

Extraction of Information From Predictive Statements of Federal Tax Leaders

Debra M. Hopkins, The University of Texas at Arlington
Raymond F. Hopkins, University of Dallas

Abstract

Past studies indicate numeric data contains information. This study focuses on extraction of information from language, a critical feature in taxation, since tax law is usually conveyed in nonnumeric formats. Respondents differing in tax education levels were tested on ability to extract information from tax leaders' predictive statements. Non-tax students found all statements significant. Tax students and professionals attached significance only to directly quoted statements.

Introduction

Accounting's concern with transmitting business data to users for economic decision-making is reflected in research indicating presence of information in numeric data, such as market studies. Behavioral studies also indicate individuals extract information from numeric data for economic decisions.

However, information is transmittable through any ordered communication system, including printed text [Shannon, 1951; Lachman, 1979]. Researchers in cognitive psychology and psycholinguistics agree language is an information-carrying vehicle [Miller, 1965; Neisser, 1967; Branford, et. al., 1972, 1977; Warner, 1981].

Little work in accounting explicitly focuses on individuals' abilities to extract information from language, although analyses of auditors' opinions approach the study of information extraction from language [Felix and Kinney, 1982].

In taxation, accountants' ability to extract information from language is critical. Tax law is conveyed most frequently in nonnumeric forms such as the *Internal Revenue Code*, Income Tax Regulations, Revenue Rulings and court decisions. Tax accountants must both understand and interpret such text to guide clients' economic decisions.

Commercial tax services furnish accountants with tax law data and offer reprints of proposed and actual legislation, copies of Congressional committee reports, Treasury Department studies and editorial analyses.

A possible use limitation for such tax sources is that they are ex post sources--generated after decision making is completed. Accountants tax planning for clients may want data reporting tax leaders' efforts during generation of tax policy. Such data are informative if they preshadow actual outcomes.

Perhaps aware that "process-intensive" sources of tax data are desired by readers, many tax services also report remarks of tax leaders (direct quotations and those attributed to tax leaders from "official sources"), reprints of speeches by such leaders and occasional interviews.

Statements of tax leaders offered prior to legislation passage may provide readers with insight into structure of legislation, a tax bill's legislative progress and its chance of passage. If accountants reading tax leaders' statements possess a measure of confidence in those leaders, the statements may offer information for making ex ante tax planning decisions.

For example, prior to passage of the Tax Reform Act of 1986, tax leaders frequently stated the Investment Tax Credit, a tax incentive for purchasing depreciable personal property, was scheduled for repeal. Accountants confident in relying on such statements could tax plan prior to the Act's final passage.

To summarize, individuals may take action based on advice of known authorities. This is a two-step process: (1) individuals may more likely rely upon statements where they feel confidence in the speaker; (2) relying upon such statements may affect decision-making. Or, readers may more likely take action upon statements by others in whom they have confidence.

This study explicitly tests readers' confidence in predictive statements made by Federal tax leaders on passage of tax legislation. Having confidence in such statements may offer increased ability planning for outcome of tax legislation. Or, where readers have confidence in tax leaders' statements, the statements become useful to readers.

In this study, "confidence" is a surrogate for "information". Readers confident in statements made by a tax leader on tax legislation passage presumably have extracted information from those statements useful in decision making.

Five hundred fifty (550) respondents completed a magnitude-scaled questionnaire of sixteen predictive statements made by tax leaders on outcomes of tax legislation. Respondents were grouped by level of tax education: non-tax students, graduate tax students and tax professionals employed by Big Eight CPA firms. Magnitude scaling was used to lessen response bias associated with ordinal-scaling of opinions.

Background

In information systems theory, ordered systems are those with elements behaving in a probabilistic manner. Extracting information from a system may depend on general knowledge of the system's past behavior (its order) and specific knowledge and experience with that system [Bransford *et. al.*, 1972, 1977; Johnson *et.al.*, 1973].

The amount of information extracted may

vary with strength of the signal received, which is a function of low noise levels in the transmitting channel and transmitter strength.

Language transmission noise is reduced by a receiver's general knowledge of language structure or syntax. Further noise reduction occurs when the receiver is familiar with subject matter or semantics [Bransford and Franks, 1971]. In contrast, a decision maker may have incorrect perceptions with data not commonly received and where the decision maker is unsure of the data's possible meanings [Feltham, 1972, p. 135]. Thus, one would expect tax accountants to more easily interpret Revenue Rulings than one lacking such specialized training.

In a study focusing on decision processes of expert and novice subjects, Bouwman [1984] had subjects verbalize thought processes during financial statement analyses. Bouwman found expert subjects relied on knowledge from past experiences to develop lists of typical problems and to generate problem hypotheses against which to compare observations. These decision processes were noticeably absent among novice subjects.

Transmitter strength in language, or one's confidence in comprehending messages, is often subjective and assigned by receivers from specific system knowledge [Bransford and Johnson, 1973; Fillenbaum, 1974; Haviland and Clark, 1974; Clark and Haviland, 1977; Warner, 1981]. Messages from persons perceived as authorities by language receivers may be assigned stronger weights than messages from nonauthorities. A statement by the President on tax legislation may impact tax planning more than casual remarks by a neighbor.

Information economics implies information is costly and should only be produced if utility is enhanced. Data not changing individual assessments may not be information worth processing. Utility may, in fact, be decreased if costly data contain no information. In Feltham's words: "the additional information must have positive value if the value is to exceed the cost" [1972, p. 84]. Further, "the decision maker may lose valuable time if he receives large quantities of irrelevant information" [Feltham, 1972, p. 142].

Changes in individual utility depend on many

factors. Feltham [1972, p.135] indicates decision makers' perceptions of data depend on "how data are presented, his background and his training." Clearly, tax accountants derive more information from tax returns than persons who have never seen such forms.

Other studies indicate information processing abilities, or cognitive styles, affect information extraction ability. Studying the cognitive characteristic of "intolerance to ambiguity", Dermer indicated "the cognitive characteristics of an information user may affect his perception of what information is important, and, hence, may affect how information influences his ultimate behavior" [1973, p. 511]. Therefore, given two different statements carrying potential information, an appropriate test of changes in readers' assessments of confidence (or, readers' abilities to extract information from language) should include individuals with non-similar backgrounds to test language's transmitting strength.

Information theory holds statements with significant information should produce significant assessment changes in knowledgeable groups. To Feltham, "data are information if their receipt results in a change in the receiver's probability distribution" [1972, p. 8]. Or, in Demski's words: "Information refers to data that may alter a decision maker's predictions" [1972, p. 4]. Tax accountants presented with perfect information of tax legislation outcome could alter decision making to economic advantage.

Statements with significant information should produce no significant change in unknowledgeable groups, since the latter, by definition, are unable to extract the information.

Finally, if statements don't produce assessment changes in knowledgeable groups, information theory holds the statements contain no information, or aren't useful. Tax accountants with perfect knowledge of a tax bill's outcome won't alter decision making after reading repetitive confirming statements.

Methodology

Introduction

This study's respondents read predictive statements made by legislative and administrative tax

leaders in federal government and evaluated such statements for degree of personal confidence felt from reading them. The research instrument also tested respondents' sensitivity to names and positions of such leaders, year statements were made and mode of statement (direct quotes v. indirect, or attributed, remarks).

To isolate effect of specific knowledge on results obtained, tests were made both within and between three respondent groups differing in tax education levels: non-tax accounting students, graduate tax students and tax professionals.

Research Questions

The research questions of interest in the study were as follows:

After reading direct quotes of tax leaders, were respondents' expressions of confidence in the statements (their extractions of information):

1. Sensitive to name and position of tax leader?
2. Sensitive to the year such quotes were made?
3. Affected by specific knowledge of the tax system?

After reading indirect (attributed) quotes of tax leaders, were respondents' expressions of confidence in the statements (their extractions of information):

4. Sensitive to name and position of tax leader?
5. Sensitive to the year such quotes were made?
6. Affected by specific knowledge of the tax system?

Structure of Test Instrument

Statements evaluated were made or attributed to tax leaders from 1975-1982. During this time, legislative activities resulted in seven major tax acts, listed in Exhibit I. Tax leaders of interest are listed in Exhibit II.

A total of 187 predictive statements made by tax leaders before passage of tax acts listed in Exhibit I were identified using a daily tax news service (*Daily Tax Report*). Predictive statements were those containing each of the following:

1. Either a direct (quoted) or indirect (attributed) remark by the tax leader of interest.

2. A prediction of outcome (favorable or unfavorable) for a specific tax act.

Exhibit III gives examples of predictive statements. A full copy of the survey instrument is available from the authors.

Identified statements were classified as either direct or indirect (attributed) quotes. Eight direct and eight indirect statements of tax leaders were randomly selected to construct test instruments. For each predictive statement, name and position of the tax leader was listed as was year of statement.

After reading each statement, respondents were asked to evaluate it using a magnitude scale which permitted them to assign a measure to degree of personal confidence felt reading the statement. This degree of personal confidence was equated with amount of information extracted from the statement.

Use of Magnitude Scaling

Test instruments used magnitude scaling to permit respondent expression of opinion strength

without limiting and possibly biasing constraints of category scaling. Each test instrument contained sixteen bipolar magnitude scales, one for each statement. Exhibit III illustrates this scaling technique.

Magnitude scaling has been validated in social science testing [Sellin and Wolfgang, 1964; Dawson, 1971; Lodge *et. al.*, 1976]. It yields proportional, ratio-preserving measures of opinion strength supporting parametric testing [Lodge, 1981, p. 7], in contrast to category scaling use in measuring respondent opinions. Information may be lost or distorted with category scaling if fixed scale ranges fail to parallel respondents' true ranges of opinions [Marks, 1968; Shimm, 1974]. Use of magnitude scaling minimizes this possible test bias [Lodge, 1981, p. 6].

Administration of the Test Instrument

Four test instruments each containing the sixteen questions previously discussed were constructed and administered. These instruments exposed respondents to the following:

For Indirect (Attributed) Statements:

Exhibit I

Federal Tax Acts, 1975-1982

Tax Reduction Act of 1975
Tax Reform Act of 1976
Tax Reduction & Simplification Act of 1977
Revenue Act of 1978
Windfall Profit Act of 1980
Economic Recovery Tax Act of 1981
Tax Equity and Fiscal Responsibility Tax Act of 1982

Exhibit II

Tax Leaders of Interest

Chairman of House Ways & Means Committee
Chairman of Senate Finance Committee
Ranking Minority Member, House Ways & Means Committee
Ranking Minority Member, Senate Finance Committee
Chief of Staff, Joint Committee on Taxation
Secretary of the U.S. Treasury Department
President of the United States


Exhibit III.

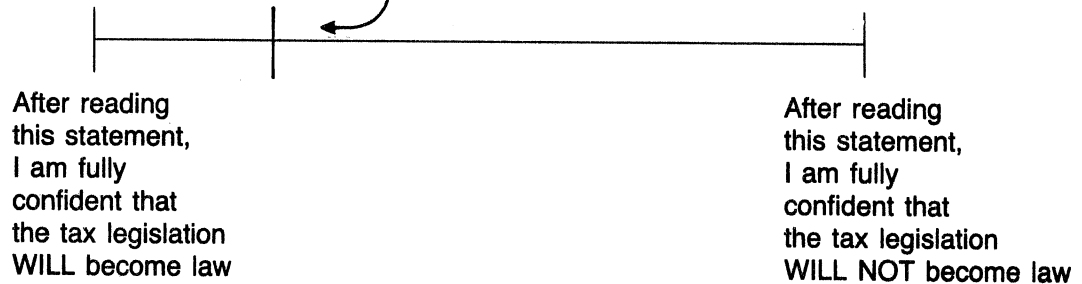
Test Instrument

QUESTIONNAIRE #1

DIRECTIONS: This questionnaire contains statements of specific income tax leaders in the U.S. government.

Please evaluate each statement using the scale beneath each statement. To do so, please *draw a vertical line (or slash)* crossing the scale at the point best reflecting your evaluation.

For example, if the tax leader's statement made you feel somewhat confident (but not fully confident) that tax legislation would become law, you might draw a line like this:  Try to make your line or slash as straight as possible.

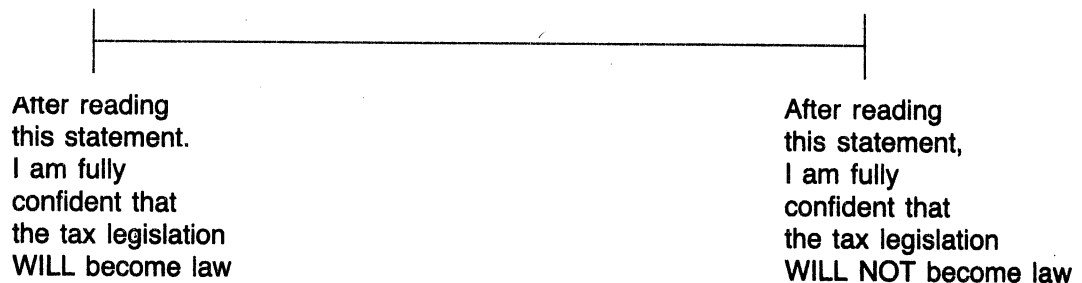


STATEMENT #1

Speaker: Russell B. Long, Chairman, Senate Finance Committee

Year: 1976

"I think that the Congress will pass the tax cut for a year or, maybe, for a year and a half."

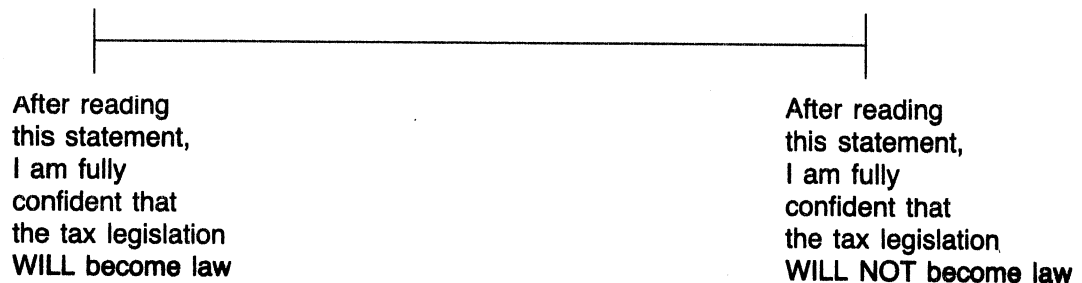


STATEMENT #2

Speaker: James Earl Carter, President

Year: 1980

(The tax leader above) today warned that he would veto a tax bill as large as the Senate's, but added he hoped the House-Senate conference could come up with a satisfactory compromise version.



Test A: Correct Position (and Name) of Tax Leader; Correct Year of Statement
 Test B: Correct Position (and Name) of Tax Leader; Incorrect Year of Statement
 Test C: Incorrect Position (and Name) of Tax Leader; Correct Year of Statement

For Direct (Quoted) Statements:

Test D: Correct Position (and Name) of Tax Leader; Correct Year of Statement
 Test E: Correct Position (and Name) of Tax Leader; Incorrect Year of Statement
 Test F: Incorrect Position (and Name) of Tax Leader; Correct Year of Statement

Tests of Hypotheses

All statements selected for test instruments concerned tax bills subsequently enacted into law. This was known to researchers; respondents' awareness may have varied with knowledge levels. For this reason, researchers expected positive results via the magnitude scale. A one-tailed t-test was employed to determine if a significant difference from zero existed for any group given a specific statement. For example,

H_{0ik} : There is no difference from zero in assessment of statement *i* for group *k*.

H_{aik} : There is a difference from zero in assessment of statement *i* for group *k*.

Using: $t = \frac{\bar{x}_{ik}}{s_{\bar{x}_{ik}}}$

did tax students reveal significant confidence in a direct statement where tax leader position was correct but year of statement was incorrect?

Differences in respondents' assessment of tax leaders' statements were made by the usual t-test employed for the following hypotheses. Test results are shown in Table I.

Another set of hypotheses was tested to determine if average response of one group for a specific statement differed significantly from average response of another group. This test would indicate if one group placed more confidence in the statement or perceived it to contain more information than the other group. This would occur if samples were drawn from two populations with different prior probabilities. The hypotheses were as follows. Results of these tests are in Table II.

Analysis

The t-test results from Table I indicate an interesting phenomenon has taken place. Whether statements were direct or indirect (attributed), non-tax students perceived them as significantly

Table I.
Results of t-Tests

Test	Indirect Statements			Direct Statements		
	A	B	C	D	E	F
Group:						
Non-tax students	4.596*	2.691*	4.377*	5.160*	4.675*	5.516*
Tax students	-1.494	-1.200	4.903*	2.044**	2.190**	2.143**
Tax professionals	0.913	-0.614	0.240	4.790*	3.690*	3.030**

* Probability < .001

** Probability < .025

different from zero. This appears to contradict an expected result: unknowledgeable individuals confronted with data should express no confidence in the data or should be unable to extract information.

As a further contradiction, tax students and tax professionals perceived indirect statements as noninformational, with one exception (Test C), while agreeing with non-tax students on importance of direct statements. In other words, tax students and tax professionals did not place much confidence in (or extract much information from) attributed statements from tax leaders.

This leads to the conclusion that tax students and professionals would not change decision making after reading such statements. This could be a costly error. Recall that all statements used referred to tax legislation successfully en-

acted. Both indirect and direct statements should have sent equal amounts of information to knowledgeable groups. By disregarding information contained in indirect statements, tax accountants may be restricting decision making abilities. All groups for all tests indicated a significant deviation from zero when the statements were direct (quotes).

That significant differences occurred for most of the tests led to the conclusion that year or position of speaker made no difference to respondents. The most striking result is between direct and indirect statements. Tax students and professionals place little confidence in indirect (attributed) statements while viewing direct (quoted) statements as important. Non-tax students evidently did not discern any difference between direct and indirect statements.

H_{oik}' : There is no difference between groups for statement i .

H_{aik}' : There is a difference between groups for statement i .

The statistic used for these tests was the difference in means t -statistics:

$$t = \frac{\bar{x}_{ik} - \bar{x}_{ik}'}{s_{\bar{x}_{ik}} - s_{\bar{x}_{ik}'}}$$

Table II.
Results of t -Tests

Tests	A,C	A,B	D,E	D,F
Groups:				
Non-tax students vs. Tax students	1.848**	6.480*	2.744**	2.243**
Non-tax students vs. Tax professionals	5.576*	4.994*	1.344	1.427
Tax students vs. Tax professionals	1.910**	-1.303	-1.158	-0.900

* Probability < .001

** Probability < .025

Table II results indicate with one exception a difference in populations tested. Non-tax students attribute more information to indirect statements (Tests A, B and C) than do tax students or professionals. In the direct statement category (Tests D, E and F), significant differences occur between non-tax students and tax students, but nowhere else, perhaps because non-tax students perceived direct quotes as more important than indirect statements.

Tax students and tax professionals agreed on the importance of direct statements. This would seem to reflect results in Ashton and Kramer (1980) where past studies of decision making showed both decisions and information processing behavior of business students and primary decision makers to be similar. There appears to be a distribution of prior probabilities affecting test results. When reading statements, tax students and tax professionals assign heavier weights to quotes than do non-tax students.

There are at least three implications in these observations. First, attributed statements gathered and printed by tax services aren't perceived as carrying information by users (tax professionals and tax students). Such statements might be considered private data because they are paid for by individuals using services. With noninformational but costly data, users suffer disutility.

Second, while tax service users (tax students and professionals) expressed little confidence in attributed statements, they should have, given all statements in the test instruments related to successfully passed tax legislation. Indirect statements should have been read as important as direct statements. Feltham addresses this problem when indicating decision makers may interpret meanings different from those producing data. These differences in perception cause decision makers to use data incorrectly [1972, p. 141].

The fact that CPAs and tax students did not respond positively to attributed statements of tax leaders while non-tax students did, may indicate a learned attitude of skepticism on the part of tax students and professionals. One benefit of this study might be that such individuals may want to place more confidence in attributed statements; to not do so, puts an unnecessary restriction on abilities to make tax decisions.

Third, the curious result between non-tax students and other groups may be due to a difference in cognitive styles, as discussed earlier [see also Schkade and Potvin, 1981]. The sample of non-tax students came from beginning accounting courses, which include non-accounting majors. These individuals may be less "tolerant of ambiguity", per Dermer [1973], than tax students and tax professionals skilled in reading tax services and less inclined to attach importance to quoted statements.

Conclusion

Five hundred fifty respondents used a magnitude scale to measure degree of confidence in reading predictive statements of tax leaders. This degree of personal confidence was a test surrogate for amount of information respondents extracted from reading the statements.

Non-tax students perceived statements as carrying information whether statements were quoted or attributed. Tax students and tax professionals deemed quoted statements to carry more information than attributed statements.

Implications of test results include the possibility of disutility if tax students and professionals fail to use attributed statements as information. The results also suggest a difference in information processing styles between trained accountants and others.

References

1. Ashton, R.H. and S.S. Kramer (1980), "Students as Surrogates in Behavioral Accounting Research: Some Evidence," *Journal of Accounting Research*, (Spring, 1980), pp. 1-15.
2. Bouwmana, M. J. (1984), "Expert Versus Novice Decision Making in Accounting: A Summary," *Accounting, Organizations and Society*, Vol. 9, No. 3/4 (1984), pp. 325-7.
3. Bransford, J.D., J. Barclay and J.J. Franks (1972), "Sentence Memory: A Constructive vs. Interpretive Approach," *Cognitive Psychology*, 3 (1972), pp. 193-209.
4. Bransford, J.D. and M.K. Johnson (1973), "Contextual Prerequisites for Understanding: Some Investigation of Comprehension and Recall," *Journal of Verbal Learning and Verbal Behavior*, 98 (1973), pp. 203-5.
5. Bransford, J.D. and N.S. McCarrell (1977), "A Sketch of a Cognitive Approach to Comprehension: Some Thoughts About

- Understanding What It Means to Comprehend," in *Thinking: Readings in Cognitive Science*, P.N. Johnson-Laird and P.C. Wason (eds.), (Cambridge, Cambridge University Press, 1977), pp. 377-399.
6. Clark, H.H. and S.E. Haviland (1977), "Comprehension and The Given-New Contract," in *Discourse Production and Comprehension*, R.O. Freedle (ed.), (Norwood, Ablex Publishing, 1977), pp. 1-40.
 7. *Daily Tax Report*, (Washington, D.C., The Bureau of National Affairs, Inc.).
 8. Dawson, W.E. and R.P. Brinker (1971), "Validation of Ratio Scales of Opinion by Multimodality Matching," *Perception and Psychophysics*, No. 9 (1971), pp. 413-417.
 9. Demski, J.S. (1972), *Information Analysis*, (Reading, Addison-Wesley, 1972).
 10. Dermer, J. D. (1973), "Cognitive Characteristics and the Perceived Importance of Information," *The Accounting Review*, 48 (1973), pp. 511-519.
 11. Felix, Jr., W.L. and W.R. Kinney, Jr. (1982), "Research in the Auditor's Opinion Formulation Process: State of the Art," *The Accounting Review*, 47 (1982), pp. 245-271.
 12. Feltham, G. A. (1972), *Information Evaluation: Studies in Accounting Research* #5, (Sarasota, American Accounting Association, 1972).
 13. Fillenbaum, S. (1974), "Pragmatic Normalization: Further Results for Some Conjunctive and Disjunctive Sentences," *Journal of Experimental Psychology*, 102 (1974), pp. 574-578.
 14. Haviland, S.E. and H.H. Clark (1974), "What's New? Acquiring New Information as a Process in Comprehension," *Journal of Verbal Learning and Verbal Behavior*, 13 (1974), pp. 512-521.
 15. Johnson, M.K., J.D. Bransford and S. Solomon (1973), "Memory for Tacit Implications of Sentences," *Journal of Experimental Psychology*, 98 (1973), pp. 203-5.
 16. Lachman, R., J.L. Lachman and E.C. Butterfield (1979), *Cognitive Psychology and Information Processing: An Introduction*, (Hillsdale, Lawrence Erlbaum Associates, 1979).
 17. Lodge, M. (1981), *Magnitude Scaling: Quantitative Measurement of Opinions*, (Beverly Hills, Sage Publications, 1981).
 18. Lodge, M., D. Cross, B. Tursky, M.A. Foley and H. Foley (1976), "The Calibration and Cross-Modal Validation of Ratio Scales of Political Opinion in Survey Research," *Social Science Research*, 5 (1976), pp. 325-347.
 19. Marks, L. E. (1968), "Stimulus-Range, Number of Categories and the Form of the Category Scale," *American Journal of Psychology*, 81 (1968), pp. 467-479.
 20. Miller, G. A. (1965), "Some Preliminaries to Psycholinguistics," *American Psychologist*, 20 (1965), pp. 15-20.
 21. Neisser, U. (1967), *Cognitive Psychology*, (New York, Appleton-Century Crofts, 1967).
 22. Schkade, L.L. and A.R. Potvin (1981), "Cognitive Style EEG Waveforms and Brain Levels," *Human System Management*, 2 (1981), pp. 329-333.
 23. Sellin, J.T. and M.E. Wolfgang (1964), *The Measurement of Delinquency*, (New York, John Wiley, 1964).
 24. Shannon, C.E. (1951), "Prediction and Entropy of Printed English," *Bell Systems Technical Journal*, 30 (1951), pp. 50-64.
 25. Shinn, A., Jr. (1974), "Relations Between Scales," in *Measurement in the Social Sciences: Theories and Strategies*, H.M. Blalock, Jr. (ed.), (Chicago, Aldine, 1974).
 26. Warner, E. (1981), "Current Issues in Psycholinguistics," *Journal of the American Society of Information Science*, 32:6 (Nov. 1981), pp. 405-411.
 27. Wegener, L. E. (1968), "Stimulus-Range, Number of Categories and the Form of the Category Scale," *American Journal of Psychology*, 81 (1968), pp. 467-479.