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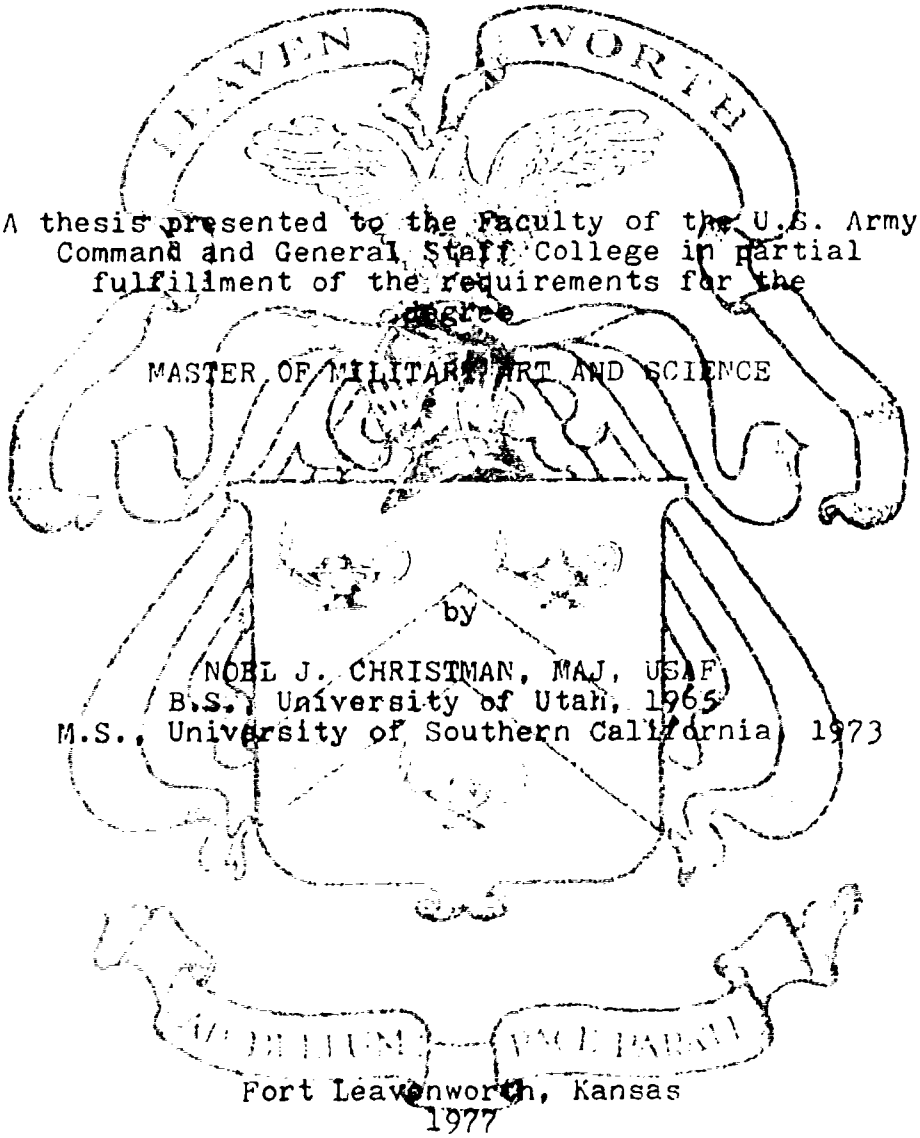
This paper surveys the topic of human factors in the form of a taxonomy. Human factors are and always have been of vital concern to the military commander, and are essential elements in the way all organizations function.

Military literature does not offer a significant source of study materials for developing professional knowledge and skills in human factors related studies. Civilian literature, however, is available and applicable to the military leader's needs.

The taxonomy, a classification system based on theory underlying the subject, is an especially valuable vehicle for surveying a topic like human factors. The structured development of a subject that is inherent to the taxonomy has several practical and intellectual benefits. The practical aspects include information storage arrangement, curriculum design, and terminology clarification. Intellectual implications recognize that new information is more easily understood and remembered when it fits into a pattern, or informational structure, already established in individual thinking. Also, this structure guides attitudes about the relevance of new material to a given subject

This taxonomy divides human factors into individual, small group, and large group categories as primary divisions. the sub-levels of each address information input, processing, and the attitudina l reactions which result.

A HUMAN FACTORS TAXONOMY



A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

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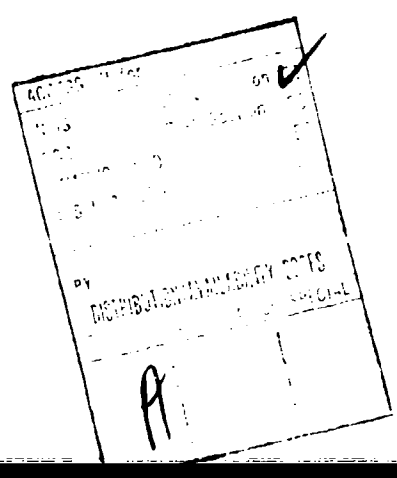

ABSTRACT

This paper surveys the topic of human factors in the form of a taxonomy. Human factors are and always have been of vital concern to the military commander, and are essential elements in the functioning of all organizations.

Military literature does not offer significant human factors study materials for developing professional knowledge and applicable skills. Civilian literature, however, is available and applicable to the military leader's needs.

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CHAPTER I

INTRODUCTION

Purpose

The purpose of this paper is to develop a taxonomy of human factors in the military and to demonstrate its practical use.

Definitions

Human factors are those determinants of human behavior that influence job performance; for example, morale, perceptions, learning, and esprit de corps. They result from the combination of personal experiences, social and cultural background, religious and educational training, and the design of the brain and nervous system. Physical attributes such as strength and endurance are not included. Obviously there is a great deal of mutual influence between man's mental and physical performance; however, there is an essential difference between lifting a load and wanting to do so. It is the latter that is addressed in this paper.

A taxonomy is a classification system, that is a means for organizing material in a systematic arrangement of classes. It is characterized by categories based on principles that underlie the subject matter and by its hierarchical arrangement of classes. The animal kingdom, for example, could be classified according to the size, color, or habitat of its members. In the taxonomy of animal life, however, categories are based on evolutionary lines of development. Thus the Theory of Evolution is the underlying principle and the basis for creation and arrangement of groupings in the study of the animal kingdom. Likewise, an hierarchical arrangement is evident in branches which descent chronologically and depict each unique development in a line of progeny as a next lower subcategory.

Delimitations

The military environment being considered is the current United States Department of Defense. No distinction is made between services since human factors are equally important and basically the same in them all. The term "soldier" is used throughout this paper, unless otherwise stated, as a generic collective to identify all male and female members of the armed forces.

The time frame is limited to the present, therefore no historical perspective will be developed in the taxonomy. Also, factors such as ideology, which are of

direct importance in some foreign military organizations, but not in our own, will not be directly included. Ideologies that are part of the U.S. military man's make-up are derived through social and cultural channels rather than formal military training. They will therefore be included only indirectly as part of this study.

It is not within the scope of this paper to develop the theoretical topics used in the taxonomy. Only brief statements describing the primary notion of each theory will be given, along with concise statements to describe each category and establish relationships among them. The rationale and methodology of building the taxonomy will be developed in Chapter IV.

Taxonomy Applications

The many theoretical implications of the taxonomy will be examined in Chapter III. It is appropriate as an introduction, however, to mention some practical applications. The most obvious is in the arrangement of stored subject matter in a systematic manner for easy retrieval. This is the purpose of the Dewey Decimal System for books, Roget's Thesaurus for words, and an office filing system for letters.

In an academic sense, the taxonomy may be used as an aid in designing a class or course curriculum

dealing with human factors. It can help clarify relationships among individual subjects, and be used as a cross check against a more standard functional arrangement of material to insure that no important information has been neglected.

Finally, the taxonomy can be an aid to communication. Ambiguities can be resolved and relationships among terms better understood through reference to a taxonomy.

Importance of Human Factors

The human aspects of war and military life are important beyond overstatement. War is a human event; no plan, action, or machine of war can exist without first having been conceived or created by man. None can function without his direction. Sun Tzu, writing in the sixth century B.C., listed "moral influence" as the first of his five fundamental factors of war.[1] Although much has changed socially and technically in the past 25 centuries, the significance of human factors has not diminished. Many authors, in fact, hold them to be more vital now than ever before.[2]

The socially sophisticated and highly educated soldier of today cannot be led effectively without the knowledgeable application of principles studied in the Behavioral Sciences. In "free world" military establishments he will not, for example, submit to strongly

authoritarian leadership, but must be influenced to do his best through understanding of his needs and motivations.[3]

Technology, while appearing to replace men with machines, has in fact put greater reliance on individual and small group performance in operating machines effectively.[4] By any measure, the human side of war is a timely subject worthy of study.

1. S.B. Griffith, Sun Tzu - The Art of War (New York and Oxford: Oxford University Press, 1963), p. 63.

2. Morris Janowitz and Roger W. Little, Sociology and the Military Establishment (New York: Russell SAGE Foundation, 1965), p. 42.

3. Ibid., p. 437.

4. Ibid., p. 42.

Chapter II

HUMAN FACTORS IN THE MILITARY

"I call high morale the greatest single factor in war."

Field Marshal Bernard Montgomery

While the previous chapter presented an overview of the entire paper, this one will establish the historical and continuing importance of human factors in the military. Sources of information about human factors in military and civilian literature, and their relevance to the military environment, will be discussed.

Historical Importance

There can be no doubt of the vital role played by human factors in the military environment. Personal qualities that characterize the professional soldier such as courage, willpower, purpose and innovativeness all result from human qualities. Writing in 500 B.C., Sun Tzu stressed the importance of controlling the mental attitudes of both friendly and enemy troops to secure victory in war.[1] The mid-fifteenth century Synodal Code of the Russian Tsar Alexey Mikhaylovich contained

instructions on the mental states of armed men and how to direct them in the service.[2] Knowing and influencing the mood and temper of military men has long been a primary concern of commanders.

Lieutenant Colonel P.L. MacDougall, Superintendent of Studies at the Royal Military College, England, in the mid 1800's, quoted Napoleon extensively in his book, The Theory of War.[3]

> The divine part of the art (of war) is that which is derived from moral considerations of the character, talent and interests of your adversary: of the opinion and spirit of the soldier, who is strong and victorious, or feable and vanquished, according as he believes himself to be.

In a chapter entitled, "On Moral Agents in War," MacDougall quotes the great battle captain further as saying, "in war 'the moral' is to 'the physical' in the ratio of three to one." In other chapters MacDougall discusses personal qualities of commanders and ways to influence men.

Current Importance of Human Factors

Although technology has greatly altered the complexion of the battlefield, the essential humanness of wartime events remains. S.L.A. Marshall, retired Brigadier General, military historian, and student of combat in WWII and Korea wrote, "Only when the human, rather than the material aspects of an operation are put uppermost can tactical bodies be conditioned to make the

most of their potential unity."[4] In The Yom Kippur War, A.J. Barker summed up the importance of human factors vis a vis technology in that 1973 conflict by stating, "All these (new) weapons were to have a tremendous impact on the war - the extent of which has been assessed and will be reassessed time and again. But in the Middle East the human element proved to be as important as it ever was."[5]

Doctrinal writings of both the United States and Soviet armies support the importance of human factors in modern war. US Army Field Manual 30-40, Handbook on Soviet Ground Forces, Para 3-1, quotes a statement of Soviet military policy, "It is not equipment alone, no matter how advanced it is, but man capable of using it to the fullest extent, man distinguished for his high morale, that will secure victory in war." From material issued at the US Army Command and General Staff College, "Combat power is a combination of the physical means available to a commander and the moral strength of his command."[6]

Study Material Sources in the Military

With human factors widely accepted as an important aspect of the military environment, a question arises as to sources of relevant information available to the professional soldier and its applicability to the military environment. The armed forces have done considerable work in human engineering and psychological testing.

Psychophysiology has received a great deal of attention in support of the space program and psychiatry in the military environment, especially combat, has been studied.[7]

All of these efforts have made valuable contributions in their respective areas, but they are written in highly technical language by and for scholars and specialists. Lay readers cannot readily understand or apply this material to their work. Also, such material tends to be peripheral to the line officer's needs.[8] Subjects like institutional training, testing and evaluation, and man-machine interface design are explored in depth, while the basic business of improving understanding, communications and interpersonal relationships among the troops has received little attention in the military writings. As a result, no significant pool of military literature exists to use in the study of human factors.[9]

Study Material Sources From Civilian Literature

Military men tend to assert that civilian studies in applied psychology, and the management techniques based on them, are of no value in the military environment. This attitude probably stems from two conditions. First, the theoretical and obscure language and ideas developed by Sigmund Freud and others early in the study of human behavior were of little direct or practical use.

Opinions formed on the basis of these writings would naturally be skeptical. Second, many people believe that violence in the combat environment precludes rational behavior; therefore excluding the battleground from a rational investigation. Each of these views, however, is being increasingly contradicted by a growing number of studies and an increasing volume of literature which support the notion that civilian studies can and should be used; and that human behavior, including that in combat, can and should be studied by military people.

On the question of readability and utility, a kind of everyday psychology has developed in behavioral science and organizational theory literature that is readily studied and used by laymen. For example, T.A. Harris' book, I'm OK - You're OK, is a popular version of Dr. Eric Berne's theory of Transactional Analysis.[10] Harris' book was on The New York Time's best seller list for over a year. Hundreds of books now on the market are written for managers to apply in their work, rather than for specialists to use in their practices. For example, Ernest Dale's, Management: Theory and Practice, features four chapters on applying Behavioral Science to management processes, plus others on organizational theory, decision making, and planning based on the behavioral scientist's perspective.[11] The Personnel Management Process, by Wendall French, also features several chapters of behavioral science topics

applied to management.[12]

Another trend that makes current literature more useable for the layman is that much of the modern theoretical writing is in the form of easily understood models. Complex factors that influence human behavior are condensed into concepts which can be understood and used by laymen. For example, Maslow's hierarchical need level model[13] is a tool useful even to the high school level reader for a better understanding of himself and those around him.

Human Factors Study in the Military

Not only are writings in the psychological and behavioral science fields becoming more practical and readable, but there is mounting evidence that military people can and should apply these lessons toward the enhancement of their duties.

The Soviet book, "Military Psychology - A Soviet View," for example, develops every aspect of the soldier's life and work as a suitable topic for scientific study.[14] In the introduction to the book, the USSR Minister of Defense, Marshal of the Soviet Union A.A. Grechko, is quoted as saying that all officers should study psychology to become better leaders. A U.S. Air Force study in 1966 concluded that the Herzberg model of job satisfaction factors applies equally well to military members and to civilians.[15] Captain C.O. Halverson reached the same

conclusion in his 1974 Command and General Staff College thesis, Motivation and Job Satisfaction for Middle Level Career Army Officers.[16]

In his Master's thesis, A Comparative Analysis of Job Satisfaction in Air Force and Civilian Management, at Louisiana Tech University, Philip M. Berg used the Herzberg model as the basis for comparing 751 civilian to 430 Air Force managers. Although there were some variations in the profiles developed of the two groups, the obvious premise of the work is that the model selected applies to them both.[17]

Another study, published in the "Journal of Applied Psychology", by P.V. Johnson and R.H. Marcum of Purdue University, applied the Maslow need level model to three echelons of Army officers for the purpose of developing a need fulfillment profile.[18] Their work describes a clear variation in the potential for need fulfillment among pay grades and between staff and command positions.

Some topics, developed in civilian literature, apply directly to the combat environment. Dr. M.D. Meerloo, for example, has discussed the psychological and physiological characteristics of shock.[19] He has noted that surgical and combat shock are both caused by fear and panic, and that knowledge and training can do a lot to reduce the likelihood and severity of these phenomena. Dr. Von Greyez, in Psychology of Survival, has examined the trauma of nuclear war and concluded that prior

knowledge and training are the principal means of controlling panic, shock and loss of control.[20] In his article, "Buddy Relations and Combat Performance," Roger Little looks specifically at social roles in combat situations.[21] It is hardly surprising that he found relationships on the battlefield do not become irrelevant, but rather grow more intense and become more important to job performance there.

Management Study and the Military

Management methods based on the behavioral sciences are seen by many military people as being too "soft" for application in the potentially life-and-death military environment. This attitude stems largely from two common misunderstandings. First, an assumption is made that a single management method or style is prescribed for all situations. Actually, the most widely read authors develop models which cover a range of leadership styles. These vary from unstructured, group centered approaches to sternly autocratic methods. The Hersey-Blanchard model, for example, includes an analysis of the people and organizational circumstance as a specific step in the process of selecting an appropriate leadership style.[22] The knowledge and application of a range of approaches provides a bag of tools which can benefit all military leaders.

A second reason that management techniques are frequently believed not to be applicable in the military is based on the premise that only methods suitable for combat can be used. This notion rings with "macho," but is clearly not realistic because of the vast majority of all military activities are performed in non-combat environments. Even during a major conflict, like Vietnam, the preponderance of all military man hours each day are not spent fighting. Units and crews that do fight or work in other hazardous conditions can adjust their behavior patterns as necessary while not actually doing so. For example, the role of flight lead in a fighter formation requires an extremely autocratic style of leadership, contrasting sharply with the casual atmosphere of the same group during non-flying activities. The necessary adjustments in interpersonal relationships are made in accordance with differing circumstances.

The strongest case for the applicability of modern management approaches to the military can be made by observing that both the Army and the Air Force are now conducting internal management consultant programs styled after civilian program models. The Army is training Organizational Effectiveness Staff Officers for assignment into installation and operating organizations to function as a consultant for commanders and to help with organizational problems.

1. S.B. Griffith, Sun Tzu - The Art of War (New York and Oxford: Oxford University Press, 1963), p. 41

2. V.V. Shelyag, A.D. Glotochkin, K.K. Platonov (eds), Military Psychology - A Soviet View (Moscow: Military Publishing House of the Ministry of Defense of the USSR, 1972), p. 27.

3. P.L. MacDougall, The Theory of War (London: Longman, Brown, Green, Longmans, and Roberts, 1858), p. 43.

4. S.L.A. Marshall, Men Against Fire (New York, Washington: Combat Forces Press and William Morrow & Co., 1947), p. 59.

5. A.J. Barker, The Yom Kippur War (New York: Random House, Ballantine Books, 1974), p. 115.

6. Lesson M3161-6, Appendix I, para. 3a USACGSC, 1975.

7. N.D.C. Lewis, B. Engle (eds.), Wartime Psychiatry (New York: Oxford University Press, 1954), 950 pp.

8. Morris Janowitz, Roger W. Little, Sociology and the Military Establishment (New York: Russell SAGE Foundation, 1965), p. 121.

9. New manuals such as FM 22-100, Military Leadership, June 1973 are beginning to fill this void.

10. Thomas A. Harris, M.D., I'm OK - You're OK (New York: Avon Books, 1973), 304 pp.

11. Ernest Dale, Management: Theory and Practice (New York: McGraw-Hill Book Company, 1965), 771 pp.

12. Wendell French, The Personnel Management Process (Boston: Houghton Mifflin Company, 1974), 741 pp.

13. Abraham H. Maslow, Motivation and Personality (New York: Harper and Row Publishers, 1954).

14. Shelyag, op. cit.

15. C.O. Halverson, "Motivation and Job Satisfaction for Middle Level Career Army Officers" (unpublished Master's Thesis, CGSC, 1975), p. 31, citing Air Force Study (Department of the Air Force, Office of the Chief of Staff, A Study in Officer Motivation: New View, Washington: Government Printing Office, 1966, p. 118).

16. Ibid.

17. Philip M. Berg, "A Comparative Analysis of Job Satisfaction in Air Force and Civilian Management" (Ruston, Louisiana, an unpublished research paper at the Louisiana Tech University, 1971).

18. Paul V. Johnson, Robert H. Marcum, "Perceived Deficiencies in Individual Need Fulfillment of Career Army Officers," Journal of Applied Psychology, 1968, p. 457.

19. M.D. Meerloo, Patterns of Shock (New York: International Universities Press, Inc., 1950), 150 pp.

20. Von Greyez, Psychology of Survival (Amsterdam, New York: Elsevier Publishing Co., 1962), 150 pp.

21. Roger Little, "Buddy Relations and Combat Performance," The New Military - Changing Patterns of Organization, ed. Moris Janowitz (New York: SAGE Foundation, 1964), p. 195.

22. Paul Hersey, K.H. Blanchard, Management of Organizational Behavior (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972), p. 133.

CHAPTER III

THE TAXONOMY

What Is A Taxonomy

As explained in Chapter I, this study will develop a taxonomy of human factors in the military environme Human factors study was discussed in Chapter II, and it is the purpose of this chapter to explore the nature, history, and importance of the taxonomy.

The word, "taxonomy," means a classification system based on theory underlying the subject matter. Classical examples of taxonomies are the classification systems for plants and animals. The groupings of phylum, class, order, family, genus and species not only serve to organize and structure the subject matter but clearly demonstrate the underlying Theory of Evolution.

Classification Systems

A "taxonomy" as defined in the preceding section is a classification system. It is therefore appropriate here to reflect on the nature, uses and importance of such systems.

A classification system is a set of rules for arranging things or ideas into an orderly array of groupings. All members of each group have some mutual property not shared by members of any other group. Thus each group can be designated, characterized and located by its nominal property.

In the most general sense, classification schemes serve to conveniently organize material for systematic storage and easy retrieval. Thus hardware contained in bins is sorted by size and shape; correspondence is filed in alphabetical order. This was Melvil Dewey's intent when, as a student library assistant, he devised a radical new means of classifying and arranging books in the library. Before his contribution, books were customarily arranged by alphabetical order, size, color or accession.[1] It is not that Dewey invented the notion of classification, or even first applied it to books in the library. Indeed, books systematically arranged by color are, in fact, classified. The obvious shortcoming, however, is the lack of correlation between color and subject matter.

From the practical standpoint, Dewey's contribution was the selection of nominal groupings to designate, characterize and locate each category of book by our primary interest in them, subject matter. A more fundamental improvement, however, was the elevation of focus from size and color - physical properties - to informational content - an intellectual quality - as the

discriminating factor. The significance of this latter point is profound, and will be further developed in subsequent sections.

Classification and Structure

The property that facilitates storage and retrieval when material has been classified is structure: that is, relative position of each informational element. Relativeness connotes positions that exist in a framework defined by the relationships among them. On a number line, for example, one would expect to find "four" between "three" and "five." This is, in fact, how the structure of a number line may be defined.

The structure of a classification system is frequently reflected in physical locations. For example, books shelved in a library, word symbols in a dictionary, and magnetic pulses in a computer memory bank may be positioned in accordance with such a system. These arrangements provide a means of physically locating the desired information and insuring its proximity to other relevant material. This function is very important, but not fundamentally so. The more basic value of structure is in the mental processes which result from structure imposed on information. "Attending" and "relating" are two processes directly influenced by informational structure.

The attention of an observer is directed into preconceived categories by structure. That which is included in or near the category of interest is treated as relevant, while excluded material is frequently ignored. This process is good and necessary from a practical standpoint. One would not, for example, want to plow through ancient history while researching modern aviation. On the other hand, limitations imposed while using categories should be borne in mind. Consider, for instance, how differently an armor officer views the battlefield than does an artilleryman. When they entered the service their perceptions may have been quite similar, but as their professional development is moulded according to the personnel classification system they come to hold quite different points of view.

Major academic disciplines were separated over the years into discrete schools for study. Some of these categories were defined rather arbitrarily, for convenience at various universities. These divisions caused the development of separate points of view, and even different jargons, in dealing with the same topics. Some of the greatest academic and scientific achievements of recent years have resulted from the synthesis of ideas found in schools previously isolated from each other by the classification system. Biochemistry, Biophysics, Psychosociology, and Neuropsychology are all modern terms that reflect this trend. The clear implication is that

an arbitrary separation of information may well have delayed the necessary synthesis, and that if some other means of classification had been applied the separation may not have occurred and progress could have been made much faster.

The Structure of Intellect

Philosophers have long inquired into the structure of knowledge and its relationship to thinking.[2] Aristotle, Bacon, and Locke, among others, classified all knowledge as they understood it. Conventional wisdom subconsciously displayed in our language today implies the importance of the structure of knowledge with such phrases as "frame of reference." There is clearly more involved in this notion than a "point of view," since a structured mental framework from within which one views the world is clearly implied. Although not yet empirically demonstratable, the existance of a mental or intellectual structure is the central theme of work going on in several areas.

Following the lead of Thurstone in the 1930's, and the Air Force psychologists of WW II, J.P. Guilford is developing a structural model of the intellect.[3] His premise is that intellectual processes fall into detectable and identifiable categories, in much the same way that we divide problem solving into processes of identifying, defining, developing alternatives, and so forth. The categories in his model are interrelated in

predictable patterns which he represents in a three-dimensional matrix. Guilford has identified five operations (cognition, memory, divergent production, convergent production, and evaluation) which are performed on four types of content (figural, symbolic, semantic, and behavioral). The results of these interactions are six products (units, classes, relations, systems, transformations and implications.) His matrix is now being used to predict the characteristics of some 35 factors which have not yet been detected. When found, these factors will fill in the blank cells of the model. There is a strong resemblance between the approach taken by Guilford and that taken by Mendeleev in the development and use of the Periodic Table of the Elements. The Periodic Table is, of course, a two dimensional matrix which led to the discovery of many elements after their characteristics had been predicted as those needed to fill blank positions in the table.

Remembering is the mental process that is most clearly demonstrated as being structured. It is both understood and accomplished best as a process of establishing the relative position of each new bit of information within an existing file. In his book, Remembering Made Easy, Arthur L. Logan suggests several aids for remembering names, objects, numbers and events.[4] In each case the key in his method is to firmly establish a connection between the thought to be remembered and some pre-memorized list,

or a link from one item to the next in a new list. It is the "memory trail", or interconnecting pathway among thoughts, that one follows in remembering.[5] The very strong evidence in support of this view led J.R. Anderson and G.H. Bower to define learning in terms of building associations between new information and that already known.[6] With the definition of structure, as given in a previous section of this paper, the implication is that all learning and remembering, that is all non-inherited mental content, is in the form of an informational structure.

At this point it is appropriate to inquire briefly into a possible cause for structure being apparently such an integral part of mental activities.

Intellectual Structure and the Brain

Study and experimentation in neural physiology are rapidly developing a picture of how the brain and nervous system work, and may ultimately provide the reason for what appears to be a structural basis for all mental activity. From the study of the eye's retina, a true neural extension of the brain, it has been learned that nerve cells act to reinforce or inhibit the responses of adjacent cells, depending on the pattern and movement of the visual image.[7] Such functional interrelationships between cells are established by the neural wiring schema which joins them, literally, just as radio

components are joined by electrical conductors. In addition to sensing an image, the reinforcement/inhibition patterns actually discriminate in favor of certain types of images. This discrimination phenomenon constitutes a preliminary decision which directs attention to the selected objects.

Nodes, clusters, and cells of the brain are similarly interconnected with reinforcement and inhibitory circuits. In the brain, however, learned behavior and memory exist in the form of selectively created neural circuits. These circuits are created as a response to informational inputs. It is clearly the structure of these circuits, as determined by perceived relationships among informational elements, that dictates the performance of the brain.[8] The "memory trails" mentioned in the previous section become, quite literally, electrochemical pathways which, when followed, trigger a series of complex patterns of neural responses that may only be arrived at by following the appropriate path. The true genius of Freud was to infer that all mental processes occur in such an interrelated and structured media.

Although this discussion has digressed somewhat from the primary topic, the excursion was short and necessary to put the notion of structure, therefore classification and, ultimately, the taxonomy in its proper "frame of reference."

1. Melvil Dewey, Decimal Classification (New York: Forest Press Inc., 1951), p. ix.

2. Ibid., p. ix.

3. Donald W. Taylor, "Thinking," Theories in Contemporary Psychology, ed. Melvin H. Marx (London: The MacMillan Company, 1963), pp. 475 - 480.

4. Arthur L. Logan, Remembering Made Easy (New York: ARC Books Inc., 1955), 94 pp.

5. John R. Anderson, Gordon H. Bower, Human Associative Memory (Washington D.C.: Hemisphere Publishing Corp., 1974), pp. 355-388.

6. Ibid.

7. Jorg Peter Ewert, "The Neural Bases of Visually Guided Behavior," Scientific American, March 1974, p. 104.

8. Lennart Heimer, "Pathways in the Brain," Scientific American, July 1971, p. 48.

CHAPTER IV

METHODOLOGY

Research Method

Library search provided the primary source of material for developing the taxonomy. Books on psychology, sociology, management, physiology and related topics were scanned to generate topical lists. This methodology is similar to that used by Bloom and his committee in developing their taxonomy of educational objectives.[1]

Sorting the lists into tentative arrays led to the choice of an arrangement which best fit guidelines described in the following section. Further development of the trial arrangement resulted in the taxonomy presented in Chapter V.

The thesis advisory committee met with the author during the formulative stages of this paper for review and discussion to insure that terms selected communicated the same meanings to all readers. This was an important step in view of the communications role intended for the completed taxonomy.[2]

General Guidelines

The following guidelines were developed for the process of building a taxonomy. They are the practical rules necessary to supplement the theory discussed in Chapter III. The guidelines used in this paper parallel, for the most part, those used in the Taxonomy of Educational Objectives.[3] They serve to reduce the ambiguities in developing the taxonomy, and to insure its utility.

First, the taxonomy must be logically developed and internally consistent. A given word or phrase, for example, must retain the same meaning throughout. Also, relationships implied by a term's position in the array must be supported by any definitions or discussions of the terms involved.

Second, the array configuration and term discussions must conform to current understanding of psychological phenomena. This requirement can be satisfied by referring to current literature. The relationships among concepts, however, are not so easily determined. Writers tend to develop their topics on human behavior as though an entire picture were being presented. However, as E.R. Hilgard observed of learning theory,[4] and as Paul Hersey and Kenneth Blanchard demonstrated with organizational theory,[5] the best picture results from fitting together the many small pieces that individual theories offer. This piecing

together can be done either as an over-arching theory, as is the Hersey-Blanchard model, or in the form of taxonomy, as done by Bloom et al. Since writers do not usually discuss the interrelationships between their own theories and those of others in the field, it is incumbent on the observer to infer them.

Third, the terms used in the taxonomy must be neutral and descriptive. They should imply no value judgements as to a superiority of one notion over others. Also, the language and structure must allow future entires on the subject without bias or prejudice.

Fourth, and finally, definitions and relationships expressed in the taxonomy should reflect common usage. Since one of the primary benefits of a taxonomy is to aid in communications, it is essential that a general understanding on the subject not be violated. This rule is, however, subordinate to the previous three.

The Larger Context

The delimitations section of Chapter I addressed some of the "boundaries" of this paper in terms of scope and depth. This section will discuss the boundary subject areas showing how human factors in the military environment fit into the larger context.

The military can be subdivided many ways, but functional subdivisions are probably the most often used. An excellent example is Forrest K. Kleinman's The Modern

United States Army.[6] With a focus on the soldier, Lt. Col. Kleinman describes the Army in terms of training, equipping, organizing, deploying, supporting, supplying, and administering. Functional divisions are also typically applied to regulations, manuals and organizational materials as a matter of practical necessity. This type of categorization, however, does not satisfy the requirements of a taxonomy; that is, the subdivision structure is not normally based on underlying principles.

For the purpose of establishing a position of human factors in the military and the larger scheme of things, manpower, a subdivision of the military, is divided into 1) Physical Attributes and 2) Human Factors. The military, in turn, is divided into 1) Materiel, 2) Manpower, and 3) Doctrine. The next higher level, of which the military is one division, is National Means For International Influence. The members of this category are 1) Geographic, 2) Cultural, 3) Economic, 4) Military, and 5) Political means.

The above categories were selected because they are in popular use and are built upon clearly distinct theoretical bases. These criteria are in accordance with the rules established in the previous section, the theory developed in Chapter III, and the rationale that is discussed in the following section.

A TAXONOMY OF NATIONAL MEANS FOR INTERNATIONAL INFLUENCE

100 Geographic

200 Cultural

300 Economic

400 Military

- 410 Materiel
  - 11 Supplies
  - 12 Equipment
  - 13 Facilities
- 420 Manpower
  - 21 Physical Attributes
  - 22 Human Factors
- 430 Doctrine
  - 31 Organizational
  - 32 Operational

500 Political

Rationale For The Taxonomy

A taxonomy, as applied to the animal kingdom, is a symbolic reproduction of the subject. Conceptual relationships between word symbols on paper exactly mirror physical relationships among the objects represented. This pure application of taxonomy theory is possible only where, 1) a physical structure or system does in fact exist, and 2) where a single theoretical structure embraces the entire subject as the theory of evolution does in the case of living things. For subjects comprised of many contributing theories but lacking a single overarching structure, like educational objectives, a less rigorous approach has been used: inferred conceptual groupings.

An example of how conceptual groupings may be accomplished can be demonstrated using the square, circle, cube, and sphere. One may pair together the square and cube, then the circle and sphere. This arrangement can be viewed as categories embodying the concepts of "roundness" and "squareness." Another possibility is to pair the square and circle, then the cube and sphere. This array demonstrates "two dimensions" as opposed to "three dimensions." Since the theoretical development of geometry reflects the dimensional concepts, the latter choice of pairings would be made in preference to the more philosophical choice first mentioned.

Two additional distinctions should be made here between the natural and conceptual taxonomies. First, while only one possible arrangement can represent the physical and historical facts describing the subject of a natural taxonomy, there are many possible approaches to arranging a broad theoretical subject. The taxonomy presented in this paper, for example, is not a unique solution but only one of many possible means for accomplishing the task. Second, the natural taxonomy proceeds, by inherent properties of its subject, from the relatively simple to the more complex. This hierarchical characteristic must be artificially adopted in the conceptual taxonomy as a convention of arrangement.[7]

Although the study of human behavior transcends many disciplines, a common distinction to them all is the number of individuals being considered at a time. Thus a single person is studied differently than are a few, or many. These distinctions are seen as fundamental to the study of human factors, and were selected as the first level of division in the taxonomy. The selection can be defended by observing similar divisions of relevant disciplines: physiology and psychology for individual study, behavioral science (especially group dynamics) for small groups, and sociology and organizational theory for large groups. These are not arbitrary categories, but represent fundamental differences in how humanness is perceived, expressed, and acts to affect the course of events.

At the next lower level in the taxonomy all three of the categories mentioned above are divided into three sub-categories. First is the mechanism used in relating to the outside world. For the individual this includes the senses, nervous system, and the brain. For groups the mechanism takes the form of relationships among individuals accommodating communication and mutual influence. This is the machinery for acquiring information and making it available for processing.

The second subdivision is the processing that occurs after information is acquired. This is the process, as opposed to the mechanism, for internally reacting to information. For the individual this includes learning, remembering, decision making, creative thinking, and the like. In groups this is the interaction among members as they perform these same processes in a coordinated effort.

Third are the constructs that explain inclinations or tendencies resulting from accumulated information and mental habit patterns. Attitudes, behavioral dispositions, and group spirit fall into this category. These are the sources of behavior that cannot be explained by a surface examination of the situation and information at hand; the hero's fount and the coward's abyss. Morale and esprit de corps are in this category.

1. Benjamin S. Bloom (ed.), Taxonomy of Educational Objectives (New York: David McKay Company, Inc., 1956), p. 15.

2. It is significant that the major problem encountered on terminology by the committee was the discriptor used for the group equivalent to morale. The lack of development of this topic in the theoretical literature is discussed under Conclusions in Chapter VI.

3. Ibid., p. 13.

4. E.R. Hilgard, Theories of Learning (New York: Appleton-Century-Crofts, 1948), p. 53.

5. Paul Hersey, Kenneth Blanchard, Management of Organizational Behavior (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1969), p. 173.

6. Forrest K. Kleinman, Robert S. Horowitz, The Modern United States Army (Princeton, New Jersey: D. Van Nostrand Co., Inc., 1964), 208 pp.

7. Bloom, op. cit., p. 18.

CHAPTER V

THE HUMAN FACTORS TAXONOMY

This chapter presents the taxonomy along with the abstract of the paper. The purpose for this arrangement is to allow Chapter V to stand alone if extracted for reference purposes. Additionally, a condensed version of the taxonomy is presented following the abstract. The condensed version is provided to orient the reader and to avoid confusion in the detailed taxonomy by structuring a model frame of reference.

The Abstract

This paper surveys the topic of human factors in the form of a taxonomy. Human factors are and always have been of vital concern to the military commander, and are essential elements in the functioning of all organizations.

Military literature does not offer significant human factors study materials for developing professional knowledge and applicable skills. Civilian literature, however, is available and applicable to the military leader's needs.

The taxonomy, a classification system based on the theory underlying the subject, is a valuable tool for

surveying human factors. The structured development inherent to a taxonomy has several practical and intellectual benefits. The practical aspects include information storage arrangement, curriculum design, and terminology clarification. Intellectual implications recognize that new information is more easily understood and remembered when it fits into a pattern, or informational structure, already established in individual thinking. Also, this structure guides attitudes about the relevance of new material to a given subject.

This taxonomy divides human factors into individual, small group, and large group categories as primary divisions. The sub-levels of each address information input, processing, and the attitudinal reactions which result.

Condensed Version Taxonomy

To provide a quick reference for orientation while reading the full version, the following condensed taxonomy is presented.

1.000 The Individual
- 1.100 Psychophysiological Factors
- 1.200 Information Processing
- 1.300 Attitudinal Disposition (Morale)

2.000 The Small Group
- 2.100 Processes and Roles
- 2.200 Information Processing
- 2.300 Attitudinal Disposition (Esprit de Corps)[1]

3.000 The Large Group
3.100 Organizational Theory
3.200 Information Processing
3.300 Attitudinal Disposition (Esprit de Corps)

1.000 The Individual

The basic unit of all human activity is the individual. At this level too, begins the study of human activity and characteristics.

1.100 Psychophysiological Factors

The external world exists, for the individual, as complex patterns of neural activities: current and remembered. What the world can consist of for him, and how he can respond to it, is determined by the design and capabilities of the brain and nervous system.

1.110 Sensory Parameters

These are the limiting values beyond which receptors cannot detect inputs.

.111 Threshold - Minimum perceivable intensity

.112 Response Spectrum - Range over which the receptor is sensitive (e.g. color from violet to red, tonal range from 20 to 20,000 cps).

.113 Discrimination - The distinguishing among or separating of nearly similar or coincident sensory inputs.

.114 Habituation - Reduced perceived input strength due to prolonged or repeated input without variation.

1.120 Sensory Degradation

A reduction in sensory effectiveness due to conditions imposed on the nervous system.

.121 Fatigue - General physical weariness brought on by long hours and exertion; generally dulls senses and reduces responsiveness.

.122 Stress - The psychological strain and agitation brought on by perceived circumstances.

.123 Sensory Overload - Inputs carrying too much information at too rapid a pace; processing lags behind and perceptions become confused.

.124 Sensory Conflict - Inputs from one or more receptor source come into conflict; perceptions can become confused unless one input is selected for exclusive attention.

1.130 Input Interpretation

Receptor signals arrive to the brain in the form of neural pulses. How they are decoded and integrated with all others is the interpretation process.

.131 Recognition - the process of locating among remembered neural activity patterns one that is similar to that currently being experienced.

.1311 Experience - A cumulative backlog of remembered neural activity patterns.

1.131 Input Interpretation, Recognition (Continued)

.1312 Logical Organization - Sorting inputs into contextual patterns to achieve a similarity with those remembered.

.132 Multisensory Synthesis - The process of piecing together a complete picture of the immediate world by integrating inputs from the several sources available.

1.200 Information Processing

Groups of neural patterns that have been integrated, interpreted and sorted as to content comprise information. It is the processed results of raw data inputs from receptors; the ideas and notions, one level of abstraction above neural experiences, that make up our thought processes.

1.210 Input Modes

Information arrives in the form of a directly observed event or as symbolic representation.

.211 Direct Observation - The combination of all information inputs relating to the immediate environment as it is being physically sensed.

.212 Symbology - All non-real time experiences and abstract ideas are input symbolically.

.2121 Non-language - Informationally significant events or circumstances that do not fall in the language category.

211 After event circumstances
212 Pictures

1.2121 Input Modes, Symbology, Non-Language (Continued)

213 Non-word symbols
214 Gestures and body language
215 Implications and insinuations

.2122 Language - an organized body of symbols used according to mutually understood rules of syntax to communicate information.

221 Hand signs and signals using alphabet
222 Written words
223 Spoken words including inflection

1.220 Storage

The retention of neural patterns.

.221 Learning - The process of placing new information into accessible storage.

.2211 Conditioned Learning[2] - Learning by repetition encouraged by rewards.

.2212 Associative Learning[3] - Learning by step-wise association of new to previously stored information.

.222 Memory - The preservation and recall of neural experiences (includes forgetting).

.2221 Nativism[4] - Inborn information.

.2222 Reconstruction Theory[5] - Mental process is duplicated on cue as a picture flashing on.

.2223 Associative Theory[6] - Residual traces of past mental processes are located by tracing hierarchical connections.

1.222 Storage, Memory (Continued)

.2224 Gestalt Theory[7] - All memories are stored as slight tissue modifications which are cumulative and more meaningful then the sum of the individual changes.

1.230 Manipulation

After being interpreted and processed into information, virtually all mental experiences are further treated, by the processes outlined below, at the idea level of abstraction. This is where the power of the human brain is exercised.

.231 Conservation or Transmission - The conversion of input information into another form for output without changing content.

.232 Reduction - The selection of a portion of the information at hand for further consideration.

.2321 Flagging - Designating items for attention

.2322 Summarizing - Reducing amount while conserving the most important parts.

.233 Elaboration - The process of using information in combination with other knowledge, habits, and skills to produce a result.

.2331 Idea Synthesis - Combining notions.

.2332 Decision Making - Resolving conflict between notions.

1.233 Manipulation, Elaboration (Continued)

.2334 Creative Thinking - Bringing out ideas that were previously unknown, by synthesis.

1.240 Output Modes

All human informational output requires physical action and is inherently symbolic. Action taken to affect a change in the physical environmental circumstance would belong in the Manpower Taxonomy, not in this study.

.241 Demonstration - Performance of an act to communicate by the implication of movements or their results.

.242 Symbology (See 1.212)

.2421 Non-language (See 1.2121)

.2422 Language (See 1.2122)

1.300 Attitudinal Disposition (Morale)

Complex cumulative networks of internalized information and mental habit patterns that determine outlook, attitude, and mood. The constructs used to explain the phenomenon "morale" are deduced from observation of human behavior.

1.310 Stress (Psychological)

A disabling perception of pressure, whether cognitive or subconscious, that results from conflict between or among simultaneous mental processes.

1.310 Stress (Psychological) (Continued)

.311 Anxiety - The result of perceiving an inability to cope with threat.

.312 Frustration - The result of perceiving a blockage to need fulfillment.

1.320 Motivation

An internal urge or impetus that drives all behavior. Motivation is understood to have dimensions of strength and direction. It arises from both psychological and physiological origins.

.321 Incentive - An external circumstance that is perceived as a means for need fulfillment (reward).

.322 Need (Maslow's need theory)[8] - A psychological or physiological requirement.

.3221 Physiological Needs - Body function demands.

.3222 Safety - Freedom from physical harm.

.3223 Security - Assurance that physical needs will be met into the forseeable future.

.3224 Affiliation - Close relationships with others.

.3225 Esteem - Perceived peer opinion and self-image of one's personal worth.

.3226 Self-actualization - Fulfillment of potential development and accomplishment.

1.320 Motivation (Continued)

.323 Reward Potential (Valence Theory)[9] - Perceived potential value of incentive (reward).

.3231 Perceived Value - Magnitude of benefit if reward is received.

.3232 Likelihood of Qualifying.

.3233 Likelihood of Receipt After Qualifying.

2.000 The Small Group

Small groups have been defined variously as being 2 - 5 people up through 2 - 20 by writers on the subject. The limiting number in specific cases depends on the individual people involved and the activity undertaken by them. The essential concept is that a network of interpersonal relationships exists such that all members are simultaneously influenced by the single activity being conducted by the group members.

2.100 Processes and Roles

The functions in the small group analogous to an individual's nervous system are the processes and roles undertaken by its members. These are the structures and mechanisms by which the group members interrelate, communicate, and influence each other.

2.110 Roles in Group Discussions

Specific types of participation are necessary for groups to exist and function. These

2.110 Roles in Group Discussions (Continued)

behavior types are called roles.

.111 Task Oriented - Roles necessary to task accomplishment.

.1111 Seeking Information or Opinion
.1112 Giving Information or Opinion
.1113 Clarifying
.1114 Summarizing
.1115 Consensus Testing
.1116 Elaborating
.1117 Initiating

.112 Maintenance of Group - Roles to facilitate group processes.

.1121 Encouraging
.1122 Gate Keeping - Directing conversational traffic
.1123 Harmonizing
.1124 Compromising
.1125 Standard Setting
.1126 Testing

2.120 Types of Authority

Power to influence other group members can be attributed to these basic types of authority.

.121 Physical Intimidation

.122 Legal Status

.123 Organizational Position

.124 Control of Information

.125 Knowledge of Subject

.126 Personality Characteristics

2.130 Exchanges Between Members

The processes, conventions, and structure of interrelationships among group members engaged in sharing information prescribe their exchanges.

2.130 Exchanges Between Members (Continued)

.131 Transactional Analysis Theory (Harris)[10]

.132 Social Exchange Theory (Blau)[11]

.133 Interaction Process Analysis (Bales)[12]

.134 Field Theory (Lewin)[13]

.135 Social System Theory (Homans)[14]

2.200 Information Processing

A grouping of individuals becomes a group through mutual participation in information processing. The human characteristics of a small group are developed and studied in terms of information being transferred among its members and their reactions in the process.

2.210 Network Design

The configuration of the communications linkages within the group.

.211 Linear - Members in a line.

.212 Circular - Members in a circle.

.213 Wheel - Members in circle with one in center.

.214 Star - All talk to one in middle only.

.215 Honeycomb - Members in rows and columns.

.216 Hierarchical - One superior and several subordinates.

.217 Multiconnection - All talk to all others.

2.220 Decision Making

.221 Authoritarian or Autocratic

.222 Black Ball

2.220 Decision Making (Continued)

.223 Majority Rule

.224 Consensus

2.230 Creative Thinking

.231 Brainstorming - An open "free think" idea generating session where all spontaneous ideas are recorded with critical analysis reserved for a later time.

.232 Delphi Technique - An estimative or predictive process where individual anonymous expert opinions are pooled in a forced consensus through iterative modifications based on relative position feedback.

2.300 Attitudinal Disposition (Esprit de Corps)

The term "esprit de corps" pertains to the group outlook, attitude, and mood just as morale does in the case of the individual. Group esprit de corps is a function, in part, of the extent to which individual group members perceive their own needs being met by group affiliation and participation. It results from the complex interrelationships and exchanges, at several levels of abstraction, among group members.

3.000 The Large Group

Gatherings and organizations too large to fall into the previous category, but smaller than a society, in toto,

belong here. Large groups are made up of many overlapping and intermeshing small groups, formal and informal, which are related or become mutually identified by a common structure of interest and communication.

3.100 Organizational Theory

The mechanisms by which large groups function are developed and understood primarily in terms of the leader's roles and activities, and assumptions about people that underlie various behavioral norms in leader/subordinate relationships.

3.110 Leadership

.111 Traits

.1111 Intelligence
.1112 Self-confidence
.1113 Initiative
.1114 Self-knowledge
.1115 Integrity
.1116 Responsibility
.1117 Courage
.1118 Decisiveness
.1119 Personality Characteristics

.112 Styles

.1121 Authoritarian or Autocratic
.1122 Democratic
.1123 Consensus Seeking

.113 Orientation

.1131 Task
311 Time and motion study
312 Process design
.1132 Organization
321 Span of control
322 Functional configuration
323 Product system configuration
.1133 Human Relations
331 Job enrichment
332 Team building
333 Management by objectives
334 Participative management

3.110 Leadership (Continued)

.114 Skills

.1141 Planning
.1142 Staffing
.1143 Organizing
.1144 Coordinating
.1145 Directing
.1146 Controlling
.1147 Motivating

3.120 Assumptions About People

.121 Theory X - Theory Y (McGregor)[15]

.122 Scheim's Four Assumptions (Scheim)[16]

.123 System 1 through System 4 (Likert)[17]

.124 Maturity - Immaturity Theory (Argyis)[18]

.125 Life Cycle Theory (Hersey and Blanchard)[19]

3.200 Information Processing

Without information exchange among individuals and included small groups, the large group would not exist. The "Infcstructure"[20] includes all formal and informal channels for information to be moved within the large group including interfaces to the outside world.

3.210 Formal Channels

Communications channels that are design features of the organization comprise the formal infostructure.

.211 Direction of Communication

.2111 Vertical
.2112 Lateral

.212 Mode

.2121 Letter

3.212 Formal Channels, Mode (Continued)

.2122 Newspaper
.2123 Regulations and Manuals
.2124 Audio Tapes
.2125 Video Tapes
.2126 Meeting

.213 Purpose

.2131 Inform
.2132 Direct
.2133 Coordinate

3.220 Informal Channels

.221 Grape Vine

.222 Ideas in Good Currency (Schon)[21] - The social version of "attending" as various subjects become popular topics for conversations.

.223 Social Concept of Reality (Berger & Luckman)[22] The social process of internalizing a view of what constitutes the real world.

3.300 Attitudinal Disposition (Esprit de Corps)

Large group esprit de corps is an extension of the concepts discussed for the small group (2.300).

1. The term "Esprit de Corps" was selected by the author as a descriptor for this category. Two committee members, however, felt the term was too limiting and too jargonistic. Alternative suggestions were "Disposition" and "Group Disposition."

2. Bernard M. Bass, James A. Vaughan, Training In Industry: The Management of Learning (Belmont, California: Wadsworth Publishing Co., Inc., 1969), p. 7.

3. John R. Anderson, Gordon H. Bower, Human Associative Memory (Washington, D.C.: Hemisphere Publishing Corporation, 1974), 517 pp.

4. Ibid., p. 42.

5. Ibid., p. 58.

6. Ibid.

7. Ibid., p. 46.

8. Abraham H. Maslow, Motivation and Personality (New York: Harper and Row Publishers, 1954).

9. Edward E. Lawler, Pay and Organizational Effectiveness: A Psychological View (New York: McGraw-Hill, 1971), pp. 79-99. From Readings For General Psychology (PL 202 and PL 252), (Lexington, Massachusetts: Xerox College Publishing), p. 54.

10. Thomas A. Harris, M.D., I'm OK - You're OK (New York: Avon Books, 1973), 304 pp.

11. Peter M. Blau, Exchange and Power in Social Life (New York: John Wiley and Sons, Inc., 1967), 352 pp.

12. Robert F. Bales, Interaction Process Analysis (Cambridge, Massachusetts: Addison-Wesley Press, Inc., 1950), 200 pp.

13. Clovis R. Sheperd, Small Groups - Some Sociological Perspectives (Scranton, Pennsylvania: Chandler Publishing Company, 1964), p. 23.

14. George Caspar Homans, Social Behavior - Its Elementary Forms (New York: Harcourt, Brace & World, Inc., 1961), 398 pp.

15. Paul Hersey, Kenneth H. Blanchard, Management of Organizational Behavior (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972), p. 46.

16. Ibid., p. 166.

17. Ibid., p. 60.

18. Ibid., p. 50.

19. Ibid., p. 174.

20. The term "infostructure" was coined by this author in an unpublished paper at the University of Southern California, Sacramento Campus, 1975.

21. Donald A. Schon, Beyond the Stable State (New York: W.W. Norton & Company, Inc., 1971), 254 pp.

22. Peter L. Berger, Thomas Luckman, The Social Construction of Reality (New York: Doubleday & Co., Inc., 1967), 208 pp.

CHAPTER VI

CONCLUSIONS

Application to the Military

There are two practical applications of this taxonomy in the military, one personal and one institutional. First, officers or NCOs who wish to develop or better understand the relationship between the leader and the led can use this taxonomy as a guide to study human factors. This structure facilitates selection of reading material, minimizes unnecessary overlap and insures adequate coverage. It also provides the framework to correlate new knowledge of human factors, while aiding comprehension and retention.

Second, the primary use for this taxonomy in the military will probably be institutional. A need for research by service sponsored activities, e.g., Army Research Institute (ARI) and the RAND Corporation is indicated in the conclusions derived from this taxonomy.

The design of courses of study will be facilitated and enhanced by reference to this taxonomy. A separate course on human factors, for example, could use portions of the taxonomy as an outline. In a more general course

on human resource development such as USACGSC Course number 9570, Personnel Management - Human Resource Development, topics in human factors are interspersed with discussions of activities and skills in counselling, management, and leadership. In this case the taxonomy would be useful to outline segments of the course, and to position them in context within the larger subject area of human factors.

Course 9570 has three seminar periods specifically designed to address human factors, including motivation and small group behavior. While several theories of motivation are discussed in the class, there is nothing in the course material to establish motivation as an element of morale along with stress, anxiety, and frustration. Neither is there a discussion of the dimensions of motivation as a whole topic as opposed to examination of some representative theories. A more complete treatment of the subject could be developed with no more presentation time required if a structure like that in the taxonomy were adopted for the material in the human factors portion of the course.

Conclusions

This taxonomy is clearly not exhaustive, but does provide a framework for additional relevant material. Also, two important implications can be drawn from this study.

First, the structure of the taxonomy clearly demonstrates that human factors are a result of continuing information processing. This is much more specific than the generally cited concept that we are products of our environment. "Experience" in the environment is a broad, general concept that fails to describe a specific process. It relies instead on an intuitive understanding of what such experience entails. Reference to the acquisition and storage of information, along with the mental habit patterns that result, focuses in a descriptive way on the processes that determine human factors.

Second, there is a conspicuous absence of theoretical development in the literature of a group equivalent to morale. Many indicators exist for assessing the level of "morale" in an organization; AWOL and reenlistment rates, awards and decorations, and disciplinary action rates for example. Also, it is widely accepted that esprit de corps in a unit can be favorably influenced by a challenging mission, firm and fair discipline, and clear communications channels. Knowledge of these effects, however, does not explain the phenomenon itself.

One possible view is that esprit de corps is simply the sum, or average, of the morale of all group members individually. This idea is, in fact, reflected in the practice of assessive indicators as mentioned above. Such a concept, however, is clearly too simplistic.

Just as information processing at the individual and group levels are qualitatively different, esprit de corps is certainly a complex result of exchanges among group members at several levels of abstraction and with varying degrees of influence over each other.

The absence of material on the nature of esprit de corps in the theoretical literature would strongly suggest the need for original research and theoretical development of the concept. Since this is a phenomenon of well recognized importance in the military, it would be appropriate for service sponsorship of such studies through civilian defense contractors such as ARI or RAND Corporation activities.

BIBLIOGRAPHY

BIBLIOGRAPHY

Anderson, John R. Human Associative Memory. Washington, D.C.: Hemisphere Publishing Corp., 1974.

Bales, Robert F. Interaction Process Analysis. Cambridge, Massachusetts: Addison-Wesley Press, Inc., 1950.

Barker, A.J. The Yom Kippur War. New York: Random House, Ballantine Books, 1974.

Bass, Bernard M., and James A. Vaughan. Training In Industry: The Management of Learning. Belmont, California: Wadsworth Publishing Co., 1969.

Berg, Philip M. "A Comparitive Analysis of Job Satisfaction in Air Force and Civilian Management." Unpublished Master's thesis, Louisiana Tech University, 1971.

Berger, Peter L., and Thomas Luckman. The Social Construction of Reality. New York: Doubleday & Co., Inc., 1967.

Blau, Peter M. Exchange and Power in Social Life. New York: John Wiley and Sons, Inc., 1967.

Bloom, Benjamin S. (ed.) Taxonomy of Educational Objectives. New York: David McKay Co., Inc., 1956.

Dale, Ernest. Management: Theory and Practice. New York: McGraw-Hill Book Co., 1965.

Dewey, Melvil. Decimal Classification. New York: Forest Press Inc., 1951.

Ewert, Jorg Peter. "The Neural Bases of Visually Guided Behavior." Scientific American, March 1974.

French, Wendell. The Personnel Management Process. Boston: Houghton Mifflin Company, 1974.

Greyerz, Von. Psychology of Survival. Amsterdam, New York: Elsevier Publishing Co., 1962.

Griffith, S.B. Sun Tzu - The Art of War. New York: Oxford University Press, 1963.

Halverson, C.O. "Motivation and Job Satisfaction for Middle Level Career Army Officers." Unpublished Master's thesis, U.S. Army Command and General Staff College, 1975.

Harris, Thomas A. I'm OK - You're OK. New York: Avon Books, 1973.

Heimer, Lennart. "Pathways in the Brain." Scientific American, July 1971.

Hersey, Paul, and K.H. Blanchard. Management of Organizational Behavior. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972.

Hilgard, E.R. Theories of Learning. New York: Appleton-Century-Crofts, 1948.

Homans, George Casper. Social Behavior - Its Elementary Forms. New York: Harcourt, Brace & World, Inc., 1961.

Janowit , Morris, and Roger W. Little. Sociology and the Military Establishment. New York: Russell SAGE Foundation, 1965.

Johnson, Paul V., and Robert H. Marcum. "Perceived Deficiencies in Individual Need Fulfillment of Career Army Officers." Journal of Applied Psychology. June 1968.

Kleinman, Forrest, K., and Robert S. Horowitz. The Modern United States Army. Princeton, New Jersey: D. Van Nostrand Co., Inc., 1964.

Lawler, Edward E. Pay and Organizational Effectiveness: A Psychological View. New York: McGraw-Hill, 1971. From Readings for General Psychology (PL 202 and PL 252). Lexington, Massachusetts: Xerox College Publishing.

Lewis, N.D.C., and B. Engles (eds). Wartime Psychiatry. New York: Oxford University Press, 1954.

Little, Roger. "Buddy Relations and Combat Performance." The New Military - Changing Patterns of Organization. New York: SAGE Foundation, 1964.

Logan, Arthur L. Remembering Made Easy. New York: ARC Books, Inc., 1955.

MacDougall, P.L. The Theory of War. London: Longman, Brown, Green, Longmans, and Roberts, 1858.

Marshall, S.L.A. Men Against Fire. New York, Washington: Combat Forces Press and William Morrow & Co., 1947.

Maslow, Abraham H. Motivation and Personality. New York: Harper and Row Publishers, 1954.

Meerloo, M.D. Patterns of Shock. New York: International Universities Press, Inc., 1950.

Schon, Donald A. Beyond The Stable State. New York: W.W. Norton & Co., 1971.

Sheperd, Clovis R. Small Groups - Some Sociological Perspectives. Scranton, Pennsylvania: Chandler Publishing Company, 1964.

Shelyag, V.V., and A.D. Glotochkin, and K.K. Platonov (eds). Military Psychology - A Soviet View. Moscow: Military Publishing House of the Ministry of Defense of the USSR, 1972.

Taylor, Donald W. "Thinking." Theories in Contemporary Psychology. London: The MacMillan Company, 1963.