mission. They started in an assembly area, crossed a line of departure, navigated over a predetermined axis or route to an objective, thus the term lane training.

Today the lane training strategy is used by all types of Army units. When observed in other units the term lane training is a bit of a misnomer because in many cases the lane is one static location. For example, a lane for a Maintenance unit might be to repair a diesel power plant/pack. This lane requires a maintenance bay or field static location and all of the resources necessary to perform the tasks for the team participating in the training. The term lane doesn't seem to fit here but the lane training strategy works as well with this type of unit as it does with the Infantry unit.

The definition of lane training is a technique for training Company level and subordinate platoons and sections on a series of related leader and individual tasks that are critical to the successful execution of priority mission-essential tasks. Lanes are developed using a top down analysis of missions, critical collective sub-tasks, as well as supporting leader and individual tasks. This pyramidal approach allows subject matter experts to filter critical tasks from the myriad of knowledges, skills and abilities which seemingly

carry the same level of importance. Lanes also reinforce the critical linkages between echelons and provide the vehicle to train on the techniques and procedures that contribute to mission accomplishment at all levels.

Lane Development

Each mission-essential task for each company of the Forward Support Battalion are broken down into subordinate collective lanes. Each lane is then dissected to identify related leader and individual tasks. This process aligns tasks to missions, but individual and leader tasks need another filter applied to reduce further the total volume of tasks to be trained. The filter that was applied to reduce the total number of tasks for each lane was subjective; the criterion was to select only those tasks that if not performed adequately would impact adversely on the successful completion of the collective mission of the lane. This process provides leaders and soldiers with a realistic number of tasks to attain and maintain proficiency. In addition, it maintains focus on the commander's mission essential tasks to attain and maintain unit competencies.

The lane training approach applies a development structure to ensure that each completed activity will be of maximum usefulness even if time prevents further training. If there is time for just one more training activity, what should it be?

Implementation of Lane Training

The preferred method of training in the Army is hands-on. If training can be resourced, it should be conducted on the actual equipment and as close to the same conditions as would be expected in combat as possible. Many units find it very difficult to resource hands-on lanes on a regular basis during Inactive-duty training at their local armories. Most units can resource lanes during their annual training cycle but training on critical collective tasks once a year is not adequate to develop or sustain task proficiency.

What generally happens in units when critical tasks cannot be trained due to a resource constraint is to schedule training on other, easier to resource, tasks. The problem that this creates is not evident at first glance because effective training may be occurring. However, valuable training time is being spent on lower priority tasks at the expense of training on more critical tasks that support priority lanes.

It is this problem that our project is addressing by applying computer-based training technology. By developing CBI for tasks that are difficult to train due to some resource constraint, commanders and managers can ensure that training time is spent on high priority skill development.

Selection of Tasks for CBI Development

An objective approach was developed to consider tasks for application of computer-based instruction. Many studies have been done on media selection for training development and basically all of them indicate that no one media is the total answer to training needs. The assumption applied to this project was that if hands-on training was difficult for the unit to conduct at the Armory then computer-based technology would be applied to provide a method to train on the task. It was also assumed that computer-based instruction would not replace hands-on training but would prepare soldiers and leaders by providing preparatory training on critical tasks so that when hands-on training could be conducted, soldiers would progress much faster to achieve proficiency. The hands-on training opportunity would be a validation of the effectiveness of computer-based instruction. This phase of the project has yet to be measured. However, a plan is being developed to capture this data for analysis.

Quality computer-based instruction is not cheap to produce. In order to get the most for the budget, a quantitative approach was used to select tasks for CBI development. Decision matrices were formulated to apply a numerical value to all of the priority individual and leader tasks that were critical to each lane. Figure 1 illustrates the decision criteria or states of nature that were applied in the decision matrix for evaluation. These criteria are a combination of the general advantages of computer-based instruction which could be applicable to any training material and specific conditions that are present in the military to inhibit hands-on training. Table 1 is a sample of how the decision matrices were laid out.

The decision matrices also provide for the application of weights to the criteria. In our situation it was decided that the most important

aspect to consider was whether the tasks were difficult to train in the armory environment. A weight of 2 was applied to this criteria. All other criteria were given a weight of 1. This same objective approach could be used by any organization to determine tasks for CBI development. The specific criteria could be modified as well as the relative importance of each criterion.

By applying a quantitative method, a priority list is produced. This allows for CBI development to progress based on availability of funds in a training priority sequence.

RESULTS

The initial SIMITAR objective was to develop prototype individual and leader training for Forward Support Battalions of the National Guard. The scope of the problem included addressing 52 Military Occupational Specialties with literally hundreds of required knowledges, skills, and abilities each. The overall goal of the project is to achieve 200-300% improvement in training effectiveness in the time available.

A lane training strategy has been used to prioritize tasks for training. This is accomplished by dissecting organizational goals and objectives and reducing them down to the core level individual and leader tasks that are critical to mission accomplishment. The key to the lane training strategy is attaining individual and collective proficiency on critical tasks first. Although this seems logical and straightforward, very few organizations achieve and maintain this level of training focus. One problem is that some tasks critical to the lanes are difficult or impossible to train at the Armory due to some resource constraint.

The application of computer-based instruction - applying an objective measurement to determine the highest payoff tasks - has been an effective and efficient use of development resources.

DISCUSSION

The goal of developing a methodology for selection of training to apply computer-based instruction produced two separate procedures to accomplish the objective.

The first step was to determine a method for prioritization of tasks for training. Lane training, although not invented here, seemed to be the best training strategy for isolating the highest payoff individual and leader tasks for the target units in the Forward Support Battalions.

Once the priority individual and leader tasks for the unit were identified, the second step applied an objective method of selecting the tasks for CBI development. This procedure produces a prioritized list of high payoff tasks for CBI development.

Although the results of the procedures outlined here have not yet been validated, the initial reactions from customers are very positive. It certainly is better than a haphazard approach to the application of development resources to computer-based instruction.

CONCLUSIONS

Multi-media hardware and software developers are making great strides in improving the development tools. Although quality computer-based instruction requires significant development time, efficient production of CBI is improving on a daily basis. The power of interactive computer-based instruction makes it a highly potential area for meeting training needs. It is imperative that development resources are utilized in an effective and efficient manner. This project presents an approach to this process.

ACKNOWLEDGMENTS

The author would like to thank Dr. William A. Deterline for his professional assistance in the preparation of this paper.

Figure 1
DECISION CRITERIA FOR CBI DEVELOPMENT
(States of Nature)

SPECIFIC CRITERIA

- **COMPLEXITY OF TASK** - Difficulty of training the task due to the technical skill required.
- **LOW DENSITY CRITICAL TASK** - Tasks that are critical to the mission of the unit but involve only a few individuals.
- **EQUIPMENT SHORTAGE** - Lack of equipment on which to train.
- **SUPPORT EQUIPMENT** - *Lack of special tools or test equipment to conduct training.*
- **FACILITIES** - Insufficient or inadequate facilities or training areas.
- **LACK OF TRAINERS** - Qualified trainers are not available.
- **TIME INTENSIVE** - An extensive amount of time is required to set up and conduct training.
- **SAFETY** - Students can learn potentially dangerous tasks without risk.

GENERAL CRITERIA

- **REDUCED LEARNING TIME** - Studies indicate that interactive learning is as much as 50% more efficient than traditional training techniques.
- **REDUCED COST** - By comparison with CBI, hands-on lane training is very resource intensive.
- **INSTRUCTIONAL CONSISTENCY** - Hands -on training conducted by each first line supervisor can be inconsistent in quality and accuracy.
- **PRIVACY** - Peer pressure can adversely effect learning. Each student can work on a task until mastery without fear of being criticized by peers.
- **MASTERY OF LEARNING** - A structured program of instruction provides a map for logical learning.
- **INCREASED RETENTION** - Interaction between the student and CBI provides increased retention over time.
- **INCREASED MOTIVATION** - Interactive learning has proven to be very motivational for the student.
- **INCREASED ACCESS** - Quality training can be available to the student at the time and place convenient to each student.

TABLE 1

DECISION MATRIX FOR SELECTION OF CBI TASKS

UNIT: LANE: TASK:	COMPLEXITY OF TASK	LOW DENSITY CRITICAL TASK	EQUIPMENT SHORTAGE	SUPPORT EQUIPMENT	FACILITIES	LACK OF TRAINER	TIME INTENSIVE	REDUCED COST	REDUCED LEARNING TIME	TRAINING INCONSISTENCY	PRIVACY	MASTERY OF LEARNING	INCREASED RETENTION	INCREASED SAFETY	INCREASED MOTIVATION	INCREASED ACCESS	
WEIGHT	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	WEIGHTED VALUE
TASK																	