

Improving individuals' and groups' abilities to solve problems and make decisions is recognized as an important issue in education, industry, and government. Recent research has identified models of problem solving, although there is less agreement as to appropriate techniques. Separate research on personality and cognitive styles has identified important individual differences in how people approach and solve problems and make decisions. This inventory will help the organization and individual understand the problem-solving process as it relates to performance and improvement based on Carl Jung's theory of personality types and will help the organization identify specific techniques to support individual differences.

The recent transition to the information age has focused attention on the processes of problem solving and decision making and their improvement (e.g., Nickerson, Perkins, & Smith, 1985; Stice, 1987; Whimbey & Lochhead, 1982). In fact, Gagne (1974, 1984) considers the strategies used in these processes to be a primary outcome of modern education. Although there is increasing agreement regarding the prescriptive steps to be used in problem solving, there is less consensus on specific techniques to be employed at each step in the problem-solving/decision-making process.

There is concurrent and parallel research on personality and cognitive styles that describes individuals' preferred patterns for approaching problems and decisions and their utilization of specific skills required by these processes (e.g., encoding, storage, retrieval, etc.). Researchers have studied the relationship between personality characteristics and problem-solving strategies (e.g., Heppner, Neal, & Larson, 1984; Hopper & Kirschenbaum, 1985; Myers, 1980), with Jung's (1971) theory on psychological type serving as the basis for much of this work.

One conclusion that may be drawn from these investigations is that individual differences in problem-solving and decision making must be considered to adequately understand the dynamics of these processes (Stice, 1987). Attention must be paid to both the problem-solving process and the specific techniques associated with important personal characteristics. That is, individuals and organizations must have a problem-solving process as well as specific techniques congruent with individual styles if they are to capitalize on these areas of current research.

The purpose of this inventory is to relate a model of the problem-solving process to a theory of personality type and temperaments in order to facilitate problem solving by focusing on important individual differences. Specific techniques that can be used in the problem-solving/decision-making process to take advantage of these differences are also identified. The integrated process is applicable to a variety of individual and group situations.

Most Frequently Used for:

- Validating and identifying the need for change in a part or the entire organization as it relates to group dynamics and problem-solving
- Planning and monitoring organizational change programs and continued development of teams
- Supporting change programs designed to enhance employee engagement, organizational learning and development, quality and reliability changes

- Facilitating mergers, acquisitions, and strategic alliances as well as long term team processes and realignments of leadership or processes

How we do it

Working in partnership with Lotus Consulting Services our Partner we provide insight into organizational learning styles through the application of a unique instrument which allows organizations to make more informed decisions to improve performance and ultimately shareholder value.

The instrument provides an effective means to assess and consider change for the organization. Through the instrument we can establish the primary learning states and the determinant drivers responsible. By working in partnership with the organization the team identity can be established and described, and effective change management considered.

How we measure it

Overview of the Reliability and Validity of all Org-ology profiles

Instrument Development

The content of the Org-ology profiles were developed and designed by Lotus Consulting Service on the basis of 15 years of research and practice in organizational settings. The surveys and inventories tap those aspects of culture that had demonstrated links to organizational effectiveness, such as having a shared sense of responsibility, possessing consistent systems and procedures, being responsive to the marketplace, and having a clear purpose and direction for the organization (e.g., Oberholtzer, 2004).

Reliability and Validity Evidence

The scales of the Org-ology profiles have been examined using both reliability analysis and confirmatory factor analysis. Coefficient alphas range from .70 to .86 for the various indexes and from .87 to .92 for the various traits, indicating scientifically acceptable levels of consistency within scales. Factor analytic results support the hypothesized structure of the Org-ology profiles.

A number of analyses have found relationships between scores on the Org-ology profiles and measures of organizational and personal effectiveness. For instance, correlations between 160 organizations' culture scores and respondents' mean ratings of their organizations' growth, market share, profitability, quality of products and services, and new product development ranged from .10 to .50 (mean $r=.32$).

Other analyses have examined correlations between culture indexes and separate measures of organizational effectiveness, such as customer satisfaction and sales growth. These results have been presented or submitted for presentation at scientific conferences (e.g., Oberholtzer, 2005).

Correlations between culture and organizational effectiveness measures:

Culture indexes and customer satisfaction:

- Ranged from .10 to .21 (mean $r=.16$) at 338 automotive dealerships
- Ranged from .21 to .31 (mean $r=.26$) at 90 grocery stores
- Ranged from .29 to .51 (mean $r=.45$) at 31 markets of a construction company

Culture indexes and sales growth:

- Ranged from .19 to .24 (mean $r=.22$) at 151 automotive dealerships

Culture indexes and ROI:

- Ranged from .23 to .36 (mean $r=.29$) at 31 markets of a construction company

Culture indexes and gross margin:

- Ranged from .01 to .33 (mean $r=.18$) at 31 markets of a construction company

These results indicate that an organization's culture and person effectiveness, as measured by the Org-ology profiles and Survey's, is directly related to its performance.

Overall, the results of these analyses offer support for the psychometric integrity of the Org-ology profiles as well as the survey's link to organizational and personal effectiveness.

Reliability

A major concern of test developers is whether each test question reliably measures the construct (i.e. deep-seated mental framework) it is supposed to measure. If a test is well designed, for example, scores from each individual item that it measures should correlate positively with the total score. Thus, test "reliability" refers to the ability of the test to produce consistent scores over time.

Statistical procedures used in development of all Org-ology profiles include inter-item reliability (item by item), split-half (overall) reliability, and test/re-test reliability.

Inter-item Reliability

Inter-item reliability is an internal measure of how well each item correlates to the total score for that item. During development, the authors carefully measured both inter-item and construct relationships. For example, if the response to question 14 was supposed to measure Assertiveness, the value of this response would be expected to increase with the total score for Assertiveness. If the item score and total score were not positively correlated, question 14 would be dropped from the test.

Split-half Reliability

Split-half reliability is a measure of relationship between scores on the first half of the test with scores on the last half. The measure of Split-half (overall reliability) used for the Org-ology profiles is coefficient alpha. Coefficient alpha refers to the average of all possible inter-item and split-half correlations, both good and bad. Without relying on single indicators of reliability which may contain large amounts of error, coefficient alpha provides an overall measure of the internal reliability of the test. The coefficient alphas for the Org-ology profiles are:

<u>Construct</u>	<u>Coefficient Alpha</u>
Analytical	.83
Structural	.76
Social	.76
Conceptual	.76
Expressiveness	.83
Assertiveness	.83
Flexibility	.80

Test/re-test Reliability

Test/re-test reliability is a measure of how well a person answers the profile over time. Test/re-test measures were conducted during the development of the profile. Results indicate that persons who completed the profile over a period of two years, tended to respond in much the same manner. Here are the statistical correlations for each attribute for that study: (Any number .70 or greater is considered a very strong correlation.)

<u>Construct</u>	<u>Correlation</u>
Analytical	.84
Structural	.77
Social	.74
Conceptual	.82
Expressiveness	.80
Assertiveness	.78
Flexibility	.82

Further test-retest studies were completed in 2005. This time, Org-ology profiles scores for 171 females and 117 males were measured; some subjects took the test as early as 2004. This data was examined using the Analysis of Variance (ANOVA) procedure to determine whether change in test scores was due to chance. The ANOVA data showed Conceptual scores increased slightly between the first testing and second testing. This may be due to an Org-ology profiles "workshop effect" where participants learned more about the Org-ology profiles.

Validity

Face Validity

The validity of a test refers to how well a test measures what it is supposed to measure. Like reliability, there are several different types of validity. *Face* validity refers to whether a test-taker perceives the test to be credible. If thinking styles and behaviors were to be measured, for example, asking questions about bank deposits or religious affiliations would seriously threaten face validity. Irrelevant questions may stimulate respondents to question the validity of the entire test and thereby produce unreliable answers. Questions on the Org-ology profiles were specifically written to be relevant to everyday events and behaviors.

Content Validity

Content validity refers to the adequacy of the Org-ology profiles to measure the behavior it is supposed to measure. A typing test, for example, has a clear relationship between what the test measures and a specific skill; i.e. the test is "content valid". Content validity is more difficult to obtain for a general communication instrument. It must rely on personal feedback from people who agree or disagree that the test describes common thinking or behavioral attributes and on the face validity of its questions.

Participants who take the Org-ology profiles generally agree the test accurately measures their thinking attributes and behavioral attributes.

Criterion Validity

Criterion validity is a measure correlating a person's score with performance in some other area. Using our earlier example, if a high score on the typing test could be later seen as high performance in the typing pool, the typing test could be considered criterion valid. Because the Org-ology profiles was not developed to predict or measure performance in specific jobs, we have not collected general information about criterion validity.

Construct Validity

The final form of validity is *construct* validity. A construct can be described as a deep-seated mental "construction" or characteristic. Construct validity refers to whether Org-ology profiles measure separate deep-seated thinking preferences and behaviors. No attempt was made to "peel open" participants' minds to evaluate intelligence, emotional affect or their clinical or physiological aspects.

Construct validity is often determined using measures similar to those used in determining reliability. That is, the Org-ology profile factors were statistically examined to see whether they were independent or covaried with each other. The table of correlations below indicates the expected interrelationships among the four thinking styles and three behavioral attributes.

Relationships of the Attributes

Behavioral research is generally filled with overlapping results. How can a person, for example, not be "assertive" when he or she is also "expressive"? Much of this confusion comes from the fact that behavioral science is "fuzzy"—that is, one behavior often overlaps of another behavior. The similarities between attributes were recognized during our research and an attribute was only included when it helped explain different behaviors between people with similar thinking styles.

Construct Relationships

The relationships between thinking attributes and behavior attributes are the strength of Org-ology profiles. They also make understanding Org-ology profiles slightly more complex. The relationships between the Org-ology profiles factors are shown in the following table:

1	2	3	4	5	6
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1. Analytical						
2. Structural	.18					
3. Social	NS	NS				
4. Conceptual	.11	-.74	.26			
5. Expressiveness	.10	-.51	.55	.52		
6. Assertiveness	.25	-.50	.15	.49	.80	
7. Flexibility	NS	-.20	.84	.38	.66	.30

Correlations are significant at the $P < .01$ level using a two-tailed test of significance.

The data from the Org-ology profiles research base now contains response from thousands of people. The table above shows how the relationships between behaviors, attitudes, and thinking styles generally vary in strength and direction. Here are some of the highlights:

Relationships Between Thinking Attributes

There is a minimal correlation between Analytical and Structural ($r = .18$); Analytical and Conceptual ($r = .11$); and, Social and Conceptual ($r = .26$). Structural showed a strong negative relationship with Conceptual ($r = -.74$) indicating an expected bipolarity between an expressed interest in either creativity or rule following. Social showed no statistical relationship with either Analytical or Structural attributes. This indicates the four thinking styles tend to measure different factors, some of which move in opposite directions.

Relationships Between Behavioral Attributes

Expressiveness was strongly related with Assertiveness ($r = .80$) and had a strong relationship with Flexibility ($r = .66$). While it is difficult to separate assertiveness in a social situation from assertiveness in a task situation, it is possible to be task assertive without being socially assertive. Therefore, the two scales (e.g., Assertiveness and Expressiveness) were included to explain the presence of autocratic behavior. Flexibility, on the other hand, should have lower correlations with Assertiveness than with Expressiveness and this was confirmed by the data (.66 compared with .30).

Relationships Between Thinking Attributes and Behavioral Attributes

The three behaviors showed the expected relationships with each other, but differing relationships with the thinking attributes, as intended. Flexibility moved independently from Analytical ($r = .07$, ns); negatively with Structural ($r = -.20$); very positively with Social ($r = .84$) and, generally positive with Conceptual ($r = .38$).

These relationships showed that people who rated themselves as being socially or conceptually oriented thinkers also tended to rate themselves as being flexible (a beneficial trait in social and creative situations). Analytical thinking had no strong Flexibility indicators either way. Structural thinking indicators were negatively related to Flexibility indicators, which meant that people who valued rules and order were also likely to be less flexible than others.

People who rated themselves as Assertive were slightly correlated with Analytical ($r=.25$) and Social ($r=.15$); negatively related with Structure ($r=.50$); and, moderately correlated with Conceptual ($r=.49$). These relationships indicate that Assertiveness is largely associated with rule-breaking (a negative Structural Attribute) and risk-taking (a positive Conceptual attribute).

Expressiveness is negatively associated with Structural ($r=-.51$) and positively associated with Analytical ($r=.10$), Social ($r=.55$), and Conceptual ($r=.52$). These patterns indicate that rule followers are likely to be quiet and reserved; problem solvers tend to be independent; and, social and creative thinkers are likely to be more outgoing.

Flexibility is negatively associated with Structural ($r=-.20$) and positively associated with Social ($r=.84$) and Conceptual ($r=.38$). These relationships indicate that Social thinkers will almost always also be flexible and that Conceptual thinkers are likely to be flexible.