A REVIEW OF THE ROLE OF TAXONOMIES IN HUMAN RESOURCES MANAGEMENT

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The use of taxonomies in human resources management is considered both from theoretical and applications perspectives. First, a philosophical overview is provided, followed by a review of existing taxonomies in management research. The review consists of selected taxonomies based upon traditional human resources management functions, as well as taxonomies focused on more "macro" domains. Methodological issues concerning the construction of taxonomies are then indicated. Finally, research questions and needs are identified which will help future model building, as well as assist in the increased efficiency of human resources management.

"taxonomy . . . 1: the study of general principles of scientific classification: SYSTEMATICS 2: CLASSIFICATION; specif: orderly classification of plants and animals according to their presumed natural relationships" (Webster's Seventh New Collegiate Dictionary, 1965, p.904)

AN OVERVIEW

Taxonomies are, quite simply, attempts at classification. In human resources management, we can classify individuals, task/performance behaviors, organizations, strategies, or external environments within taxonomic networks. In short, about any source of variation can be used as a dimension along which to create a taxonomy.

The intent of the current article is multi-faceted. First, we discuss the presumed need for taxonomies in human resources management (HRM). Then, we note selected taxonomic developments which have been used in various func-

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tional areas of HRM, as well as other taxonomies across the micro-macro continuum which characterizes management research. We then consider some methodological (not necessarily statistical) issues associated with the development of taxonomies. We also take a devil's advocate approach and ask "Why bother with taxonomies and all their pitfalls?" Finally, we outline research questions and needs for our field if HRM is to efficiently embrace the use of taxonomies in theory and practice.

Before continuing, we note that it would have been informative if we could have provided *specific,* rule-driven answers to questions about the use of taxonomies in HRM: i.e., rules for satisfying the definition of taxonomies; rules for units to be used in taxonomies (entire jobs, tasks, attributes, etc.); rules for choosing the specific statistical techniques when deriving and validating taxonomies. Unfortunately, our review indicates that there is no cookbook answer to these questions. Given there is no overarching theory of human resource management (Wallace 1983), we note that research about, or use of, taxonomies *depends upon* a variety of factors reflecting the purposes and reasons for developing the taxonomy in the first place (cf. Pearlman 1980). Thus, we see our role as educative, rather than prescriptive, in nature. We (1) delineate some major issues in the development of taxonomies so that users will be more reflective when implementing categorization systems and (2) identify some research gaps that might help document the usefulness of taxonomies in both practical decision making and the development of HRM theory.

The Basic Premise of Taxonomies. The above dictionary definition of "taxonomy" refers to classifications according to "natural relationships" among the phenomena being classified. These may include relationships between elements in the same class, between classes, and/or relationships between the class system and other phenomena of interest. As in experimental design, the purpose of taxonomic work is often the reduction of "within-group" error variance. That is, taxonomies are created so that, within a grouping, elements (individuals, tasks, etc.) are as similar as possible. Thus, variance within these groupings is small and statements/predictions/theories about these category-specific elements will be more accurate than global statements about all units in the population. Of course, the efficiency (or utility) of such a taxonomy will depend upon the degree to which within-cell variance is reduced *relative to* the variance across different groups in the taxonomy. [This is just like the F-ratio in the analysis of variance—the power of a statistical test is increased when the between-to-within ratio of sums of squares becomes larger.]

Several writers in HRM have noted the benefits of decreasing the within-category variance (i.e., of forming groupings/taxonomies of elements). For example, McCall and Bobko (1990) note that an increase in the precision of measurement is one way in which to increase the chance for any scientific discovery. Further, Wallace (1983) notes six steps necessary for the development of theories in HRM. For Wallace, exploratory designs and case studies are initial steps in the development of theory; the final steps are correlational and experimental studies. The *link* between the initial stages and confirmatory

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stages is "Taxonomic Designs." Such taxonomic effort necessarily involves iterative steps needed to design and validate measures of underlying constructs. Carper and Snizek (1980) also present a variety of reasons for using taxonomies, including: (1) "large amounts of information . . . [can] be collapsed into more convenient categories that would then be easier to process, store and comprehend" (p. 73) and (2) organizational change can be better predicted (again, an appeal to smaller within-cell variance). Finally, one criticism of theory development in organizational sciences is that each organization (or analogously, each person or each job) is completely "unique." Therefore, no science in our field is possible. Behling (1980) has echoed this criticism yet provided an answer by appealing to the use of taxonomies, where groups of similar organizations (or persons, or tasks) are placed together. In turn, appropriate generalizations and theory can be adopted *within* these levels of the taxonomies (see also McKelvey 1975, for such a statement).

Philosophical Perspectives. The role of a taxonomy is to form groupings of objects which are similar. As noted above, it is assumed that the predictability of human behavior within organizational categories will be enhanced and information will be easier to process (because of the "chunking of information"). But these two useful aspects of taxonomies (increased precision, chunking) are in some sense opposites. That is, a researcher can chunk in greater amounts, such that the limiting "chunk" is the original, undifferentiated population. This is opposite to the within-cell variance reduction principle. In fact, the limiting case of within-cell variance reduction would be to have as many categories as individuals (or tasks, or organizations, etc.). Thus, the decision to group "n" elements is bounded by two extremes: (1) place all elements in one group and (2) create n groups (if elements were individuals, this latter approach would be analogous to a between-subjects design in the analysis of variance). Gould (1981) notes that taxonomists in biology tend to fall into one of the above two camps: "'lumpers,' who concentrate on similarities and amalgamate groups . . . and 'splitters,' who focus on minute distinctions and establish species on the smallest peculiarities of design" (p. 44). Thus, there is a constant philosophical (and practical) tension in the creation of taxonomies between a need to differentiate elements and the need to keep the number of clusters relatively small.

The scientific use of taxonomies (and this philosophical tension) can be traced back to two Greek philosophers, Plato and Aristotle. Plato was interested in delineating the universe of "Forms"—which were conceived as entities that existed beyond the day-to-day occurrences of them. For example, consider the Form of "chair." There are many specific chairs in our everyday experiences. However, beyond those instances, there exists a Form of "chair"—a realm of timeless things of which particular chairs, seen and felt by our senses, are merely transitory instances of the more basic Form. [This is very reminiscent of the notion of "hypothetical construct" (MacCorquodale & Meehl 1948)].

In trying to understand the world of Forms, Plato proposed setting down as

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many Forms as could be thought of. As Warner (1958) then puts it, "Plato believed in the possibility of discovering (or constructing) . . . a kind of map of the world of Forms, where Good was the highest genus. Essentially, Plato is proposing a . . . method of orderly classification." (pp. 76–77). Indeed, Plato's *Republic* (see Cornford 1965) clearly outlines different types of persons (e.g., "gold," "silver," "bronze") and different types of jobs (e.g., rulers, craftsmen). Plato envisioned selecting persons for jobs based on their individual abilities (as categorized above), not on their birthright or wealth: a classic case of person-job matching! Brumbaugh and Lawrence (1963) restate Plato's philosophy as, "When interests . . . and talents match, then justice is possible at the same time for the person as self and for society as organic whole" (p. 37).

Aristotle (a disciple of Plato) also embraced this idea, although in a more practical way. Aristotle believed that the world of Forms could not be separated from our physical world of sensation. Thus, Aristotle attempted to integrate the worlds of form and matter through a focus on common sense and experimental fact. He is credited with the first series of encyclopedic observations in biology and medicine (Brumbaugh & Lawrence 1963). Such a focus on observation, classification, and taxonomy greatly shaped future scientific endeavors, including the relatively modern psychological and management sciences.

In sum, taxonomies have their origins in early philosophical thinking. They are formed for the purpose of categorizing information. In turn, the hope is that both predictive accuracy and theoretical understanding will be increased. Within the last several decades, taxonomic literature has appeared in the fields of biology, philosophy, psychology, and sociology. We now selectively discuss how taxonomic approaches have been used in HRM.

A TAXONOMY OF HRM TAXONOMIES

In thinking about uses of taxonomies in human resources management, it is convenient to think about a "micro-macro" continuum of applications. For example, human resource management is driven by the need of organizations to manage one third of the production function (assuming that firm performance is a function of raw materials, capital, and labor). Thus, traditional "micro" HRM functions are represented by taxonomies which encompass job analysis and the evaluation of performance, selection, training and development programs, etc. Becoming more "macro," one can focus on group processes, group performance, situational differences, and unit performance. At the organizational level, one can consider organizational performance, organizational taxonomies, or organizational strategic orientations. We briefly take each one of these perspectives in turn.

In reading this review, several ideas should be kept in mind. First, Fleishman and Quaintance (1984) suggest that taxonomies are guided by (1) the purpose (objectives) of the system, (2) the descriptive basis of the system (what the elements of the system are), and (3) the method or procedure used to arrive at the classification system. The taxonomies reviewed below can differ

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on one or all of these facets. Second, a complete review of all taxonomies in the field is beyond the length of this article. A representative sample of taxonomies will be reviewed. Third, Heneman (1969) and Wallace (1983) both critiqued HRM as being fragmented and narrow, voicing concerns regarding levels of analysis and limited, "parochial" definitions. Their common goal was the identification of some general conceptual system that defines the major constructs in HRM and the general relations among them. The reader should keep these three ideas in mind as we review taxonomies related to HRM functions. We will return to these issues in the summary comments.

1. Job Analysis

Gael (1988) noted that the best job analysis method "depends on objectives and the situation at hand" (p. xv). Hence, a unique taxonomy of job specific attributes could, in theory, be derived for each unique HRM application. Fleishman and Quaintance (1984) developed one of the most comprehensive treatments of taxonomic issues in job analysis to date. The basic approaches they describe reflect (a) behavioral description, (b) behavioral requirements, (c) ability requirements, and (d) task characteristics. They also noted that any given HRM application of a job analysis defines its purpose. The HRM purpose will, in turn, influence whether behavioral description, behavioral requirements, ability requirements, task characteristics, or some hybrid combination is used as the defining taxonomic attribute.

Many existing job analysis taxonomies are what Fleishman and Quaintance (1984) refer to as Aristotelian or Linnean taxonomies, named after the philosopher and biologist who advocated the categorization of phenomena based on the investigator's subjective judgment regarding an object's "essence" (see previous section). Fine's (1977) Functional Job Analysis (FJA) technique is one example. Fine and Eisner (1980; 1981) have demonstrated that classifications of jobs using FJA are successful in the development of apprenticeship programs and performance tests for certain jobs.

Other taxonomies are more "numerically" based (Fleishman 1975; Fleishman & Quaintance 1984). In this instance, quantitative measures of similarity are used to identify clusters or underlying factors that then define taxonomic classes (cf. Christal 1972; Christal & Weissmuller 1988). The viability of these taxonomies also depends on their ability to achieve the basic HRM purpose for which they were developed.[1]

However, the most interesting taxonomic issues in job analysis involve the exploration of relationships between characteristics of work (behavioral description, behavioral requirement, and task characteristic approaches) and characteristics of the worker (an ability requirements approach). Calls for explication of these basic relationships between the person and the job appear throughout the literature (cf. Burke & Pearlman 1988; Dunnette 1966, 1976).

McCormick, Jeanneret, and Mecham's (1972) efforts in the development of the Position Analysis Questionnaire comprise one of the earliest of these integrate efforts. McCormick et al. assumed that there is some meaningful order or

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structure underlying human work behaviors that is directly related to performance on various combinations of work activities, working conditions, and task characteristics. They further assumed that each structural component of human work behaviors (i.e., dimension) is associated with a profile of basic human attributes required for successful performance (cf. McCormick 1964). While McCormick tended to focus on the nature of the work itself, Fleishman (1972, 1975) developed an attributes requirements taxonomy which focused on the human attributes related to work performance. More recently, Cunningham, Boese, Neeb, and Pass (1983) have extended and combined the approaches of Fleishman and McCormick and developed a taxonomy suitable for occupational education and guidance.

While the above work has been mostly for jobs "in general", there has been a parallel literature on taxonomies of managerial/supervisory jobs.[2] Tornow and Pinto (1976) developed the Managerial Position Description Questionnaire for managerial positions, while Dowell and Wexley (1978) developed the Supervisor Task Description Questionnaire (suitable for first-line supervisors). Switching the focus from tasks to behaviors, Komaki, Zlotnik, and Jensen (1986) developed the Operant Supervisory Taxonomy and Index. The two well-known behavioral leadership factors of "consideration and "initiating structure" (Fleishman 1973) have also been used to create a 9×9 taxonomic grid of managerial style (Blake & Mouton 1964). Further, Whitely (1985) proposed an integration of content and process approaches to managerial work taxonomies. Switching the focus yet again to the *development* of executive talent, Bobko, McCoy, and McCauley (1988) presented a taxonomy of lessons which executives claim to have learned over their careers. Finally, perhaps the most extensive longitudinal research effort targeted at understanding managerial skills and abilities has centered around assessment center measurement technologies (cf. Bray 1964; Howard & Bray 1988). For example, Ritchie & Moses (1988) demonstrated how requirements found in managerial positions provide the foundation for skill and ability dimensions evaluated in assessment center exercises. However, while assessment centers have been adopted in practice, research has failed to confirm some of the linkages between person and job constructs (cf. Klimoski & Brickner 1987; Russell & Kuhnert in press).

2. Selection

The introduction of meta-analytic techniques (Burke 1984; Schmidt & Hunter 1977) has had a striking impact on selection taxonomies. The field had previously held to the tenet that every pairing of a selection test with a new employment application required new evidence of criterion-related validity (cf. Dunnette 1966). Meta-analytic techniques suggested that some variance in criterion-related validities across many tests (primarily, but not exclusively, cognitive skill tests) was due to difference in sample size, measurement error, and criterion range restriction across applications (Hunter & Hunter 1984). After correcting for these differences, "true" criterion-related validities for

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many tests were shown to vary minimally across applications. This literature is controversial (James, Demaree, & Mulaik 1986) and conclusions about situational specificity of validity coefficients are not yet definitive. Nonetheless, job analytic and selection taxonomies should help identify relevant variance components and help fine-tune tests of validity generalization hypotheses. Further, Pearlman's (1980) review of the use of job families in selection research concludes that taxonomies with *broad* content structure are more useful in practice and theory development than approaches based on more molecular, finely-grained analyses of jobs.

Implications for taxonomies, constructs, and theories *not* driven by Pearson product-moment correlation coefficients are less clear. Taxonomies of moderators may well yield substantial differences in effect sizes when other types of structural parameters are employed. For example, Dunbar and Novick (1988) demonstrated that regression coefficients in the prediction of training performance can vary substantially as a function of gender. Distinctions between differential validity (correlations) and differential prediction (regression weights) have been drawn for some time (Kirkpatrick, Ewen, Barrett, & Katzell 1968). Further, Vance, Brooks, and Urban (1991) hypothesize that parameters in linear structural relations analysis (LISREL) will depend upon the type of job being analyzed, as well as the type of individual being assessed. Thus, the usefulness of taxonomies (and related questions of situational specificity) are still unresolved issues in selection.

Some taxonomic efforts in selection involve the use of biodata. The use of subgroups, and behavioral tendencies of individuals within those subgroups, has a substantial history in the field of HRM (cf. Toops 1959). A few longitudinal efforts have demonstrated that groups can be identified on the basis of homogenous work and life experiences (Mumford & Owens 1984; Owens & Schoenfeldt 1979; Rychlak 1974, 1982). Further, ethnographic efforts by Lindsey, Holmes, and McCall (1987) suggest a number of life events that impact the development of top-level executives.[3]

3. Training and Development

Taxonomic efforts in this arena are extremely extensive—the learning process has been a focus of attention for many fields besides HRM. Generally, the purpose of training and development systems is to obtain some change in individuals' skills and abilities that impacts organizational performance. The delineation of how training and development taxonomies are derived, and their bases for classification, could fill volumes. For example, operant conditioning, chaining, sign learning, rote learning, insight, short-term memory, field expectancies, motor patterns, etc. are but a few of the many classes of learning that have been explored (cf. Fleishman & Quaintance 1984). Training and development textbooks routinely cite Gagne's (1970) eight classes of learning situations and/or Bloom's (1971) taxonomy of educational objectives.

Kanfer and Ackerman (1989) present a recent integrative effort which ap-

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plies a cognitive framework to understanding *training and skill acquisition* episodes. These authors integrate taxonomies of cognitive skills and abilities, information processing stages in knowledge acquisition, proximal motivation (stages of self-regulation), and distinctions between controlled vs. automatic cognitive processing into a model of how individuals acquire a specific skill.

In a recent example of a *developmental* taxonomy, Kuhnert and others describe learning stages that determine how individuals understand or make meaning out of their life experiences (Kuhnert & Lewis 1987; Kuhnert & Russell 1990). The adult development taxonomy of Kegan (1982) is used to explain how transactional and transformational leaders differ in terms of the "lens" through which they view their experiences. Each lens consists of an array of deeply held values, attitudes, and beliefs about all facets of life (i.e., both work and non-work related). These authors contend that taxonomies of life experiences which impact this developmental process might be constructed using methods from the biodata literature.

In sum, the first three categories of taxonomic effort in the current review (job analysis, selection, training and development) reflect functional areas in HRM and pervade taxonomic research perspectives in the field. They are dominated by examinations of *individuals* in the workplace. We now turn to several other levels of analysis which can impact directly on our understanding of human behavior in the work place.

4. Groups

While not often used in HRM, work-group taxonomies do exist which might inform the more traditional HRM functions. Selection instruments, training interventions, and the choice of communication technology in the firm might depend substantially on the types of work-groups encountered. For example, many textbooks distinguish between command, task-oriented, and informal groups. Another group-level categorization scheme involves five basic patterns of interdependence within groups: independence, contrient, serial, reciprocal, and pooled (cf. Organ & Bateman 1986, for an explication of these categories). Also, Handy (1976) provides a list of organizational purposes for which groups are formed (control, problem solving, information collection, conflict resolution, etc.). It may prove fruitful to develop theory and HRM interventions based upon the *interaction* of group-level taxonomies and individually-based (e.g., attribute) taxonomies.

Further, in the utility analysis domain, group level considerations lead to questions about the additivity assumptions in current equations for estimating dollar utility. For example, assume all, but one, positions in a work group have been filled by "superior" workers. Will adding an "average" final member to the group be almost as good as adding a "superior" final member (given group effects of training and socialization, or given the fact that not everybody in the work group can become the "leader")? It has been suggested that the answer to this question about marginal utility depends upon the type of job *and* the type of group being analyzed (Nord & White 1987).

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5. Organizations

There is a substantial body of research and theory devoted to taxonomies of organizations (see Carper & Snizek 1980, for a thorough review). Reflecting the Platonic/Aristotelian distinction noted earlier, these taxonomies tend to be theoretical or empirical in their development. Theoretical taxonomies include Weber's (1947) categories of patrimonial, feudal, or bureaucratic organizations and the schemes of Perrow (1972) and Thompson (1967). The latter two schemes are both based on the types of underlying technologies involved. An example of an empirically based taxonomy may be found in Goronzy (1969), who statistically derived four clusters of organizations based on their size and technology characteristics.

The *strategic orientation* of corporations has also been the subject of theoretically-based taxonomic efforts. The most famous of these taxonomies are those by Porter (1980) and Miles and Snow (1978). Further, Hambrick (1983) has developed a taxonomy of organizational *environments* and positions of the firm within each type of environment. Combining these notions, the *fit* of an organization within an environmental taxonomy, relative to the firm's place in a strategic taxonomy, has been empirically investigated (Kim & Lim 1988).

It should be noted that these macro-level taxonomies are not often incorporated into the work of human resource management researchers or industrial psychologists. However, now that our field is (appropriately) embracing the concept of "strategic human resources management," the above literatures should be quite critical. Indeed, in his critique of current job analytic research, Wallace (1983) calls for "taxonomic research . . directed towards empirically establishing vertical linkages among the levels or units of analysis in defining job content" (p. 9). Taking this notion beyond the domain of job analysis, our field needs to consider taxonomies which empirically (and theoretically) link strategic and environmental dimensions with job, task, and personal attribute dimensions. One attempt at this intersection may be found in Johnson, Sambharya, and Bobko (1989). Using airline industry data, these authors found that an industrial relations outcome (e.g., average wage paid) was determined by an interaction of Porter's strategic taxonomy and an environmental factor (deregulation).

6. Theory

We have selectively reviewed taxonomies across the micro-macro continuum (e.g, tasks, individuals, groups, strategies). Taking this micro-macro continuum to the limit, researchers can consider *theory* as a unit of analysis, and derive taxonomies of theories. For example, Pinder and Moore (1979) have noted that some theories (e.g., open systems theory) may be so general that they afford little predictive accuracy. These authors argue that "middle range theories" (cf. Merton 1968) should be developed in order to increase the precision with which organizational processes can be understood. In turn, they present a need to develop taxonomies of these middle range theories. The logic

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is similar to that noted above: reduce the within-cell variance (i.e., create categories of theories which are suitable for particular contexts) in order to increase predictive accuracy.[4]

As with strategic taxonomies, taxonomies of theory have been under the purview of more macro-related disciplines in management. However, taxonomies of more "micro" theories are not out of the question. One recent attempt in this area was conducted by Greenberg (1987) who developed a taxonomy of organizational justice theories.

The above review demonstrates that taxonomies have played a substantial role in the behavioral management disciplines. Much of the work has been at the macro-level (i.e., the development of organizational taxonomies), while the use of taxonomies in more micro-related HRM has been dominated by applications in job and task analysis. We now turn to some methodological findings and concerns that we have observed in reviewing these literatures.

METHODOLOGICAL ISSUES

In this section we review methodological, not statistical, issues. For statistical theory, the reader is referred to just about any textbook on multivariate data analysis; in particular, to chapters on classification, discriminant analysis, cluster analysis, and factor analysis. (Also, Sneath & Sokal 1973, devoted an entire book solely to the use of statistical techniques in generating taxonomies.) Indeed, many multivariate techniques have been used to generate and/or confirm taxonomic structures. Further, as noted earlier, multivariate techniques proceed by focusing on the statistical concept of *variance*. Cluster and discriminant analysis proceed by minimizing within-group variation, relative to between-group variation (or between-group distances). Factor analysis attempts to maximize the variance captured by a relatively small number of components/factors (the variance of each component being called an eigenvalue). The hope is that if the underlying factors are uncovered, then the taxonomic elements (individuals, attributes, tasks, organizations, etc.) will vary in critical ways along these factors.

Some Judgment Calls. Suppose one wanted to form a taxonomy of all individuals who worked in a particular job. One approach would be to obtain holistic estimates of the similarities between persons. This would typically be done by getting supervisors to compare individuals (in a pairwise fashion) on some similarity scale. The resulting similarity matrix could then be subjected to a multidimensional scaling technique or a clustering algorithm.[5] In contrast, many taxonomic applications in HRM are based on the technique known as factor analysis. In the above case, a factor analytic researcher would identify a variety of questions or items along which individuals can differ. These items would then be factored (i.e., linear combinations of items would be identified) and individuals placed within the resultant factor space. Notice that the goals of clustering (or multidimensional scaling) algorithms and factor analysis are

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the same; however, the techniques proceed differently. The scaling analyses start with the whole elements (in the above example, individuals) which are being taxonomized. The factor analysis starts with smaller pieces of information (items) and builds up to the resulting grouping of individuals. Thus, there is a judgment call to be made here about which method is to be used (McGrath 1982). Research is needed to see how robust taxonomic systems are to these judgment calls and their somewhat different statistical approaches.

In HRM taxonomic work, there are related questions about the choice of units for analysis. For example, does a clustering of job *elements* give us the same information about jobs that would be obtained if we were to do a similarity analysis on *entire* jobs, in a more holistic manner (i.e., with holistic similarity ratings)? Wallace (1983) states this concern in an even more general way, arguing that job analysis can be approached at many different *levels of analysis:* employee attribute, task element, overall task, position, overall job, occupation, or job family levels. It is not clear that there is a direct translation from the analytic results at one level to results at any other level. For example, Chia, Hoffman, Campbell, Szenas, and Crafts (1989) recently reported a comparison between job analyses based on "job tasks" vs. "job activities" (the job activities were not necessarily specific to any particular job task.) They found that task-based categories could be more reliably measured, yet activity-based categories provided greater discriminability across jobs. In fact, Wallace calls for "taxonomic research to be directed towards empirically establishing vertical linkages among the levels or units of analysis in defining job content" (p. 9).[6]

Empirical vs. Theoretical Derivations. Many authors (e.g., Carper & Snizek 1980; Pinder & Moore 1979) have noted that taxonomies can be developed through the use of theory or through the statistical manipulation of empirical data sets. This reflects the basic distinction between Plato (the theorist interested in "ideal forms") and Aristotle (the empiricist, biologist) noted earlier. In their review of organizational taxonomies, Carper and Snizek (1980) note that theoretically based schemas have lacked precision in their ability to predict differences between organizations, while empirically constructed taxonomies have tended to be problem-specific and thus lack generalizability to other situations. The dialectic tension between theory and empiricism is alive and well in the development of taxonomic structures.

In HRM, much of the job analytic work has tended to be very empirically based (e.g., note just about any of the references in the above sections labeled "1." and "3."). However, a rare (but useful) theoretically based taxonomy in HRM is provided by Komaki, Zlotnick, and Jensen (1986). In this work, Komaki et al. use operant conditioning theory to develop seven categories of supervisory behavior. The empirical validity of this system has subsequently been verified (Komaki 1986).[7]

Cross-Validation. The traditional appeal to the need for cross-validation is crucial in the development of HRM taxonomies. Empirically derived tax-

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onomies are usually dependent on multivariate statistical techniques which maximize (or minimize) variance in the sample at hand. As such, some validity shrinkage (or instability of the results in a new sample) is expected (Bobko 1990). The field of HRM desperately needs research which considers the stability of extant empirically based taxonomies (see Tornow and Pinto 1976, for an example of the use of a hold-out sample).[8]

Information Loss. The issue here concerns discrete versus continuous constructs. The notion of taxonomies (or categories) implies that elements under analysis (individuals, tasks, etc.) can be placed in discrete, mutually exclusive categories. However, it may be that there are underlying continuities involved. For example, in Komaki et al.'s (1986) taxonomy, there are two sub-categories of performance monitoring labeled "past tense" and "present tense." The former category is defined by supervisors who are "concerned with completed work events;" the latter category involves concern with "ongoing work events." Obviously, placing a supervisor in one of these categories is a matter of degree, rather than kind. Further, supervisors can concern themselves with *both* types of categories, even in the same feedback sequence (e.g., "Please make sure you give care to the appropriate formatting of the article; otherwise the journal will not accept it no matter how good its content.") Further, even in biologically based categories (e.g., a simple coding of gender), most psychologists would assume that there is some underlying psychological continuum which accounts for any differences in averages (or validity coefficients) between males and females (cf. Bartlett, Bobko, Mosier, & Hannan 1978). The possibility that underlying continuities are ignored by taxonomic categories causes some concern.

First, there is information loss in artificially created categories, resulting in attenuated validities for the category system (cf. Cohen 1983). Thus, taxonomic theories in HRM may not predict future performance as accurately as continuous models of tasks and behaviors. Second (and related), the determination of where to cut continuities (for the purpose of creating a classification scheme) tends to happen in the middle of the scale. For example, "median splits" are a favorite technique of some researchers. However, Bobko and Schwartz (1984) have noted that small differences from the cut-points (e.g., the median) can change the category into which an observation is placed. They also note that many empirical distributions are bunched at the median (e.g., any "bell-shaped" distribution). Thus, if there are many data points near the cut-point, the resulting category system has the potential to be quite unreliable. The field of HRM needs methodological research which documents the extent of loss in information and predictive capacity (if any) when category systems are invoked and/or when artificial categorization is used.

How Important is "Important" (Or Other Descriptors)? In job analytic research, subject matter experts often provide ratings about characteristics of a given job. These ratings can be on scales of "importance," "frequency," "time spent," etc. Unfortunately, it is not clear what to do with all of this information.[9] One could analyze all of these dependent variables separately and hope

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for convergence of results, or one could combine them in some a priori way (e.g., using "frequency" *times* "time spent" as the dependent scale).

In developing their supervisory taxonomy, Dowell and Wexley (1978) used a variant of the combination technique. They analyzed ratings of "importance," but they eliminated activities which received low "time spent" ratings. Tornow and Pinto (1976) finessed this problem in their taxonomy by simply instructing judges to consider *both* "the item's importance to the position and the frequency of its occurrence" (p. 412). They labeled this combination of factors "significance." Needless to say, it is not clear how judges combined these two factors, nor whether or not judges used similar combination rules. Cunningham et al. (1983) had judges rate job elements on *four* scales: "significance" "extent," "applicability," and an element specific scale. These scales were used for different elements in the study (for example, Cunningham et al. note that the "significance" scale was not appropriate for 108 of the 511 elements considered [see p. 237]). Finally, Cranny and Doherty (1988) demonstrate that researchers should *not* use "importance" ratings as the basis for factoring job analytic data. For example, suppose there are some behavioral items that all raters agree are very important. Then, there will be little or no variance for these items, the items will not correlate with other behaviors (regardless of content), and these important behaviors will not impact the final results. Cranny and Doherty list other problems, as well, and conclude that, "sources of variance in importance ratings by . . . [subject matter experts] . . . are irrelevant to the grouping of job behaviors" (p.320).

It should be clear that there is a plethora of scales which could be used to provide ratings of job components.[10] The field of HRM desperately needs systematic research to help understand the relationships among these different scales and their myriad combinations (see Cragun & McCormick 1967, for an early attempt at assessing the differential reliability of these scales). As noted by Fleishman and Quaintance (1984), the choice of scale will depend upon the purpose of the job analytic work (e.g., analyzing a job for its developmental potential might lead to different scales than analyzing the same job for purposes of setting a pay system).

Motherhood and Apple-Pie. Several review articles on taxonomies in management research provide listings of advice to individuals interested in constructing taxonomies. Most of them seem to be statements of common sense, but bear repeating. Pinder and Moore (1979) list six suggestions attributed to Hempel (1965), including: the measures used should be universally understood and reliable, valuation overtones should be excluded from the assessment, comparisons between groups should foster real understanding, sorting schemes should be efficient and lead to meaningful generalizations. Carper and Snizek (1980) list ten suggestions attributed to McKelvey (1975), including: use the broadest sampling of units, use a probability sample of units, the number of attributes should be no larger than the capacity of the computer analysis program, criteria for judgment calls in analysis should be made public, and classification breaks should optimize parsimony and intraclass reliability.

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Chrisman, Hofer, and Boulton (1988) note that categorical levels in taxonomies should be mutually exclusive, internally homogeneous, collectively exhaustive, stable, and based on relevant language. Again, all of these suggestions reflect what has been said earlier and/or are simply a matter of good science. Several are difficult to operationalize (e.g., "real understanding," "parsimony"). We label all of them "motherhood and apple-pie" suggestions and do not disagree with the implied meaning in any of them.

By the way, Chrisman et al. (1988) also offer other requirements for the *overall* classification system. We disagree with some of them. For example, they require that "the theoretical foundation of a classification system should not be specific to a certain period in time" (p. 417). While such a requirement would make science easier, it is not necessarily realistic. Surely, there are historical periods of time in which characteristics of the work world (e.g., technological advances) are different enough to warrant new ways of classifying organizations, tasks, or individual ability requirements.[11] Indeed, philosophers in the organizational sciences (e.g., Gergen 1973) have noted that theories of human behavior are not necessarily "transhistorical."

Finally, the above criterion of "real understanding" implies that taxonomies ought to be evaluated in some type of construct validity fashion. Some taxonomies have been evaluated from predictive perspectives: e.g., does the PAQ predict salary (McCormick et al. 1972)?; does the Operant Supervisory Taxonomy distinguish between two extreme groups of managers (Komaki 1986)? In a substantially more complete review, Fleishman and Mumford (in press) evaluated Fleishman's ability requirements taxonomy from the perspectives of both internal validity (e.g., replicability, reliability, consistency across jobs, etc.) and external validity (usefulness as a predictive device, useful for hypothesis generation in the development of training systems, etc.). HRM would be better served with more of these strong attempts to validate taxonomies against such fundamental criteria.

Why Taxonomize? Here we briefly consider reasons *against* the use of taxonomies, on the assumption that these reasons will be considered as cautionary notes when, in fact, researchers do create taxonomies.

First, it was noted earlier that categorization may be associated with a loss of statistical information. That is, do categories like "male" vs. "female" or "critical" vs. "not critical" really help us understand the underlying phenomena, or do they do injustice to fundamental (possibly continuous) hypothetical constructs? Just because we name something, do we really understand anything?[12]

Second, we have cited numerous authors using "parsimony" or "ease of communication" as a rationale for creating taxonomies. Many authors would argue that, when faced with two competing taxonomies that are equal in predictive power, preference should be given to the one deemed most uncomplicated. However, since all taxonomies involve some loss of information, the arbitrary decision to choose the least complicated taxonomy may forfeit critical information. For example, the widespread acceptance of a "parsimonious" job

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family taxonomy based on profiles of test validities could lead to a reliance on inferences of validity generalization and, in turn, to a reduction in job-specific (or firm-specific) validity studies. The absence of these efforts could decrease the likelihood that future investigators might discover a "better" taxonomy of job families based on regression coefficients or other structural parameters relating test scores to performance.

Third, it was noted earlier that a taxonomy splits phenomena into discrete chunks and, in turn, there is concern that the sum of the resultant categories will not accurately reflect the whole phenomenon under study (i.e., is the whole simply the sum of the parts?). Bobko (1980) has indicated this as a problem in the development of organizational taxonomies and middle range theories. He claims that each different way of creating a category system (i.e., the level of analysis used, the scales used for the ratings, etc.) is based on fundamental value decisions. As such, knowledge is enhanced from these multiple perspectives, but there is no linear, summative progression as other taxonomies/perspectives are added to the literature.[13]

Fourth, the construction of taxonomies proceeds on the reduction of within-group variance: i.e., the supposition is that discoveries within HRM will occur as the *precision* of our analysis increases. However, while McCall and Bobko (1990) indicate that statistical precision is *one* route to discovery, it is *not necessarily* a prerequisite for discovery.[14] In fact, McCall and Lombardo (1978) have noted that one of the reasons leadership research has been relatively unproductive is a premature focus on "objective chunks" (p.178), rather than a focus on the flexibility with which single individuals deal with ambiguous problems.

Fifth, the construction of taxonomies also proceeds by trying to *maximize* between-group variance. However, McCall and Bobko (1990) note that the *lack* of variance (and, in the extreme, no variance) can be equally useful for uncovering processes in HRM. For example, if individual differences are so abundant, then why aren't they more pervasive in some work settings (Webb & Weick 1979)? If no variance in pay structures are observed across different environments, doesn't this tell us something important (collusion, regulation, etc.)? In sum, like all other methodological approaches, taxonomic constructions have their pitfalls, as well as their uses.

IDENTIFICATION OF FUTURE RESEARCH NEEDS REGARDING THE ROLE OF TAXONOMIES IN HRM

There are a variety of conclusions and future research needs (both theoretical and empirical) which can be identified from our above analysis of HRM taxonomies. As stated earlier, Fleishman and Quaintance (1984) note that taxonomic issues can be grouped by *how* HRM taxonomies are created, how HRM taxonomies are *evaluated,* and *what* is used to create HRM taxonomies. We group our conclusions and research needs into these three categories.

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How HRM Taxonomies Are Created

(a) Basic research is clearly needed regarding the scales used to provide ratings of HRM phenomena. For example, do ratings of importance vs. time spent vs. criticality result in different taxonomies? Are Cranny and Doherty (1988) correct about the inappropriate use of importance ratings? Are there better ways of combining multiple rating dimensions than are currently used? Certainly, the job evaluation literature can inform some of these research questions.

(b) We need to conduct basic research on *who* provides the ratings which are used in taxonomic analyses (e.g., incumbents, first line supervisors, upper level management, union representatives, clients, etc.). Fleishman and Mumford (in press) conclude that judgments about task ability requirements are consistent across rater types. However, does this consistency hold for other taxonomies based on rater judgments? If not, how should differences be combined and/or dealt with?

(c) Will results from holistically based statistical methods (e.g., clustering or scaling analyses based on similarity ratings) provide the same (or complementary, or different) information as factor analyses (which start from "smaller" pieces of information, and linearly combine the pieces into factors along which elements can be placed)?

(d) It may be fruitful to consider taxonomic dimensions which cut across the traditionally used dimensions. For example, "time" may be one such critical dimension. Pinder and Moore (1979) noted that taxonomies of how organizations *change* may be more informative than taxonomies of what organizations currently look like. Or, a focus on individuals across time could shift attention from taxonomies of individual differences in performance to taxonomies of individual differences in career patterns (and could subsequently be related to training decisions, socialization processes, and long-term strategic goals of the organization).

Evaluation of HRM Taxonomies

(e) Do the existing taxonomies in HRM (again, mostly job analytic) *really help* the field? Has our "real understanding" improved as a result of taxonomic theory? Has the implementation of taxonomies in HRM led to the selection of better predictors? Have the current taxonomic efforts in job analysis really improved our capacity to capture differential validity? Has individual performance really improved, compared to some baseline expectation (as a result of better person-job matching)? Has organizational effectiveness really improved? Reviews by Burke and Pearlman (1988) and Peterson and Bownas (1982) suggest not.

(f) As noted above, there have been some attempts at validating existing taxonomic efforts within construct (or predictive) validation strategies. More are needed. Further, *comparisons* between competing taxonomies are, to our

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knowledge, non-existent. Critical comparative tests will eventually be required to fully evaluate the construct validity of HRM taxonomies.

(g) Research is also needed to help answer the question, "Is there any information loss in the use of categories when taxonomies are invoked?" If so, what is the extent of the loss? Will the sum of the parts of the taxonomy retrieve all of the information contained in the whole phenomenon? Do discrete categories (e.g., gender) really reflect the underlying construct of interest? If there is information loss, is it worth it (from the perspective of parsimony, explanation, generality of theory, etc.)? In other words, empirical trade-off functions between parsimony (small numbers of categories: the lumpers) and finely tuned categories (the splitters) need to be documented.

What HRM Taxonomies Are Made Of

(h) The field of HRM would benefit from a more macro approach than has been used in the past. Currently, taxonomies in HRM are almost exclusively driven by individual-level based job analytic work. We should be embracing the notions of group performance, unit performance, and organizational effectiveness. This will add research emphasis to taxonomies of work groups, organizational strategies, organizational performance, and corporate environments.

(i) Given the enhanced perspective in (h) above, we need research on the linkage and interrelationships between different levels of taxonomic analysis (Wallace 1983). Thus, for example, a taxonomy of organizational strategies would inform a job performance taxonomy (i.e., this is part of the emerging field of strategic human resource management). A good example of the micro-macro linkage in HRM can be found in Lawler's (1990) discussion of strategic issues in compensation. Classic micro-level compensation approaches have focussed on types of job evaluation strategies (e.g., quantitative and nonquantitative; see Belcher 1974) and taxonomies of wage and salary surveys (e.g., labor market vs. product market; see Mahoney 1979). Lawler (1990) argues that pay systems must reflect the more macro environmental issues facing the firm, rather than simply mirroring competitive practices of the industry. While Lawler uses this linkage to argue that skilled-based pay is a preferable micro-HRM tactic, it is an excellent example of the potential to link macro- and micro-based taxonomies.

In sum, taxonomies can be (and have been) used to think about models of human behavior at work and about the efficient management of human resources. However, limits to the role of taxonomies have not been clearly delineated. The extent to which results are a function of our choices of method or units of analysis is simply not clear (nor is the extent to which the results *should* be the same across these dimensions). Further, the incremental utility of HRM taxonomies (including both theoretical and empirical utility) has not been adequately assessed. We hope the above research suggestions guide users of taxonomies in developing theory and/or answering questions about the practical utility of HRM interventions.

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NOTES

1. For example, DeNisi (1976) notes that particular clusterings of jobs may be useful in maximizing the *transfer* of training. By training workers "for a variety of jobs at once" (p. 105), within clusters, both the time perspective and value of training interventions can be increased.

2. See Mumford, Fleishman, Zaccaro, Levin, and Hein (in press) for a review of 65 leadership classification systems proposed between 1940 and 1968.

3. One of these classes of experience, generically labelled "negative life experiences," was replicated in two independent samples by Russell, Mattson, Devlin, and Atwater (1990) and Russell and Domm (1990).

4. By the way, Pinder and Moore (1979) add two unique contributions to the development of taxonomies. First, they suggest that how organizations *change*, rather than how they differ at any point in time, can be a fruitful taxonomic dimension. Second, they note that mean differences across taxonomic categories are not necessarily sufficient descriptors of different organizations. That is, while the mean responses may be the same, some organizations are more *variable* in their responses to internal and external demands. Pinder and Moore argue that these differences in within-organizational variation are also fruitful taxonomic dimensions.

5. This approach could be used to evaluate similarity ratings for *any* unit of analysis: e.g., individuals, groups, organizations, or environments. In fact, see Bobko, Bobko, and Davis (1984) for such an application in taxonomizing video games!

6. This same problem has been noted by educational researchers interested in developing taxonomies of learning. For example, Bloom (1971) states "Some fear was expressed that the taxonomy might lead to fragmentation and atomization of educational purposes such that the parts and pieces finally placed into the classification might be very different from the more complete objective with which one started." (pp. 5–6)

7. Another example of a theoretically based taxonomy is presented in Dawis and Lofquist (1975). Their taxonomy is based upon a theory of work adjustment which cross classifies occupational aptitude patterns with occupational reinforcer patterns in order to develop psychologically homogeneous groups of occupations.

8. The efficiency of taxonomic systems can also be assessed by an ability to correctly classify elements within the schema. It is important that any statistics used take into account the fact that chance agreement can occur (this can happen quite simply by predicting that all data falls into the category with highest known a priori probability). A straightforward index which accounts for this chance agreement is the kappa coefficient (Cohen 1960; Hanley 1987).

9. This is an instance of Segal's Law (Bloch 1978, p. 79): "A man with one watch knows what time it is. A man with two watches is never sure."

10. One of the authors, and other researchers, once spent several months trying to decide on a rating scale of this nature. One researcher advocated the use of "essentiality" as the descriptor of choice. Other members of the team questioned whether or not "essentiality" was a continuous variable. Could a job be only "somewhat essential?"

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11. For example, Hull and Collins (1987) demonstrated a need to update organizational typologies based upon advances in technology.

12. As Bellow (1970, p. 103) says, "All men by nature desire to know. That's the first sentence of Aristotle's *Metaphysics* . . . . When you set up a new enterprise, you redescribe the phenomena and create the feeling that we're getting somewhere . . . ."

13. As Hesse states (1929/1963, p. 192), "It is also known that man consists of a multitude of souls, of numerous selves. The separation of the unity of the personality into these numerous pieces passes for madness. Science is in this so far right as on multiplicity may be dealt with unless there be a series, a certain order and grouping. It is wrong insofar as it holds that one only and binding and lifelong order is possible . . . ."

14. McCall and Bobko (1990) do indicate that the *concept* of precision is useful. As they state, "a Solomon four-group design is rarely practical, but thinking through the critical issue of control is." (p. 10).

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