CONTRACTOR DEVELOPED TRAINING PACKAGES

ARE THEY ADEQUATE?

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ABSTRACT

Currently, the Department of Defense is procuring the most sophisticated weapons systems in the history of this country. Unfortunately, this is resulting in a rather serious problem in that current technological developments are vastly outpacing educational systems approaches. Studies reveal that a wide gap is becoming evident between the skills possessed by the high school graduates and their ability to deal with complex weapons systems. From this, it can be deduced that increased emphasis must be placed upon the design and development of educational and training methodologies for these systems. Innovative and motivating training data, which includes everything from simple handbooks to complicated scenarios, must be provided by the contractors concurrently with the piece of equipment. In addition, this data must meet the needs of the target audience in the military today.

Ideally, these materials are to be designed in compliance with the Instructional Systems Development (ISD) model and must meet specifications required by Data Item Descriptions (DIDs) which vary from contract to contract. In addition, whenever possible these materials should be performance-based and criterion referenced.

Unfortunately, past experience has shown that many initial deliverable items which are being produced under contract to the government are less than adequate training tools and do not meet the basic requirements of the DIDs or the ISD model. There exists many possible reasons for this inadequacy ranging from poorly written specifications, and thus different interpretations, to a lack of expertise in educational foundations and technical writing. From a review of various training packages delivered by several contractors, one can conclude that although contractor personnel who develop training material possess a great deal of technical expertise and subject matter knowledge, many do not apply the fundamental skills of education theory and technical writing. This results in poorly written training deliverables and ineffective communication concerning educational requirements.

This paper will highlight and investigate the problems that the authors have experienced in the area of evaluation and acceptance of technical weapons systems training material. It will also offer suggestions as to what government contractors, as well as the government, may do in order to produce and deliver a better quality product in a much more cost-effective and expeditious manner.

INTRODUCTION

As we sit down to write this article, we have just returned from what many may consider a typical government/contractor progress review. Perusing our notes, it becomes apparent that a multitude of breakdowns in communication occurred between the government and the contractor as well as internally within both the government and the contractor's plant. These breakdowns, unfortunately, resulted in numerous arguments, increased interpersonal friction, and the creation of ever present government change orders causing an escalation in the price of the contract.

A cursory examination of a successful contractor's resources reveals that the foundations required for effective curricula development are generally present. Therefore, the question must be asked: Are these training foundations properly utilized in order to meet the high demands of the Department of Defense? This paper will examine this issue, offer insights into current vendor produced training materials and provide suggestions for improvements.

In evaluating the adequacy or inadequacy of contractor-produced training materials, it is necessary to briefly examine the procurement process and highlight the potential anomalies which exist. The cycle commences with the solicitations. Simply stated, it is here that the government, via an Invitation for Bid (IFB), Request for Proposals (RFP), Request for Quotations (RFQ), etc., describes the service and/or product it wishes to acquire. Herein lies the first problem. Surely you have experienced the difficulty and

frustration of not being able to explain exactly what it is that you want. This level of difficulty can vary from relatively simple instructions such as "turn on the light in the living room" to much more complex communications as "describe the operation of your 318 V8 turbocharger." Imagine the numerous communication hurdles which must be overcome by government personnel in describing a training program for a device or system which has yet to be conceived. How can training element managers provide explicit details for training programs related to a novel system when the capabilities of that system cannot be sufficiently identified or described by representatives of the user in the field? This is one basic problem faced by training element managers on a daily basis.

Take a step back and look at the existing state-of-the-art in current weapons systems development. Compare today's defense systems with those of a few years ago. It becomes readily apparent that technology has advanced at an escalating rate. On the other hand, pick up a daily newspaper and read one of the articles concerning the inability of many of today's high school graduates to read and comprehend. The combination of more complex and sophisticated technology with an apparent decreased reading grade level has created a great amount of concern among personnel in the operating forces. It is apparent that no matter how "wonderful" and sophisticated a system is, it is of absolutely no value unless it is properly operated and maintained. There then exists a dichotomy which generates a "hypothetical gap between technological development of hardware procured by DOD and the educational accomplishments of the target population assigned to operate and maintain this equipment." (2) Training personnel within the government have recognized this, and in the mid 70's began to institute a number of rather dramatic changes to both in-house and contractor-developed training programs. Now all programs must be developed in accordance with Instructional Systems Development (ISD) procedures. ISD is basically a total systems approach to training. That is, training as a whole is analyzed and initial determinations are made as to what constitutes a task. These tasks are then further analyzed, and the ones selected for training are associated with an objective as well as an evaluation criterion for that objective. When this has been determined, the training design and media selection are undertaken.

The ISD model is basically a very sound model which utilizes many of the highly theoretical education concepts presented to us in college education courses. These theories were highly idealogical and very rarely worked as they were supposed to in the public schools. Nonetheless, initial military training material developed under ISD is now being fielded throughout the military spectrum and the results are surprisingly pleasant. Studies indicate that a greater amount of learning transfer is taking place via ISD-produced material than by older, more traditional methods of instruction. (1) This initial evidence has caused many high officials in the Department of Defense to take a second and third look at ISD. As a result, it may be safe to predict that ISD-developed materials will be getting greater attention and will continue to be required for training material development. Therefore, it would be of great benefit to both government and contractors to have a deeper understanding of the current state of affairs concerning ISD.

Unfortunately, in the view of the authors, industry has not yet achieved a working understanding of the basic theory and operation of the ISD model. This has caused deliverables to be in non-conformance with ISD principles, and therefore, unacceptable to government reviewers. Private contractors seemingly still recruit personnel familiar with the technical aspects concerning operation and maintenance of hardware but neglect to hire ISD specialists. Without innovative training technology, the result is very often an inferior or unacceptable product. Let us examine the effect that this lack of ISD understanding has on training system design.

TASK ANALYSIS

The first step in the ISD process is to establish what constitutes or will constitute adequate on-the-job performance. This is referred to as a Task Analysis. The Task Analysis should serve to generate the criteria and data that provide a basis for initial foundations as well as assist in the selection of alternative concepts and designs without constraining creativity. More specifically, Task Analysis answers the question of what tasks, performed in what manner, under what conditions, in response to what questions, and to what standards of performance make up the job. Regardless of how well the next steps are carried out, if the job analysis data is not valid and reliable, the resulting instructional program will fail to produce personnel competent to perform their duties at a basic level.

Currently, the government is receiving far from adequate task analyses. It seems that all too often contractor training personnel do not understand what is required in order to construct a solid task analysis or simply do not have access to the necessary information needed for decision making. One available resource which contractor training personnel may use to support this phase of development is the Logistic Support Analysis Report (LSAR). (5)

The LSAR, which is supplied by contractor project engineers and logistic managers, provides a breakdown of operation and maintenance support activities currently being experienced or expected to be experienced by fielded systems. It is the job of contractor training personnel to analyze this data and make recommendations as to task determination and the requirements for training. Some tasks are

seldom required on the job and only minimum job degradation would result if the task were not performed. On the other hand, some tasks are highly critical to successful job performance, or the complex nature of the task makes training essential. Economic and time considerations require the trainer to make decisions as to which tasks will be selected for training and the extent of training which will be provided. Many contractors either fail to realize or neglect to consider the importance of this task selection process. The result of this inattention to proper task selection destroys the foundation of the training design and results in the production of an unacceptable training curriculum. Figure 1 provides an example of what an unacceptable submission of a task and skill analysis would be. It is apparent from this example that the curriculum developers either: a), did not have a working knowledge of education concepts or the ISD model; or b), were not provided with sufficient information via preliminary research, i.e., LSAR; or c), did not take an adequate amount of time to prepare the document, or d), simply had a very poor writing ability.

As was mentioned earlier, the task and skills analysis is the base of the development effort. It is the foundation upon which the curriculum will be built. If this section lacks continuity or is vague, as shown in Figure 1, the whole program suffers. Many developers fail to realize or understand this, as evidenced by actions such as delivering an instructor's manual or a student's guide, months before the task and skill analyses. When asked about it, they reply, "It's not complete as yet, but will be completed soon." It equates to a student writing a required outline after the completion of a term paper. Contractors do not understand that an outline, Task and Skill Analysis, is a tool which helps turn out a professional product. Figure 2 is representative of an acceptable analysis which supports this initial development effort. It is apparent that the developer of the document demonstrated in Figure 2 manifests the considerations of the ISD model in this phase of the curriculum development process.

1. JOB TASK ANALYSIS SUMMARY

NOMENCLATURE: DATE: NOVEMBER 1980

2. TASK IDENT	TASK STEPS IDENTIFICATION 3. TASK DESCRIPTION	4. STEP NO.	5. STEP DESCRIPTION	6. EQUIPMENT
A1	Monitor performance of and perform preventive and corrective maintenance on XXX			
		1	Describe the functional operation of XXX receiver control circuits	None
		2	Locate receiver control circuits	
		3	Describe the functional operation of the XXX transmitter control circuits	None
		4	Locate transmitter control circuits	
		5	Recognize and locate equipment malfunction indications	
		6	Demonstrate the correct fault isolation procedures	
		7	Demonstrate correct post repair procedures	
		8	Demonstrate correct disassembly, repair and reassembly procedures	
		9	Demonstrate correct alignment and calibration procedures	

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This is not a task

This should not be described - why do you need to describe X before you repair it?

NOT ACCEPTED!

these are not steps!

where are the steps to do this?

FIGURE 1

This is an example of an unacceptable task and skill analysis which does not demonstrate the requirements of the ISD model.

JOB TASK ANALYSIS SUMMARY

1.

Nomenclature FIRE FIGHTING/DAMAGE CONTROL Date 29 November 1979

2. Task Ident.	TASK STEPS IDENTIFICATION AND ANALYSIS			
	3. Task Description	4. Step Number	5. Step Description	6. Equipment
L1.1	Operate fire fighting equipment.	L1.1.1	Operate the P-250 pump.	
		L1.1.1.1	Prepare the P-250 pump.	
		L1.1.1.1.1	Assemble all necessary equipment in the operating area.	Foot valve and strainer
		L1.1.1.1.2	Connect the foot valve and strainer to the suction hose.	Suction hose
				Exhaust hose
		L1.1.1.1.2.1	Place the female threads of the foot valve and strainer against the male threads of the suction hose.	Spanner wrench
				Tri-gate
		L1.1.1.1.2.2	Give the foot valve and strainer a quarter turn counterclockwise to align the threads.	2-1/2 inch fire hose
		L1.1.1.1.2.3	Turn the foot valve and strainer clockwise until it is tight.	Two 1-1/2 inch hoses
		L1.1.1.1.3	Connect the suction hose to the P-250 pump.	Two all purpose nozzles
				Fuel tank
				Screwdriver

accepted!

FIGURE 2

This is an example of an acceptable portion of a task and skill analysis. Note that the enabling objectives are modified by specific job performance measures. The numbering system identifies a topical outline format.

As government representatives tasked with the responsibility of accepting and/or rejecting the deliverables provided by private contractors, curriculum reviewers devote a great deal of time to the evaluation of the task and skills analysis. Specifically, they examine the logical progression of the tasks selected to determine whether the tasks are actually tasks and if so: a) do they satisfy a need for training; b) can training be provided in a practical and cost-effective manner; c) do the tasks complement each other for use on the job; and d) how will performance measures be constructed?

The area of performance measures provides an interesting observation. A surprising number of contractor training personnel seem to be encountering difficulties in the construction of job performance measures. Review meetings between government and contractor personnel repeatedly revealed this fact. Questions pertaining to what should be measured, i.e., product, process or both, via what method, and with what consequences of failure often were the cause of many vague responses. Inquiries about predictive validity or fidelity seldom were answered in concrete terms. Since these topics were questioned early in the design process, it often led to strains between contractor and government personnel. This, unfortunately, caused tension to develop and decreased the level of interpersonal communication which is greatly needed throughout the design-development of the curriculum.

DESIGN

The second phase of the ISD model is that of design. Unfortunately, the reaction by many government Training Element Managers, as to whether or not the curriculum is favorably received, is usually based solely upon how well the materials are initially presented. It can be compared to the new home buyer who bases his opinion of a house solely on curb appeal - new paint, nice lawn, etc. Ideally, government reviewers must go beyond that and examine the foundation as well; thus, a "pretty" instructor guide with little substantiation for its contents will not necessarily meet the rigorous

Terminal learning objectives are actually direct translations of job performance measures (JPMs) into learning objectives for the training world. Therefore, if the designer takes time to prepare a well constructed task analysis which contains rather detailed JPMs, the design of the associated materials should be relatively simple.

Objectives contain specific descriptions of an action the learner is to exhibit after training, the conditions under which the action will take place, and the standards or criteria which must be reached for satisfactory performance. These objectives are

Learning objectives, which are the "heart" of the design phase, are reviewed closely.

performance. The philosophy under which they and all other curriculum efforts operate are

such things as contract requirements, the philosophies of the contractors as well as the government Training Element Managers, overly specific or extremely vague data item descriptions (DIDs) and writer inability or misunderstanding. Let us examine this a bit further.

One of the major dilemmas which has a direct effect upon the design of instructional materials is legal requirements of contractor scheduling. The contracting officer places a great deal of emphasis upon delivery dates as is necessary to meet the terms of a contract. This is often dictated by such things as operational equipment delivery, ready for training dates, etc., which are established by higher headquarters, thus placing any decision out of the realm of working level personnel. Unfortunately, this causes the contractor to be forced into an obsession to comply - delivery on time becomes the striving goal. As a result, the quality of the program is often overshadowed by the delivery date, and the government receives numerous blank pages titled and noted "to be developed" because of insufficient data. This is extremely frustrating, as well as very costly.

Perhaps, there should be a re-examination as to the legitimacy of scheduling requirements and the applicability of data item descriptions or other specific working standards before any development of curricula is undertaken. It is apparent that something needs to be done in order to focus the attention toward quality research and design rather than compliance with delivery dates just to satisfy legal requirements in the contracts.

Corporate philosophies also affect the training product. Technology growth in the last ten years has been astonishing. Attitudes toward training design have also changed dramatically. Although the basic foundations of education are still the same, the training methodology has taken on new dimensions. Innovative government education and training specialists have realized this and are experimenting with novel approaches to training for their programs. Such vehicles as videotape and videodisc, computer assisted instruction as well as visual and physical simulation, are being solicited in new weapons systems procurement. The reasons for this can be capsulized into the fact that training via these avenues is more efficient, interesting, cost-effective and practical.

This is not to say that the traditional written material is to become obsolete. There will always be a requirement for written documentation and instruction. Fortunately, as many innovative contractors are beginning to realize, these simple written materials must be augmented by innovative training devices. The Department of Defense's training requirements have become so technical, complex and expensive that now the most efficient method of training is often via non-traditional methods similar to those mentioned earlier. It is the opinion of these authors that the time has now arrived that if a contractor does not soon make a decision to hire competent personnel who are well versed in the non-traditional avenues of training; i.e., simulation, video/computer interface, etc., he will fall by the wayside in his quest to obtain defense systems contracts.

In essence, then, there must be certain changes made in the training acquisition process. Initially, the government must provide more specific direction to the contractor regarding the product which is to be developed. In addition, it is imperative that the contractor be given the freedom to determine, a) what is needed for training, b) the most effective methods to provide that training, and c) adequate time for the preparation of the instructional material.

In summary, this paper has provided a cursory examination of the current process of training system acquisition. There exist many problems, ranging from minute to monumental, caused by both the government and contractors. It would take a dissertation to expound upon all of the anomalies which are present. Obviously, this is beyond the scope of this paper. Figure 4 is a capsuled attempt to highlight areas where deficiencies are perceived to exist. It is structured so as to remain objective in nature, yet be highly critical of both parties in DOD training acquisitions. The ISD model serves as its base, since it is the vehicle by which we, as government Training Element Managers, review contractor produced deliverables.

On the other hand, a private contractor whose business is training development must be aware of the current state-of-the-art in education. He must realize that trends in technology are vastly outpacing those in education and that attempts must be made to bridge this hypothetical gap. This can be done by recruiting personnel who are knowledgeable about current trends and are willing to step out and take the necessary initiative to introduce the innovative training methodology dictated by current technological advances. (1)

We do not purport that an individual well versed in ISD is the panacea for inadequate training program development. Obviously, there is no one perfect method which will ensure effective training. But, as Montemerlo and Harris suggest, the development of effective training packages requires among other things an interdisciplinary team of subject matter experts and skilled instructional technologists. (4) The recommendations alluded to in this paper are just as susceptible to inept application as are current methods. The authors suggest that if training development is given additional attention, and conscientious consideration, there will be a significant impact upon future training developments.

		SUGGESTED GOVERNMENT ACTION	SUGGESTED CONTRACTOR ACTION	CURRENT PRODUCT	SUGGESTIONS
ANALYSIS	Task Selection/Determination	Provide adequate job description/constraints.	Analyze LSARs, etc. and make determinations for ISD incorporation.	Tasks not definitive.	Contractor insure proper interface and understanding between LSA and ISD personnel.
	Select Tasks for Training	Insure contractor understands/develops logical rationale for selection.	Examine complete picture as to need, practicality and cost.	Entire instructional system not considered	Contractor should take further steps to analyze target population and training environment. Government should provide more definitive guidance as to the product they desire; examples should be provided. Government should also provide adequate preparation time for foundations of training. Quality suffers if this phase is eliminated and COTR should budget accordingly.
	Write Job Performance Measures		Provide rationale which may determine evaluation of tasks.	Not being done prior to design of material as evidenced by lack of evaluation criteria.	Contractor should make all efforts to recruit personnel familiar with training evaluation and task selection techniques.
DESIGN	Objectives	Provide regulatory instruction (DIDs) which demonstrate concrete guidelines and do not stifle creativity.	Construct objectives which contain all elements (Action, Condition, Standard) and are written as well as performance based whenever possible.	Objectives generally not acceptable due to lack of one or more elements. Often numerous objectives contained in one objective and performance measures are vague.	Contractor's viewpoint needs alteration. Behavioral objective approach is often viewed as a necessary evil and not product generally unsatisfactory.
	Tests	Must insure that salient points of objectives are tested. Insure written and performance evaluations have predictive validity.	Insure all facets of objective are adequately measured.	Tests are constructed after instruction is written; result is a simple reiteration of classroom presentation.	Contractor should employ specialists in the area of test construction. Curriculum should not just provide instruction necessary to "pass the test."
	Media Selection/Format	State of the art in training must be considered and leeway for contractor creativity allowed. COTRs cannot be reluctant to introduce innovative design.	Examine target population as well as subject matter and make determination as to most efficient media for information presentation.	Little, if any, target population analysis done. Training material currently consists primarily of traditional written manuals which impact upon learning	Contractor's should strive to introduce more innovative and creative training methodologies. Visual literacy of target population must be examined and modern techniques employed.

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