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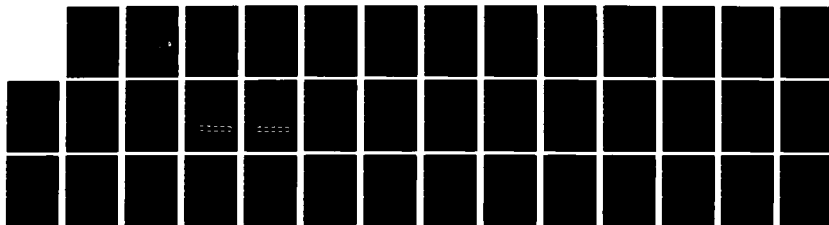
UNITED STATES ARMY DEFINITIONS AND CONCEPTS FOR A
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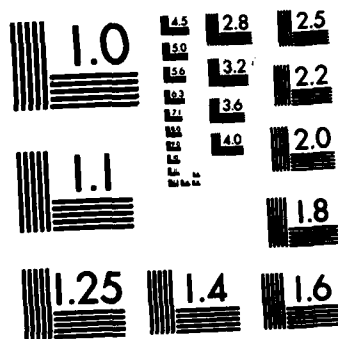


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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The levels of Army management are reviewed in light of their assigned responsibilities for the timely production of Army materiel and associated training materials. Terms, management levels, and systems approach processes are discussed in detail. Product procurement is discussed in terms of inputs, processes, products, outputs, and outcomes, and the roles of executive senior managers, Senior managers, middle managers, and technicians are carefully delineated.					

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UNITED STATES ARMY DEFINITIONS AND CONCEPTS FOR A SYSTEM APPROACH TO
SUCCESSFUL TRAINING EFFORTS AND RESULTS

by

Roger Kaufman, PhD

Tallahassee, Florida

December, 1982

A report prepared under Battelle Delivery Order 0370.

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INTRODUCTION

This report was accomplished under Battelle Scientific Support Personnel program Delivery Order No. 0370. The COTR was Dr. Steve Duncan, USA Training Developments Institute, Fort Monroe, Virginia.

This activity serves as an integration of much of the work of the author in the areas of Needs Assessment, System Planning, and evaluation. It is based, in part, upon a number of published and yet-to-be published works.

The basic concepts underlying Reactive and Proactive planning were provided by Dr. Steve Duncan of TRADOC, and the concepts of Internal and External Evaluation were first suggested by Major Graham Brown of the British Army.

The purpose of this report is to provide the US Army and TRADOC with a conceptual and practical approach to measurably improving the effectiveness and efficiency of its forces in the field through the wise and best use of precious human resources. The Army has made great strides in training and training development. The next rational step is to orchestrate these changes and resources into a system approach which is built upon the measurable requirements for Army success in the field. It is more than training alone, or instructional systems alone, but the combination of these into a holistic approach.

UNITED STATES ARMY DEFINITIONS AND CONCEPTS FOR A SYSTEM

APPROACH TO SUCCESSFUL TRAINING EFFORTS AND RESULTS

This report presents terms, definitions, and concepts and then integrates them into a holistic approach that will be useful in the identification and successful application of human performance and training for the US Army. The clear understanding and application of these terms and concepts will contribute to the measurable improvement of individual and unit performance within the Total Army.

SYSTEM APPROACH TERMS DEFINED.

The following terms are defined in this document:

- Means
- Ends
- Objectives
- Organizational Efforts
- Organizational Results
- Societal Impact
- Organizational Elements Model
- Inputs
- Processes
- Products
- Outputs
- Outcomes
- Internal
- External
- System Approach
- Systems Approach
- Systematic Approach
- Proactive Approach
- Reactive Approach
- Needs Assessment
- Quasi-Needs Assessment
- Needs Analysis
- Front-end Analysis
- Problem
- Problem Analysis
- System Approach to Training
- Systems Approach to Training
- Systematic Approach to Training
- Cost-Results Analysis
 - Cost-Efficiency Analysis
 - Cost-Effectiveness Analysis
 - Cost-Benefit Analysis
 - Cost-Utility Analysis

Methods-Means-Media Analysis
Methods-Means-Media Selection
Program Evaluation and Review Technique (PERT)
Evaluation
Internal Evaluation
External Evaluation

SOURCES AND REFERENCES.

The tools, models, and concepts presented here frequently derive from several other sources. These are listed here with numbers assigned each. These numbers will be used in the following text in order to identify the original source.

- (1) Gagne, R. and Briggs, L. J. **PRINCIPLES OF INSTRUCTIONAL DESIGN.** 2nd Edition, New York, Holt, Rinehart & Winston, 1979.
- (2) Kaufman, R. **IDENTIFYING AND SOLVING PROBLEMS: A SYSTEM APPROACH.** San Diego, Cal., Third Edition, University Associates Publishers, 1982.
- (3) Kaufman, R. and Carron, A. S. "Utility and Self-sufficiency in the Selection of Educational Alternatives." *Journal of Instructional Development*, 1980.
- (4) Kaufman, R. and English, F. W. **NEEDS ASSESSMENT: CONCEPT AND APPLICATION.** Englewood Cliffs, N. J. Educational Technology Publishers, 1979.
- (5) Kaufman, R. and Thomas, Susan B. **EVALUATION WITHOUT FEAR.** New York Franklin Watts, Inc., 1980.
- (6) Kaufman, R. and Stone, B. **PLANNING FOR ORGANIZATIONAL SUCCESS.** New York, John Wiley & Sons, 1983.
- (7) Kaufman, R. "A System Approach--a Redefinition." Occasional Paper No. 30, Center For Needs Assessment and Planning, Learning Systems Institute, Florida State University, Tallahassee, Florida. 1983.
- (8) Mager, R. F. **PREPARING INSTRUCTIONAL OBJECTIVES.** 2nd Edit., Belmont, California, 1975.

(9) Mager, R. F., Troubleshooting the Troubleshooting Course, Pitman Learning, Inc., Belmont, CA, 1982.

(10) Scriven, M. THE METHODOLOGY OF EVALUATION. AERA Monograph Series on Curriculum Evaluation. Chicago, Rand McNally, 1967.

(11) US Army Training and Doctrine Command. Interservice Procedures for Instructional Systems Development, TRADOC Pamphlet 350-30, VOL I-V, Ft Monroe, VA, 1975.

(12) US Army Training and Doctrine Command. Training, A Systems Approach to Training, TRADOC Regulation 350-7, Ft Monroe, VA, 1982.

A NOTE ABOUT TERMS AND USAGE: While most people do not enjoy being presented with new terms, or revised definitions for old and perhaps familiar words, the following provides some useful new ways of defining terms. They are presented not to put old wine in new bottles, or to simply shift things around to look "new". Rather, they are presented to provide operational, precise, and rigorous definitions for words which have multiple meanings in today's common usage. Your careful consideration of these terms is requested as the additional precision in terms offered by these definitions makes possible more successful communication, less confusion, and better results.

Means. These are the ways, methods, procedures, techniques, activities, and how-to-do-its that are used to bring about results.

Ends. An "end" is any accomplished result. There are three types of **ENDS**: two of which are internal to an organization, and one which is accomplished outside of the organization in the operational environment of the Army. (See definitions below for the terms Organizational Results, Products Outputs Outcomes.)

Objectives. In the field of training and education, fewer terms have received as much attention and have enjoyed so little success in their implementation. Objectives seem to be at the very heart of Army training, yet rarely do developers write correct and useful measurable **OBJECTIVES**. Useful, measurable, results-oriented **OBJECTIVES** are more apparent than real in Army materials today because they lack specificity and because they speak to Means and not Ends.

A useful objective (Mager, 1975) will have the following characteristics and elements:

- States what results (ENDS) will be accomplished.
- States who or what will DEMONSTRATE the results (ENDS).
- States under what conditions the accomplished results (ENDS) will be demonstrated or observed.

- States the exact criteria which will be used to measure successful accomplishment of the results (ENDS).

- States the above in unambiguous terms so there will not be confusion among doers and evaluators concerning what is to be accomplished, when it is to be accomplished, under what conditions it will be observed, and what are the clear criteria for measuring its accomplishment.

Unfortunately, most OBJECTIVES are too frequently written to communicate purposes relative to procedures to be followed (MEANS, not ENDS) so that processes are locked-in to military training long before the required results (ENDS) are stated and justified. By so doing, the methodological cart is put in front of the results-referenced horse. In the Army, as well as in most education and training establishments, OBJECTIVES are too frequently poorly or incorrectly formed. This practice encourages waste and unknown or unwanted results which flow simply from a confusion of MEANS (the how-to-do-its) and ENDS (the results to be accomplished).

Organizational Efforts. These are the resources and MEANS that an organization can or does use to achieve ENDS (2). (See Inputs and Processes.)

Organizational Results. These are the results an organization accomplishes and can demonstrate. There are two varieties of Organizational Results (see Products and Outputs). One addresses en route results that alone are not valuable to an individual or an organization (such as passing a performance test or an inspection), but may be combined into an overall Organizational Result (i.e., unit performance effectiveness as demonstrated through ARTEP proficiency). (2)

Societal Impact. The impact that the combined Organizational Efforts and Organizational Results have in and for society, such as overcoming or neutralizing any possible enemy threat. (3) (See Outcome.)

Organizational Elements Model (OEM). These are five elements that define that which an organization uses, does, accomplishes, and may or actually does deliver outside of the organization. Two of the Organizational Elements define Organizational Efforts, two define Organizational Results, and one defines Societal Impact. The five Organizational Elements are:

INPUTS

PROCESSES

PRODUCTS

OUTPUTS

OUTCOMES

Four of the Organizational Elements are Internal to the organization:

INPUTS

PROCESSES

PRODUCTS

OUTPUTS

One Organizational Element is External and deals with societal, outside of the Army impact:

OUTCOME

When viewed from the perspective of the United States of American as a whole Nation, the Army is a MEANS to National ENDS, as are all military agencies, governmental agencies, social organizations (such as The Departments of Education, Health and Human Services, Agriculture, Defense, Energy, Labor, Commerce, the Supreme Courts, etc.). Thus, Inputs, Processes, Products, and Outputs are Internal Organizational Elements from a National, holistic frame of reference. (2, 3, 6)

From the same holistic reference, the External Element, Outcomes, are the survival, self-sufficiency, self-reliance, and constructive growth of the United States.

When defining and developing an effective and efficient Army, all of the five Organizational Elements must be considered and related.

INPUTS. These are the existing, current conditions under which the Army finds itself, to include all resources, laws, rules, regulations, doctrine, personnel, facilities, existing budgets, equipment, programed future weapon systems, skills/knowledges/abilities of personnel, the state and condition of allies and enemies and "neutral" parties, political realities and conditions both internal and external to the US. Inputs are the ingredients and raw materials for the Army to use and/or consider in meeting its internal and external requirements for National survival and self-sufficiency.

PROCESSES. The ways and means for accomplishing results using the Inputs that may or must be used or considered. Processes include any how-to-do-it procedures, methods, curriculum, operation, delivery methods and means which can or will produce the results required. Processes are where the Army spends most of its time, efforts, and resources. Training is a Process, as is commanding, drilling, maneuvering, fighting, scouting, surveiling, operating, flying, driving, running, walking, and shooting. Any method, technique, or procedure is a Process and must be considered as a MEANS to a (hopefully) useful END. Currently, the Army has a number of Processes in place and operating in order to accomplish worthwhile ENDS: examples include the use of personnel, schools, courses, methods of organization and reporting, units, divisions, battle plans, strategies, tactics, training courses, procedures and materials, etc.

PRODUCTS. The results the Army accomplishes on its way to providing required results in enemy threat neutralization. Products are any single result that may be combined with other Products to yield total Organizational Results which will be useful during possible threat neutralization. Examples of Products include competent, combat-ready soldiers, a training simulator that meets all design specifications, a validated self-instructional training course, a validated system approach model and procedure, a new tank that has passed delivery inspection at the factory, a Pershing warhead that has been quality accepted and is available at depot level for installation, or a servicable rifle. Products, while important, are not valuable by themselves in an effective Army. They must be combined with other useful Products in order to have an effective and efficient, ready-to-fight-and-win Army. Products are the en route results which must be aggregated into that which the Army can and will deliver during time of war or National crisis.

OUTPUTS. These are the Organizational Results that the Army can or does deliver to the Nation when called upon to do so. It is the aggregated Products which together form the response capability of the Army. (It might be combined with other Products and Outputs from other US Government agencies, including the Air Force, Navy, Marines, Coast Guard, FBI, CIA, and other allied military and governmental forces, such as combined military operations in World War II, Vietnam, or more recently in Lebanon.) Outputs are the results which then may be or are delivered outside of the Army.

OUTCOMES. These are the end-result of all of the Organizational Elements, and are those impacts which an Army can or will have in and for National Defense, security, and survival. It is indicated by success in overcoming or neutralizing any actual or anticipated enemy force, including their Inputs, Processes, Products, and Outputs. The role of a successful US Army is to assure that enemy Outcomes will be nil for that hostile force. The five Organizational Elements, when used correctly and related one to the others will assist the TRADOC Community in identifying and usefully linking its Organizational Efforts, Organizational Results, and Societal Impact so that we will win the first battle of the next war, and significantly decrease the probability of enemy attack or adventuring through demonstrated US superiority and ability to win under any threat scenario. Successful commanders correctly link MEANS and ENDS. In addition, they always select useful ENDS, both within and outside of the Army. The Organizational Elements Model (OEM) allows that correct linking and selection. (2, 6)

System Approach. The process by which one identifies, documents, justifies, and selects Needs; then systematically meets those Needs. Needs are defined (see Needs, below) as gaps in results (Products, Outputs, Outcomes), not gaps in Processes or Inputs. A System Approach includes formal consideration of all five of the Organizational Elements (Inputs, Processes, Products, Outputs, Outcomes).

Systems Approach. The systematic design and development of a system that is Internal only, and assumes that the goals and objectives of the Organization, unit, school, training syllabus, course, or Division, are correct, useful, and will deliver required Outcomes, when attained.

Systematic Approach. Any approach that is repeatable and progresses in a known and efficient manner.

Both a System and a Systems approach may be systematic. One does not have to achieve useful results to be systematic, in fact one might be quite systematic in pursuing an objective which is unnecessary.

Reactive Approach. This approach assumes that the goals, objectives, and specific performance requirements are "given" and that one must follow through to achieve the pre-ordained objectives. In most cases, Army training is reactive in that courses and courses of study are pre-specified by the School or Command, and instructional developers are limited to achieving the given objective, useful or not, in the most efficient manner possible. Reactive Approach usually focus mostly in Organizational Efforts, and the Organizational Elements of Inputs and Processes, with the results being targeted in these elements or, on occasion, toward Products. The reactive approach is always Internal, and never moves to identify current or required Outcomes. The primary methodology of the reactive approach is analysis with an emphasis upon deductive logic; the breaking down of existing goals and methods into constituent component parts.

Proactive Approach. This approach allows one to assume little or nothing about the utility of existing goals and objectives, and allows new goals to be considered as well as the elimination of existing ones which will not yield useful results. The proactive approach allows for the identification of the gaps that exist between What Is and What Should Be for Outcomes as well as for Outputs and Products before determining What Should Be for Processes and Inputs. Because it requires the identification of What Should Be for Outcome, the proactive approach uses both analysis and synthesis (both Inductive and Deductive logic).

NEED. The gap between What Is and What Should Be for results. NEED is only used as a noun, not as a verb or in a verb sense. This definition encourages the exclusive use of NEED to describe a gap in results, not a gap in resources (Inputs) or methods and techniques of delivery (Processes). To use NEED as a verb (e.g., we "need" more training, or we "need" more money) is to confuse MEANS and ENDS. (Money itself is not a result, it is the purposive use of money to help attain useful results which is important.) When we use NEED as a verb, we take the chance of focusing our efforts and wasting our resources on Processes without identifying and justifying important results. One may identify three types of NEEDS: for Products, Outputs, and/or Outcomes. (2, 6)

QUASI-NEED. A quasi-NEED is a gap between What Is and What Should Be for Inputs and/or Process. It is only sensible to close gaps in Inputs or Processes when these gaps have been based upon gaps in results, especially gaps in Products, Outputs, and/or Outcomes. (2)

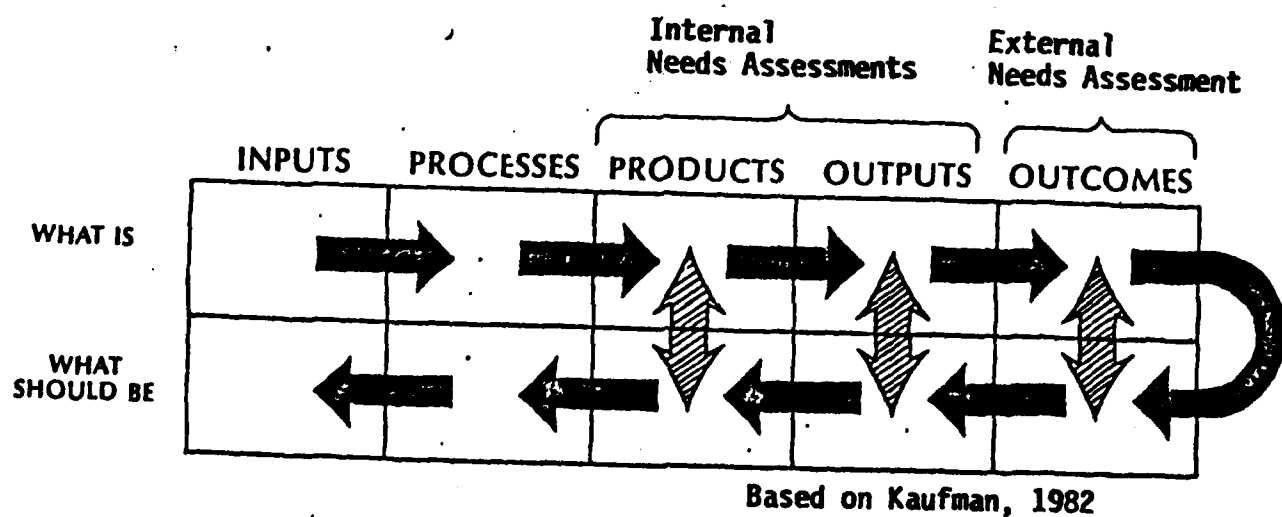
Determination of gaps in Inputs and Process can be critical, but these relate to resources and methods, and as MEANS, they should be based upon the useful ENDS to be achieved.

It helps to continue to apply some of the earlier definitions and concepts to defining the various assessment and analysis tools. These will be divided into two varieties: Proactive and Reactive techniques.

PROACTIVE TECHNIQUES. The following assessment model is Proactive because it relies upon and assumes nothing about the existence, validity, utility, and correctness of the current organization, organizational goals, objectives, and current assignment of duties. Because of this focus, Proactive techniques are External in their concern and starting reference, and thus are more likely to be successful under those conditions where stated or unstated assumptions might be incorrect or incomplete.

NEEDS ASSESSMENT. The process for identifying, documenting, and justifying the gaps between What Is and What Should Be for results--Products, Outputs, and/or Outcomes, and placing the gaps (NEEDS) in priority order for closure. (2, 4, 6) Needs Assessment may be accomplished for each of the types of results. If it is dealing solely with Outcomes, it is Proactive. If is used to deal with the interrelationship of Outputs and Outcomes, then the Needs Assessment is Reactive.

Following is a graphic representation of possible Needs Assessments showing the two dimensions of What Is and What Should Be for the Organizational Elements Model.

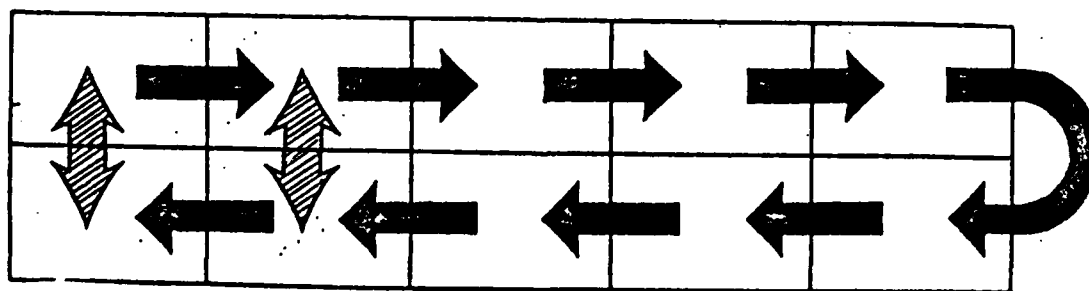


Thus, there are three types of Needs Assessments, two which are Internal (for Products and Outputs) and one which is External (Outcomes). (2)

Because Needs Assessment (which starts with an assessment of gaps in Outcome and then proceeds to determine gaps in Outputs and then Products) makes no assumptions about the existence of an organization, or the utility and correctness of any existing organizational goals and objectives, it is Proactive in its thrust and intentions.

REACTIVE TECHNIQUES. The following models and methods accept the current organization and the validity, utility, and correctness of the organizational goals and objectives . Because of these assumptions, they are Internal in their focus and concern.

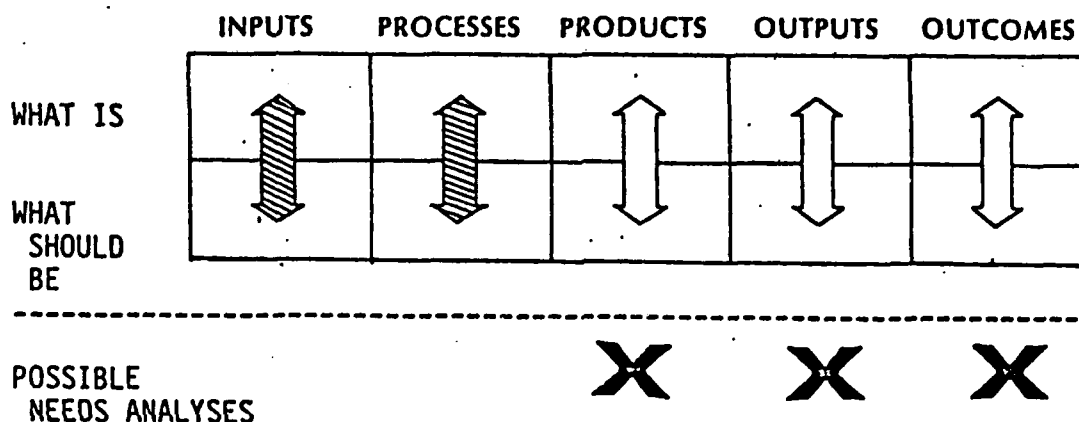
QUASI-NEEDS ASSESSMENT. The process for identifying, documenting, and justifying the gaps between What Is and What Should be for Processes and/or Inputs, and placing the gaps in priority order for closure. (2)



From Kaufman, 1982

Quasi-Needs Assessments are reactive in nature since they deal with existing goals, objectives, and organizational purposes.

NEEDS ANALYSIS. The analysis of Needs into their constituent component parts. In order to analyze a NEED, it must first be identified, documented, and selected for analysis. Any NEED may be analyzed, including those which related to Products, Outputs, and/or Outcomes:



In actual practice, Needs Analysis is usually applied to Products and Outputs-- Internal concerns.

Since Needs Analysis deals with an existing NEED (or Problem, see below) it is a tool for a reactive response to a problem or discrepancy.

FRONT-END ANALYSIS. This is the analysis of problems which are identified on the "front-end" of an organization. It is used, almost exclusively, in determining whether an already identified problem is a training problem or one to do with other organizational concerns, such as personnel selection and placement, work place layout and design, and the like. Thus, front-end analysis is almost always Internal in its focus and concern.

Front-end Analysis is reactive since it proceeds from an existing set of problems, and analyzes these Organizational Results in order to determine constituent component parts and possible causes of a performance discrepancy.

Problem. A "problem" is a NEED selected for closure or reduction. If there is no Need, then there is no Problem. (2)

Problem-Analysis. A type of analysis which takes an existing problem (usually a performance discrepancy) and breaks it down into its constituent component parts to analyze and determine the causes of the discrepancy. Again, in order to analyze something, that something has to be known and identifiable. The following are general "umbrella" models for using the above tools, techniques, and concepts.

System Approach to Training. This is a holistic approach which includes in its analysis all of the Organizational Elements, including Inputs, Processes, Products, Outputs, and Outcomes. It is Proactive in nature, since it starts External to the organization, and makes no assumptions about current organizations, organizational results, organizational efforts, or structure. The System Approach has two phases:

- Identifying, justifying, and scoping Needs (gaps in Products, Outputs, and Outcomes).

- Getting from What Is to What Should Be for the gaps in results. A System Approach to Training is actually a misnomer, since a System Approach should only specify "training" as a Process only after determining if training will be the most effective and efficient solution to reduce or eliminate the NEEDS identified in a Needs Assessment.

Systems Approach to Training. This is an Internal (Reactive) approach which intends to systematically improve the effectiveness and efficiency of Internal operations and results (Organizational Efforts and Organizational Results). A

Systems Approach to Training assumes, by and large that "training" is necessary and a correct resolution to a performance problem. When compared to Proactive models, a systems approach is more likely than Proactive models to develop training programs even when training is not the correct PROCESS to use to meet the identified and justified Needs.

Systematic Approach-to-Training. This is any repeatable, reliable method or approach which can be applied to achieve some pre-selected set of purposes. Most problem solving models are systematic approaches.

Following are some analytic tools which, when used appropriately, could be useful in implementing a successful US Army System(s) Approach.

COST-RESULTS ANALYSIS. These are an array of techniques which will compare costs with results. These include:

Cost-Efficiency Analysis: the comparison of costs and Processes

Cost-Effectiveness Analysis: the comparison of costs and Products

Cost-Benefit Analysis: the comparison of costs and Outputs

Cost-Utility Analysis: the comparison of costs and Outcomes

Related to the Cost-Results Analyses is the accounting for Inputs. This technique is simply called ACCOUNTING.

METHODS-MEANS-MEDIA ANALYSIS. These are the formal techniques for determining the most effective and efficient media and delivery techniques based upon environment and content for given learner audiences.

METHODS-MEANS-MEDIA SELECTION TECHNIQUES: The decision rules and procedures for actually selecting the best Methods-Means-Media.

EVALUATION. Evaluation determines the gaps between "what was accomplished" and "what was intended to be accomplished." Evaluation also determines the merit or worth of that which has (or has not) been used to accomplish the results. Evaluation can only deal with an existing system, operation, or

Product, while Needs Assessment may relate to any system or operation which currently does or does not exist. Needs Assessment examines gaps between What is and What Should Be (with the emphasis upon should) while Evaluation relates only to gaps between What Was Accomplished and What Was Intended to Be Accomplished. (5)

For example, one could conduct an evaluation of a specific AIT training program by determining what completion rates and scores the trainees obtained, and by evaluating the completers performance on-the-job after completing AIT and being assigned. This comparison of What Is (the status of results) with What Was Intended (the goals and objectives) would constitute an Evaluation. However, such Evaluation data would not allow the Army to determine if the training course, including the achieved learner performance, was useful in allowing the Army to provide combat ready troops capable of overcoming possible enemy threats in time of war. Delivering a successful course (whether individualized, in self-instructional form, on video tape, or delivered by classroom lecture) does not assure that the course delivered will, by itself or in combination with other successful courses, be useful in the Army big-picture efforts to win in battle.

Evaluation will provide important and useful data on What Is, as compared to What Was Intended, but will not allow one to make targeted decisions on the usefulness of a specific course for the Army. On the other hand, if started at the Outcome level, Needs Assessment will allow one to compare the gaps between What Is (current results or combat potency) and What Should Be (emphasis upon Should) in terms of Army usefulness in overcoming threat.

Evaluation deals with current status and results, Needs Assessment deals with identifying that which should be, could be, or must be in terms of external results. Needs Assessment will allow the Army to determine:

(1) What is now working successfully.

(2) What should be added.

(3) What should be deleted or modified for the total Army, not for just a course or school.

Case-in-Point: A course which wasn't required.

As an example, one Army course was being prepared for individualization. It was a course on filling out a motor pool use form. The course was selected for TEC delivery because it was frequently used and often provided problems for the would-be user. A visiting consultant team did an on-site review of the use of the form and discovered that although the form was required, it provided no information which was ever used again after the form was completed. The form was a terminal instrument...it just "was." Since it was not important in doing anything which was important for Army effectiveness and efficiency, the decision was made to delete both the training and the form. An evaluation simply noted that people were incorrectly filling out the form. A Needs Assessment showed that the form closed no gaps between What Is and What Should Be for useful Army results.

INTERNAL EVALUATION. This is an evaluation of what was and was not accomplished within the organization, especially as it relates to Products.

EXTERNAL EVALUATION. An evaluation which relates to accomplishments outside of the organization (Outcomes) or determines the accomplishment or non-accomplishment of Products and their impact on other Products and Outputs of the organization.

PUTTING THE CONCEPTS TOGETHER

Each of the above terms and concepts are useful. But they are most useful when they form a cohesive, coherent whole that may be used to identify, define, develop, implement, test, evaluate, and make revisions in order to affect a fully functioning military subsystem.

All too often, each of these tools and techniques are seen in isolation from a larger whole, and are pursued for their own sake--useful MEANS get distorted into simplistic ENDS.

The following is an integration of all of the above tools and techniques into a holistic approach: A System Approach to Army training effectiveness. The resulting model will define what may and should be accomplished by professionals at each level of US Army activity, including the levels of:

Technician
Middle Manager
Senior Manager
Executive Senior Manager

First, the "umbrella" model for the TRADOC community.

AN ARMY SYSTEM APPROACH MODEL FOR HUMAN PERFORMANCE EFFECTIVENESS

Regardless of the level of activity or assignment, the Army operates in five different levels, one for each of the Organizational Elements:

INPUTS

PROCESSES

PRODUCTS

OUTPUTS

OUTCOMES

In setting Army and TRADOC policy and plans, it is critical that Needs Assessment, strategic planning, long-range planning and the resulting operational planning begin with Outcomes. (Long-range planning simply

projects the requirements to meet current goals and objectives out over a 3-5 year time frame; strategic planning asks what the future is likely to bring and what it could bring in order that the current organization may be responsive to it and survive; operational planning is the planning to assure that current operations will be successful.)

Without an Outcome-orientation, resulting programs, projects, and training courses will be a jumble of conventional wisdom, past experience, luck, and hope for the future...for an operational plan made up simply of concerns for Internal results and activities, and without concern for the ultimate response requirements of the Army and the United States. The result will be a patchwork quilt of reaction-motivated quick-fix solutions to problems which may be more apparent than real.

Allocation of function, the TRADOC community, and organizational success. Not everyone in the Army is capable of planning relative to Outcomes. Each person has her or his own assignment and command responsibilities, but it is important that they be complementary and achieve a symbiotic relationship. Thus, each of the Organizational Elements must fit together, not work independent of each other and the Army, not independent of the survival and self-sufficiency of the United States as a whole.

Thus, an allocation of functions to Army personnel is sensible and desirable if they are interrelated properly.

Personnel assigned to Inputs. There are some personnel who are concerned with Inputs, including the Quartermaster Corps, stores clerks and supervisors, accountants, compliance enforcers, and facilities and equipment managers.

Personnel assigned to Processes. Other personnel are "doers" and are responsible for the correct and timely delivery of Processes, such as trainers, developers, planners, tactician, strategists, soldiers on assignment, officers on assignment--anyone charged with doing. Most of the time, efforts, energies, and resources (Inputs) are used in Processes. Anything that goes between Inputs and Products is a Process. Training, for example, is a Process which is intended to measurably improve the effectiveness and efficiency of personnel. Training is a Means to accomplishing useful Products...results accomplished by people (when working they are also Processes). If training is to be useful and worth the price charged, it should allow people to achieve useful results, not just any result. Objectives should not only be measurable, they should be useful as well.

Personnel assigned to Products. Some Army personnel are concerned with the immediate effects of the Inputs and Processes upon results. Army instructors and training personnel have to certify the acquisition of specific skills, knowledges, and attitudes (if the Objectives have been written correctly)--the accomplishment of Products. Company commanders are interested in the Products of group accomplishment of specified performances, such as setting up a field communication network according to specifications, or correctly launching a missile and hitting within the correct circle of accuracy. Most supervisors and middle-level managers are concerned with the linkages between Inputs and Process, in terms of the Products they deliver.

Personnel assigned to Outputs. Senior managers, especially, are concerned with overall effectiveness of a battalion, an Army, or a major military action. They are concerned not only with the individual and collective fragmented Products, but they are concerned with the orchestration and integration of all of the Products taken together in delivering useful and timely Organizational Results.

Personnel assigned to Outcomes. Executive Senior Managers (and those who want to become them) are concerned with the cumulative effect of all of the Organizational Elements in terms of National Security, and the overcoming and neutralization of enemy threat. To be concerned with less would mean that the Army could be a solution to nobody's problems.

The most senior and successful managers are concerned first with Outcomes, and then, usually by delegation, to assure that each of the Organizational Elements fit together into a coherent, cohesive, useful whole.

Integrating all of the assigned personnel. In order for any one person's assignment to one of the Organizational Elements to be successful, that which they accomplish and deliver to the other Elements must be evaluated and found to be useful as well as compliant. (Thus an Internal Evaluation of Organizational Efforts and Organizational Results.)

So, each Element must check, at least, with the Element above it to assure that it is delivering things which are useful:

INPUTS ↔ PROCESSES ↔ PRODUCTS ↔ OUTPUTS ↔ OUTCOMES

By each Element level checking with the one (or better yet, all of the others) above it, a consistency and coordination of efforts and results will be assured.

The general assignments of TRADOC personnel will be:

Technicians:	INPUTS PROCESSES
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Middle Managers:	INPUTS PROCESSES PRODUCTS
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Senior Managers:	PRODUCTS OUTPUTS
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Executive Senior Managers:	OUTCOMES
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(This analysis suggests that there be an additional designation in the TRADOC community: Executive Senior Manager. It is further suggested that an Executive Senior Manager is one who may and does make policy decisions, and thus, by assignment would be an O-7 and above. It is at this level that one may initiate decisions which will determine impact external to the US Army.)

Case-in-point: Technician Level Contribution

This level will assume the usefulness of their assignment, and strive to provide the basic underpinnings of a successful Army. For instance, they might be assigned the development of a self-paced course on Tank Track Maintenance for a new MXX tank which will be operational in two years. This level accepts the assignment, for it assumes that all upper levels have come to their requirement by valid and useful analysis, planning, trade-offs, and allocation of resources and risks.

The Technician level will usually be assigned the tasks of determining the entry skills, knowledges, and attitudes of entry soldiers into a training course, determining the resources and funds available for such training (dollars, instructors, instructor competencies, location for training, TRADOC regulations, etc.) and then developing individual training courses and training materials using specific ISD techniques. This will be accomplished by drawing upon the processes skills available to them through such materials and how-to-do-its as CRI, Front-End Analysis, Systematic Approach, Systems Approach, individualization, self-pacing, television, multi-media, etc., to meet specified objectives (usually supplied by the Middle-Manager level personnel, or at least approved by that level). The training course or instructional materials will be designed developed, tested, and sent to middle-management for approval. Thus, the Technician Level is most concerned with Inputs and Processes.

Each level should know that they must "fit" with the other levels to assure total Army effectiveness as well as efficiency. Training and management development for each of the levels should emphasize and clearly delineate the skills and abilities required of each, and exactly how each level will be integrated and related.

Case-in-Point: Middle-Manager Contributions

The Middle-Manager is usually required to assure quality and timeliness of the Products of the Technician. The Middle-Manager assumes the correctness and utility of his/her assignment, and is responsible for meeting that assignment. If a Tank Track Maintenance Course is required for the new MXX Tank, then the Middle-Managers job is to assure that it is completed according to specifications and that it delivers the required skills, knowledges, and attitudes for completers of that course.

As a supervisor of Technicians and the results developed and delivered by Technicians, there is a concern for, and a management of Inputs and Processes (e.g., approving the analysis of Input characteristics of trainees, sites, thods-means-media trade-offs, etc.) and will certify compliance with all requirements, rules, and regulations.

In addition, the Middle-Manager develops the performance specifications and objectives for any Product which will be developed and delivered by the Technicians. The Technician might develop the behavioral objectives in collaboration with the Middle-Manager, but the responsibility for the objectives and the quality of the Technician's Products will rest with the Middle-Manager. The focus of attention for the Middle-Manager will usually be at course-level, or course-cluster level. He or she will define the boundaries of work and Product, and assure the timely delivery of quality (working) courses and course materials. As a manager, the Middle-Manager should identify any potential problems in the Products she/he is to deliver in terms of their utility in the field, in combat, or in threat situations. The Middle-Manager is responsible for Inputs, Processes, and Products.

Case-in-Point: Senior Manager Contributions

The Senior Manager has a wider-angle perspective and associated responsibilities than the Middle-Manager and the Technician. The Senior Manager is to orchestrate and manage the Inputs, Processes, and Products of all Technicians and Middle-Managers under their control. Thus, the Senior-Manager must make certain that all completed Products meet their objectives, and that there has been compliance with all rules, regulations, and requirements, but also he is concerned that all of the Products "fit" together to achieve useful results for that management unit. For example, if one were developing the training courses for an MXX tank, then the Senior Manager is responsible for all of the Inputs, Processes, and Products required to deliver a useful Output. Seen in this way, the Senior Manager is required to assure that all which is designed, delivered, tested, and released will allow the MXX tank to operate according to specification, including all personnel and personnel interaction with the hardware, under predicted battlefield conditions.

The Senior Manager assumes that the MXX tank is useful, important, and is to be made combat ready. However, it is the responsibility of the Senior Manager to report up the chain of command any actual or potential problems for the Outputs and Products being developed under his/her management in terms of possible inability to meet current and future threat scenarios. Thus, the Senior Manager is responsible for the Organizational Elements of Input, Process, Product, and Output.

Case-in-Point: Executive Senior Manager Contributions

The Executive Senior Manager is responsible for the compliance and utility of all Products and Outputs developed in the Army. While supervising the actions and results of all Senior Managers, the Executive Senior Manager is responsible for the well being and success of the total Army, not just for the success of single School, Division, Post, or Camp. This person not only has to assure that the MXX tank works according to specifications, but also has to assure that the MXX tank is the correct solution to current and predicted Army problems and situations, and must revise as required.

The Executive Senior Manager understands that all individual Products and Outputs might be in compliance with assigned specifications, but also NOT add up to the combat potency required. (In Sociological terms, the Executive Senior Manager understands and acts on the knowledge that "the sum is greater than the parts.") Not only do all of the parts have to work individually, but they must integrate, coordinate, and mesh perfectly with everything the Army does, should do, and will do in threat situations.

The Executive Senior Managers's concern and responsibility is with the TOTAL Army, while other managers are concerned with their assigned responsibilities. Thus, the Executive Senior Manager is concerned with "holistic" perspectives, while the Senior Manager is concerned with their command and the Middle Manager is concerned with individual pieces of a command.

Thus, a System Approach for the TRADOC community will define and accomplish interlinking of the five Organizational Elements. To do less would result in a potentially inefficient or ineffective set of deliverables to the rest of the Army.

Technicians and Middle Managers are generally charged with "reaction" activities, since they assume the validity and utility of the assignments and charges made to them by the Senior Managers. Senior Managers are concerned with Proactive duties, since they can (and should) define useful goals and objectives as well as require compliance to existing ones.

While Senior Managers can assure the effectiveness of the Army, Middle Managers and Technicians can only assure compliance with assignments and the efficiency of their assigned, Internal, work. Executive Senior Managers may determine current and future impact, and affirm or change policy relative to US Army impact outside of the Army boundaries.

Case-in-Point: Linking all levels

Using the MXX Tank hypothetical example, the following are the areas of concern for each level:

Technician: applying processes to meet assigned specifications for the MXX Tank track maintenance course.

Middle Manager: assuring compliance with regulations and assuring that the assigned Products for the MXX Tank track maintenance course are delivered on time and will meet assigned requirements. Also, that other assigned MXX Tank courses are completed as well, such as Gun Turret Troubleshooting Course, gun repair, etc.

Senior Manager: assuring that all MXX Tank courses and soldier support actions and Products are delivered according to specification, on time, and that all of the elements of the MXX Tank readiness program will allow the Tank to meet all assigned objectives. The Senior Manager will coordinate all Products with other commands to assure that the entire MXX Tank system will work when it is deployed.

Executive Senior Manager: assures that the MXX Tank will work in predicted threat environments, and will assure that it works with all other combat elements of the Army and other US military commands and allied forces under possible threat scenarios, and will make recommendations to Department of the Army and DOD concerning modifications to existing elements, additions required, possible sources of problems along with cost-effective and cost-beneficial solutions to the problems.

TOOLS FOR DIFFERENT OPERATIONAL LEVELS.

The following are the tools which will most often be used by personnel operating at each level:

TECHNICIAN: Technicians will usually be operating at the Reactive level, and will be concerned with Inputs and Process, as they relate to Products (which will usually be predetermined and part of their assignment). They will set objectives and determine performance requirements (generally using Task Analysis techniques) using a Systematic Approach. Because they are operating in an Internal Mode, they will use a Systems Approach to Training. Among the tools they will use are:

Objectives
Systems Approach
Systematic Approach
Quasi-Needs Assessment
Methods-Means-Media Selection Techniques
Instructional System Design and Development Techniques (ISD)
Internal Evaluation
Auditing

Based upon these, they will generally do a training development cycle which may include some of the following:

Obtain training requirement
Set measurable objectives
Determine possible methods-means-media for meeting objectives
Select methods-means-media
Design methods-means-media
Field Test methods-means-media
Revise as required
Release training package

TECHNIQUES FOR MIDDLE MANAGER. Because the Middle Manager is most responsible for the development and delivery of Products, and will be concerned with the Organizational Elements of Inputs, Processes, and Products, he will generally use the following:

Front-End Analysis
Needs Analysis
Task Analysis
Problem Analysis
Quasi-Needs Assessment
Methods-Means-Media Analysis
Cost-Effectiveness Analysis
Cost-Efficiency Analysis
Program Evaluation Review Technique (or other management tools such as Management by Objectives, etc.)
Formative Evaluation
Internal Evaluation
Accounting

The general training development cycle used by the Middle Manager is likely to include:

- Obtain training requirement
- Conduct Front-end Analysis
- Conduct Needs Analysis
- Conduct Task Analysis
- Conduct Problem Analysis
- Conduct Quasi-Needs Assessment
- Conduct Methods-Means-Media Analysis
- Determine cost-effectiveness
- Determine cost-efficiency/Account for inputs
- Conduct Formative Evaluation
- Manage Training system development and test
- Release completed training package (or course)

TECHNIQUES FOR SENIOR MANAGERS. The Senior Manager generally deals with the Organizational Elements of Inputs, Processes, Products, and Outputs. The following are tools which they probably will use:

- Needs Assessments (usually for Product and/or Output)
- Front-End Analysis
- Needs Analysis
- Cost-Benefit Analysis
- Program Evaluation and Review Technique (or other tool for management and control of results)
- External Evaluation

They will usually delegate and monitor the actual "doing" activities of training analysis, design, development, and internal evaluation. Their training development cycle will likely be:

- Identify, document, and select Needs
- Identify, document, and select Quasi-Needs
- Determine Cost-benefit of alternative Quasi-Needs
- Approve Methods-Means-Media recommended
- Review program progress and en route accomplishments
- Conduct External Evaluation
- Require revisions
- Release final training/human improvement development programs.

EXECUTIVE SENIOR MANAGER TECHNIQUES. The Executive Senior Manager is responsible for the effectiveness of any training and human performance activities and results. Executive Senior Managers will be concerned with the Organizational Elements of Products, Outputs, and Outcomes. The techniques used by the Executive Senior Manager would include:

- Needs Assessment (usually for Outcome and Output)
- Management By Objective
- External Evaluation
- Cost Benefit Analysis
- Cost Utility Analysis
- Goal-free Evaluation
- Summative Evaluation

They will usually delegate all development activities and responsibilities, and will review only results and impact of Products and Outputs developed and delivered.

Their Training Development cycle would include:

- Determine Current TRADOC Policy
- Determine Outcome discrepancies
- Select Outcome Discrepancies to be closed
- Assign Front-End Analysis
- Assign Training packages and programs
- Assign other human performance improvement programs
- Determine linkages with other Army/Military/Governmental agencies to assure overall threat neutralization ability
- Integrate training requirements with weapon system selection, design, delivery, and implementation
- Conduct External Evaluation
- Require necessary revisions
- Install successful training programs
- Eliminate unrequired training programs
- Assure US Army ability to overcome or neutralize any enemy threat

MANAGEMENT FUNCTION ALLOCATIONS USING A SYSTEM APPROACH

Relating to the Organizational Elements Model (OEM) the following function allocations are suggested in assigning of duties and responsibilities:

<u>ASSIGNMENT LEVEL</u>	<u>OEM CONCERNS AND RESPONSIBILITIES</u>
TECHNICIAN	INPUTS PROCESSES
MIDDLE MANAGER	PRODUCTS
SENIOR MANAGER	OUTPUTS
EXECUTIVE SENIOR MANAGER	OUTCOMES

There are, therefore, both specific duties, concerns, and responsibilities as well as overlap among the assignment, duties, and responsibilities of each of the TRADOC community personnel levels.

RELATING THE SYSTEM APPROACH TOOLS TO THE OEM. The following relates which of the tools useful in a System Approach "fit" with each of the Organizational Elements. It should be noted that some tools will be useful in more than one Organizational Element.

<u>ORGANIZATIONAL ELEMENT</u>	<u>USEFUL TOOL, RESOURCE, TECHNIQUE OR RESULT</u>
INPUTS	accounting resources existing objectives existing Needs existing personnel existing resources TRADOC regulations DOA regulations DOD regulations US law Executive orders treaties

PROCESSES

curriculum
methods-means-media
 selection techniques
cost-efficiency analysis
Systems Approach
System approach
systematic approach
training
ISD
Formative Evaluation
Summative Evaluation
Goal-free Evaluation
CRI
mastery learning
classroom lectures
television delivery
management-by-objective
self-paced instruction
programed instruction
Needs Assessment
Needs Analysis
Front-end Analysis
problem analysis
reactive approach
proactive approach
OEM model
ARTEP Exercises

PRODUCTS

validated learning
 packages
test results
competence
completed task analysis
completed Needs
 Assessment
completed Needs Analysis
completed Front-end
 Analysis
completed course
completed curriculum
completed training
 program
completed Evaluation
 (formative, summative,
 goal free)
combat ready soldier

OUTPUTS

combat ready divisions
combat read units
combat ready Army
ARTEPS results
combat ready soldiers in
correct place in the
field

OUTCOMES

Enemy threat
neutralization
Peace
Safety for civilians
Survival of soldiers

The above shows both the types of things that would represent each OEM as well as identifying where most of the major tools and techniques would be useful. Note that any tool or technique represents a Process, and the results of the use of it will deliver a Product.

APPLYING NEEDS ASSESSMENT AND NEEDS ANALYSIS TOOLS AND TECHNIQUES

Following are some steps which each level of Army training activity might follow to conduct a successful assessment and/or analysis of Needs.

Middle Manager Level and Technician Level: This will be a Needs Analysis effort. When assigned by the Middle Manager, the Technician will:

- Identify current performance levels as measured by tests or comparison of current performance levels with existing performance standards.
- Identify required levels of performance.
- Determine gaps in levels of performance, ideally by different types of learners.

- Identify skills, knowledges, and attitudes which should be changed.
- Identify skills, knowledges, and attitudes which should be continued.
- Identify the causes for performance discrepancies through analysis of the components of behavior (such as conducting a learning hierarchical analysis of required acquisition and comparing that with the actual, currently induced learning steps and levels).

- Recommended methods-means-media for closing the gaps and maintaining the currently successful performances.

The Middle Manager will approve the objectives, and allow the Technician to move ahead with course development.

Data sources which could be used include current training test results, ARTEPS data, simulation exercises, specific testing by the Technician relating to current job results, expert opinion, supervisory judgments (note: these last two are very unreliable sources of data).

Senior Manager Level: This will usually be a Needs Assessment accomplished at the Product and Output levels. Here the Senior Manager will (or cause to be accomplish):

- Determine current performance levels of individuals and/or teams in operational situations.

- Determine required performance levels of individuals and/or teams in operational situations. (This is Needs Assessment-related since it deals with gaps in Outputs.)

- Determine gaps in entry and exit levels for supposed enabling training courses and programs which "cause" the performance discrepancies. (This is a Needs Assessment at the Product level.)

- Determine possible ways and means of closing the gaps at the Product and Output levels based upon diagnosed causes. (This is Needs Analysis, for it is focusing on causes or origins of the Needs rather than upon identifying and documenting Needs.)

- Selecting the ways and means for closing the gaps in Products and Outputs.

- Assigning the ways and means for development to Technician through Middle Manager.

Executive Senior Manager Level: This effort will almost always be Needs Assessment since the identification of gaps in resources and causes should be accomplished at a lower level. The Executive Senior Manager will (or cause to be accomplished):

- Identify current and future threats to the Army.
- Identify current and future threats to the Joint Military and Allied Forces.
- Identify current performance capabilities for the Army in each of the threat scenarios (here one could use ARTEP or simulation data).
- Identify gaps in performance capability by major Army elements (such as divisions, corps, etc.)
- Identify existing competent response and performance capability.
- Identify change requirements and continuation requirements to overcome possible enemy threats. These are External Needs Assessment issues, and they relate survival (Outcomes) with delivery capability (Outputs) in order to determine Needs.)

- Identify causes for the Needs in terms of those Products which constitute each Output and Outcome. (This is a shift to Needs Analysis since it is seeking causes for Needs, not just identifying the Needs.)

- Identify causes which are changeable within the Army.

- Identify causes which are external to the Army.

- Recommend changes, both Internal and External to the Department of the Army and/or to DOD.

Needs Assessment and Needs Analysis are linked. Needs Assessment identifies, documents, and justifies the causes and origins of the gaps in results. While Needs Analysis determines the causes of the gaps, both Needs Assessment and Needs Analysis must be data based and should come from empirical data whenever possible. Both tools are critical for linking Army training with effective US Forces success in future threats.

IMPORTANCE OF NEEDS ASSESSMENT AND NEEDS ANALYSIS IN NEW WEAPONS

ACQUISITION AND FIELDING

When identifying future weapon systems, it should be of critical importance to conduct a Needs Assessment before doing a Needs Analysis or actually acquiring a new weapon system. By first conducting a Needs Assessment, the possible threats will be identified and documented, the possible responses (including diplomatic, political, hardware, personnel) will be considered (along with the advantages and disadvantages of each), and then (and only then) will a new weapon system be selected. A Needs Assessment will also reveal what human and physical resources are available for the design, development, implementation, maintenance and test of the selected solution (weapon system) when it is developed and fielded.

In an analysis of Needs, one will then be able to determine the personnel and environmental factors that will be present in which the weapon system will have to operate, and will not assume a consistency of resources. For example: the personnel entering the Army as of early 1983 may not be the same calibre and competence as those entering and available when a seven year lead-time weapon system is to be fielded. These dynamic factors will be critical and must be formally considered, not just held as a constant for ease of decision making.

Frequently, in most organizations (not just the Army) decisions about major weapons (or Product lines in industry) are made without the External Needs Assessment data and frequently there are problems in the successful implementation of the weapon systems which were "not predicted." External Needs Assessment, followed by Internal Needs Assessments and then Needs Analyses will reduce the acquisition and fielding problem measurably. It will shift the Army from a reactive mode to an proactive mode.