



## **Using the Myers-Briggs Type Indicator to Study Managers: A Literature Review and Research Agenda**

William L. Gardner  
*University of Mississippi*

Mark J. Martinko  
*Florida State University*

*This paper provides a review of research into the relationships between psychological types, as measured by the Myers-Briggs Type Indicator (MBTI), and managerial attributes, behaviors and effectiveness. The literature review includes an examination of the psychometric properties of the MBTI and the contributions and limitations of research on psychological types. Next, key findings are discussed and used to advance propositions that relate psychological type to diverse topics such as risk tolerance, problem solving, information systems design, conflict management and leadership. We conclude with a research agenda that advocates: (1) the exploration of potential psychometric refinements of the MBTI, (2) more rigorous research designs, and (3) a broadening of the scope of managerial research into type.*

More than five decades ago, Katherine Briggs and Isabel Myers began work on an instrument to operationalize Jung's (1921/1971) theory of psychological types. Today, over three million people a year (Center for Applications of Psychological Type, CAPT, 1992a) complete the *Myers-Briggs Type Indicator (MBTI)* (Myers & McCaulley, 1985). Major corporations administer nearly 40 percent of these instruments for applied purposes such as team building and management development (Moore, 1987). Paralleling these applications has been an increase in research relating psychological type to managerial behaviors such as decision making (Nutt, 1986a, 1989, 1990), conflict management (Kilmann & Thomas, 1975; Mills, Robey & Smith, 1985) and leadership (Roush & Atwater, 1991). Evidence of relationships between psychological types and organizational roles (Steckroth, Slocum & Sims, 1980), information systems (Davis & Elnicki, 1984) and managerial effectiveness (Gardner & Martinko, 1990) is also available. Accompanying this increased attention, however, have

---

Direct all correspondence to: William L. Gardner, Hearin-Hess Associate Professor of Management, University of Mississippi, Department of Management and Marketing, School of Business Administration, University, MS 38677.

---

Copyright © 1996 by JAI Press Inc. 0149-2063

been legitimate concerns about the conceptual foundations and psychometric properties of the MBTI, as well as the rigor of much of the research which employs it (Cowan, 1989; DeVito, 1985; Garden, 1991; Hicks, 1984, 1985; McCrae & Costa, 1989; Schweiger, 1985; Sippes & Alexander, 1987; Sippes, Alexander & Friedt, 1985; Sippes & DiCaudo, 1988; Tzeng, Outcalt, Boyer, Ware & Landis, 1984; Tzeng, Ware & Chen, 1989).

Given the increased usage of the MBTI by researchers and practitioners, as well as concerns about the indicator and associated theory and research, this paper asks: "To what extent is the MBTI a reliable and valid instrument for studying the relationships among managerial personalities, cognitions, behaviors, effectiveness and situational variables?" The reasons for asking this question are threefold. First, as management research using the MBTI expands, the need to assess its utility for these purposes likewise increases. Second, an assessment of the rigor of management type research is required to ascertain the validity of the results. Third, a critical review is needed to explicate the implications of these results for management theory and practice, as well as avenues for future research. Thus, addressing this question will help clarify whether enthusiasm or skepticism about the MBTI is more warranted.

### Theoretical Background

Psychological type theory proposes that people have preferred modes of perception (sensing [S]/intuition [N]) and judgement (thinking [T]/feeling [F]), as well as "attitudes" which reflect their orientation of energy (extraversion [E]/introversion[I]) and their orientation toward the outer world (judging [J]/perceiving[P]). These four sets of preferences combine to form 16 distinct personality types. An understanding of type preferences and their interactions serves as the core of "type theory." Table 1 summarizes the focus, preferences, and potential strengths and weaknesses of alternative types (Barr & Barr, 1989; Myers & Myers, 1980). While a complete description of these dimensions and the 16 combinations is beyond this paper's scope, Jung (1921/1971), Myers and Myers (1980), and Myers and McCaulley (1985) provide the necessary background.

Jung also asserted that people develop a dominant function and an auxiliary function for balance. To determine if the judging or perceiving function is extraverted and/or dominant, Myers' added the JP scale. She reasoned that since Es focus outwardly, the JP preference directly indicates their dominant function. Conversely, the dominant function for Is is their preferred mode for dealing with their inner world. Because the JP scale reflects their extraverted function, the relevant dimension is the opposite of their JP preference. For example, feeling is dominant for INFPs and intuition is auxiliary (Myers & McCaulley, 1985).

### Psychometric Properties of the MBTI

The available MBTI Forms include Forms F, G, G—Self-scorable, J and K. Form G is now the standard instrument. The 50 item "Abbreviated Form"

Table 1. Summary of Purported Psychological Type Preferences and Characteristics

<i>Psychological Types</i>	<i>Focus and Preferences</i>	<i>Strengths</i>	<i>Weaknesses (If Overextended)</i>
Extraversion	Energized by outer world; focus on people and things; active; breadth of interest; interactive; sociable; outgoing.	Good at social interaction; enthusiastic and confident; stimulates communication and ideas; instigates action; open and straightforward.	Intellectual superficiality; intrusive; lack of respect for others' privacy; easily distracted by external stimuli.
Introversion	Energized in inner world; focus on thoughts and concepts; reflective; depth of interest; concentration; inwardly directed.	Good at personal interaction; stays calm and focused; can concentrate intensely; develops ideas; uses discretion in talking.	May loose touch with outer world; bottles up emotions; keeps people at a distance; easily preoccupied; gives insufficient feedback.
Sensing	Facts; data; details; concrete; practical; reality-based; present-oriented; utility.	Pragmatic; precise; stable; results-oriented; sensible; systematic; bases opinions on observations.	Lacks long-range outlook; may overlook implications and meanings; may reject innovative ideas.
Intuition	Meanings; associations; possibilities; hunches, speculations; theoretical; future-oriented; novelty.	Imaginative; conceptualizes easily; creative; holistic perspective; intellectually tenacious; idealistic.	Unrealistic; out-of-touch; may overlook key variables or facts; bored by routine; scattered; overcomplicates.
Thinking	Analysis; objective; logic; impersonal; critique; reason; criteria; justice; systematic inquiry; principles.	Rational; analytical; assertive; deliberative; logical; carefully weighs alternatives; firm but fair; explains thoroughly.	Undervalues or suppresses own and others' feelings; overly analytical; cold; insensitive; critical; judgmental; overly formal.
Feeling	Sympathy; subjective; humane; personal; harmony; empathy; appreciate; values; compassion; trust; consideration.	Persuasive; empathic; warm; sensitive; demonstrative and expressive; draws out feelings of others; loyal; committed to values.	Overly sensitive; moody; may give indiscriminately; can become emotionally overburdened; unable to give unpleasant feedback.
Judging	Organized; planned; settled; closure; control one's life; set goals; structured; routine.	Plan, organize, and control well; persistent; lives are well-structured; decisive; conscientious; reliable.	Closed-minded; inflexible; can jump to conclusions too quickly; intolerant; critical; judgmental.
Perceiving	Pending; flexible; curious; spontaneity; tentative; let life happen; undaunted by surprise; open to change.	Open-minded; adaptable; spontaneous; understanding; tolerant; inquisitive; zest for experience.	Indecisive; procrastinates; unfocused; disorganized; impulsive; may collect data too long before deciding.

Table 2. Psychometric Properties of the MBTI

Psychometric Property	Source/References	Key Findings
Reliability		
Internal Consistency	<i>MBTI Reviews:</i> Carlson (1985); Carlyn (1977); Myers & McCaulley (1985).	Split-half reliabilities and coefficient alphas for the continuous scales consistently exceed .75 for all four scales. Split-half reliabilities for dichotomous scales typically exceed .60 for Phi coefficients and .75 for Tetrachoric correlations.
	<i>Organizational Studies:</i> Hellriegel & Slocum (1980) Hoy & Hellriegel (1982) Ruble & Cosier (1990) Schweiger (1985) Steckroth et al. (1980)	Coefficient alphas for Form AV of .72 (SN) and .80 (TF). Split-half reliabilities for Form G of .67 for the SN and TF scales. Coefficient alphas for Form G of .85 (SN) and .79 (TF). Coefficient alphas for Form G of .74 (SN) and .69 (TF). Coefficient alphas for Form F of .78 (EI), .74 (SN), .73 (TF) and .72 (JP).
Test-Retest Reliability	<i>MBTI Reviews:</i> Carlson (1985, 1989); Carlyn (1977); McCauley & Carskadon (1983); Myers & McCauley (1985).	Test-retest product-moment correlations on all four scales range from .80 plus after 4 weeks, to .60 plus after 2.5 years. Test-retest agreement on type categories for test intervals of 5 weeks to 6 years, range between .64 and .90, and typically exceed .70 for each scale. Composite type agreement after 5 weeks for four and three scales of .47 and .80, respectively.
Validity		
Factorial Validity	<i>Supportive Findings:</i> Johnson & Saunders (1990); Thompson & Borello (1986a, 1986b); Tzeng et al. (1984, 1989). <i>Nonsupportive Findings:</i> Ross (1966); Sippes & Alexander (1987); Sippes & DiCaudo (1988); Sippes et al. (1985).	Tzeng et al. (1989, p. 255) concluded that their factor analysis of Form G items "yielded clear simple factors being matched almost perfectly with the theoretical scales of the MBTI." The other studies came to similar conclusions, obtaining strong support for the factorial validity of the indicator. Sippes et al.'s (1985, p. 796) factor analysis of Form F items yielded six factors, while four resembled the MBTI's dimensions "there was nowhere near one-to-one correspondence." The other studies concluded that the EI and JP scales are factorially valid measures of sociability and impulsivity/non-planning, respectively, rather than the constructs proposed by type theory.
Scale Intercorrelations	<i>MBTI Reviews:</i> Carlson (1985); Carlyn (1977); Thorne & Gough (1991).	While the EI, SN and TF scales are relatively independent of each other, the JP scale is often significantly correlated with the SN scale, and occasionally with the TF scale.

<p>Criterion-Related Validity</p>	<p><i>MBTI Reviews:</i> Carlson (1985); Carlyn (1977); Myers &amp; McCauley (1985); Myers &amp; Myers (1980); Thorne &amp; Gough (1991).</p>	<p>Extensive evidence of criterion-related validity is supplied by the type distribution tables which reveal differences in type proportions across occupations that are consistent with type theory. Significant correlations of the MBTI scales with various interest, personality, academic and observational measures, further document the MBTI's criterion-related validity.</p>
<p>Structural Properties</p>	<p><i>MBTI Reviews:</i> DeVito (1985); Garden (1991); McCrae &amp; Costa (1989).</p>	<p>The critical structural assumptions of type theory, and the MBTI's ability to operationalize them, remain largely unvalidated.</p>
<p>* Dichotomous/ Opposing Types</p>	<p><i>Supportive Findings:</i> Hicks (1984); Myers &amp; McCauley (1985); Tzeng et al. (1989)</p>	<p>Some studies (e.g., Hicks, 1984) show a discontinuity at the midpoint of continuous scales (e.g., S vs. N), when they are plotted against some external criteria (e.g., "bookishness"). Tzeng et al. (1989, p. 734) concluded that, even when continuous unipolar scales are used, factor analyses "support the nature of underlying bipolarity between two preference poles in personality ratings."</p>
<p>* Dominant/ Auxiliary Functions</p>	<p><i>Nonsupportive Findings:</i> McCrae &amp; Costa (1989).  <i>Supportive Findings:</i> Mitchell (1991).</p>	<p>McCrae and Costa (1989) examined significant relationships between the NEO-PI and MBTI continuous scores; they were unable to find any evidence of discontinuity or bipolarity.  For each mental function, significant differences in scores on some Type Differentiation Indicator (Form J) subscales were identified between subjects exhibiting dominant versus auxiliary strengths.</p>
<p>* Unique Composite Types</p>	<p><i>Nonsupportive Findings:</i> Carlson (1980); McCrae &amp; Costa (1989).  <i>Supportive Findings:</i> Hicks (1985); Thorne &amp; Gough (1991).  <i>Nonsupportive Findings:</i> McCrae &amp; Costa (1989); Ross (1966); Stricker et al. (1965).</p>	<p>When subjects' strongest functional preferences on the continuous scales were used as an alternative measure of the dominant function, no significant relationship between this measure and the dominant function identified by the JP scale was identified.  The composite type profiles Thorne and Gough (1991) developed from the IPAR data, correspond closely to the type descriptions advanced by Myers. Hicks (1985) demonstrated that the interaction of intuition and thinking is associated with susceptibility to the fundamental attribution error.  McCrae and Costa (1989) found that only one of 55 possible two-, three-, or four-way interactions implied by type theory was significant. The other studies identified scale interactions which are not completely consistent with type theory.</p>

(Form AV) was discontinued due to reliability and validity problems. Every form produces preference scores for the four dichotomous scales. Continuous scores can also be computed using the formula provided in the MBTI Manual (Myers & McCaulley, 1985).

### *Reliability*

The available evidence (see Table 2) suggests that the "estimated reliabilities of type categories appear to be satisfactory in most cases" (Carlyn, 1977, p. 465). The split-half reliabilities of continuous scores for numerous samples repeatedly exceed .75 for each scale (Carlyn, 1977; Carlson, 1985; Myers & McCaulley, 1985). Test-retest reliabilities for continuous scores usually exceed .70 and often surpass .80. However, dichotomous type scores yield lower reliabilities. McCarley and Carskadon (1983) found that only 47 percent of their subjects scored the same on all four scales after five weeks. Since the chance probability of choosing all four preferences on a retest is only 6.25 percent and the percentage of preferences that remained unchanged on three scales exceeded 80, MBTI type scores appear to be relatively stable. Still, continuous scores are more reliable than type categories, and hence better suited for research.

Only five management studies report reliabilities and these are limited to the continuous scales. Of these, only Steckroth et al. (1980) discuss the reliability of all four scales, with each exceeding .70. The others limited their focus to the SN and TF scales; these reliabilities ranged from a low of .67 on both scales (Hoy & Hellriegel, 1982), to a high of .85 for the SN scale (Ruble & Cosier, 1990). While some of these reliabilities are lower than those reported in prior reviews, they are acceptable (Nunally, 1978). Nevertheless, future studies should report reliabilities to clarify whether or not MBTI refinements for organizational settings are necessary.

### *Evidence of Validity*

As Podsakoff and Organ (1986) emphasize, constructs tapped by self-report measures of personality such as the MBTI, can not, in the strictest sense, be verified by other means. While there may be other measures of these constructs, there is no direct means of checking data integrity. Because respondents engage in higher-order cognitions such as inferences about themselves, the data are fairly abstract and it is difficult to ascertain their accuracy. Still, the result *is* a measure of the construct; the key issue is to establish its validity.

Efforts to validate the MBTI have produced mixed results (see Table 2). Carlyn (1977, p. 471) concludes that it "appears to be a reasonably valid instrument which is potentially useful for a variety of purposes." Carlson (1985) likewise found that MBTI validation studies yielded "generally positive" results. Others have voiced concerns about the MBTI's factorial, criterion-related and construct validity (McCrae & Costa, 1989; Sipps & Alexander, 1987; Sipps, Alexander & Friedt, 1985; Sipps & DiCaudo, 1988). While a complete review of this literature is beyond this paper's scope, we provide a selective overview focusing on the indicator's criterion-related validity and key structural properties below.

**Criterion-related validity.** Extensive validity evidence is supplied by type distribution tables which reveal differing type proportions across occupations that are consistent with type theory (Myers & McCaulley, 1985). Numerous correlations between the MBTI scales and various interest, personality and academic measures provide further support (Carlyn, 1977; Carlson, 1985; Myers & McCaulley, 1985). However, because the scales were often simply correlated with other self-report measures collected at the same time, some portion of these correlations may stem from common method variance. When measures have the same source, distortions from the source can bias both measures and lead to an erroneous inference of a relationship (Podsakoff & Organ, 1986). Fortunately, much of the validity evidence is derived from multiple data sources (see Thorne & Gough, 1991). Future validation studies should model this practice by taking procedural steps (e.g., separation of measures) to minimize common method variance.

**Structural properties of type theory.** To date, the key structural assumptions of type theory, and the MBTI's operationalization of them, remain largely unvalidated. As Garden (1991, p. 4) observed, the existing research "may validate no more than a trait interpretation of the scales." As Table 2 shows, evidence for the 1) dichotomous and opposing preferences, 2) dominant and auxiliary functions, and 3) interactive effects and composite types proposed by Myers, is equivocal at best (Garden, 1991). While a complete discussion of these issues is beyond this paper's scope, we consider evidence for and against dichotomous preferences, since this is the most basic feature of Myers' theory.

The findings summarized in Table 2 indicate that there is some limited empirical evidence of discontinuity at the midpoints of the continuous scales (e.g., Hicks, 1984). There is also support for the underlying bipolarity of type preferences (Tzeng et al., 1984). However, because other researchers (e.g., McCrae & Costa, 1989) have been unable to corroborate these results, considerable skepticism about the assumption of dichotomous types remains (Garden, 1991).

Another stream of research which draws this assumption into question focuses on a "type verification" process developed by Kummerow (1988). When Kummerow (1988) and Walck (1992) used this process to help managers identify their "true type," 37 and 25 percent of the subjects, respectively, reported a change in type. Interestingly, far greater proportions changed from E to I, T to F, and J to P, than in the reverse directions. Of special significance is Walck's (1992) finding that 80 percent of disagreements occurred when preference scores were "slight." By separating subjects into dichotomous groups at the midpoint, the indicator may falsely categorize those with slight preferences a substantial portion of the time, thereby undermining its construct validity.

Additional insight into this danger is provided by Ott, Mann and Moores' (1990) study of the impact of type and method of instruction (lecture versus computer-assisted instruction [CAI]) on student performance in a basic accounting course. Instead of the SN and TF scores being dichotomized, they were split into three groups, with the middle group being labeled "borderline." As expected, Ss and Ts performed better on exams with the lecture method,

while Ns and Fs learned best with CAI. Of special interest are several curvilinear relationships that were revealed. Borderline SN students scored lower on exams for both methods of instruction than did either extreme Ss or Ns; borderline TF students outperformed both Ts and Fs on the exams when lectures were used. Importantly, these findings would have been obscured if the type preferences had simply been dichotomized.

There are also serious statistical drawbacks to dichotomous scores. As Cohen (1983) noted, assuming a bivariate normal distribution with correlation  $r$ , the "artificial" dichotomization of one continuous variable at the mean reduces the variance accounted for to  $.64r^2$ ; if both are dichotomized at the mean, the amount of variance accounted for declines to  $.40r^2$ . Because this is equivalent to a loss of 38 to 60 percent of the available data points, the power of the analyses slips dramatically. Moreover, Hunter and Schmidt (1990) showed that for studies included in meta-analyses, artificial dichotomization in the independent and/or dependent variable, distorts the mean correlation in a downward direction. In sum, empirical support for the prediction of type theory that there are four dichotomous pairs of types is equivocal. As such, more research is needed to assess the MBTI's validity, especially with respect to its structural assumptions. In the meantime, given the dangers and statistical shortcomings of dichotomous scores, we strongly recommend that researchers use continuous scores. In addition, they should routinely explore the possibility that the variables of interest are related in a curvilinear, as opposed to a linear, fashion.

Despite the concerns raised, we believe that the weight of existing validity evidence indicates that the MBTI and type theory merit additional theoretical and empirical attention. Moreover, considering the relevance of type theory to managerial cognitions and behavior, we believe that management could and should serve as an appropriate field for studying the indicator's construct validity.

### **Methodological Properties of Management Research into Psychological Type**

Given the relevance of type theory to management, it is important to assess the methodological properties of the existing research. Toward this end, we have examined all *published empirical studies which employed managers as subjects or examined issues directly related to management*. To identify these, all management journals and the *MBTI Bibliography* (CAPT, 1992b) were reviewed. These studies were then categorized regarding their methodological properties. Studies with non-managerial subjects (e.g., change agents/OD consultants, entrepreneurs) that focused on issues only tangentially related to management (e.g., intervention style, information system usage and satisfaction) (Alvai & Henderson, 1981; Ginn & Sexton, 1988; Hamilton, 1988; Slocum, 1978) were omitted. Nonetheless, selected results from excluded studies are discussed where relevant.

We classified the qualifying studies as descriptive or predictive-analytical based on their research purpose (Sekaran, 1989). We further categorized the



descriptive studies<sup>1</sup> as quantitative or qualitative, while subdividing the predictive-analytical studies into those which used non-experimental (Table 3) versus experimental (Table 4) designs.

Most of the selected studies (75 percent) used practitioners or students with work experience as subjects. This compares favorably with MBTI research in other fields, which relies heavily on university samples (Carlson, 1985). There are also less favorable attributes, including an overreliance on nonprobability sampling designs such as convenience, judgement or volunteer samples (88 percent). A failure to discuss key properties of the research is also prevalent. For instance, 43 percent of the studies do not identify the MBTI form, and 90 and 29 percent, respectively, omit reliability coefficients and discussions of generalizability. A more detailed review of particular categories of studies follows.

**Descriptive-quantitative studies.** Of the thirteen studies assigned to this category, all but one (Hai, 1983) were published in the *Journal of Psychological Type* (Cabral & Joyce, 1991; Craig, Craig & Sleight, 1988; Gaster, Tobacyk & Dawson, 1984; Hawkins, Williams & Hawkins, 1990; Johnson, 1992; Lueder, 1986a, 1986b; Malone, 1988; Mosley & Pietri, 1985; Pollitt, 1982; Reynierse, 1991; Roach, 1986). These studies' strengths stem from their usage of all four MBTI scales and comparatively large samples, ranging from 83 (Lueder, 1986a) to 360 subjects (Johnson, 1992). They also have serious methodological limitations. For example, each study used type as opposed to continuous scores, and none reported reliabilities for their samples. Only three specify a priori hypotheses (Gaster et al., 1984; Hai, 1983; Hawkins et al., 1990), and the analyses were typically limited to descriptive (frequencies, cross-tabulations) or simple inferential statistics (Chi-Square). While these studies indicate the proportions of types within managerial samples, they reveal little about managers' cognitions or behaviors.

**Descriptive-qualitative studies.** Two descriptive studies were categorized as qualitative (Kilmann & Mitroff, 1976; Mitroff & Kilmann, 1975). In each, a short "personality test" measuring the SN and TF dimensions was administered, and the managers were asked to write a story describing their ideal organization. These scales were combined to determine which of four "decision styles" the managers favored: sensing-thinking (ST), intuition-thinking (NT), sensing-feeling (SF), and intuition-feeling (NF). Next, the stories were "content analyzed" for similarities and differences related to decision style. As predicted, the ideal organization was described by: 1) STs in factual, realistic and impersonal terms; 2) NTs in general, theoretical and impersonal terms; 3) NFs in general, idealistic and human terms; and 4) SFs in factual, realistic and personal terms.

While such analyses provide rich descriptions of the organizational preferences of different types, there are some notable shortcomings of this design. One stems from the failure to identify the instrument. Apparently, an abbreviated measure was used because the research occurred in a consulting setting where ease of administration was important. Given the lack of reliability and validity data, however, one must be skeptical of the results. A second

Table 3. Summary of MBTI Studies: Predictive-Analytical/Non-Experimental

Authors	Journal	Sample	Scales	Form	Supplemental Measures	Analysis
Blaylock (1981)	<i>Psychological Reports</i>	28 MBA and Senior Management Students	SN TF	N.A.	Perceived Risk of Decision Scenarios	ANOVA
Brightman & Sayeed (1990)	<i>Group and Organization Studies</i>	153 Senior and Middle Managers and Staff	All	E	Miscellaneous Questionnaires	Crosstabs, Chi-Square and MANOVA
Campbell & Kain (1990)	<i>Journal of Psychological Type</i>	127 Entry-, Mid-, and Top-Level Managers	All	G	Information Presentation Mode Survey	Chi-Square, ANOVA and Duncan Multiple Range Test
Chanin & Schneer (1984)	<i>Human Relations</i>	94 Business Policy Undergraduates	All	N.A.	Thomas-Kilmann MODE Instrument	T-tests and Pearson Correlations
Evered (1977)	<i>Human Relations</i>	96 MBA Students	All	N.A.	Rotter E-I Test, Actual and Imaging Style	Frequencies, Chi-Square, Correlations
Gardner & Martinko (1990)	<i>Journal of Psychological Type</i>	40 Public School Principals	All	F	Performance and the Leader Observation System	Frequencies, Chi-Square, Correlations, and t-tests
Handley (1982)	<i>Journal of Counseling</i>	33 Graduate Psychology Students	All	N.A.	Miscellaneous Questionnaire	Correlations and t-tests
Hay (1966)	<i>Personnel and Guidance Journal</i>	62 Engineering Managers	All	F	Questionnaires, Q-Sort, and Performance Evaluations	Correlations and ANOVA
Hellriegel & Slocum (1980)	<i>Business Horizons</i>	88 Upper-Middle Business Managers	SN TF	A.V.	Organizational Stories	Content Analysis and Frequencies
Hoy & Hellriegel (1982)	<i>Academy of Management Journal</i>	150 Small Business Managers	SN TF	G	In-depth Interviews	Correlations, Chi-Square and Discriminant Analysis

Kilmann & Thomas (1975)	<i>Psychological Reports</i>	86 OB Graduate Students	All	F	Miscellaneous Questionnaires	Pearson Correlations
Mills, Robey & Smith (1985)	<i>Psychological Reports</i>	199 Project Managers	All	N.A.	Thomas-Kilmann MODE Instrument	Correlations
Percival, Smitheram, & Kelly (1992)	<i>Journal of Psychological Type</i>	160 and 180 Undergraduates and Professionals	All	G	Thomas-Kilmann MODE Instrument	Chi-Square Analysis
Roush & Atwater (1991)	<i>Military Psychology</i>	90 Navy Midshipmen	All	G	Multifactor Officer Questionnaire	Correlations, Chi-Square and <i>t</i> -tests
Schweiger & Jago (1982)	<i>Psychological Reports</i>	61 Employed MBA Students	SN TF	G	Vroom-Yetton Problem Set 5	Partial Correlations, <i>t</i> -tests and ANOVA
Steckroth, Slocum & Sims (1980)	<i>Journal of Experiential Learning and Simulation</i>	96 Business Executives	All	F	Organizational Stories	Correlations, Chi-Square, ANOVA, Lambda
Stumpf & Dunbar (1991)	<i>Decision Sciences</i>	343 Lower, Middle and Top Managers, 64 Financial Analysts and Specialists	SN TF	F	Action Bias Measures from the Metrobank Simulation	<i>F</i> -tests, Eta statistic, Multiple Regression Analyses, Partial Correlations

Notes: N.A. = Not Applicable.

a. Although the authors of this study do not indicate the MBTI form used, Mosley and Pietri (1985) report that it was the abbreviated version.

Table 4. Summary of MBTI Studies: Predictive-Analytical/Experimental

Authors	Journal	Sample	Scales	Form	Supplemental Measures	Analysis
Behling, Gifford & Toliver (1980)	<i>Decision Sciences</i>	25 MBA Students	SN	N.A.	Betting Decisions	Multiple Regression, Correlations
Blaylock & Rees (1984)	<i>Decision Sciences</i>	16 MBA Students	SN TF	N.A.	Larcker & Lessig's Information Usage Questionnaire	ANOVAs, Aligned-Ranks Nonparallel Test, Kendall's W
Boreham (1987)	<i>Instructional Science</i>	23 Helping Professionals	SN	F	Causal Attributions	Content Analysis and <i>t</i> -test
Chenhall & Morris (1991)	<i>Accounting Organizations and Society</i>	64 Middle to Senior Level Managers	SN	G	Treatment of Opportunity Costs in Resource Allocation Decisions	Probit Regression Analyses, Loglinear Analyses
Davis & Elnicki (1984)	<i>OMEGA</i>	96 MBA Students	SN TF	N.A.	Decision Time, User Confidence and Cost Performance	MANOVA, ANOVA, Duncan Multiple Range Test
Davis, Grove & Knowles (1990)	<i>Psychology Reports</i>	132 MBA Students	SN TF	N.A.	Cost Performance	Correlation, ANOVA, Duncan Multiple Range Test
Henderson & Nutt (1980)	<i>Management Science</i>	32 Hospital Administrators and 30 Business Executives	SN TF	N.A.	Project Summary Instrument	ANOVA
Hunt, Krystofiak, Meindl & Youstry (1989)	<i>Organizational Behavior and Human Decision Processes</i>	128 Undergraduate OB Students	SN TF	N.A.	Preferred Decision Strategy	Frequencies, ANOVAs, and <i>t</i> -tests
Nutt (1986a)	<i>MIS Quarterly</i>	137 Top Executives of Service Organizations	All	N.A.	Project Adoption and Perceived Risk	ANOVA, ANCOVA, Duncan Multiple Range Test

Nutt (1986b)	<i>Technological Forecasting and Social Change</i>	48 Experienced Mid- to Upper-Level Managers	SN TF	N.A.	MIS and Risk Preference Scales and Bunder's Ambiguous Tolerance Scale	ANOVA and ANCOVA
Nutt (1989)	OMEGA	38 Top-Level Bank Executives	SN TF	N.A.	Project Adoption and Perceived Risk	ANOVA and Duncan Multiple Range Test
Nutt (1990)	<i>Journal of Management Studies</i>	79 Top Executives and 89 Middle Managers	SN TF	F	Project Adoption and Perceived Risk	ANOVAs and Duncan Multiple Range Test
Ramnarayanan & Gardner (1991)	<i>Proceedings of the 18th DSI Meeting</i>	144 Graduate Business Students	SN TF	F	Profit, Response Time, and User Satisfaction	Factor Analysis, ANOVA, Correlation and Duncan Multiple Range Test
Rodgers (1991)	<i>Journal of Economic Psychology</i>	330 Bank Loan Officers	SN	N.A.	Perception of Customer, Risk Judgements, Decision Choice	One-way ANOVA, Covariance Structural Modeling Technique
Ruble & Cosier (1990)	<i>Organizational Behavior and Human Decision Processes</i>	162 Upper Division Business Students	SN TF	G	Multiple-Cue Problem Learning Paradigm	ANOVA, Chi-Square, and Correlations
Schweiger (1985)	<i>Journal of Business Research</i>	20 Employed MBA Students	SN TF	G	Simultaneous Verbal Protocols	Content Analysis and Correlations

Note: N.A. = Not Applicable.

limitation arises from a failure to complement the qualitative insights gained with quantitative analyses. Because the "content analyses" appear to have been based solely on subjective impressions, it cannot be determined if the purported results are real or imagined. Moreover, Mitroff and Kilmann's (1975) study does not even report the number of subjects. Thus, it is clear that these studies lack methodological rigor. As such, their conclusions must be interpreted with caution, even though some corroborating support has been obtained from subsequent studies which included quantitative analyses (Hellriegel & Slocum, 1980; Ramakrishna & Schilavy, 1986; Steckroth et al., 1980).

**Predictive-analytical/non-experimental studies.** The properties of the 18 studies (35%) that fall in this category are summarized in Table 3. In general, they appear in higher quality journals than the descriptive studies. In addition, the sample sizes of most of these studies (72%) exceeded 50, with 61 percent using inferential statistics to test a priori hypotheses. Nonetheless, with few exceptions (e.g., Gardner & Martinko, 1990), these studies are limited by a nearly exclusive reliance on self-report measures. As noted above, studies that draw inferences by correlating cross-sectional self-report measures are especially susceptible to biases arising from common method variance. Given the heavy usage of self-report measures in these studies, such bias may be extensive.

**Predictive-analytical/experimental studies.** Only 31 percent (16; five by Nutt) of the selected studies used experimental or quasi-experimental designs (see Table 4). In general, these studies used the most rigorous designs and were published in the most rigorous journals. Each included a priori hypotheses and more sophisticated statistical analyses. Because all but one study focused on the SN and/or the TF scales, insights regarding other dimensions are scarce. The power of six studies is also restricted by samples of less than 50 subjects. Nearly every study relied solely on self-report measures, making them susceptible to common method variance biases. However, the fact that the measures were often collected in different time periods reduces the severity of this shortcoming.

**Summary.** The prior section makes it clear that the rigor of the managerial research into type is mixed, with the experimental studies employing the strongest designs. The low quality of much of this research has undoubtedly undermined the MBTI's reputation and created skepticism about its utility (DeVito, 1985; Garden, 1991; McCrae & Costa, 1989). However, this skepticism may be unfounded since the available evidence suggests that the MBTI merits further study and refinement. Nevertheless, future research must use more rigorous designs before greater confidence can be placed in the results.

### **Key Findings and Research Propositions**

In this section, we examine the nature and strength of key findings from the managerial type research. While empirical support for some relationships is strong, others are tenuous and require verification. When possible, the strength of the significant relationships will be discussed. However, because many studies limit their statistical analyses to significance tests without reporting

measures of strength, it is not always possible to determine the effect size. Still, because of the need to develop theory in this area, we advance propositions whenever there is sufficient conceptual or empirical support. Recognizing the limitations of this research, the propositions are not seen as authoritative statements of lawful relationships. Rather, they describe potential relationships that merit research attention and require confirmation.

### *Type Distributions within Managerial Samples*

Normative samples for the United States suggest that 55 to 60 percent of all people are extroverts. Roughly 60 percent prefer sensing and judgement to intuition and perception. TF preferences vary by gender, with about 60 percent of males and females, respectively, being Ts and Fs (Myers & McCaulley, 1985).

While all types appear in managerial samples, TJs are most prevalent (see Table 5). Indeed, although majority preferences for Es (12 samples), Is (5 samples), Ss (15 samples) and Ns (7 samples) were split across studies, managers favored thinking and judgement in 97 and 100 percent of these samples, respectively. Chi-square analyses comparing managerial samples to the general population (Gardner & Martinko, 1990; Gaster et al., 1984; Malone, 1988; Mosley & Pietri, 1985) also show that TJs are overrepresented. Importantly, type theory predicts that TJs, the "logical decision makers" (Myers & McCaulley, 1985), will be attracted to administration. Thus, available theory and research suggest that:

**P1:** *Managers are more inclined to prefer thinking and judgement over feeling and perception than members of the general population.*

This proposition is important because it implies that certain types self-select themselves for administrative positions. However, Kummerow's (1988) and Walck's (1992) research suggests that some subjects may be falsely reporting TJ preferences because they see them as indicative of desirability managerial traits. Indeed, many managers who score as TJs may be "falsifying" their preferences due to social desirability biases (Ganster, Hennessey & Luthans, 1983). Falsification may be most acute among female managers who report thinking preferences significantly more often than women in general (e.g., 57 percent versus 40 percent; Cabral & Joyce, 1991), but not as often as males (Craig et al., 1988; Hai, 1983; Pollitt, 1982). This finding is disturbing with regard to construct validity since it suggests that the MBTI may be tapping impression management behaviors rather than basic psychological preferences. Thus despite the volume of research which suggests a predominance of TJ managers, studies with more rigorous designs are required before this proposition can be unequivocally accepted.

### *Perception: Sensing versus Intuition*

**Concrete versus abstract stimuli and perceptions.** As Table 1 indicates, type theory asserts that Ss favor concrete data whereas Ns prefer abstractions. Studies of field independence-dependence reveal that Ns excel at disembedding

Table 5. Type Distributions from Managerial Populations<sup>a</sup>

Organizational Level	Author(s)	Subjects	Majority Preference and Percentage										Most Common Composites		
			% E	% S	% T	% J	ST	NT	SF	NF					
Top	Mosley & Pietri (1985)	341 Banking Executives	56.0	73.0	83.0	73.0	62.0	21.0	11.0	6.0					ESTJ 28% ISTP 19%
	Nutt (1986a)	137 Top Executives of Service Organizations	54.7	49.6	57.6	51.1	25.5	32.1	24.8	17.5					I.S. <sup>b</sup>
	Nutt (1990)	79 Top Executives of Hospitals	N.A.	44.3	57.0	N.A.	29.1	27.8	15.2	27.8					N.A. <sup>c</sup>
	Reynierse (1991)	319 Outplaced Senior Executives	56.7	49.6	86.8	77.1	43.6	43.3	5.0	8.2					ENTJ 21% ESTJ 20%
	Roach (1986)	67 Executives	66.0	33.0	82.0	66.0	30.0	52.0	3.0	15.0					I.S.
Middle/Lower	Brightman & Sayeed (1990)	144 Middle Managers	50.0	77.8	72.2	72.9	N.A.	N.A.	N.A.	N.A.					N.A.
	Gaster, Tobacyk & Dawson (1984)	316 Retail Store Managers	65.0	83.0	93.0	92.0	77.0	16.0	6.0	1.0					ESTJ 47% ISTJ 27%
	Hawkins, Williams, & Hawkins (1990)	243 Mid-level Social Service Managers	37.4	57.2	71.2	74.1	42.0	29.2	15.2	13.6					ISTJ 25%
	Hoy & Hellreigel (1982)	150 Small Business Managers	N.A.	86.0	81.3	N.A.	70.7	10.7	15.3	3.3					N.A.
	Johnson (1992)	338 Mid-level Wholesale Grocery Managers	62.1	68.0	76.9	73.1	54.4	22.5	13.6	9.5					ESTJ 30% ISTJ 15%
	Nutt (1990)	89 Hospital Middle Managers	N.A.	40.5	58.4	N.A.	23.6	34.8	13.5	24.7					N.A.
	Roach (1986)	70 Supervisors 161 Middle Managers	39.0	70.0	71.0	73.0	53.0	19.0	17.0	11.0					I.S.
			45.0	57.0	78.0	70.0	46.0	32.0	10.0	12.0					I.S.



Mixed	Cabral & Joyce (1991)	203 Entry, 2nd and 3rd Level Managers	51.2	50.2	74.9	70.0	39.9	35.0	10.3	14.8	ISTJ 21% ESTJ 16%
	Campbell & Kain (1990)	127 Entry, Middle and Top Managers	67.7	59.8	84.2	66.7	51.9	32.3	7.8	8.7	I.S.
	Hai (1983)	261 Hospital Administrators 156 Business Managers	54.0	57.9	65.9	N.A.	36.8	29.1	21.1	13.0	N.A.
	Heitriegel & Slocum (1980)	88 Top-Middle Business Managers	48.0	66.0	75.6	N.A.	51.3	24.4	14.7	9.6	N.A.
	Lueder (1986a)	83 Top Executive Educators	N.A.	56.8	62.5	N.A.	37.5	25.0	19.3	18.2	N.A.
	Lueder (1986b)	89 Executive Educators	67.5	28.9	60.2	74.7	19.3	41.0	30.1	9.6	I.S.
	Malone (1988)	302 Business Managers	77.0	30.3	65.2	79.8	28.1	37.1	2.2	32.6	I.S.
	Mills, Robey & Smith (1985)	199 Project Managers	52.0	68.0	77.0	62.0	52.0	25.0	16.0	8.0	ISTJ 21% ESTJ 17%
	Schweiger & Jago (1982)	61 Full-Time Employed MBA Students	42.2	63.8	85.4	79.4	56.7	28.6	7.0	7.5	I.S.
			N.A.	50.0	50.0	N.A.	29.0	21.0	29.0	21.0	N.A.

Notes: a. Because the SN and TF combinations (problem solving styles) create four cells, a minimum of 60 subjects was required for inclusion of a study in this table in order to achieve a good estimate of the range of responses; since the combination of all four scales produces 16 distinct categories, 240 respondents was established as the minimum sample size for reporting composite scores.

b. Insufficient subjects.

c. Not available.

abstract figures from complex backgrounds, while the context strongly affects Ss (Carey, Fleming & Roberts, 1989; Corman & Platt, 1988). Similar results arise with other measures of cognitive complexity (e.g., Ferguson & Fletcher, 1987).

Despite these supportive results, organizational researchers have obtained mixed SN findings. Schweiger (1985) used MBA students and simultaneous verbal protocols to assess this scale's utility as a measure of decision processes. Based on type theory, he predicted that the SN scale would be negatively related to the use of: 1) facts, 2) quantitative analysis, and 3) decision rules, and positively related to 4) errors in thinking. No support was obtained for the first two predictions. However, partial correlations (.5 plus) revealed strong relationships between the SN scale and the latter two measures. Ss used decision rules more than Ns, while the tendency of Ns to quickly reach conclusions caused them to make more errors. Unexpectedly, Ns also preferred nonquantitative analyses more than Ss. Schweiger (1985) suggests that Ss dislike nonquantitative analysis because it seems unrealistic, a property which appeals to Ns' imagination. Overall, these results imply that the SN scale captures some but not all of the intended cognitive processes, providing partial support for the MBTI's logical validity. As Schweiger (1985) acknowledged, however, his study is limited by the sample size of 20, which included only nine intuitive subjects.

Other organizational studies provide more supportive findings. Evered (1977) asked graduate management students to describe images of their futures. Content analysis revealed significant differences in reality images, with 87 percent of Ss describing a concrete, sensible and material world; 65 percent of Ns described a less tangible, nonsensible world of imagination. In a similar vein, Boreham (1987) examined the attributions made by 23 helping professionals in diagnosing a simulated malfunctioning system. A significant relationship between the SN scale and the number of attributions was identified. While 82 percent of Ss cited obvious and immediate causes only, 75 percent of Ns made more complex attributions linking the proximate cause with other factors.

Rodgers' (1991) studied the information processing styles of 330 loan officers. Path analysis revealed that Ss' loan evaluations were strongly related to their initial perceptions ( $\beta = .82$ ), and to a lesser extent, liquidity ( $\beta = -.29$ ) and income ( $\beta = -.12$ ) measures. In contrast, Ns relied mostly on initial perceptions ( $\beta = .98$ ), and less so on risk measures ( $\beta = -.11$ ). The initial perceptions ( $\beta = .33$ ) and evaluations ( $\beta = .60$ ) of Ss also affected decisions to accept or reject loan applications. Ns were influenced solely by their evaluation ( $\beta = .70$ ). A one-way ANOVA revealed that Ss also significantly outperformed Ns, who were more conservative and risk averse. Rodgers (1991) posited that because Ns perceive larger data sets more accurately than separate components, they may have misaggregated the data and relied too heavily on past experiences and risk.

Finally, Chenhall and Morris (1991) theorized that the holistic outlook of Ns helps them to consider relevant opportunity costs in resource allocation decisions, whereas Ss' preferences for concrete data cause them to overlook subtle opportunity costs. Because project sponsorship encourages managers to

ignore adverse data, they expected it to moderate these effects. An experiment was run whereby the resource allocation decisions of 64 middle to senior level managers were studied. Probit analyses revealed that Ns considered relevant opportunity costs more than Ss, as expected. Ss were inclined to incorrectly treat "as relevant, past expenditures on assets incurred specifically for the project, but for which there are no alternative uses and therefore no opportunity costs" (p. 31). When sponsorship bias was introduced, both Ns and Ss ignored past asset expenditures, regardless of their relevance. These findings illustrate how situational factors can offset the impact of cognitive style.

Overall, these results lend support to the assertion that Ss favor concrete and factual data, while Ns rely on hunches and heuristics. Rodgers' (1991) and Chenhall and Morris' (1991) findings are especially noteworthy since they represent relatively rigorous studies. Thus, there is sufficient evidence to advance:

*P2: Managers with preferences for sensing tend to perceive and process concrete stimuli and information, whereas intuitive managers favor more abstract information and perceptual processes.*

**Perceptual preferences and managerial behavior.** Type theory contends that Ss are practical, conventional, detail-oriented and systematic, while Ns are idealistic, unconventional and creative. Support for these assertions is provided by Thorne and Gough (1991), who used data collected via a 300-item *Adjective Check List* (ACL) to create alternative measures of the MBTI's scales. The ACL was independently completed by 8 to 16 observers for each of 614 subjects. All ACL items were then rated by MBTI experts to identify the 10 most indicative and 10 most contraindicative items for E, S, T and J preferences. Ratings for these items were combined to produce aggregate ACL cluster scores. Among the sensing items are conservative, precise, methodical, practical and realistic; intuitive (contraindicative) items include imaginative, original, insightful, idealistic and unconventional. A significant correlation ( $r = .34$ ) between the ACL-SN cluster and MBTI-SN scale exists, providing evidence of construct validity.

The SN scale is correlated ( $r = .45$  for males;  $r = .35$  for females) with the ACL's Creative Personality scale, along with three separate observational measures of creativity. Other studies corroborate these findings (Carne & Kirton, 1982; Hunter & Levy, 1982). Carne and Kirton (1982) also showed that a combined intuition/perception measure correlated more strongly with innovation ( $r = .62$ ) and originality ( $r = .51$ ) than either dimension separately. Similarly, Hunter and Levy (1982) found that NPs attempted more problems and performed better on the *Embedded Figures Test* than SJs. These results imply that when an N's conceptual abilities are combined with a P's open-mindedness and flexibility, enhanced creativity often results. As such, researchers may find it beneficial to examine the joint impact of these dimensions on managerial creativity.

One of the few studies to examine the relationship between the SN scale and managerial behavior is Gardner and Martinko's (1990) study of 40 principals. The correlations between SN scores and observed behaviors revealed that Ss processed paperwork more often ( $r = -.28$ ), but for less time than Ns ( $r = .33$ ). The authors speculate that this reflects Ss' preferences for facts and their efficiency at routine, detail-oriented activities. However, due to the post hoc nature of this explanation and the lack of type research into managerial behavior, more extensive and rigorous studies of these relationships are clearly necessary. Nevertheless, the available results tentatively suggest that:

**P3:** *Sensing managers are predisposed toward practical, conventional, detail-oriented and systematic behavior; intuitive managers are inclined toward idealistic, unconventional and creative behaviors.*

**SN preferences and organizational level.** Table 5 reveals that Ns are predominant among top managers, while Ss are most common in samples of middle and lower level managers. When Roach (1986) contrasted sub-samples of supervisors, managers and executives with his total sample, he found that the proportion of Ns rose with movement up the hierarchy. Van Velsor (1988) of the Center for Creative Leadership also reports that Ns and NTJs are overrepresented among 1,981 top and middle managerial participants of this program. This implies:

**P4:** *The proportion of managers with intuitive versus sensing preferences increases as one moves up the organizational hierarchy.*

The preponderance of Ns among top managers is consistent with propositions 2 and 3 and type theory in general. One would expect creative, imaginative and cognitively complex managers to be well-suited for executive positions. Further, these attributes enable Ns to be especially adept at strategic planning (Hurst, Rush & White, 1989). Hence, the prevalence of Ns among top managers is consistent with the notion that they excel in positions that require strategic management skills. Efforts to test this prediction could begin by exploring:

**P5:** *Intuitive managers engage in strategic planning activities more frequently and more effectively than sensing managers.*

It is important to consider the potential reasons for the prevalence of Ns among higher level managers. One possibility is that the conceptual skills of Ns, such as strategic and holistic thinking, cause them to be disproportionately promoted to top level positions. Alternatively, top executives' responsibilities may cause them to develop their intuition more fully. Thus, the direction of causality is unclear: Do Ns rise to top level managerial positions, or do top level positions cause managers to exhibit (or, at a minimum, report) more intuition? As a third possibility, these forces may be interactive. Unfortunately,

the merits of these explanations cannot be determined from the available research. To do so, longitudinal studies which measure managers' type preferences over time and follow their promotion progress are required.

*Judgement: Thinking versus Feeling*

**Information preferences.** A basic tenet of type theory is that Ts focus on impersonal and objective information in making decisions, while Fs favor personal and subjective data. Although some support is available (Ferguson & Fletcher, 1987), organizational researchers have virtually ignored this contention. One exception is an experiment by Kerin and Slocum (1981). While their prediction that Fs would favor subjective data (taste tests) was not supported, the corollary hypothesis that Ts would prefer objective data (test market statistics) more than Fs was confirmed. These mixed results make it clear that more management research is required to clarify the relationships between the TF dimension and evaluations of stimuli. Such research could begin with:

**P6:** *Thinking managers use objective information to decide; feeling managers prefer subjective information.*

**Judgmental preferences and managerial behavior.** Type theory asserts that Ts are logical, assertive and impersonal, while Fs are more affective, cooperative and personal. We examine the evidence of these relationships below.

**Logical versus affective processes.** Thorne and Gough's (1991) ACL analyses provide some support for the proposed relationships. Among the thinking items for the ACL-TF cluster are logical, rational and unemotional; feeling items include considerate, tactful, sympathetic and warm. This cluster correlates significantly with the MBTI-TF scale ( $r = .17$  for males;  $r = .35$  for females). Schweiger's (1985) results were less supportive since the posited relationships between the TF scale and logical or affective processes did not emerge. Still, he unexpectedly found that Ts articulate their decisions to a significantly greater degree than Fs ( $r = .43$ ). He speculates that Fs rely on unconscious affective processes more than Ts. While the lack of support for his TF hypotheses raises validity concerns, the sample of 20 subjects clearly limited the power of the analysis.

The strongest validity evidence for the TF scale is provided by Seegmiller and Epperson's (1987) content analysis of natural language. Specifically, MBTI-TF scores were strongly correlated ( $r = .55$ ) to natural speech scores, as well as self-evaluations of TF preferences ( $r = .61$ ). Assuming that verbal statements reflect thoughts and actions, these results confirm that Ts are logical and analytical, while Fs prefer affective processes and interpersonal relationships.

Studies of organizational and occupational issues are also supportive. For example, Gardner and Martinko's (1990) finding that principals favoring thinking engaged in staffing activities more than Fs ( $r = -.27$ ) is consistent with the notion that Ts prefer systematic analyses. Similarly, Steckroth et al. (1980) found that members of functional units that require logical analyses (e.g.,

operations research, economics) scored toward the thinking extreme. Personnel managers, who deal primarily with human relations, scored much higher on feeling. Finally, Tzeng et al.'s (1989) joint factor analysis of type and occupational preferences revealed that thinking was associated with occupations that require analytical reasoning (e.g., architect, research-oriented professor, inventor), while feeling was linked to occupations that focus on subjective values (e.g., individual and group therapists). Overall, these results tentatively suggest:

**P7:** *Ts engage in logical, analytical and impersonal evaluative behavior; Fs rely on affective processes and exhibit personal responses.*

**Assertiveness/Cooperativeness.** Type theory suggests that Ts are more assertive than Fs, but less cooperative and supportive. As Tucker (1991, p. 571) observes, this notion stems from the MBTI manual (Myers & McCaulley, 1985), which depicts Fs "as disliking telling people unpleasant things, as being sympathetic, and as enjoying pleasing others." In contrast, Ts "are said to be firm and tough-minded, to have a need to be fairly treated, and to tend to try to be the best."

Support for this view is supplied by several studies which correlated the MBTI with the Thomas-Kilmann Conflict MODE Instrument (Chanin & Schner, 1984; Kilmann & Thomas, 1975; Mills et al., 1985; Percival, Smitheram & Kelly, 1992). The findings are consistent across studies, with the TF scale being negatively and significantly related to assertiveness and distributiveness, and positively with cooperativeness (see Table 6). These results indicate that Ts are more assertive and less cooperative than Fs, as do separate studies of assertiveness (Tucker, 1991; Williams & Bicknell-Behr, 1992). Kilmann and Thomas (1975) suggest that a reliance on feeling makes it harder to pursue personal concerns without considering others' needs. The negative correlation with distributiveness, which reflects the satisfaction achieved by each party, also implies that Ts are more assertive. With respect to specific modes of conflict management, every study except Kilmann and Thomas's (1975), found that Ts report competing to resolve conflicts more than Fs. Finally, each study found that Fs are more accommodating.

While these findings demonstrate considerable consistency across studies, the effect sizes are modest. Indeed, the largest  $r^2$  of .11 for the accommodating mode, suggests that the TF scale accounts for only 11 percent of the variance in this self-reported behavior. Moreover, given the possibility of common method variance bias, the actual relationships may be even weaker. Hence, it appears that the MBTI is not an appropriate measure of conflict management tendencies. Instead, specialized measures such as the MODE instrument are better suited for this purpose. Still, the consistency of the results suggests some basic differences in the ways that Ts and Fs prefer to resolve conflicts.

**P8:** *Thinking-managers tend to be assertive in resolving conflicts, whereas feeling managers are more inclined to cooperate.*

Table 6. Correlations of the TF Scale with Selected Conflict Management Dimensions and Modes

Study	Assertive	Cooperative	Distributive	Competing	Accommodating
Chanin & Schneer (1984)	-.26*	.19*	-.26*	-.22*	.26**
Kilmann & Thomas (1975)	-.27*	.25*	-.38***	-.21	.35**
Mills, Robey & Smith (1985)	-.29*	.23*	-.34*	-.30*	.30*
Average	-.27	.22	-.33	-.24	.30
r <sup>2</sup>	.07	.05	.11	.06	.09

Notes: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

One reason for these modest effects could be that the interactions between MBTI dimensions were ignored. Only Percival et al.'s (1992) study explored the relations between composite types and conflict management. To do so, 138 subjects with scores above 10 in the appropriate direction on the EI, TF and JP scales were selected as "strong exemplars" of each of eight MBTI profiles. The preferred conflict-handling strategies of each group were then examined. While ETJs tended to compete, all other Ts were more inclined to compromise. Similarly, while EFJs preferred collaboration, all other Fs favored accommodation. Thus, we advance:

*P9: ETJs favor competition as a conflict management strategy, whereas all other Ts are inclined to compromise; EFJs tend to collaborate in resolving conflict, while all other Fs prefer accommodation.*

### *Decision Styles*

Myers saw the mental functions as the core of type theory since "perception—by definition—determines what people see in a situation and their judgement determines what they decided to do about it." (Myers & Myers, 1980, p. 1). Management theorists (Hellriegel & Slocum, 1975; Mason & Mitroff, 1973; Nutt, 1979) have gone on to argue that the mental functions combine to form four decision styles. The ST style is a practical approach that relies on logical analyses of factual data. NTs use logical, impersonal and theoretical analyses to explore the possibilities inherent in a problem. SFs rely on personal values to evaluate facts collected via the senses. NFs consider the possibilities for serving the needs of people in general. Management research has focused primarily on these styles.

**Perceptions and tolerance of risk.** Some of the most rigorous and extensive type research focuses on perceptions and tolerance of risk. Nutt, in particular, explores the impact of decision style under varying levels of uncertainty (Henderson & Nutt, 1980; Nutt, 1986a, 1990). These studies used similar designs in which top and/or middle level business or service managers assessed capital expansion projects. Uncertainty was manipulated by varying the spread of the projected return on investment (ROI) across two levels with the same mean, but either a high (20%) or low (4%) range. Decision style was consistently related to the managers' risk perceptions and adoption decisions, with the  $R^2$  exceeding .5 for both dependent measures in Nutt's (1986a, 1990) studies. Overall, this research provides considerable support for Nutt's hypothesis that SFs are less risk averse than other styles. In each study, SFs perceived the least risk and were most likely to adopt projects, whereas STs saw the greatest amount of risk and were reluctant to adopt. NTs and NFs saw moderate amounts of risk and were inclined to adopt. Henderson and Nutt (1980, p. 381) speculate that SFs may be less risk averse because they "anticipate that they will share the risk at some point by asking a decision group to ratify projects they believe to be adoptable."



**P10:** *SFs perceive relatively low levels of risk and are extremely risk tolerant, especially when they anticipate sharing the risk with other persons; STs perceive high levels of risk and are highly risk averse; NTs and NFs perceive and tolerate risk at moderate levels.*

Despite the consistency of the above findings, there are some divergent results. Although no differences in risk assessments related to decision style emerged in Nutt's (1989) study of simulated loan decisions, NT bank executives were the least likely to approve a loan. Similarly, Blaylock (1981) reports that NTs see the most risk in operational control and strategic planning scenarios. Nutt (1989) speculates that NTs may have been conservative because they were unable to perform "what-if" analyses. Alternatively, STs may be more comfortable with risk in these industries/situations because they are the dominant group.

**Decision environment.** Blaylock (1981) varied the environment (structured/unstructured) and two risk measures (standard deviation and skewness) across decision scenarios. As predicted, significant interactions between decision styles, environments and risk emerged. Because post-hoc analyses were not reported, the risk tolerance of specific styles across situations is not known. Given this weakness, and the small sample ( $n = 28$ ), these results must be interpreted with care. Still, they suggest that the "information conveyed by the decision setting interacts with the traditional measures of risk and with the individual's preferred mode of information processing" (Blaylock, 1981, p. 902).

Decision environment was also varied in three related studies (Henderson & Nutt, 1980; Nutt, 1986a, 1990) so that it was either compatible or incompatible with each subject's decision style. In the incompatible treatment, STs were given an NF description, NTs an SF description, and vice versa. While Henderson and Nutt (1980) obtained support for the prediction that incompatible settings elicit more risk aversion, Nutt (1986a, 1990) found that it only held true for STs. The other styles saw less risk and were more prone to adopt. Nutt posits that SFs, NTs and NFs perceive more risk and are risk averse in compatible settings because they fear like-minded persons will see through their arguments. Alternatively, they may simply know more about the dangers of compatible settings.

**P11:** *ST managers perceive less risk and are most risk tolerant in compatible decision environments, while SFs, NTs and NFs perceive less risk and are most risk tolerant in incompatible environments.*

The importance of the decision environment is further demonstrated by two studies (Nutt, 1989; Ruble & Cosier, 1990) which show that it can entirely offset the influence of decision style. In Nutt's (1989) experiment, bank executives evaluated simulated loan applications in terms of their risk and prospects for approval. ST, NT, SF and NF cultures were created by varying the loan applicant's attributes and the information provided to secure loan

approval. For instance, the ST culture requested a loan to purchase equipment to cut costs; financial statements were supplied to make a logical and factual case for the loan. The other cultures were operationalized in a similar manner.

Results revealed that while the loan decisions were shaped by uncertainty, culture and decision style, the expected interaction between style and culture did not emerge. That is, the bankers' perceptions and decisions did not change when their style matched the firm's culture. Instead, loan applications from ST cultures were seen as less risky and more worthy of approval, regardless of the subjects' decision styles. Nutt (1989, p. 307) concluded that "culture was far more important than a banker's decision style in making loan decisions." Apparently, the industry's dominant ST orientation swept away the effects of decision style.

Ruble and Cosier (1990, p. 288) tested the hypothesis that "ST type individuals will perform better on a task with measured financial indicators, while NF types will perform better on a task with estimated human resource ratings." In actuality, the task was identical across treatments; only the cue labels (financial versus human relations) were varied. The results revealed that subjects performed better when the decision setting was described in human resource terms, regardless of their decision style. Here again, the authors concluded that decision context dominated the impact of decision style. They go on to suggest that people in general may feel they can handle human relations problems better than financial problems, since they have more experience with people. An "availability heuristic" may also be operating since information about people is more readily recalled. This explanation applies equally well to Nutt's (1989) study, since bankers have more experience with ST cultures, and are used to invoking ST criteria to make loan decisions. Clearly, more research is needed to identify the conditions under which the decision setting dominates, as opposed to interacts with, decision style. However, the available evidence suggests:

**P12:** *In "strong" situations where environmental stimuli specify appropriate managerial behavior, the influence of decision style on risk perceptions and tolerance will be obfuscated.*

**Utility of information system features.** Several theorists propose that decision style is related to preferences for MIS features and decision aids. Mason and Mitroff (1973) assert that Ss prefer raw data, Ns favor abstract summaries that stress possibilities, Ts rely on symbolic and impersonal data, and Fs focus on the human component. These and other authors (De Waele, 1978; Nutt, 1986a) argue for customized display modes to accommodate preferences, while encouraging managers to use information which their styles entice them to ignore. We review studies which have explored these notions using structured tasks below.

**Decision time.** Both Davis and Elnicki (1984) and Campbell and Kain (1990) found that Ns took less time to decide than Ss; NTs took the least and STs the most. The latter study also found that Js were more efficient in deciding

than Ps. Davis and Elnicki (1984) revealed a style by format interaction: NTs took the least time with graphical-raw data, STs with graphical-summarized data, NFs with tabular-summarized formats, and SFs with tabular-raw formats. Finally, Ramnarayanan and Gardner (1991) found that under low time constraints, Ns using graphs took less time than Ss. With tables, Ss required less time than Ns, and Ts less time than Fs. The decision time orders for graphical (NF < NT < ST and SF) and tabular formats (ST < SF < NT and NF) emerged as expected.

*Satisfaction.* Davis and Elnicki (1984) and Ramnarayanan and Gardner (1991) found that Ss were more confident of their decisions than Ns across formats. NTs were the least confident and STs the most in the former study. In the latter, Ns saw graphs as more accurate and useful while Ss favored tables, as expected. These effects vanished in the combined format—high time constraint treatment.

*Performance.* Davis and Elnicki (1984) initially predicted that because of NTs' analytical skills, they would exhibit the highest level of performance (cost minimization), followed by STs, NFs and SFs. In actuality, SFs achieved the lowest costs, followed by STs, NFs and NTs. Davis and Elnicki (1984) posited that the high performance of Ss may have been due to the relative importance of perception over judgement for this structured task (a production simulation). Because Ns prefer possibilities and inferences, rather than hard facts, they may have been hindered by the task structure. Davis, Grove and Knowles's (1990) hypotheses partially reflected these results by predicting that STs would achieve the lowest costs, followed by NTs, SFs and NFs. These authors recognized that Ss tend to outperform Ns on structured tasks, but continued to expect Ts to achieve lower costs than Fs. Instead, Ss and Fs displayed superior cost performance, with SFs incurring the lowest costs, followed STs, NFs and NTs. They again concluded that Ss make better decisions within structured task environments than Ns.

While Ss repeatedly outperformed Ns on the structured resource allocation tasks, the TF results were less consistent. Fs achieved lower costs than Ts (Davis & Elnicki, 1984; Davis et al., 1990), as well as higher profits with graphs under high time constraints (Ramnarayanan & Gardner, 1991). However, Campbell and Kain (1990) found that Ts allocated resources better than Fs. As for decision style, SFs performed best, while either NTs or NFs performed worst (Campbell & Kain, 1990; Davis & Elnicki, 1984; Davis et al., 1990).

*Conclusions.* Several conclusions can be drawn from this literature. First, psychological type is related to satisfaction and performance on structured tasks, with Ss being more satisfied and effective than Ns. Second, Ss, especially STs, take more time to decide than Ns, as long as the details they desire are accessible. Third, even though Ns view graphs as more useful and accurate than tables under time pressure, they perform worse with them and are less confident (Ramnarayanan & Gardner, 1991). Fourth, combined formats or low time constraints can overcome format and task mismatches, suggesting that multiple formats and ample time can enhance decision support.

A key strength of these studies is that all but one (Campbell & Kain, 1990) used experimental designs to test a priori hypotheses (see Table 5). Still, given the complexity of the relationships, more research is required to corroborate and clarify these findings. Indeed, even for the recurrent finding that Ss outperformed Ns, the fact that this relationship was inconsistent with the hypotheses derived from type theory is cause for concern. In hindsight, however, it is not surprising that Ss do well on structured tasks since they prefer routine and hands on activities. Nonetheless, it is clear that more research is needed to explicate the decision tasks for which specific types excel. As such, we advance:

**P13:** *Psychological type, presentation format, and time constraints interact for structured decision tasks, such that:*

- a. *Ss achieve higher levels of task performance than Ns;*
- b. *Ss, and STs in particular, take more time to decide than Ns, unless the details they require are unavailable;*
- c. *Ss, and STs in particular, are more confident of their decision performance than Ns, and NTs in particular;*
- d. *Ns perceive graphical formats to be more accurate and useful than tabular formats, whereas Ss favor tabular formats; and*
- e. *Multiple formats and relaxed time constraints can reduce differences in satisfaction and performance across types.*

#### *Orientation of Energy: Extraversion versus Introversion*

More attention has been directed toward the EI dimension within the psychology and counseling literature than any other scale (Carlson, 1985). Management researchers, however, have virtually ignored it. The research reviewed below suggests that this dimension is relevant to managerial behavior.

**External versus internal orientation.** The MBTI-EI scale is consistently correlated with other EI scales and criterion measures (Carlson, 1985; Carlyn, 1977; Thorne & Gough, 1991). Nevertheless, researchers debate whether the MBTI truly operationalizes the EI construct as posited by Myers and Jung (Ross, 1966; Sipps & Alexander, 1987; Sipps & DiCaudo, 1988). McCrae and Costa (1989) argue that the high correlation between the MBTI-EI and the NEO Personality Inventory (NEO-PI) Extraversion scales is inconsistent with type theory since the latter scale measures sociability, activity, dominance and positive affect, rather than orientation of energy. This criticism seems inappropriate, however, since type theory asserts that the external orientation of Es causes them to be sociable, confident and active, whereas the inward focus of Is causes them to be reserved.

Part of the problem in validating the EI scale stems from the difficulty of developing criterion measures. Still, Thorne and Gough (1991) found that the ACL-EI cluster could serve as an observational measure of extraversion/introversion. This cluster correlates moderately and significantly with the MBTI-EI scale ( $r = .32$  for males,  $r = .40$  for females). Although many of the ACL extraversion items measure sociability (e.g., talkative, outgoing), others

reflect an external focus (e.g., energetic, active). Moreover, while it is hard to observe an "inward flow of energy," the introversion items suggest an inner focus (e.g., reflective, preoccupied). Thus, the existing evidence and type theory imply:

**P14:** *Extraverted managers focus on the outer world of the environment, organization, groups, people and tasks; Is direct their energy towards the inner world of ideas, beliefs and values.*

**EI attitudes and managerial behavior.** Type theory contends that Es act in an assertive, active and sociable manner, whereas Is are reflective, reserved and focused. Prior reviews (Carlson, 1985; Carlyn, 1977; Myers & McCaulley (1985) and Thorne and Gough's (1991) work lend support to this position. Although similar relationships probably exist for managers, little empirical evidence is available. Nonetheless, Gardner and Martinko (1990) found that introverted versus extraverted principals engaged in decision making/problem solving activities ( $r = .54$  for frequency,  $r = .39$  for time) and processed paperwork ( $r = .30$ ) more often, while socializing/politicking for less time ( $r = -.29$ ). These findings are consistent with the notion that Is are internally focused. However, the counter-intuitive finding that Is interacted with outsiders more often than Es ( $r = .28$ ), reminds us that such explanations are speculative and require more research.

Studies of the relationships between extraversion, assertiveness and conflict management have yielded inconsistent results. Some suggest that Es, and especially ETs, are more assertive than Is and IFs (Tucker, 1991; Williams & Bicknell-Behr, 1992). Similarly, Kilmann and Thomas (1975) found that Es resolve disputes more assertively than Is, although other researchers failed to confirm this relationship (Chanin & Schneer, 1984; Mills et al., 1985). Both Kilmann and Thomas (1975) and Mills et al. (1985) found that the EI scale correlates weakly with an integrative dimension that reflects efforts to satisfy opposing parties. Finally, Mills et al. (1985) and Percival et al. (1992) found that Es appear to collaborate more than Is, while avoiding conflict and accommodating less.

Given the inconsistency of these findings, the threat of common method variance bias, and the weakness of the correlations ( $r$  ranging from .15 to .29), it is impossible to draw definitive inferences. While type theory implies that Es, who prefer to actively engage the world, are more assertive and collaborative than Is and less likely to avoid conflict, the evidence is not convincing. Nevertheless, given the theoretical rationale and limited empirical support for this assertion, we believe that the following propositions merit study:

**P15:** *Extraverted managers behave in an assertive, active and sociable manner; Is are more reflective, reserved and focused.*

**P16:** *Extraverted managers are assertive, integrative and collaborative in resolving conflicts; Is rely more on avoidance and accommodation.*

### *Orientation Towards the Outer World: Judgement versus Perception*

The assumption that the JP scale "determines which type of function is used in the outer world ... has not yet been satisfactorily validated" (Garden, 1991, p. 5). Moreover, correlations with the SN and TF scales (Carlson, 1985; Carlyn, 1977), raise questions about its independence. After examining the correlations among the scales and criterion variables, Thorne and Gough (1991) concluded there is some conceptual overlap between the SN and JP, but not the TF scales. They argue that both scales tap a stability versus change dimension, since Ss and Js are conservative, while Ns and Ps are changeable and nonconforming. This dimension appears to vary across scales, however, with the SN scale reflecting cognition and the JP scale reflecting behavior.

**Situational orientation and JP preferences.** Type theory posits that Js favor structure and closure, whereas Ps are more open-minded and prefer dynamic situations (Myers & McCaulley, 1985). Thorne and Gough's (1991) findings that the JP scale correlates negatively with the ACL Order scale ( $r = -.36$  for men;  $r = -.53$  for women) and positively with the Change scale ( $r = .41$  for men;  $r = .36$  for women) lend support for this notion. The JP scale also relates directly ( $r = .38$ ) to field independence (Carey et al., 1989) which implies that Ps are less likely to impose structure based on the context.

Other studies link JP scores to career decisions. Tzeng et al. (1989) found that J and P preferences are associated with occupations stressing order versus spontaneity, respectively. Preferences for order may also explain why Js are common in administrative roles. Finally, Steckroth et al. (1980) found that perceiving managers were predominant in line positions demanding rapid responses, whereas Js were most prevalent in staff positions with longer planning horizons.

Because none of these studies directly examined the relationships between situational attributes and JP preferences, firm conclusions cannot be drawn. Efforts to clarify these relationships could begin by investigating:

**P17:** *Managers with preferences for judgement favor structured and stable situations, whereas Ps prefer unstructured and dynamic situations.*

**JP attitudes and managerial behavior.** Type theory suggests that Js' behavior is planned and methodical, while Ps are more creative and spontaneous. Support for these relationships comes from the significant correlation ( $r = .33$ ) of the MBTI-JP scale and the ACL-JP cluster (Thorne & Gough, 1991). ACL judging items include organized, planful and responsible, whereas perceiving items include spontaneous, changeable and restless. The flexibility, spontaneity and openness of Ps may also explain why the JP scale correlates positively with creativity measures (Carey et al., 1989; Carne & Kirton, 1982; Thorne & Gough, 1991).

Research relating the JP scale to managerial behavior is sparse. Still, Gardner and Martinko's (1990) findings that Js process paperwork ( $r = -.33$ ),

exchange routine information ( $r = -.30$ ), and interact with outsiders ( $r = -.31$ ) more than Ps are consistent with the notion that Js impose structure and control. Roush and Atwater (1991) found that perceiving midshipmen designated as leaders for a squad of plebes (freshmen), used laissez-faire leadership and management-by-exception more than Js. These results are congruent with the view that Js emphasize planning and control, whereas Ps are more casual about their duties.

Although these studies provide useful insights, more management research on the JP scale is obviously necessary. As a starting point, we advance:

**P18:** *Judging managers behave in a highly planned, conscientious, and methodical manner; Ps are more spontaneous, flexible and creative.*

### *Psychological Type and Managerial Effectiveness*

While several researchers have explored the relationships between type and managerial effectiveness, the rigor of such studies is often suspect. With the exception of Hay's (1966) study, each was published in the *Journal of Psychological Type*. Most used selected criteria to identify the performance levels of principals (Gardner & Martinko, 1990), executive educators (Lueder, 1986a, 1986b), or wholesale grocery managers (Johnson, 1992). The type distribution for these managers was then statistically contrasted with that of a more general base population. In others, the relationships between the managers' type (Gaster et al., 1984) or continuous scores (Hay, 1966) and subjective performance ratings were directly assessed. Every study, however, relied primarily on descriptive and/or non-experimental designs, without specifying a priori hypotheses.

**SN preferences and managerial effectiveness.** Few consistent relationships between type and managerial effectiveness have been found. While most of those identified pertain to the SN scale, they are not always in the same direction. Gaster et al. (1984) found that sensing retail managers earned higher performance ratings than Ns. Similarly, Gardner and Martinko (1990) determined that Ss were prominent among high (74%) but not moderate (48%) performing principals. STJs in particular were overrepresented in comparison to the general population among high (63%), but not moderate, performers (43%). Other studies suggest an opposite relationship with Ns outperforming Ss. Lueder (1986a, 1986b) found that two samples of high performing school administrators included significantly more Ns, NTs and ENTJs than a base population of educational managers. Johnson (1992) showed that Ns were overrepresented among top achieving wholesale grocery managers (64%). Finally, Hay (1966) reports that engineering managers' SN scores correlated significantly ( $r = .27$ ) with job success, with NPs earning the highest ratings.

**Potential SN-effectiveness moderators.** Given these contradictory SN results, it is appropriate to search for potential moderating variables to reconcile these inconsistencies. Unfortunately, most type studies, and type distribution

studies in particular, routinely ignore moderating variables. As a step toward remedying this deficiency, we consider two promising moderators below: organizational level and the task requirements of the manager's position.

The subjects in the Gaster et al. (1984) and Gardner and Martinko (1990) studies occupied lower level managerial positions and fulfilled relatively routine duties. In contrast, the samples for which Ns were most prominent included either middle (Johnson, 1992) or middle/top level (Hay, 1966; Lueder, 1986a, 1986b) managers who performed more novel and creative tasks (e.g., engineering manager, marketing director). For example, most managers in Lueder's (1986a, 1986b) samples held higher level jobs (e.g., superintendents) than the principals studied by Gardner and Martinko (1990). This pattern is consistent with the results summarized in Table 6, which suggest that Ns are more prominent among middle and upper level managers. Apparently, Ss are better suited for the routine and detailed roles of lower level managers, whereas Ns are more adept at the strategic planning responsibilities of top management. Thus, we advance:

**P19:** *Organizational level moderates the relationship between SN preferences and managerial effectiveness, with Ss being more effective in lower positions, while Ns excel in the upper levels.*

**P20:** *Task requirements moderate the relationship between SN preferences and managerial effectiveness, with Ss being well suited for routine and detailed activities, while Ns excel at nonroutine tasks and creative problem solving.*

**TF preferences and managerial effectiveness.** Only Gardner and Martinko (1990) identified a direct relationship between TF preferences and managerial effectiveness. Specifically, Ts were overrepresented among the high performing principals (79%) but not the moderates (57%). Moreover, STs (who were exclusively STJs) were especially prominent among the high (63%) as opposed to the moderate (12.5%) performers. In contrast, other studies reported that NTs (Johnson, 1992; Lueder, 1986a, 1986b) were predominant among high performers.

In considering the lack of direct relationships between the TF scale and managerial effectiveness, it is useful to note that 93 and 86 percent of the managers in the Gaster et al. (1984) and Johnson (1992) studies, respectively, were Ts. As such, there was a restriction of the TF scale's range which made it difficult to identify a relationship. However, studies for which there was more TF variability, also failed to find a relationship (Hay, 1966; Lueder, 1986a, 1986b). Thus, with the exception of Gardner and Martinko's (1990) study, there is no evidence that Ts make more effective managers than Fs, or vice versa. Instead, both types can and often do excel as managers. Still, some Ts (e.g., STs, STJs, NTs) appear to be especially well suited for specific kinds of managerial positions (e.g., principals, wholesale grocery managers, executive educators). Clearly, more research is needed to clarify the extent, circumstances and manner in which managers' TF preferences are related to their effectiveness.



**EI preferences and managerial effectiveness.** The only study to identify a relationship between the EI scale and managerial effectiveness was Lueder's (1986b), which suggested that Es were overrepresented among "Executive Educators to Watch." The fact that EI differences in effectiveness did not emerge more often is consistent with the conclusion that the proportions of extraverts to introverts varies from managerial sample to sample (see Table 6). Thus it appears that Es and Is are equally inclined to manage and do so effectively.

**JP preferences and managerial effectiveness.** Gardner and Martinko (1990) found that Js were overrepresented among high (84%) but not moderate (67%) performing principals. They speculate that "the planned and orderly nature of organizations provides the type of environment in which Js may thrive, while Ps become frustrated" (p. 41). In contrast, Hay (1966) reported a direct correlation between JP preferences and ratings of managers' job success, suggesting that Ps were highly effective. One explanation for this finding is that the creativity of Ps contributed to their performance as engineering managers. In other studies (Johnson, 1992; Lueder, 1986a, 1986b), the JP scale was unrelated to effectiveness. Of course, the restriction of range in Gaster et al.'s (1984) study (93% Js), undermined efforts to discern such a relationship. Still, given the contradictory results, the relationships identified must be considered tentative and suspect.

**Summary.** It is clear that efforts to detect simplistic linkages between type preferences and managerial effectiveness have been disappointing. Indeed, given the mixed quality of research and the inconsistent findings, no definitive conclusions regarding these relationships can be drawn. Future studies must adopt more rigorous designs and a contingency perspective to determine the functions, roles, organizational levels and situations under which particular types excel.

### Conclusions and Future Directions

At the outset, we identified our purpose as addressing this question: "To what extent is the MBTI a reliable and valid instrument for studying relationships among managerial personalities, cognitions, behaviors, effectiveness and situational variables?" Our review suggests that there is sufficient reliability and validity evidence to conclude that research into these relationships is warranted. The propositions advanced delineate relationships that are especially worthy of study. However, because legitimate concerns regarding type theory and its operationalization exist, it is important to recognize that refinements of the type construct and its measures may be necessary. Proposed refinements and alternatives to the MBTI are considered below. We also make recommendations for improving the rigor and expanding the focus of management type research.

#### *Alternative and Refined Measures*

Concerns about the MBTI's psychometric properties have led several researchers to recommend alternative measures; others argue for its refinement. The former approach was taken by McCrae and Costa (1989), who contend

that the NEO-PI is a superior instrument. However, since reservations about the NEO-PI also exist (Waller & Ben-Porath, 1987), this recommendation seems premature. The latter strategy was taken in developing the *Type Differentiation Indicator* (TDI; Form J) and the *MBTI Expanded Analysis Report* (EAR; Form K). Both forms include 20 EAR subscales (5 per scale) for tapping differences among types (Johnson & Saunders, 1990). For instance, the SN subscales are concrete-abstract, realistic-imaginative, experiential-theoretical, pragmatic-intellectual and traditional-original. These subscales could be very useful in testing our propositions since they serve as measures for most of the dimensions and behaviors of interest.

Another approach was taken by Tzeng et al. (1989) and Cowan (1989), who developed continuous, unipolar scales in response to criticisms of the bipolar forced choice format (Ramaprasad & Mitroff, 1984). Cowan's (1989) instrument measures the four mental functions only; Tzeng et al.'s (1989) includes scales for all eight MBTI extremes. Initial assessments suggest that these scales may be superior to the forced choice scales. While much work remains to assess these measures, it is crucial for researchers to stay open to possible alterations of type theory and the MBTI. As Cowan (1989) notes, "there is no obvious reason why the current status quo of this theory and its measurement cannot be improved."

#### *Methodological Recommendations*

Our critique of the management type studies identified many weaknesses, especially for those with descriptive designs. While the experimental and quasi-experimental studies were more rigorous, many findings are suspect because they are inconsistent across studies and/or weak. Still, the results are sufficiently promising to warrant additional studies with more rigorous designs.

Several steps can be taken to improve the quality of future research. Better reporting of the MBTI forms used and their reliabilities would be useful in assessing the credibility of studies and the efficacy of specific measures. To facilitate future meta-analyses, authors should report the means, standard deviations and correlations between each scale and the dependent variables. Research should also move beyond cross-sectional, correlational and distribution studies, toward experimental and longitudinal designs to explore the formation of managers' type preferences and the developmental potential of specific types.

#### *Conceptual Issues*

Myers asserted that because each type has unique strengths, no type is superior to another (Myers & Myers, 1980). Upon further reflection, however, it is clear that she recognized that the unique attributes of each type enable them to excel in certain situations. Thus, efforts to identify managerial tasks, settings and positions for which certain types are well suited are not inconsistent with Myers' writings. Instead, such research should produce insights into the development and effectiveness of types across situations. Some of the more intriguing questions revolve around the traditional nature/nurture controversy.

For instance, do the type preferences of effective managers evolve through managerial experience, or do some types gravitate toward managerial positions? Since type theory posits "true types," it is more consistent with the latter view. Indeed, it asserts that persons who change preferences after job experiences may be "falsifying" their type (Kummerow, 1988; Walck, 1992). However, because this assumption has not been extensively tested, its merits are unclear. Thus research is needed to explore the development and relative permanence of managers' type preferences.

A related question pertains to the composition of top management teams. Given the predominance of TJs among executives, it is appropriate to ask: Are management teams, and senior teams in particular, lacking the contributions of other styles? In light of research that suggests Fs are more cooperative and supportive than Ts, while Ps are more flexible and creative than Js, there should be concern about the consequences of overrepresentation. Indeed, a preponderance of TJs could lead to poor human resource management, groupthink and a lack of creativity (Hurst et al., 1989). Still, support for Myers' (1974) contention that teams with homogeneous versus heterogeneous types are less effective is limited (White, 1982). Similarly, inadequate documentation exists for the assertion of Myers and others (Kummerow & McAllister, 1988; Hurst et al., 1989; McCaulley, 1990) that the MBTI is useful for team building. Thus, more research is needed to assess the impact of type composition on group effectiveness and the value of the MBTI for developing high performing teams.

Other issues concern the development and training of managers. If evidence that some types excel at certain activities is forthcoming, to what extent could or should organizations train managers to model these "prototypes"? Again, type theory suggests that overrepresentation by some types may result in a loss of contributions from others. On the other hand, it contends that people must develop their less favored functions before they can realize their full potential (Myers & Myers, 1980). If Myers' principles are applied, managers would not be pressured to conform to prototypes. Thus, type theory recognizes the benefits that accrue from a diversity of types and encourages individual development.

### *Increasing Scope*

We advocate expanding the scope of this literature beyond the current emphasis on type distributions to include a wider range of issues. The focus should shift from decision style to more fully consider the EI and JP scales, dominant and auxiliary functions, and composite type preferences. At present, managerial research that uses all four scales, or focuses on the structural properties of type theory, is practically nonexistent. Furthermore, the finding that type varies across organizational levels implies that it may also relate to other key organizational variables. Thus, one would foresee potential relationships between type preferences and leadership styles, communication patterns, goal-setting, time management, reactions to job stress, impression management, strategic planning and other managerial behaviors. Research is also necessary to identify potential differences in the cognitive, motivational and affective processes of specific types. Finally, greater attention to situational

moderators of the relationships between type preferences, managerial behavior and effectiveness is essential. While we have advanced propositions for stimulating research on potential moderators, much more conceptual and empirical work is necessary to explain the complex linkages between the person, situation, and managerial behavior. Investigations into such issues are required to fully assess the potential contributions of type research to management theory and practice.

### Note

1. Because the descriptive studies that fell within the quantitative and qualitative categories used similar designs, their specific attributes are not summarized in separate tables. Instead, the typical attributes of such studies are discussed below. These studies are included, however, to compute descriptive statistics regarding the properties of managerial type studies.

### References

- Alvai, M. & Henderson, J.C. (1981). An evolutionary strategy for implementing a decision support system. *Management Science*, 27: 1309-1323.
- Barr, L. & Barr, N. (1989). *The leadership equation: Leadership, management, and the Myers-Briggs*. Austin, TX: Eakin Press.
- Behling, O., Gifford, W.E. & Tolliver, J.M. (1980). Effects of grouping information on decision making under risk. *Decision Sciences*, 11: 272-283.
- Blaylock, B.K. (1981). Method of studying perception of risk. *Psychological Reports*, 49: 899-902.
- Blaylock, B.K. & Rees, L.P. (1984). Cognitive style and the usefulness of information. *Decision Sciences*, 15: 74-91.
- Boreham, N.C. (1987). Causal attribution by sensing and intuitive types during diagnostic problem solving. *Instructional Science*, 16: 123-136.
- Brightman, H.J. & Sayeed, L. (1990). The pervasiveness of senior management's view of the cultural gaps within a division. *Group & Organization Studies*, 15: 266-278.
- Cabral, G. & Joyce, M.H., Jr. (1991). Managers and psychological type in an industrial setting: Sex differences and similarities, managerial level, and age. *Journal of Psychological Type*, 21: 40-53.
- Campbell, D.E. & Kain, J.M. (1990). Personality type and mode of information presentation: Preference, accuracy, and efficiency in problem solving. *Journal of Psychological Type*, 20: 47-51.
- Carey, J.C., Fleming, S.D. & Roberts, D.Y. (1989). The Myers-Briggs Type Indicator as a measure of aspects of cognitive style. *Measurement and Evaluation in Counseling and Development*, 22(July): 94-99.
- Carlson, R. (1980). Studies of Jungian typology: II. Representations of the personal world. *Journal of Personality and Social Psychology*, 8: 801-810.
- Carlson, J.G. (1985). Recent assessments of the Myers-Briggs Type Indicator. *Journal of Personality Assessment*, 49: 356-365.
- Carlson, J.G. (1989). Affirmative: In support of researching the Myers-Briggs Type Indicator. *Journal of Counseling and Development*, 67: 484-486.
- Carlyn, M. (1977). An assessment of the Myers-Briggs Type Indicator. *Journal of Personality Assessment*, 41: 461-473.
- Carne, G.C. & Kirton, M.J. (1982). Styles of creativity: Test-score correlations between Kirton Adaption-Innovation Inventory and Myers-Briggs Type Indicator. *Psychological Reports*, 50: 31-36.
- Center for Applications of Psychological Type. (1992a). *CAPT Order Catalogue*. Gainesville, FL.
- Center for Applications of Psychological Type. (1992b). *MBTI Bibliography*. Gainesville, FL.
- Chanin, M.N. & Schmeer, J.A. (1984). A study of the relationship between Jungian personality dimensions and conflict-handling behavior. *Human Relations*, 37: 863-879.
- Chenhall, R. & Morris, D. (1991). The effect of cognitive style and sponsorship bias on the treatment of opportunity costs in resource allocation decisions. *Accounting, Organizations and Society*, 16: 27-46.
- Cohen, J. (1983). The cost of dichotomization. *Applied Psychological Measurement*, 7: 249-253.
- Corman, L.S. & Platt, R.G. (1988). Correlations among the Group Embedded Figures Test, the Myers-Briggs Type Indicator and demographic characteristics: A business school study. *Perceptual and Motor Skills*, 66: 507-511.

- Cowan, D.A. (1989). An alternative to the dichotomous interpretation of Jung's psychological functions: Developing more sensitive measurement technology. *Journal of Personality Assessment*, 53: 459-471.
- Craig, D.L., Craig, C.H. & Sleight, C.C. (1988). Type preferences of decision-makers: Corporate and clinical. *Journal of Psychological Type*, 16: 33-37.
- Davis, D.L. & Elnicki, R.A. (1984). User cognitive types for decision support systems. *OMEGA International Journal of Management Science*, 12: 601-614.
- Davis, D.L., Grove, S.J. & Knowles, P.A. (1990). An experimental application of personality type as an analogue for decision-making style. *Psychological Reports*, 66: 167-175.
- DeVito, A.J. (1985). Review of the Myers-Briggs Type Indicator. Pp. 1030-1032 in J.V. Mitchell, Jr. (Ed.), *The ninth mental measurements yearbook*, Vol. 2. Lincoln: University of Nebraska Press.
- De Waele, M. (1978). Managerial style and the design of decision aids. *OMEGA International Journal of Management Science*, 6: 5-13.
- Evered, R.D. (1977). Organizational activism and its relation to "reality" and mental imagery. *Human Relations*, 30: 311-334.
- Ferguson, J. & Fletcher, C. (1987). Personality type and cognitive style. *Psychological Reports*, 60: 959-964.
- Ganster, D.C., Hennessey, H.W. & Luthans, F. (1983). Social desirability response effects: Three alternative models. *Academy of Management Journal*, 26: 321-331.
- Garden, A. (1991). Unresolved issues with the Myers-Briggs Type Indicator. *Journal of Psychological Type*, 22: 3-14.
- Gardner, W.L. & Martinko, M.J. (1990). The relationship between psychological type, managerial behavior, and managerial effectiveness: An empirical study. *Journal of Psychological Type*, 19: 35-43.
- Gaster, W., Tobacyk, J. & Dawson, L. (1984). Jungian type in retail store managers. *Journal of Psychological Type*, 7: 19-24.
- Ginn, C.W. & Sexton, D.L. (1988). Psychological types of *Inc.* 500 founders and their spouses. *Journal of Psychological Type*, 16: 3-12.
- Hai, D.M. (1983). Comparisons of personality dimensions in managers: Is there management aptitude? *Akron Business and Economic Review*, 14(1): 31-36.
- Hamilton, E. (1988). The facilitation of organizational change: An empirical study of factors predicting change agents' effectiveness. *Journal of Applied Behavioral Science*, 24: 37-59.
- Handley, P. (1982). Relationship between supervisors' and trainees' cognitive styles and the supervision process. *Journal of Counseling Psychology*, 29: 508-515.
- Hay, J.E. (1966). Self-ideal congruence among engineering managers. *Personnel and Guidance Journal*, 44: 1084-1088.
- Hawkins, C.A., Williams, M.S. & Hawkins, R.C., III. (1990). Psychological types of social service managers. *Journal of Psychological Type*, 19: 44-49.
- Hellriegel, D. & Slocum, J.W. (1975). Managerial problem-solving styles. *Business Horizons*, 18(6): 29-37.
- Hellriegel, D. & Slocum, J.W. (1980). Preferred organizational designs and problem solving styles: Interesting companions. *Human Systems Management*, 1: 151-158.
- Henderson, J.C. & Nutt, P.C. (1980). The influence of decision style on decision making behavior. *Management Science*, 26: 371-386.
- Hicks, L.E. (1984). Conceptual and empirical analysis of some assumptions of an explicitly typological theory. *Journal of Personality and Social Psychology*, 46: 1118-1131.
- Hicks, L.E. (1985). Is there a disposition to avoid the fundamental attribution error? *Journal of Research in Personality*, 19: 436-456.
- Hoy, F. & Hellriegel, D. (1982). The Kilmann and Herden model of organizational effectiveness criteria for small business managers. *Academy of Management Journal*, 25: 308-322.
- Hunt, R.G., Krzystofiak, F.J., Meindl, J.R. & Yousry, A.M. (1989). Cognitive style and decision making. *Organizational Behavior and Human Decision Processes*, 44: 436-453.
- Hunter, F. & Levy, N. (1982). Relationship of problem-solving behaviors and Jungian personality types. *Psychological Reports*, 51: 379-384.
- Hunter, J. & Schmidt, F. 1990. Dichotomization of continuous variables: The implications for meta-analysis. *Journal of Applied Psychology*, 75: 334-349.
- Hurst, D.K., Rush, J.C. & White, R.E. (1989). Top management teams and organizational renewal. *Strategic Management Journal*, 10: 87-105.
- Johnson, D.A. (1992). Predicting promotion to management in the wholesale grocery industry using the Type Differentiation Indicator. *Journal of Psychological Type*, 23: 51-59.
- Johnson, D.A. & Saunders, D.R. (1990). Confirmatory factor analysis of the Myers-Briggs Type Indicator—Expanded Analysis Report. *Educational and Psychological Measurement*, 50: 561-571.
- Jung, C.G. (1971). *The collected works of C.G. Jung*, Vol. 6: *Psychological types* (trans. H.G. Baynes, revised by R.F. Hull). Princeton, NJ: Princeton University Press (originally published 1921).

- Kerin, R.A. & Slocum, J.W., Jr. (1981). Decision-making and acquisition of information: Further exploration of the Myers-Briggs Type Indicator. *Psychological Reports*, 49: 132-134.
- Kilmann, R.H. & Mitroff, I.I. (1976). Qualitative versus quantitative analysis for management science: Different forms for different psychological types. *Interfaces*, 6(2): 17-27.
- Kilmann, R.H. & Thomas, K.W. (1975). Interpersonal conflict-handling behavior as reflections of Jungian personality dimensions. *Psychological Reports*, 37: 971-980.
- Kummerow, J.M. (1988). A methodology for verifying type: Research results. *Journal of Psychological Type*, 15: 20-25.
- Kummerow, J.M. & McAllister, L.W. (1988). Team-building with the Myers-Briggs Type Indicator. *Journal of Psychological Type*, 15: 26-32.
- Lueder, D.C. (1986a). Psychological types and leadership styles of the 100 top executive educators in North America. *Journal of Psychological Type*, 12: 8-12.
- Lueder, D.C. (1986b). The "rising stars" in educational administration: A corollary to psychological types and leadership styles. *Journal of Psychological Type*, 12: 13-15.
- Malone, O., Jr. (1988). Psychological type differences between minorities and majorities in an organizational setting. *Journal of Psychological Type*, 14: 15-24.
- Mason, R.O. & Mitroff, I.I. (1973). A program for research on management information systems. *Management Science*, 19: 475-487.
- McCarley, N.G. & Carskadon, T.G. (1983). Test-retest reliabilities of scales and subscales of the Myers-Briggs Type Indicator and of criteria for clinical interpretive hypotheses involving them. *Research in Psychological Type*, 6: 24-36.
- McCaulley, M.H. (1990). The Myers-Briggs Type Indicator and leadership. Pp. 381-418 in K.E. Clark & M.B. Clark (Eds.), *Measures of leadership*. West Orange, NJ: Leadership Library of America.
- McCrae, R.R. & Costa, P.T., Jr. (1989). Reinterpreting the Myers-Briggs Type Indicator from the perspective of the five-factor model of personality. *Journal of Personality*, 57: 17-40.
- Mills, J., Robey, D. & Smith, L. (1985). Conflict-handling and personality dimensions of project-management personnel. *Psychological Reports*, 57: 1135-1143.
- Mitchell, W.D. (1991). A test of type theory using the TDI. *Journal of Psychological Type*, 22: 15-26.
- Mitroff, I.I. & Kilmann, K.H. (1975). Stories managers tell: A new tool for organizational problem solving. *Management Review*, 64(7): 18-28.
- Moore, T. (1987). Personality tests are back. *Fortune*, March 30: 74-78.
- Mosley, D.C. & Pietri, P.H. (1985). Type profiles and managerial styles of bankers. *Journal of Psychological Type*, 10: 41-45.
- Myers, I.B. (1974). *Type and teamwork*. Gainesville, FL: Center for Applications of Psychological Type.
- Myers, I.B. & McCaulley, M.H. (1985). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.
- Myers, I.B. with Myers, P.B. (1980). *Gifts differing*. Palo Alto, CA: Consulting Psychologists Press.
- Nunally, J. (1978). *Psychometric theory*, 2nd ed. New York: McGraw-Hill.
- Nutt, P.C. (1979). Influence of decision styles on use of decision models. *Technological Forecasting and Social Change*, 14: 77-93.
- Nutt, P.C. (1986a). Evaluating MIS design principles. *MIS Quarterly*, 10: 139-155.
- Nutt, P.C. (1986b). Decision style and its influence on the strategic decisions of top executives. *Technological Forecasting and Social Change*, 30: 39-62.
- Nutt, P.C. (1989). Uncertainty and culture in bank loan decisions. *OMEGA International Journal of Management Science*, 17: 297-308.
- Nutt, P.C. (1990). Strategic decisions made by top executives and middle managers with data and process dominant styles. *Journal of Management Studies*, 27: 173-194.
- Ott, R.L., Mann, M.H. & Moores, C.T. (1990). An empirical investigation into the interactive effects of student personality traits and method of instruction (lecture or CAI) on student performance in elementary accounting. *Journal of Accounting Education*, 8: 17-35.
- Percival, T.Q., Smitheram, V. & Kelly, M. (1992). Myers-Briggs Type Indicator and conflict-handling intention: An interactive approach. *Journal of Psychological Type*, 23: 10-16.
- Pollitt, I. (1982). Managing differences in industry. *Research in Psychological Type*, 5: 4-19.
- Podsakoff, P.M. & Organ, D.W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management*, 12: 531-544.
- Ramakrishna, H.V. & Schilavy, R.A. (1986). Psychological types as a factor in organizational design: Some empirical evidence. *Proceedings of the 18th Meeting of the Decisions Sciences Institute*, Vol. 1: 140-142.
- Ramaprasad, A. & Mitroff, I.I. (1984). On formulating strategic problems. *Academy of Management Review*, 9: 597-605.

- Ramnarayanan, R. & Gardner, W.L. (1991). Interactions among presentation formats, cognitive styles and time constraints: An experimental study. *Proceedings of the Annual Meeting of the Decision Sciences Institute*: 741-743.
- Reynierse, J.H. (1991). The psychological types of outplaced executives. *Journal of Psychological Type*, 22: 27-32.
- Roach, B. (1986). Organizational decision makers: Different types for different levels. *Journal of Psychological Type*, 12: 16-24.
- Rodgers, W. (1991). How do loan officers make their decisions about credit risks? A study of parallel distributed processing. *Journal of Economic Psychology*, 12: 243-365.
- Ross, J. (1966). The relationship between a Jungian personality inventory and tests of ability, personality and interest. *Australian Journal of Psychology*, 18: 1-17.
- Roush, P.E. & Atwater, L. (1991). Using the MBTI to understand transformational leadership and self-perception accuracy. *Military Psychology*, 4(1): 17-34.
- Ruble, T.L. & Cosier, R.A. (1990). Effects of cognitive styles and decision setting on performance. *Organizational Behavior and Human Decision Processes*, 46: 283-295.
- Schweiger, D.M. (1985). Measuring managerial cognitive styles: On the logical validity of the Myers-Briggs Type Indicator. *Journal of Business Research*, 13: 315-328.
- Schweiger, D.M. & Jago, A.G. (1982). Problem-solving styles and participative decision making. *Psychological Reports*, 50: 1311-1316.
- Seegmiller, R.A. & Epperson, D.L. (1987). Distinguishing thinking-feeling preferences through the content analysis of natural language. *Journal of Personality Assessment*, 51: 42-52.
- Sekaran, U. (1989). *Research methods for business: A skill-building approach*, 2nd. ed. New York: Wiley.
- Sipps, G.J. & Alexander, R.A. (1987). The multifactorial nature of extraversion-introversion in the Myers-Briggs Type Indicator and Eysenck personality inventory. *Educational and Psychological Measurement*, 47: 543-552.
- Sipps, G.J., Alexander, R.A. & Friedt, L. (1985). Item analysis of the Myers-Briggs Type Indicator. *Educational and Psychological Measurement*, 45: 789-796.
- Sipps, G.J. & DiCaudo, J. (1988). Convergent and discriminant validity of the Myers-Briggs Type Indicator as a measure of sociability and impulsivity. *Educational and Psychological Measurement*, 48: 445-451.
- Slocum, J. (1978). Does cognitive style affect diagnosis and intervention strategies of change agents? *Group & Organization Studies*, 3: 199-210.
- Steckroth, R.L., Slocum, J.W., Jr. & Sims, H.P., Jr. (1980). Organizational roles, cognitive roles, and problem-solving styles. *Journal of Experiential Learning and Simulation*, 2: 77-87.
- Stricker, L.J., Schiffman, H. & Ross, J. (1965). Prediction of college performance with the Myers-Briggs Type Indicator. *Educational and Psychological Measurement*, 25: 1081-1095.
- Stumpf, S. & Dunbar, R. (1991). The effects of personality type on choices made in strategic decision situations. *Decision Sciences*, 22: 1047-1069.
- Thompson, B. & Borello, G.M. (1986a). Construct validity of the Myers-Briggs Type Indicator. *Educational and Psychological Measurement*, 46: 745-752.
- Thompson, B. & Borello, G.M. (1986b). Second-order factor structure of the MBTI: A construct validity assessment. *Measurement and Evaluation in Counseling and Development*, 18: 148-153.
- Thorne, A. & Gough, H. (1991). *Portraits of type: An MBTI research compendium*. Palo Alto, CA: Consulting Psychologists Press.
- Tucker, I.F. (1991). Predicting scores on the Rathus assertiveness schedule from Myers-Briggs Type Indicator categories. *Psychological Reports*, 69: 571-576.
- Tzeng, O.C.S., Outcalt, D., Boyer, S.L., Ware, R. & Landis, D. (1984). Item validity of the Myers-Briggs Type Indicator. *Journal of Personality Assessment*, 48: 255-256.
- Tzeng, O.C.S., Ware, R. & Chen, J. (1989). Measurement and utility of continuous unipolar ratings for the Myers-Briggs Type Indicator. *Journal of Personality Assessment*, 53: 727-738.
- Van Velsor, E. (1987). Database analysis: Leadership development program, Center for Creative Leadership. Paper presented at the Conference on Psychological Measures and Leadership, San Antonio, TX.
- Walck, C.L. (1992). The relationship between indicator type and "true type": Slight preferences and the verification process. *Journal of Psychological Type*, 23: 17-21.
- Waller, N.G., & Ben-Porath, Y.S. (1987). Is it time for clinical psychology to embrace the five-factor model of personality? *American Psychologist*, 42: 887-888.
- White, K.B. (1982). MIS project teams: An investigation of cognitive style implications. *MIS Quarterly*, 8(2): 95-101.
- Williams, S.B. & Bicknell-Behr, J. (1992). Assertiveness and psychological type. *Journal of Psychological Type*, 23: 27-37.