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# Kolbe Statistical Handbook

## I. Background

### A. Theoretical Positioning

The Kolbe Index evolved from Kathy Kolbe's journalistic observation that quite often, humans' actions and behavior do not go hand in hand with either their different abilities or their perceived desires. For centuries three facets of the human mind have been postulated involving knowledge, desire and volition. Kolbe's research on the conative dimension of the mind, includes a review of the historical works of philosophers, psychologists, sociologists, and anthropologists, from Plato and Aristotle to the present. In this review she found that the predominant thinking regarding the three dimensions of the mind had never been fully disputed. During the early 20<sup>th</sup> century, however, the focus was on the cognitive dimension and normative testing such as the new IQ measurements. When it became clear that cognitive norms were influenced by cultural biases, a dual focus developed that included numerous attempts to assess affective behaviors. Generally fueled by Jungian archetypes, tests of social style or preferences often reported results that implied action-orientations without explicit indication of the conative dimension. The Kolbe Index reflects the interaction between humans and their environment which was central to the work of Dewey, Jung and other theorists, but further explores the conative dimension.

John Dewey's work was premised on the belief that all learning involves a response of the individual to environmental factors. He described the process of developing coping skills based upon the individual's inherent skills in an environmental context as "instrumentation," suggesting that individuals can develop tools that allow them to use their abilities in different experiential settings<sup>1</sup>. Dewey's work is a foundation for the Kolbe in its identification of thinking and doing as complementary processes and of the significance of instrumental application of abilities in concrete behavioral settings.

Carl Jung, who, like Dewey, focused on the interaction of the individual with the environment, premised his theory of human development upon the idea that individuals have persistent preferences for certain types of human/environmental interaction. Jung's theories suggest that much of the apparent randomness in human behavior is actually a reflection of these persistent individual preferences. Jung identifies four basic functions or ways in which these personal preferences are evidenced: sensing, thinking, feeling and intuiting. According to Jung, personal types are developed through a process of individuation in which, as individuals mature, they come to recognize a dominant or primary function and an auxiliary function as primary ways of interacting with the environment, while maintaining a respect and understanding of their less dominant functions. Jung also identified two attitudinal continua which, he believed, were overlays or filters for the individual's environmental response. The continua are extroversion—a focus on objects or other individuals, and introversion, an internal reflective focus.<sup>2</sup>

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<sup>1</sup>Dewey, J. *How We Think*. Lexington, Mass.: DC Heath, 1933.

<sup>2</sup> Jung, C. *Psychological Types*. New Jersey: Princeton University Press, 1976.

Jung's work is an important foundation for the Kolbe index in its recognition of the following ideas: The first is the existence of persistent patterns or types of behavior that influence environmental interaction. The second is the recognition of an individual's dominance of a single pattern. The third is the recognition that behavioral responses can be used to measure dominance of the patterns. And finally, that there are overlays in behavior that may be represented as a continuum between two polar positions, and that these may in turn determine how individuals employ their cognitive or emotional responses in a specific setting.

The Kolbe theory recognizes that individuals have persistent predispositions for conducive interactions with the world. These predispositions can be measured through behavioral manifestations which can be reflected on a continuum. Like Isabel Myers and others who have extended Jung's theories, the Kolbe instrument does not measure the underlying functions identified by Jung, but rather focuses on the overlays that predispose an individual to apply the function in a particular way. For example, Myers added a "judgment-perception" preference to Jung's extroversion and introversion continua. She believes that individuals filter their functional responses through a filter that organizes responses in order in terms of a tendency to impose convergent or divergent order upon the environment<sup>3</sup>. Kolbe's research led her to conclude that there was no proven reliable assessment of the conative dimension, that at the time was generally ignored. So she set out to measure and predict the outward manifestation of motivation.

Through the use of observational studies, behavioral patterns were detected in a wide range of settings mentioned above. From these, Kolbe postulated four different continua which reflect individuals' predispositions to: 1) probe, 2) organize, 3) improvise, and 4) construct. She further postulated that these patterns, like the extroversion, introversion and judgment/perception continua, were patterns that remained constant over time and influenced the manner in which individuals use their functional preferences. Testing confirmed the stability of the measures and their relative independence from the continua employed by Myers and others. Further testing established correlation between predispositions and job performance, and also demonstrated that the measures were independent of race, gender or other confounding criteria.

Each pattern or creative instinct triggers observable behavior or modes of action through which an individual performs. These four continua or modes each have an operational definition for the "insistence" zone, the primary function:

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<sup>3</sup> Myers, I. *Introduction to Type*. Palo Alto, CA: Consulting Psychologist Press, Inc., 1962.

An initiating Fact Finder will most likely succeed at tasks which require an individual to:

probe	allocate	define	calculate
research	deliberate	prove	inquire
formalize	prioritize	specify	evaluate

An initiating Follow Thru will most likely succeed at tasks which require an individual to:

structure	prepare	arrange	plan
consolidate	discipline	integrate	budget
translate	coordinate	schedule	chart

An initiating Quick Start will most likely succeed at tasks which require an individual to:

invent	devise	risk	improvise
brainstorm	challenge	play hunches	promote
originate	contrive	reform	intuit

An initiating Implementor will most likely succeed at tasks which require an individual to:

form	craft	build	fix
mold	shape	render	repair
demonstrate	put together	construct	practice

## **B. Construction of the Index**

Based upon these constructs, 200 items were developed as a part of the first instrument. A decade of research began with item analyses of those 200 questions. The test instrument was refined through the use of criterion-group analysis and correlation studies through which any extraneous variables, such as cognitive or affective variables were eliminated.

The instrument was first given to groups of subjects with known estimates of intelligence. Those items which discriminated between individuals of varying intellectual levels were deleted from the instrument. The remaining items were given to subjects who had also completed the Wonderlic Personnel Test, which tests on cognitive abilities. All items which distinguished between subjects based on high and low scores on the Wonderlic were also removed in order to reduce bias based on cognitive differences.

In continuing studies, further items were eliminated when, for subjects who had also taken traditional personality instruments, endorsement of those items revealed significant correlation with items defining affective patterns. One of the personality instruments used was the Myers-Briggs Type Indicator, whose results a 1991 National Research Council report concluded have no verifiable relationship to performance (a more detailed summary of the Council's conclusions is provided in Appendix A).

At this point, 50 of the original 200 items remained. These 50 items were then given to 200 subjects, who were asked to complete the index in such a way as to attempt to present themselves

in a socially desirable manner. Those items which proved to be part of a “socially desirable response set” were then deleted. Of the 44 items in the pool of possible questions, 36 were finally selected to comprise the current version of the Kolbe index. These were found to be sufficient in order to maintain the accuracy of the instrument while reducing the effects of boredom and moderating other sources of measurement errors. By including items which relate to both normal and emotionally stressful circumstances, as well as affective and cognitive influences, the choices are counterbalanced.

### **C. Test Description, Scoring & Results**

The Kolbe A™ index is a forced-choice instrument that requires subjects to choose from four response choices two answers reflecting how they would most and least likely respond to 36 single-sentence problem-solving or behavioral scenarios.

The raw scores reflect the frequency with which the subject would tend to initiate, respond to, or resist probing, organizing, improvising and constructing behaviors. These frequencies are plotted on four ten-point scales, Fact Finder (FF), Follow Thru (FT), Quick Start (QS) and Implementor (IM) that reflect the behavioral predispositions of the subjects. These four behaviors, or Action Modes®, are divided into three zones: initiation, response and resistance.

Percentages of mental energy available for expression via each of these Action Modes are provided in order of dominance, Fact Finder, Quick Start, Follow Thru, Implementor. The Personal Productivity Pyramid in the Kolbe A index identifies the approximate amount of energy available for use through each mode, and suggests what will be an individual’s most efficient appropriation of committed effort. This result is not comparable to any other person’s results.

The scales are generally used in conjunction with each other to establish a pattern of individuals’ overall predispositions, but each sub-scale can be used independently to focus on a particular pattern in a specific context. These intensity scores for each mode vary in a manner approximating the normal curve, with more than 60% of respondents scoring in the accommodation zone. Therefore, while Kolbe index results are interpreted without comparison to others in a value-based way, it is possible to estimate a percentile ranking of available intensity in a given Action Mode.

The patterns of overall predisposition yield 17 natural “insistence patterns” which are called “Natural Advantages™.” These patterns, named for their singular or combined attributes, DO NOT imply what would necessarily be an appropriate job title. Rather, they describe methods of operation or “MOs.” The 17<sup>th</sup> Natural Advantage is that of Mediator/Transition. About 10% of the population falls into this category which has no mode of initiation, but rather accommodates or resists in each of the four modes. Some individuals are true Mediators, while others are undergoing temporary periods of Transition where they are unable to accurately identify their instinctive patterns. For a complete listing of the Natural Advantages and their characteristics, see Appendix B.

<b>MO</b>	<b>Natural Advantage</b>	<b>MO</b>	<b>Natural Advantage</b>

FF	RESEARCHER	FF/FT	STRATEGIC PLANNER
FF/QS	MANAGER	FF/IM	TECHNOLOGIST
FT	DESIGNER	FT/FF	SYSTEMS ANALYST
FT/QS	PROGRAM DEVELOPER	FT/IM	MANUFACTURER
QS	INNOVATOR	QS/FF	ENTREPRENEUR
QS/FT	THEORIST	QS/IM	PIONEER
IM	DEMONSTRATOR	IM/FF	INVESTIGATOR
IM/FT	QUALITY CONTROLLER	IM/QS	ADVENTURER
	MEDIATOR		TRANSITION

As discussed above, the Kolbe index does not measure the cognitive or the affective dimensions of the mind. That is to say those variables such as intelligence, anger, anxiousness or other components were removed from this index. Its focus is a conative one, investigating the predisposition of the subject to respond to specific behavioral settings with certain patterns of behavior. An analysis of the scores of 268 subjects who completed both the Kolbe index and the Myers-Briggs Type Indicator (MBTI) revealed no significant correlation between individual Action Modes and MBTI indices, but some mild correlation between Quick Start and Follow Thru and some facets of the S-N and J-P dimensions. Follow-up studies in May, 1992 and Fall, 1997 substantiated these findings (See Appendix C).

#### **D. Application of the Kolbe Concept®**

In order to be able to move into examining the validity and reliability of the test, an understanding of the Kolbe concept and its practical application should be established. The Kolbe concept as a theory states that all humans share the same four modes of operation, but differ in the energy distribution among the four modes. That is to say those individuals have different striving instincts in the pursuit of their personal goals. The Kolbe concept further predicts that the unique individual predisposition equips people with special talent. Therefore, people who work outside of their natural talents, or striving instincts, would experience a great deal of stress. On the other hand, people who work in harmony with their striving instincts utilize their energy wisely and maximize their performance.

This idea can be widely applied in different facets of life. On an individual basis, it provides a better understanding of oneself. It can also be used in relationship consulting, in order to understand and appreciate the other. Another way the Kolbe concept can be utilized is in the business world. Here, it can be used in selection processes, placement, team synergy and organizational development.

Some of the most frequent applications of the Kolbe index are in employee selection and team-building. This is based on the hypothesis that the most successful employees in similar jobs tend to be predisposed to respond to similar environments in consistent ways. In other words, that in order to be successful in a particular job, a person should possess a certain combination of the striving instincts that would match that job. The next section focuses on key issues of reliability and validity when using the index in this manner.

## **II. Reliability and Validity**

### **A. Predictive Reliability**

Reliability refers to the quality of a measurement and its ability to yield consistent results. In assessing the reliability of the Kolbe index, a number of measures were utilized, such as test-retest reliability, in which test-takers are asked to take a test on two occasions separated by a certain period of time. The consistency between the two scores is then measured. Another measure used to assess the reliability of the Kolbe index is internal consistency reliability. To achieve internal consistency a correlation between individual items and overall test results is calculated during the period of initial test construction. Since the Kolbe index is scored via a computer, inter-rater reliability is not applicable.

#### **1. Test/Retest**

In a study completed in 1993 it was found that the Kolbe index has an extremely high degree of test/retest reliability. In this study, 70 employees from two major corporations: a marketing, management and economic development firm, and a Big Six accounting firm, were given the Kolbe index twice with a gap of 8 to 15 months from the time of the original testing. The results were analyzed using three different statistical analyses to determine:

- Whether or not there was a statistically significant difference between the means obtained in the initial and retest situations for each Action Mode.
- Whether or not there is a strong correlation between the actual intensity scores obtained in the initial testing situation and those obtained in retest.
- When considered individually, what percentage of the sample groups changed more than two units on any Action Mode?

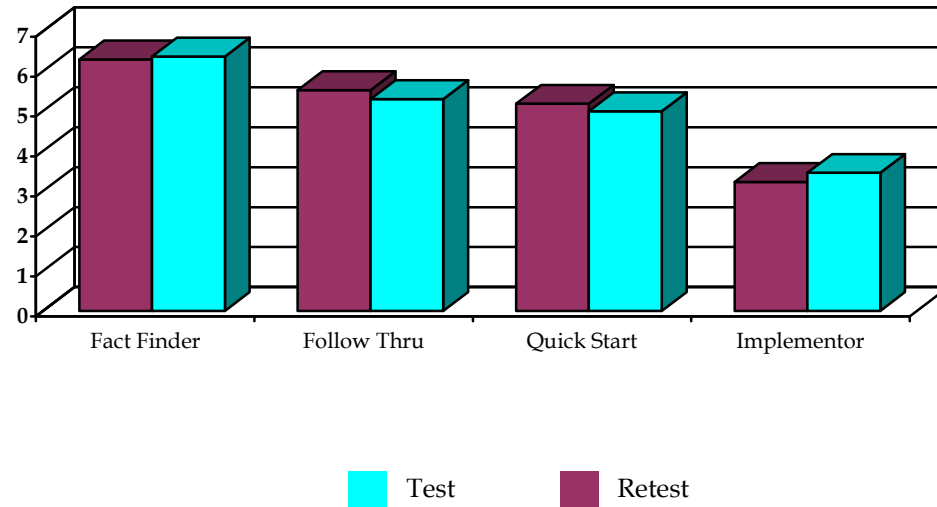
Subjects whose initial or retest profiles fell into the mid-range (no insistences) were eliminated from the analysis due to the fact that those in “transition” would be expected to change profiles upon retest. These represented less than 10% of the total number who participated in this study.

#### **Paired T-tests**

T-tests comparing the means for each test situation revealed no significant difference between the means. The first table and chart reflect the group means on the test and retest.

### Test/Retest Means by Action Mode

	FF	FT	QS	IM
<b>Test</b>	6.37	5.31	5.00	3.46
<b>Retest</b>	6.30	5.53	5.19	3.23



The next table reports the results of the T-tests by mode. In order to demonstrate any significant difference between the test and the retest,  $p$  would have to be less than .05. As the table clearly indicates, none of the  $p$  scores are less than .05, supporting the conclusion that there is no statistically significant difference between the test and the retest, thus finding that the score of the two tests tend to be extremely similar to one another.

### Results of T-tests by Mode

Mode	P values
Fact Finder	$p = .635$
Follow Thru	$p = .192$
Quick Start	$p = .297$
Implementor	$p = .081$

### Pearson Product-Moment

A Pearson product-moment correlation between the original and retest intensity scores by Action Mode was also used. Test-retest correlation ranging from .69 to .85 are considered to be significant.



### Pearson Test-Retest Correlation Coefficients

Mode	Coefficient
Fact Finder	p = .69
Follow Thru	p = .71
Quick Start	p = .85
Implementor	p = .77

### Frequency Tables

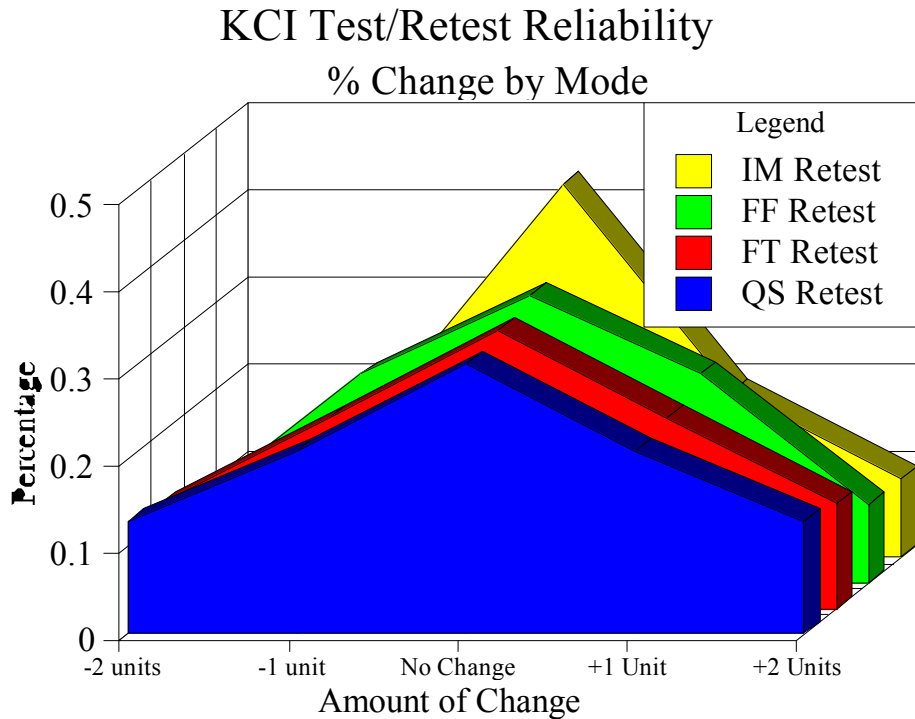
Frequency tables for examination of change in intensity units by Action Mode reveal that less than 6% of those participating in the study changed more than two units on any given Mode.

### Changes in Intensity Units by Action Mode

Action Mode	% No Change	% Changed 1 unit	% Changed 2 units	% Changed 3+ units
<b>Fact Finder</b>	32.8	48.7	12.8	5.7
<b>Follow Thru</b>	31.4	44.4	17.1	7.1
<b>Quick Start</b>	31.4	42.9	17.1	8.6
<b>Implementor</b>	42.8	38.7	17.1	1.4

From a statistical standpoint, the Kolbe index is found to be reliable, applying both correlation coefficient and T-tests studies. More importantly, however, is the stability factor from a practical standpoint, which would be the degree to which modes of insistence remain the same. The most significant criticism of the reliability of the Myers-Briggs by the National Research Council (See Appendix A) was the instability of type. Whereas in the 1983 study noted, only 47% of the MBTI test-takers retained their original type, test-retest studies of the Kolbe index reveal that for 90% of test-takers, modes of insistence remain the same. You will virtually never see a Quick Start/Fact Finder turn into a Follow Thru/Implementor, regardless of the length of time between the two tests.

To further test the reliability of the Kolbe index, a 1992 study was done on a sample of 43 sets of test/retest results drawn from a pool of Kolbe results. The results of the two tests were compared to determine the frequency of change between zones (Resist, Accommodate, and Insist) from the initial test to the retest. Theoretically, movement between zones, even though it may be only a change of one unit, is less likely than a change of one unit within a zone. In over 96% of the cases there was no change between zones from the test to the retest.



The strong test-retest correlation and the small percentage of changes that fell beyond the standard error of measurement of the test point to the fact that the Kolbe index as an instrument yields reliable results. The next step would be to inspect the accuracy of the test or whether or not, the test actually measures conative characteristics.

**Summary:** Striving Instincts and Conative Strengths: Assessing the Test-Retest Reliability of the Kolbe A™ Index, by Dr. Angela Young

The Kolbe A Index is a psychological assessment that allows understanding of the conative domain of the mind. The conative domain includes subconscious instincts, that inner intuition and drive that we all have, and the actions that result from those instincts. The Kolbe A Index is comprised of 12 different measures that together, assess the conative domain. This index has been used by businesses, universities and government agencies to improve teamwork, productivity, organizational relationships, career development and communication. Importantly however, despite its wide use over many years, its reliability and validity has never been the subject of published research. The purpose of this study was therefore to assess the test-retest reliability of this psychological instrument.

Reliability is a measure of accuracy. The more similar the scores obtained by the same person taking the test at different times, the more reliable the test; and the longer the time interval between the test and retest, the greater the validity and reliability of the test. This study evaluated time intervals between 2 and 15 years in 282 subjects who had taken the test prior to July 2006. Of the 4 Action Modes® (Fact Finder, Follow Thru, Quick Start and Implementor), upon retest,

the great majority of participants remained in the same zone as they initially began. Moreover, changes in zones (Preventing, Responding and Initiating) which indicate an overall change in the way people tend to operate or behave were also not significantly different between the test and retest.

Over 60% of participants in each sub-sample remained in the same zone with few changes of 1 zone and rarely 2 zones. Of the 282 participants, only 3 scores (or 1.1% of the overall sample) reflected a 2-zone change in the Quick Start mode and 2 scores (or .7% of the overall sample) reflected a 2-zone change in the Implementor mode. Therefore, the bottom line finding of this study is that the Kolbe A Index is a highly reliable and accurate self-assessment tool which has great predictive value. Its use will provide organizations with a useful means by which to develop teams and individuals to maximize effectiveness.

For more detailed information regarding this study, please visit:

<https://e.kolbe.com/Test-Retest-Reliability-10-Year-Study>

## **B. Validation**

Two types of validity measures are used in order to establish the validity of the Kolbe index. The first is predictive validity in which tests are administered to applicants and scores are later correlated with performance measures. Another is concurrent study, where existing high performers are tested and cut scores are established on the basis of their results. The following studies illustrate the use of the Kolbe for validation and prediction in an accounting setting.

The Kolbe A index's use in selection is based on the hypothesis that the most successful employees in similar jobs tend to be predisposed to respond to similar environments in consistent ways. These patterns fall within a well-defined, measurable range, and these ranges, in turn, tend to be consistent with the behavioral expectations of the job identified by supervisors and cohorts. The expected distribution of conative energy in each mode is 20 percent resistant, 60 percent accommodating and 20 percent initiating – a normal bell curve.

## 1. Validation Study One - Accountants

In 1990, 99 successful certified public accountants from two internationally recognized accounting firms were selected by their employers to complete the Kolbe to identify the conative profile of a successful accountant. As expected, successful CPA's were more insistent in FF than the general population (49% compared to an expected 20%) and were more accommodating in FT (77% compared to an expected 60%) and less insistent in QS (11% compared to an expected 20%) and IM (2% compared to an expected 20%) than the general population.

## 2. Validation Study Two - Big Six Accounting Firm Turnover

This study compared the percentage of turnover between two groups of professionals within an internationally recognized accounting firm. Group 1 consisted of 30 professionals whose Kolbe scores indicated that they were mismatched for their positions. Group 2 consisted of 57 professionals whose Kolbe scores indicated a good match with their positions.

The turnover rate for Group 1, where the Kolbe scores indicated a job mismatch, was significantly higher than that of Group 2, where the Kolbe indicated a good job fit.

<b>Group 1</b>	Mismatch	47.5% Turnover
<b>Group 2</b>	No Mismatch	22.8% Turnover

## 3. Validation Study Three - Big Six Accounting Firm Job Performance

In another Big Six accounting firm study, performance ratings for 49 employees were compared with their Kolbe scores indicating the relative job match. The following table reflects results that indicate a significantly higher percentage of those with Low ratings were not matched to their jobs as contrasted with those with Mid to High supervisory ratings.

<b>Performance Rating</b>	<b>Percentage with a Job Mismatch</b>
<b>Mid to High</b>	40%
<b>Low</b>	69%

## 4. Validation Study Four - Meta-Analysis

A meta-analysis groups similar studies with objective performance measurements to reflect the viability of the test across multiple selection environments. This meta-analysis used the combined results of eight studies that were used to identify the conative profiles of objectively measured high performers in different fields (aerospace, sales, construction, insurance, etc.). The analysis employs the Winer Combined Test<sup>4</sup>.

<b>Study</b>	<b>n</b>	<b>r</b>	<b>t</b>	<b>M<sub>1</sub>-M<sub>2</sub></b>	<b>Significance</b>
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<sup>4</sup> Winer, B.J.(1971) Statistical Principals in Experimental Design (2<sup>nd</sup> ed.) New York: McGraw-Hill.

<b>A</b>	425	.86	34.668	.60	>.01
<b>B</b>	30	.90	10.925	.84	>.01
<b>C</b>	45	.69	6.216	.71	>.01
<b>D</b>	39	.95	18.502	.64	>.01
<b>E</b>	87	.93	23.325	.67	>.01
<b>F</b>	39	.81	8.402	.75	>.01
<b>G</b>	177	.68	12.269	.68	>.01
<b>H</b>	50	.58	4.934	.68	>.01

**Winer  $Z_c = 41.35$**

**Cohen ES = .67**

Since the studies were concurrent, high correlations were not unexpected, nor is the  $Z_c$  of 41.35, all of which are significant at the .001 level. However, of perhaps greater interest is the measure of effect size, which compares the observed correlations with established population values. Using Cohen's equation for effect size where  $d$  = the effect size index for t-tests of means in standard units,  $M_1$  and  $M_2$  = population means in original measurement units, and  $r$  = the standard deviation of either population<sup>5</sup>, and assuming the Kolbe's use as a selection instrument, the effect size would be .67. Although no absolute standards exist for effect size, anything over .5 is considered significant<sup>6</sup>.

These studies demonstrate both the predictive reliability and validity of the Kolbe index. The next section focuses on how the index measures up to legal standards for applications in business settings.

### **III. Legal Compliance - Kolbe and Federal Law**

Consistent with the requirement for job-specific validation, the Kolbe is a non-subjective criterion-based test whose criteria may be correlated with job-specific criteria (such as sales productivity, absenteeism, etc.) through correlating scores with objective criteria reflecting job-related criteria. For an application of the legal principles for employment and advancement, as well as government guidelines, standards and case law to the Kolbe index see Appendix D. For a more detailed description of how the Kolbe system is used in selection see Appendix E.

#### **A. Compliance Studies**

The Kolbe index is a bias-free instrument, both in its more general use, and as a tool assisting in personnel-selection processes for specific jobs. Consistent with the US Civil Rights Act of 1991 that prohibits discrimination in the work place and makes it punishable by law, the Kolbe index does not differentiate on the basis of the group to which an individual belongs. Evidence of the lack of bias of an instrument used for general selection purposes is not sufficient according to the law, in order to establish the lack of bias of that instrument in a specific job. The Kolbe selection

<sup>5</sup> Cohen, J.(1977) Statistical Power analysis for the Behavioral Sciences(rev. ed.) New York: Academic Press.

<sup>6</sup> Supra

system ensures that, consistent with EEOC Guidelines, the Kolbe index will not select any race, national origin, gender, age, or disability less than 80% as frequently as the most frequently selected group.

## **1. Initial Kolbe Study**

Dr. Robert T. Keim of the Decision Systems Research Center of Arizona State University conducted an extensive study on bias and the Kolbe instrument in 1990, in which he examined 4030 Kolbe results which were broken down into 17 groups reflecting common conative patterns similar to job selection criteria.

Study samples were drawn from the database of Kolbe Corp. Because the Kolbe index has been predominantly used in the corporate management environment and with smaller entrepreneurial firms, the number of middle-aged white males is over-represented. For the same reasons, the number of insistent Implementor profiles used in analyses represent a smaller percentage of the database than is reflected in the general population. The database included profiles obtained from respondents worldwide, but a preponderance of the profiles are from individuals currently residing in the United States.

Dr. Keim initially performed analyses of variance with each of the four conative instincts as dependent variables and the independent variable being race, gender or age. In 65 out of 68 analyses of variance, the results showed that at the .05 level of significance the differences in scores on the Kolbe could not be attributed to the dependent variables of race, gender or age. For the three values where the initial analysis of variance did not provide conclusive results, a Chi Square analysis was conducted by computing a Chi Square base-model value for each with gender, race and age. Subsequent analyses of variance and Chi Square values were computed leaving out each of the independent variables. Comparisons between the base-model values and the subsequent values demonstrated that in no case do the independent variables of race, gender or age explain differences in scores. Dr. Keim concluded that "at the Alpha=.05 level the Kolbe is not biased by gender, age or race."

## Gender

Evaluation of the intensities by Action Mode for a group of 1447 males and 1125 females who took the Kolbe index in Ms. Kolbe's book *The Conative Connection* revealed remarkably similar distributions.

Gender	Mode	Mean Score	Std Deviation
Male	FF	6.164	.372
Female		6.136	.344
Male	FT	3.665	1.071
Female		3.621	1.074
Male	QS	7.547	.625
Female		7.575	.607
Male	IM	2.882	.896
Female		2.917	.925

The results again support that neither gender is more likely to follow a particular pattern of scores. The frequency table is presented below:

Mode	Gender	% Initiate	% Accommodate	% Resist
<b>FF</b>	Male	34.14	53.28	12.58
	Female	33.60	52.80	13.60
<b>FT</b>	Male	19.56	51.69	28.75
	Female	22.22	53.33	24.44
<b>QS</b>	Male	38.77	32.07	29.16
	Female	40.71	33.78	25.51
<b>IM</b>	Male	12.23	48.86	38.91
	Female	8.36	47.38	44.27
<b>TOTAL</b>	Male	26.17	46.48	27.35
	Female	26.22	46.82	26.96

## Age

For the sake of simplicity and due to an informal demarcation line used in business and industry separating those workers 40 years of age and under from those over 40, the database was sorted into these two age groups for evaluation. Because of a significant difference in the size of each sample, the table below reports the percentage of each group classified by their scores into Natural Advantage categories.

<b>NATURAL ADVANTAGE</b>	<b>% 40 AND UNDER</b>	<b>% OVER 40</b>
<b>Fact Finder</b>	9.84	9.04
<b>Fact Finder / Follow Thru</b>	20.20	19.27
<b>Fact Finder / Quick Start</b>	5.74	6.70
<b>Fact Finder / Implementor</b>	1.65	1.38
<b>Follow Thru</b>	3.10	2.84
<b>Follow Thru / Fact Finder</b>	7.11	5.98
<b>Follow Thru / Quick Start</b>	0.58	0.47
<b>Follow Thru / Implementor</b>	1.40	1.27
<b>Quick Start</b>	15.91	20.24
<b>Quick Start / Fact Finder</b>	7.42	9.35
<b>Quick Start / Follow Thru</b>	1.32	1.49
<b>Quick Start / Implementor</b>	2.91	2.78
<b>Implementor</b>	2.17	2.01
<b>Implementor / Fact Finder</b>	1.23	0.83
<b>Implementor / Follow Thru</b>	1.11	0.41
<b>Implementor / Quick Start</b>	0.82	0.74
<b>Mediator</b>	17.49	15.19

## Race

As with the age groups, the disparity in group sample sizes between whites and non-whites identified in the Kolbe database was such that the most obvious meaningful comparisons are to be seen in frequency data. The table below details the similar percentage of each group who were classified by Kolbe results into Natural Advantage categories.

<b>NATURAL ADVANTAGE</b>	<b>Whites</b>	<b>Non-White</b>
<b>Fact Finder</b>	10.03	11.95
<b>Fact Finder / Follow Thru</b>	22.17	28.15
<b>Fact Finder / Quick Start</b>	6.26	4.09
<b>Fact Finder / Implementor</b>	1.52	2.78
<b>Follow Thru</b>	3.04	3.44
<b>Follow Thru / Fact Finder</b>	6.00	9.66
<b>Follow Thru / Quick Start</b>	0.53	1.31
<b>Follow Thru / Implementor</b>	1.40	1.47
<b>Quick Start</b>	16.79	7.04



<b>Quick Start / Fact Finder</b>	8.01	4.58
<b>Quick Start / Follow Thru</b>	1.58	0.82
<b>Quick Start / Implementor</b>	2.66	1.31
<b>Implementor</b>	1.78	1.64
<b>Implementor / Fact Finder</b>	0.00	0.00
<b>Implementor / Follow Thru</b>	0.99	0.49
<b>Implementor / Quick Start</b>	0.53	0.65
<b>Mediator</b>	16.70	20.62

## National Origin

Comparisons between those born in the United States and natives of countries other than the USA reveal the most startling information from a statistical viewpoint. When a mode-by-mode distribution of insistence, accommodation and prevention is compared for respondents of US and non-US origin, the results show there are no statistically significant differences. The study included 10,124 respondents of US origin and 1,182 of non-US origin. The charts below reflect the percentage of respondents in each mode by zone of intensity. Country of origin clearly does not influence the distribution of Kolbe results.

	% Initiate		% Accommodate		% Resist	
	US Origin	Other	US Origin	Other than US	In the US	Other than US
<b>FF</b>	39.29	40.61	51.10	50.00	9.61	9.39
<b>FT</b>	20.89	26.40	55.81	52.37	23.30	21.24
<b>QS</b>	36.08	32.66	35.40	34.35	28.52	32.99
<b>IM</b>	6.87	6.60	49.03	48.39	44.09	45.01
<b>TOTAL</b>	25.79	26.57	47.83	46.28	26.38	27.16

## 2. General Selection Study

In a subsequent selection-bias study performed in 1992, 24,416 Kolbe results were studied. The Kolbe results were cross-tabulated by each of 51 professions and 10 professional levels. In each profession and level in which there was an adequate minority sample (30 or more) the data was analyzed to determine whether the Kolbe would have selected any minority group (determined by the federally protected categories of race, gender and age) less than 80% as frequently as the most frequently selected group (the criteria for adverse impact established by the EEOC). In no category in which there was an adequate minority sample would the Kolbe have adversely selected on minority status. There was no evidence that the Kolbe would have an adverse impact on any minority group if used as part of a properly designed selection process.

## B. Statistical Study

### 1. Specific Selection Case Study

In a later study for a Fortune 500 company selecting entry-level employees, the researcher established suggested cut scores, then monitored applicants scores to determine whether the instrument would result in any racial group or gender bias by any group being selected less than 80 percent as often as the most frequently selected groups. To determine selection the acceptable scores were pooled and the relationship to the most frequently selected was used to determine whether there was any group selected less than 80 percent as frequently as the most frequently selected group.

The study established that there were no significant differences in the cell frequencies for the cut score cells for the respective racial and gender groups. Consequently the Kolbe would be unlikely with this population to select any group 80 percent less frequently than any other group. See Appendix F for detailed data.

## **IV. APA Compliance**

### **A. Conform to Testing Standards - Validity Issues**

The most widely used professional standards for selection testing are the American Psychological Association's (APA) *Standards for Educational and Psychological Testing*<sup>7</sup>. To clarify Kolbe's compliance with those standards, each major applicable standard is cited in italics before the explanation of Kolbe's compliance.

#### **1. APA Standard 1.1**

*Evidence of validity should be presented for the major types of inferences for which the use of a test is recommended. A rationale should be provided to support the particular mix of evidence presented for the intended use.*

See above for validity studies on the Kolbe system.

#### **2. APA Standard 1.3**

*Whenever interpretation of sub-scores, score differences, or profiles is suggested, the evidence justifying such interpretation should be made explicit. Where composite scores are developed, the basis and rationale for weighing the sub-scores should be given.*

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<sup>7</sup> American Educational Research Association, American Psychological Association, National Council on Measurement in Education, 1985. Hereinafter referred to as "Standards."

## Conative Measurement

The Kolbe asks subjects to choose one of four answers reflecting how they would be most and least likely to respond to 36 single-sentence problem-solving scenarios. The scores are given in a ten-interval scale for each mode that reflects the subject's natural tendencies to insist, accommodate, or prevent behavior in that mode.

The composite of the scores from the four action modes is called an individual's "Modus Operandi" (MO) and is a conative reflection of the individual's instinctive strengths. Typically an individual will have one mode in which they insist (a score of 7 or above) and one in which they resist (a score of 3 or below). There are some individuals whose Kolbe scores reflect accommodation (a score of 4 to 6) in all modes. This may either be because they are individuals who instinctively facilitate the insistence or preventive behavior of others, or because they, due to some form of pressure, are experiencing a period of transition in which their instinctive responses are being thwarted by significant stress. The scores are normally distributed across the general population with approximately 20% of the general population insistent or resistant in any mode and 60% accommodating.

As will be seen below, research studies illustrate successful employees in similar jobs tend to have results on the Kolbe index, which fall within a well-defined "range of success." These ranges, in turn, tend to be consistent with the conative or functional expectations of the job identified by the employee on a companion test, the Kolbe B™, or supervisors and cohorts on another companion test, the Kolbe C™. Such ranges have proven to be valid predictors of employee success in job-related criteria, and employer and employee satisfaction.

### 3. APA Standard 1.11

*A report of a criterion-related validation study should provide a description of the sample and the statistical analysis used to determine the degree of predictive accuracy. Basic statistics should include number of cases (and the reasons for eliminating any cases), measures of central tendency and variability, relationships, and a description of any marked tendency toward non-normality of distribution.*

### Illustrative Range of Success Studies

The following section provides range of success studies for four specific professions (engineering, marketing managers, manufacturing sales, and construction) in order to demonstrate how each range is customized to a particular profession or job.

#### *Engineering*

In 1992, a sample of professionals engaged in engineering careers (n=124) completed the Kolbe to identify the conative profile of a successful engineer. As expected, compared to the general population the group was more insistent in FF, reflecting the need to research and gather data and resistant in QS, reflecting the need to avoid taking risks.

#### Engineering By Action Mode by Zone

	<b>Insist</b>	<b>Accommodate</b>	<b>Prevent</b>
<b>FF</b>	41.94	50.81	7.26
<b>FT</b>	19.35	66.94	13.71
<b>QS</b>	19.35	27.42	53.23
<b>IM</b>	14.52	62.90	22.58

### *Marketing Managers*

In 1988, a sample of marketing managers (n=55) attending the International Convention of Meeting Planners completed the Kolbe to identify the conative profile of a successful marketing manager. As expected, compared to the general population, the group was more insistent in FF, reflecting the need to research and gather data and in QS, reflecting the conative need for risk taking.

### Marketing Managers By Action Mode by Zone

	<b>Insist</b>	<b>Accommodate</b>	<b>Prevent</b>
<b>FF</b>	31	55	14
<b>FT</b>	9	64	21
<b>QS</b>	45	44	11
<b>IM</b>	0	44	56

### *Manufacturing Sales*

In 1992, a sample of manufacturing salespeople (n=164) completed the Kolbe to identify the conative profile of a successful manufacturing salesperson. As expected, compared to the general population, the group was more insistent in QS, reflecting the need to take risks, change their approach or try new methods. This sample was also resistant in IM and showed considerably less insistence in FT than the general population.

## Manufacturing Salespeople By Action Mode by Zone

	<b>Insist</b>	<b>Accommodate</b>	<b>Prevent</b>
<b>FF</b>	39.63	52.44	7.93
<b>FT</b>	9.15	67.07	23.78
<b>QS</b>	45.12	35.37	19.51
<b>IM</b>	2.44	50.61	46.95

### *Construction Workers*

In 1992, a sample of construction workers (n=100) completed the Kolbe to identify the conative profile of a successful construction worker. As expected, compared to the general population, the group was more resistant in QS reflecting the need for avoiding taking risks.

## Construction Workers By Action Mode by Zone

	<b>Insist</b>	<b>Accommodate</b>	<b>Prevent</b>
<b>FF</b>	35	58	7
<b>FT</b>	19	57	24
<b>QS</b>	31	28	41
<b>IM</b>	16	55	29

### **Consequences of Individual Conative Dissonance**

The Kolbe helps to identify each individual's instinctive strengths. For example, an individual with a score of 8 in Fact Finder would insist in probing for information in resolving a problem. An individual with a score of 5 would accommodate some probing for information. Although they would initiate behavior primarily in another mode, that behavior would be informed by their own or other's probing for information. An individual with a score of 2 in Fact Finder would prevent extensive probing for information and would initiate behavior in another mode without much reliance on either their own probing for information or the probing of others. The first individual would be well suited to a task, like a physician, where gathering extensive information is necessary for making solid judgments. The second individual might be better suited to a profession like a labor negotiator where gathering facts is important, but is secondary to the processes of developing alternatives and facilitating compromises. The third individual would be well suited to a job in which it is more important to "see the forest than the trees," like a visual artist who may initiate behavior in patterning or demonstrable ways rather than by probing for additional facts.

As the Fact Finder examples suggest, a higher score in a given mode may not be an asset for a particular job. Nor is it possible to change a Kolbe score through practice or learning. Instincts are constant and each individual has a similar quantity of mental energy associated with those instincts. Working against instinctive strengths can deplete mental energy in unproductive ways.

As illustrated by the following research, if an individual employee is in a job which represents a poor conative fit, they may experience strain due to unrealistic conative self-expectations or tension due to the unrealistic conative expectations of others.

### *Absenteeism*

In a study conducted in 1992, 60 employees from a national marketing firm, half of whom had the highest absenteeism in the company and half of whom had the lowest absenteeism were studied. Each employee completed an individual Kolbe index and a Kolbe B index for their own position. The supervisor of each employee also completed a Kolbe C index for the employee's position. The results of the study indicated that fifty percent of the high absenteeism group were experiencing conative stress while only 20% of the low absenteeism employees were experiencing similar stress. Years of employment and gender were analyzed to ensure that they were not confounding factors in the results. The results indicated no differences in absenteeism in this study between those who had been employed more than two years and those who had been employed fewer than two years nor were there significant differences based on gender. While some other factors may have contributed to absenteeism, neither length of employment or gender proved to be significant factors, but 30% of the difference in absenteeism was attributable to conative factors.

In a study completed in 1992, 50 staff-level employees were selected by a national food processing company to study absenteeism. The employees were all rated on a three-point scale for absenteeism during 1990. There were 16% of the employees in the medium to high range of absenteeism representing more than one week off during the previous year. Of that group, 62.5% were experiencing conative tension or strain, a rate more than three times that of the rest of the group.

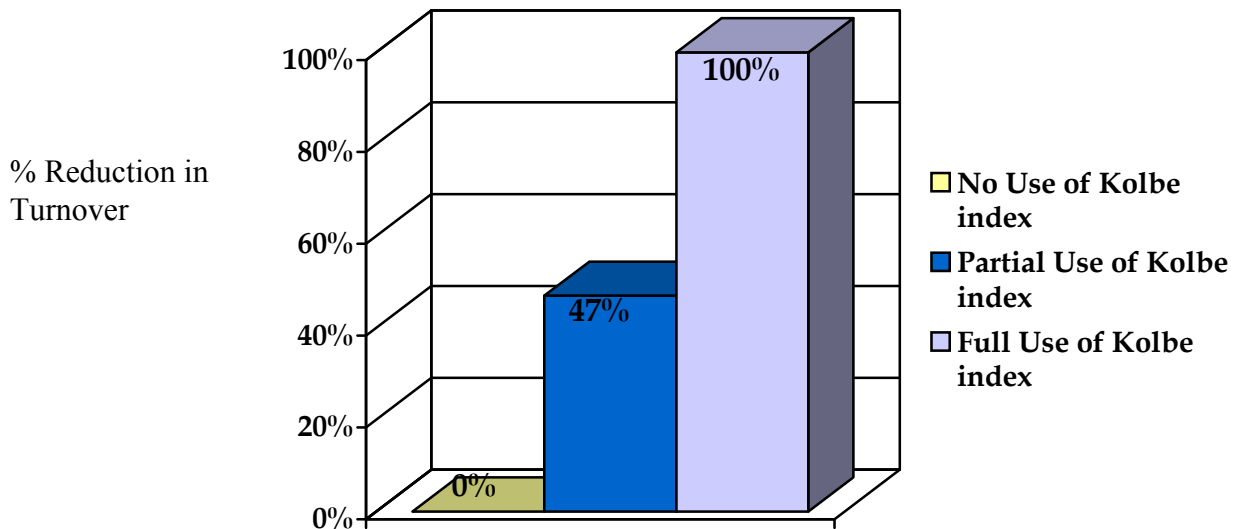
## **Conative Stress as a Predictor of High Absenteeism**

### *Retention*

Dr. Richard S. Deems, an independent Kolbe consultant, conducted a study in 1991 in which he used the Kolbe to predict branch manager turnover in a national financial services company. His study included all 483 branch manager trainees hired in 1991 who were divided into three approximately equal groups: 1) a control group which was not given the Kolbe, 2) a study group of trainees given the Kolbe whose scores fell outside the recommended range but whose managers were trained in conation to respond to the conative dissonance, and 3) a study group of trainees whose scores fell within the recommended range. At the end of six months, 11.7% of the group that had not used the Kolbe had left the company for job-related reasons, 5.5% of those who were conatively mismatched, but whose managers tried to mitigate the conative dissonance by using the trainee's Kolbe results had left for job-related reasons, and none of the conatively-

matched trainees left for job-related reasons. Dr. Deems concluded, "Selection within the recommended Kolbe range resulted in 100% retention of the desired Branch Manager-trainees."

### Use of Kolbe Index Reduction of Turnover



### Consequences of Team Conative Dissonance

If the employee functions as part of a team, mental energy may be dissipated through conative conflict due to polarization, which results from members of a team having significantly different conative approaches to resolving problems and there are not team members who can serve as a bridge through accommodating their disparate approaches. Unproductive use of team mental energy can also result from inertia -- too many team members who all approach a problem in the same way. The best conative teams are those that are comprised of an appropriate conative balance to provide the optimal opportunity for synergy between the conative approaches. An inappropriately conatively constituted team may melt down and prove wholly ineffectual despite significant cognitive skills or affective good will.

### *Innovation Teams*

In a study conducted at the University Chicago School of Business in 1990, 53 students in an entrepreneurship course participated in groups which were administered the Kolbe and then placed into three groups. The first group had all insistent Fact Finder, the second group all insistent QS and the third group was structured for conative synergy. As predicted, the first group probed for additional information and were deliberative and evaluative, but were unable to complete the designated group task. The second group was similarly unable to accomplish their task, but their instinctive drive to innovate, improvise, and experiment was responsible for their inertia. As predicted, the third group, which had each conative insistence and resistance represented, was the most successful in accomplishing the assigned task, since they were able to utilize the different strengths of group members in collaboratively meeting the group goal.

Using the Kolbe as a selection instrument allows an employer to ensure that an employee is in a position in which they will not experience conative stress due to conative requirements that they cannot instinctively meet.

#### **4. APA Standard 1.12**

*All criterion measures should be described accurately, and the rationale of choosing them as relevant criteria should be made explicit.*

Since Kolbe results reflect the way in which tasks are performed, Kolbe results can be correlated with any job-related criteria. The criteria used in the cited validation studies above have been job-related criteria chosen by employers. These studies relied on objective criteria (absenteeism, attrition, sales volume) rather than subjective evaluations of supervisors or others. It is possible to utilize subjective criteria in validating the Kolbe in a particular job setting, however, employers are urged to review their criteria to ensure that such criteria actually reflect important measures of job-related success, rather than affective assessments.

#### **5. APA Standard 1.16**

*When adequate local validation evidence is not available, criterion-related evidence of validity for a specified test may be based on validity generalization from a set of prior studies, provided that the specified test-use situation can be considered to have been drawn from the same population of situations on which validity generalization was conducted.*

A concurrent study is conducted by determining the conative characteristics of high and low performers presently employed in a position and the conative expectations of supervisors to identify an appropriate conative range for selection of future employees. Such a study can be performed relatively quickly and inexpensively. The Kolbe tests instincts, not skills or acquired attributes, and the results have high test/retest reliability. These characteristics obviate one of the major concerns about using a concurrent study: that the test may measure job-acquired skills and is therefore not a measure of aptitude but of performance. Since individual conative criteria do not change with job experience, a conative concurrent validation study allows an applicant's conative profile to be compared to the conative requirements of the position without concern about unfairly selecting against the applicant's potential for future change.

In a predictive validation study new employees are conatively tested at the time of selection and then their results are compared to their job-related performance after a period of time, typically six months or more. A conative profile for future selection is developed by identifying those employees whose Kolbe results at the time of hire would have predicted high performance and correlating their Kolbe results with the conative expectations of their supervisors.

Concurrent or predictive validation studies are appropriate where an employer hires a relatively large number of employees into a single job category each year. However, many jobs are unique and are filled infrequently. To help an employer in such a circumstance, Kolbe Corp has developed a system for validation generalization for the Kolbe based on industry accepted Bayesian techniques which allows conative criteria for a unique job to be generalized from existing data for similar positions. By using the conative characteristics identified by coworkers and supervisors, together with conative criteria identified through a conative job analysis, a



conative range for selection can be identified which will predict high performance and enhance the conative strength of the employee group.

Bayes Theorem is a theory of probability. It is premised on the concept that the probability of an outcome is affected by subsequent knowledge. Bayes Theorem provides a way of translating instinctive response into a statement of increased probability. The theorem states that probability is equal to the initial or prior likelihood multiplied by the likelihood derived from subsequent experience. When a large-scale conative validation on a replicable job is performed, it is possible to determine with a high level of confidence that the range of tolerance will not select anyone who is not well-suited conatively for the job. For example, if a validation that included 70 Kolbes were performed there would be less than a 5% likelihood that a correlation of .23 would occur by chance. With a unique position, which has a validation that includes only 5 Kolbes, the correlation would have to be .88 before you would have similar confidence that it had not occurred by chance. This difference is due to the large disparity between the sizes of the populations involved in the validation study. When performing a validation for a unique position, a Bayesian algorithm is used to strengthen the statistical power of the identified correlations. For example, if the initial correlation for a unique position as a personal assistant were .45 for a FF range of 4 to 7, and the tested population, or "n" were 7, the statistical likelihood that such a correlation is a result of chance would be .5. If the likelihood that conative correlation for a unique position were modified by using likelihood from conatively similar job families, then the predictive strength of the correlation might be significantly improved from .5 to .95.

## **6. APA Standard 1.20**

*Investigations of criterion related validity for tests used in selection decisions should include, where feasible, a study of the magnitude of predictive bias due to differential prediction for those groups for which previous research has established a substantial prior probability of differential prediction for the particular kind of test in question.*

Federal law requires employers to prove that their employment practices are 1) unbiased because they create no "disparate impact" upon a protected minority group or 2) that their biased practice(s) are good predictors of job success, and no less discriminatory options are available. See Appendix II for the studies reflecting Kolbe's compliance with Federal Standards.

## **7. APA Standard 1.24**

*If specific cut scores are recommended for decision making (for example in differential diagnosis), the user's guide should caution that rates of miscalculation will vary depending on the percentage of individuals tested who actually belong in each category.*

The Kolbe, with its associated cut scores for selection, cannot obviate the effect of prior selection processes including recruitment techniques, resume screening, cognitive or affective testing and/or interviewing. Any one of the other selection procedures may have the effect of limiting the number of applicants with a particular conative profile, and such limitations may result in a skew of the cut scores in a validation study or may result in some skew on selection of applicants. In order to minimize the impact of such errors, the validation process relies not only

on the Kolbe scores of successful and unsuccessful employees, but on independent identification of conative requirements through the Kolbe B and C indexes.

## **B. Conform to Testing Standards - Reliability and Errors of Measurement**

### **1. APA Standard 2.1**

*For each total score, sub-score, or combination of scores that is reported, estimates of relevant reliabilities and standard errors of measurement should be provided in adequate detail to enable the test user to judge whether scores are sufficiently accurate for the intended use of the test.*

See above for reliability studies for the Kolbe system in sections II and III.

### **2. APA Standard 2.2**

*The procedures that are used to obtain samples of individuals, groups, or observations for the purpose of estimating reliabilities and standard errors of measurement, as well as the nature of the populations involved, should be described. The numbers of individuals in each sample that are used to obtain the estimates, score means and standard deviations should also be reported.*

See above for the details on the reliability studies on the Kolbe system in section II.

### **3. APA Standard 2.3**

*Each method of estimating a reliability that is reported should be defined clearly and expressed in terms of variance components, correlation coefficients, standard errors or measurement, percentages of correct decisions, or equivalent statistics. The conditions under which the reliability estimate was obtained and the situations to which it may be applicable should also be explained clearly.*

Test/retest reliability of the Kolbe was discussed in section IIA.

## **V. Predicting Performance**

The ability of the Kolbe index to predict how an individual will perform in a particular role is evidenced by the studies described in this section. The studies are representative of both the Kolbe Forecast™ and RightFit™ programs for use in analyzing team dynamics and recruitment of high performers.

### **A. Kolbe Forecast™**

In 1997, a division of a major chemical producer performed a retrospective analysis of twelve teams using the Kolbe Forecast software. The results were quite remarkable.

Kolbe analyzed the teams with the Forecast software and generated the figures displayed below. The company then provided Kolbe with its own internal ratings and rankings of the teams. This internal rating was based solely upon the extent to which each team reached its stated goals and

objectives during the evaluation period. The chemical company identified three groups consisting of high performers, mid-performers and poor performers.

<b>Chemical Company Teams</b>	<b>Kolbe Viability Rating</b>	<b>Kolbe Rank</b>	<b>Company Rating</b>	<b>Eastman Rank</b>
<b>Team Four</b>	93	1	100	1
<b>Team Nine</b>	90	2	100	2
<b>Team Five</b>	89	3	100	3
<b>Team Three</b>	82	5	100	4
<b>Team One</b>	83	4	100	5
<b>Team Two</b>	74	9	100	6
<b>Team Ten</b>	80	6	100	7
<b>Team Eight</b>	76	8	93	8
<b>Team Twelve</b>	78	7	84	9
<b>Team Eleven</b>	59	11	59	10
<b>Team Seven</b>	50	12	100	11
<b>Team Six</b>	53	10	90	12

Kolbe found a strong correlation between the Forecast results and the rankings done by the division executives. Forecast predicted with amazing accuracy which teams would have a high probability of success and which ones would not. Furthermore, the program also accurately identified both the top and bottom performers in the group.

One Eastman executive commented on the accuracy of the Forecast results:

*"We were surprised that they were as close to what we had foreseen in real life as they were. We were assuming they would have a ballpark accuracy, but it was much closer than that. We would have been satisfied with ballpark."*

Based upon the retrospective analysis, Eastman has decided that in the future they will not put a team to work until they have evaluated the Forecast projections:

*"I'm a big believer in team success. Teams that are successful help morale, productivity and bottom line results. In this world today, in every part of our lives, we work in a team environment. What got me excited is that here is a tool that can help us increase the number and the likelihood of success of groups of people we put together. What we would do is propose a team and do the forecast to determine their probability of success and then decide whether to go forward or make adjustments.."*

The benefit for any company is the ability to examine how a team will perform prior to its inception. Rather than waiting until the team is assembled and dealing with the problems later, Forecast allows you the opportunity to predict performance and make adjustments to team configurations before the problems arise. This can increase the probability of success for a team dramatically and often results in both time and cost savings. As one Eastman executive put it:

*"To me, Forecast gives us the capability to meet projects on schedule and within budget more effectively. Ten to 20 percent overruns are not unusual in projects. I think using Forecast, you can increase the likelihood of not having that 10 to 20 overrun in cost. I don't know anyone who would turn down a 10 to 20 percent improvement in project completion capabilities."*

**Summary:** Forming Effective Teams in a Workplace Environment, By Erin Fitzpatrick

The need for effective teams in a growing and competitive global market is increasing. Companies have a given labor pool, and the need to segregate this pool into efficient functional teams is necessary if they are to compete and succeed in the present economy. The Master's Degree thesis by Erin Fitzpatrick addresses this need, and the effectiveness of the Kolbe Wisdom™ measure in assessing personality traits in the optimal formation of workplace teams. Thus, the goal of the present study was to analyze the accuracy and usefulness of the Kolbe Wisdom.

Study participants were students (approximately 40) enrolled in a University of Arizona course. Throughout the semester, students performed two independent projects in groups of four. They were asked to complete the Kolbe A™ Index questionnaire, and their responses were tabulated and used later to predict team performance. Skill groups were formed based on known GPAs which were divided by quartiles. The WAREwithal® software, provided by Kolbe Corp, was used to predict the performance of the teams based on viability, profitability and goal attainment.

In project 1, there was a positive correlation between the results of student projects and the Kolbe Wisdom's profitability measure and viability, whereas there was less correlation between team scores and goal attainment. The latter was likely due to the fact that GPAs were not entirely reflective of student capabilities, and therefore skill levels were not evenly distributed among groups.

After redistribution of group members based on input from the course instructor to indicate skill levels, predictions made for project 2 using the Kolbe measures were better on every criterion. The behavior of individual students within groups was also evaluated; evidence of the predictive abilities of the Kolbe Concept with respect to particular individuals and team behaviors was also found. There was a strong correlation between the Kolbe Concept measures and actual team performance.

The predictions that were made using the Kolbe measures were better on every criterion: the correlation was .8181 for Viability, .8624 for Profitability, and .6033 for Goal Attainment. The bottom line finding of this study was that the Kolbe metrics are effective in guiding team formation.

For more detailed information regarding this study, please visit:  
<https://e.kolbe.com/University-Arizona-Research-Forming-Effective-Team>

## **B. Selected Kolbe Predictive Reliability Case Studies**

### **Case Study One: Semi-Conductor Managers**

#### Population (N=64)

Participants in this study were members of a defense contracting division of a large multi-national semi-conductor company. All 64 employees of the top three management levels in the division were included in this blind study.

#### Process

In all, 64 employees completed the Kolbe A index in private during working hours. In addition, every manager completed a Kolbe C index to determine the conative requirements for each job at all three levels of management. Managers did not learn the results of either instrument until after the study was completed. The results of both indexes were calculated, and the score for each participant was compared to the requirements of his job as identified by his manager and quantified by the Kolbe C index. The comparison yielded a rating for each participant of how closely their conative traits as identified by the Kolbe A index matched with the Kolbe C index results. Next, the researcher considered performance evaluations by managers completed prior to the introduction of the Kolbe research. The evaluations were completed according to a standard used throughout the company, and included checklists covering job related skills (cognitive) and attitudes (affective).

## Results

Three participants had the highest disparity between Kolbe A and C results. Each was a manager responsible for the fulfillment and monitoring of government regulations in bidding and assuring defense contract compliance. All three of these individuals had significant differences between their Kolbe A and C results in the Follow Thru Action Mode. In all three cases, the participant was preventative in the Follow Thru mode in their Kolbe A result. The Kolbe C index results for all three identified their jobs as requiring initiation in the Follow Thru Action Mode. The fact that the three worked together and shared the conative misalignment, magnified the potential for problems related to the list of the requirements in Follow Through to: design systems, develop procedures, organize materials and presentations, and follow guidelines<sup>8</sup>.

Unknown to Kolbe, prior to completing the Kolbe index and unknown to the employees when they completed the index, the unit these three managers lead was found to be in non-compliance with government regulations. The company later was given steep fines and reprimands by the federal government. Two of the three managers singled out by the Kolbe analysis as having the most divergence between their Kolbe A index and Kolbe C index results for their job were terminated for cause as a result of the non-compliance with government regulations. The third was removed from this division and demoted to a training role in a non-business unit.

The fourth greatest disparity between Kolbe A and C results in this study was found in a manager leading an engineering group. His Kolbe A results indicated that he initiated at the 9 level in Quick Start, the Kolbe C index indicated that his job demanded preventative Quick Start results (a score of 2 on the Kolbe index scale). A performance evaluation of this manager completed prior to collection of data by Kolbe stated that the manager “oversold” production capabilities and promised “impossible deadlines.” Both the ability to sell and the need for a sense of urgency regarding deadlines are characteristics identified by the Kolbe A index as being found in people insistent in the Quick Start Action Mode, which was this manager’s result. Both qualities were indicated on the Kolbe C result as undesirable.

This manager was one of the few people with involuntary termination in year eight of the study. These four individuals had the greatest difference between the Kolbe A and C results. The actions of the first three had preceded the beginning of the Kolbe research and had been under investigation prior to the completion of either the A or C indexes. The lengthy investigatory process that resulted in their termination or demotion was done by individuals with no knowledge of the Kolbe project. Therefore, Kolbe results did not influence those outcomes. While the study has not yet been completed, the data collected to date indicate that these four individuals represent a significantly disproportionate share of the total number of managers removed from the company for inferior job performance.

### **Case Study Two: Semi-Conductor Engineers**

#### Population (N=86)

Participants in this study were members of a defense contracting division of a large multinational semiconductor company. There were 86 engineers who had been with the company an

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<sup>8</sup> See Kathy Kolbe (1993) *Pure Instinct* (New York: Random House) for listing of conative characteristics by mode and zone.

average of 15 years and had been placed on a new unit responsible for developing products which would go online in three to fifteen years. All of the engineers had outstanding academic records and were originally selected based upon being in the top 5% of their university classes. Each had similar job responsibilities according to Human Resources documentation.

### Process

The respondents completed the Kolbe A index privately during their work day and received their computer generated results in a feedback session. Ninety-five percent confirmed they functioned in the manner indicated on their Kolbe results. The remaining five percent included only those whose Kolbe results indicated they were in a period of transition meaning they were in a period where they could not report natural inclination. Management was not given Kolbe A results for any employees and the results did not go into the participants' personnel files. The group was tracked for one year to determine success in the new environment.

### Results

The results from the 86 engineers were compared to the general population expected results of<sup>9</sup>:

- 20% initiating action in each of the four Kolbe Action Modes,
- 60% responding to people and situations through each mode and,
- 20% preventing problems through resistance to taking action in each of the modes.

*Kolbe A index Results for Defense Contracting Engineers: (N=86)*

	<b>Fact Finder</b>	<b>Follow Thru</b>	<b>Quick Start</b>	<b>Implementor</b>
Prevent	2%	6%	53%	34%
Accommodate	45%	49%	39%	63%
Initiate	53%	45%	8%	3%

This group was over 2 ½ times more insistent in Fact Finder and preventative in Quick Start than the general population. In Follow Thru the group was twice as insistent, while in Quick Start and Implementor half as insistent as the general population<sup>10</sup>.

Two respondents, engineers X and Y, had results outside one standard deviation of the norm in two or more modes. Engineer X showed the greatest difference from this division's norm by being preventative in Fact Finder and preventative in Follow Thru and initiating in both Quick Start and Implementor. Engineer Y was the other significantly different member of the group. He was responding in Fact Finder, preventative in Follow Thru, initiating in Quick Start and preventative in Implementor.

At the beginning of the project Engineer X sought permission to develop a unique scheme for a significantly new product development plan. Within six months, his colleagues reported he was not functioning according to procedures, was over budget and not conforming to company or team policies. By the eighth month he was terminated by the company. Engineer Y was

<sup>9</sup> See *Pure Instinct* for statistical support of this statement.

<sup>10</sup> With an N=68 in this study, variances of up to two and a half times the norm are statistically significant.

removed from the team in month ten for noncompliance with federal regulations and disciplined by removal to a lower level assignment. After one year, Engineers X and Y were the only two of the original engineers who had left for poor work performance as identified by the company; all other participants had either been promoted, retained in their roles or reached retirement age.

### **Case Study Three: Air Force Pilots**

#### Population

This blind study included 94 pilots at Luke Air Force Base, of where 30 were Long Term Fighter Pilots (LTFP), 26 were Short Term Fighter Pilots (STFP) and 29 were Trainee Pilots (TP). All groupings were determined by the United States Air Force. Pilots in Group One, the LTFP, and Group Two, the STFP, were defined as “successful” by standards established by the Air Force that included assessment of skills, performance of specified tasks and maneuvers as rated by peers and superiors in the Air Force. All groupings and evaluations were made prior to introduction of the Kolbe instruments or results to the Air Force. To qualify for Group One pilots were required to have a minimum of 10 years continuous service as pilots, while Group Two’s pilots were required to have between 4 and 6 years of service. Group Three was chosen randomly from the then-current pilot training class by executive staff members. Pilots in this group completed the Kolbe A index during their first week of the pilot training program. The total pool of pilot trainees from which Group Three of this research was chosen had previously participated in standard Air Force selection and assessment programs which included both cognitive and affective instruments and interviews. They also had met rigorous physical standards. Members of both Groups One and Two had all previously been selected for and completed the same training program.

#### Process

All members of the three groups completed the Kolbe A index privately on the job and returned the forms directly to Kolbe Corp. All were assured by the Air Force executive staff that the results would remain confidential and that the Air Force would not receive individual respondents’ results. If they chose they could provide Kolbe with their identities and personal addresses in order to receive their individual results. Additionally, Kolbe C indexes were completed by the supervising officers and each pilot completed his own Kolbe B index. As with the Kolbe A indexes, supervising officers did not learn of the index results during the time of this study.

Once the conative characteristics for each group were established, researchers analyzed the results of the LTFPs and developed a Kolbe Range of Success™, that under Kolbe methodology is derived from an algorithm that determines the average level of intensity in each of the action modes plus and minus the standard deviation of the scores. This range reflects the conative characteristics that best match the Kolbe A indexes of high and low performers as well as the expectations of supervisors for how the job should be done. This range was compared to the profiles of pilots in both the STFP and the TP groups.

#### Results

*Kolbe A index Results for LTFP: (N=30)*



	<b>Fact Finder</b>	<b>Follow Thru</b>	<b>Quick Start</b>	<b>Implementor</b>
Prevent	7%	10%	60%	7%
Accommodate	60%	70%	33%	67%
Initiate	33%	20%	7%	26%

The study found that compared to the general population<sup>11</sup>, the LTFP group had significantly more insistence in Fact Finder and nearly half the prevention in the Fact Finder mode. These pilots were also more accommodating in Follow Thru and less preventative than the normal distribution. Additionally, this population had three times the norm preventing in Quick Start, with less than half initiating in this mode. The only noticeable difference in Implementor was the lack of prevention, at only 7% as compared to the normal distribution of 20%<sup>12</sup>.

*Kolbe A index Results for STFP: (N=26)*

	<b>Fact Finder</b>	<b>Follow Thru</b>	<b>Quick Start</b>	<b>Implementor</b>
<b>Prevent</b>	4%	11%	65%	11%
<b>Accommodate</b>	46%	58%	31%	62%
<b>Initiate</b>	50%	31%	4%	27%

The results for Group Two closely mirror that of Group One. Group Two has a slightly heavier concentration of initiating Fact Finder and Follow Thru, but reflects the same lack of prevention in these modes as Group One. The distributions in the Quick Start and Implementor modes are nearly identical. This would seem to indicate that some form of “weeding out” had occurred during the first four to six years which caused this group to more closely resemble the “successful pilots” population than the general population.

*Kolbe A index Results for TP: (N=29)*

	<b>Fact Finder</b>	<b>Follow Thru</b>	<b>Quick Start</b>	<b>Implementor</b>
<b>Prevent</b>	10%	38%	52%	11%
<b>Accommodate</b>	59%	52%	24%	52%
<b>Initiate</b>	31%	10%	24%	37%

The profile of Group Three differs significantly from both Group One and Two. This group has nearly four times the prevention in Follow Thru, half the initiation in Follow Thru and three times the initiation in Quick Start as the LTFPs. The TPs also have more initiation in Implementor and less accommodation in this mode.

Relative to Group Two, this population has twice the prevention in Fact Finder and significantly more accommodation and less initiation in this mode. In Follow Thru, the TPs have one-third the initiation and more than three times the prevention. The results also reveal a seven-fold

<sup>11</sup> All references in this report to the normal distribution of conative characteristics refer to the distribution discussed in Case Study 4B and referenced in Footnote 2 above.

<sup>12</sup> With an N=30 in this study, variances of up to three times the norm are statistically significant

increase in Quick Start initiation from the STFPs, with a corresponding reduction in accommodation and prevention in that mode. The distribution of Implementor is slightly higher in the initiation zone than with Group Two as well.

The differences that exist between Groups One and Two and Group Three indicate that while Group Three is composed of pilots with Kolbe A index results more like those of the general population, the requirements of their job and/or the training program propel only certain pilots on to longer-term success and that those requirements are consistent among different groups of pilots over time.

The results show that as the groups progress through the program and into their careers, a consistent conative profile for pilots identified as “successful” by the Air Force emerges. Comparing the profiles of the STFPs and TPs to the Range of Success for LTFPs generated letter grades which reflected this progression.

Kolbe recommended letter grades are derived by a proprietary algorithm from a comparison of a person’s Kolbe A index results with the Range of Success for his position or prospective position. An “A” grade indicates that individual was within the determined Range of Success in every Kolbe Action Mode. An “F” score indicates the individual is outside the Range of Success in three or four modes by at least four units. The Kolbe recommended cut score for selection is a grade of “B-” or above.

The Range of Success for successful fighter pilots as developed by Kolbe Corp as part of this study was as follows:

*Range of Success for LTFPs: (N=30)*

<b>Mode</b>	<b>Range</b>
<b>Fact Finder</b>	5-8
<b>Follow Thru</b>	4-8
<b>Quick Start</b>	2-5
<b>Implementor</b>	4-8

Based upon this range, everyone in Group Two would have received a letter grade of A or A-, well above the cut score. In Group Three the distribution of letter grades is as follows:

*Letter Grades for TP: (N=29)*

<b>Letter Grade</b>	<b>Distribution</b>
A	6
A-	2
B+	2
B	2
B-	2

C+	3
C	4
C-	3
D+	3
D-	1
F	1

This is to say that 17 of the pilots rated below a “B” fit for the position and would be most likely to drop out of the training program because of the mismatch between their conative MOs and that of other highly successful pilots. This is in fact what happened. Information is classified in terms of specific people, but it can be reported that according to senior officers in a meeting seven weeks into the training program, seven people had dropped out to that point. Of those seven trainees, six were ones who had received letter grades of C+ or below. There was one additional trainee who left, who had not been predicted to leave the program for conative reasons. Unfortunately, further information from the Air Force on this group of pilots has not been made available.

## Case Study Four: Commercial Airline Pilots

### Population

Subsequent to the Air Force study Kolbe Corp worked with a major international commercial airline to identify the conative characteristics necessary for successful performance of the tasks required of commercial pilots. The airline identified 53 pilots who had successfully completed a minimum of four years service with the company and had been given the highest performance rating by evaluation of peers and superiors. The airline did not disclose how it compiled those ratings. All performance ratings were completed prior to the beginning of this research.

### Process

This blind study had the pilots complete the Kolbe A index privately on the job as part of a performance review process. They were told the results would not impact promotion or compensation and would not be in their permanent record. The results were computer generated by Kolbe Corp. The pilots' supervisors were not informed of the results until after completion of the study.

Kolbe constructed a Range of Success for commercial pilots with the assistance of the commercial airline and by incorporating data collected in the Air Force study described above. Kolbe Corp then generated letter grades for each pilot in the study identified by the airline.

### Results

The distribution of Kolbe A index results among the test population fell almost entirely with the Range of Success for the commercial pilots created by Kolbe prior to the comparison.

*Kolbe A index Results for Commercial Airline Pilots: (N=53)*

	<b>Fact Finder</b>	<b>Follow Thru</b>	<b>Quick Start</b>	<b>Implementor</b>
<b>Prevent</b>	4%	0%	62%	34%
<b>Accommodate</b>	55%	51%	38%	64%
<b>Initiate</b>	42%	49%	0%	2%

The conative profiles for the “successful” commercial airline pilots and the “successful” Air Force pilots groups are quite similar, as can be seen by comparing the chart above to the Air Force results. There are slight differences in the Follow Thru and Implementor mode.

*Kolbe A index Results for LTFP: (N=30)*

	<b>Fact Finder</b>	<b>Follow Thru</b>	<b>Quick Start</b>	<b>Implementor</b>
<b>Prevent</b>	7%	10%	60%	7%
<b>Accommodate</b>	60%	70%	33%	67%
<b>Initiate</b>	33%	20%	7%	26%

The Range of Success as determined for this airline was as follows:

*Range of Success for Commercial Pilots:*

<b>Mode</b>	<b>Range</b>
<b>Fact Finder</b>	5-8
<b>Follow Thru</b>	4-8
<b>Quick Start</b>	2-5
<b>Implementor</b>	4-8

Based upon this range, 96% of the commercial airline pilots would be rated “A” hires.

### **Case Study Five: Commercial Airline Pilots**

#### Population

In another aviation study, 33 pilots from a different commercial airline took the Kolbe A index. The pilots primarily flew 737s and 747s and held the rank of captain.

#### Process

The pilots completed the Kolbe A index privately on the job. They were told the results would not impact promotion or compensation and the results would not be in their permanent records. The results were computer generated and their supervisors were not informed of them at the time of the study.

#### Results

When the Range of Success for Commercial Pilots created by Kolbe Corp for the prior study was compared to the profiles of the captains in this study, the results conclusively show the match between the two.

*Range of Success for Commercial Pilots:*

<b>Mode</b>	<b>Range</b>
<b>Fact Finder</b>	5-8
<b>Follow Thru</b>	4-8
<b>Quick Start</b>	2-5
<b>Implementor</b>	4-8

*Letter Grades for Commercial Pilots: (N=29)*

<b>Letter Grade</b>	<b>Distribution</b>
A	94%
A-	2
B+	0
B	1
B-	3

Only 3% of the pilots in this study scored below a B which indicates, according to the Kolbe methodology, that 97% of these pilots classify as “good hires” and match the conative characteristics required for the job. The exact cause of the consistent results for pilots in three different organizations that are dramatically different than the results found in a randomly selected group is not determined by the above referenced studies of pilots. However, whatever the cause, it is apparent that Kolbe A index results are a predictor of successful job performance in pilots.

**Case Study Six: Kolbe Selection for Job Title - Life Insurance Sales**

Population

This is a study of 1031 individuals whose primary job was self-reported as Insurance Sales and whose performance in the year prior to this study was measured by sales revenues of life insurance products. All respondents were working in life insurance General Agencies in the U.S. or Canada.

Process

All 1031 individuals completed the Kolbe A index after their performance levels for the previous year had been determined either by self reported total dollar sales or by total dollar sales as reported by supervisors. All voluntarily completed the Kolbe A index, which in every case was computer scored by Kolbe Corp. The respondents were then separated into three groups, by level of sales revenue:

High Performers included 520 individuals who had qualified for the insurance industry Million Dollar Round Table (MDRT) in the same year by achieving sales revenue from their individual production in the top 5% of the industry for that year.

Average Performers included 425 individuals who had not qualified for the MDRT in the year of the study, but whose sales revenue was within one standard deviation of the average for the industry in the same year. All of these individuals had been in the “insurance sales” job title for at least four years.

Low Performers included 86 individuals who had not qualified for the MDRT, and whose sales revenue production in the previous year was outside one standard deviation from the average for the industry and at least 25% below the average for the industry. All of these individuals had been in the “insurance sales” job title for at least two years.

## Results

Results of Kolbe A indexes taken by the High Performers were analyzed electronically to determine the Range of Success for this population in each Kolbe Action Mode. This range is determined by a proprietary algorithm which is derived from the average level of intensity in each of the Action Modes plus and minus the standard deviation of the scores. This range reflects the conative characteristics which best match the Kolbe A indexes of high and low performers as well as the expectations of supervisors for how the job should be done.

*Range of Success for High Performers: (N=520)*

<b>Mode</b>	<b>Range</b>
<b>Fact Finder</b>	3-6
<b>Follow Thru</b>	1-5
<b>Quick Start</b>	6-10
<b>Implementor</b>	1-4

Kolbe recommended letter grades are derived from the combination of all four Ranges of Success. A proprietary algorithm within the Kolbe selection software converts Kolbe A index raw scores, which determine those ranges, into letter grades for each individual whose Kolbe A result is compared to the established ranges. In this study all Average and Low performers’ Kolbe A scores were compared to High performers’ Kolbe A scores electronically, and every individual was given a computer-generated letter grade of A through F, including pluses and minuses from A- to D-.

An “A” grade indicates that the individual was within the determined Range of Success in every Kolbe Action Mode. An “F” score indicates the individual is outside the Range of Success in three or four modes by at least four units. The Kolbe recommended cut score for selection is a grade of “B-” or above.

Following is the distribution of letter grades for the three levels of performance for the insurance sales people in this study.

*Letter Grades for High Performers: (N=520)*

<b>Letter Grade</b>	<b>Distribution</b>
A/A-	78%
B+/B	15
B-/C+	4
C/C-	2
D+/D-/F	1

*Letter Grades for Average Performers: (N=425)*

<b>Letter Grade</b>	<b>Distribution</b>
A/A-	7%
B+/B	24
B-/C+	56
C/C-	11
D+/D-/F	2

*Letter Grades for Low Performers: (N=86)*

<b>Letter Grade</b>	<b>Distribution</b>
A/A-	2%
B+/B	8
B-/C+	22
C/C-	39
D+/D-/F	29

Based upon Kolbe cut scores developed for the job title of Insurance Sales in the life insurance industry in the U.S. and Canada, 93% of the High Performers in the study would have been recommended to be in the candidate pool<sup>13</sup>. Only 7% would have been misidentified as being below the cut score. Among Average Performers, 69% would have been below the cut score.

Had the 51 general agencies participating in the study used the Kolbe cut scores from the High Performer study, 90% of those who proved to be Low Performers in the previous year would not have been selected.

### **Case Study Seven: Branch Manager-trainees**

#### Population

This study included 483 Branch Manager-trainees in a financial services firm over a period of six months.

<sup>13</sup> Kolbe does not recommend hiring based solely upon the conative dimension measured on the Kolbe A index.



## Process

In this study, the Kolbe A index was part of a battery of tests given to all the participants. The other tests were either cognitive or affective; the Kolbe was the only test of the conative part of the mind.

Using the Kolbe methodology, a Range of Success for this position was created from the Kolbe A index results of 24 high-performing branch managers, 24 low-performing branch managers and Kolbe C index results completed by 24 district managers who had been identified as “successful branch” managers by the firm. Success and poor performance determinations were made based on performance evaluation data collected by district managers.

The 483 Branch Manager-trainees involved in the study were divided into three groups. The first group did not take the Kolbe index but took a number of other instruments. The remainder of the trainees took the index privately during work hours and the results were generated by computer. These individuals were informed that the instruments were for research purposes only and would not impact selection, placement, promotion, evaluation or compensation. The group that completed the Kolbe A index was then divided into two smaller groups based upon the letter grades for each participant generated by comparing their Kolbe A index results to the Range of Success for their position. One group was made up of those individuals who received letter grades of B- or above; the other group was those who received letter grades of C- or below. The managers of the participants who took the Kolbe index were trained on how to coach, communicate with, and motivate employees given the employees’ respective conative characteristics.

## Results

The company involved in the research identified the rate of these employees’ separation from the company due to job-related issues as a key measure of job success. The separation rate and total turnover rates for the three groups involved in the study during the sixth months following the participants completing the Kolbe A index show that the use of the Kolbe Concept in selection and employee management effectively reduced the influence of previously unmeasured variables affecting job performance and turnover. The identification of high—potential employees and the training of their managers was effective in achieving significantly improved retention.

### *Job Related Separation*

<b>Group</b>	<b>Utilization of Kolbe</b>	<b>% Job Related Separation</b>
<b>One</b>	None	11.7
<b>Two</b>	Minimal	5.5
<b>Three</b>	Full	0.0

The job-related separation rate was based on the percentage of people hired who terminated for what the corporation assessed as job-related causes. The formula used was:

$$\frac{\# \text{ terminations}}{\text{total \# in the study group}}$$

*Turnover*

<b>Group</b>	<b>Utilization of Kolbe</b>	<b>% Turnover</b>
<b>One</b>	None	44.3
<b>Two &amp; Three</b>	Minimal & Full combined	26.4

The Turnover formula was defined as:

$$\frac{\frac{\# \text{ terminations}}{6 \text{ months}}}{\text{average \# of employees in position} \times 12}$$

Selection within the recommended Kolbe Range of Success resulted in 100% retention of the desired Branch Manager-trainees.

## Appendix A - The MBTI, Performance and Selection

In the 1962 manual for the Myers-Briggs Type Indicator (MBTI), Isabel Briggs Myers clearly states, “The purpose of the Indicator is to implement Jung’s theory of type [1923]...[and that there are] basic differences in the way people prefer to use perception and judgment.” She further states that “the purpose of the indicator is to ascertain a person’s basic preferences,” reflecting habitual choice between opposites.

In test reviews in Buros’ Sixth Mental Measurements Yearbook, it was suggested that “the scales measure only limited aspects of their underlying constructs...” and that “as it stands...the test would be of dubious value for selection, where conscious faking would be a problem.”

More recent information regarding the reliability of the Myers-Briggs, however, comes from the conclusions of the National Research Council’s Committee on Techniques for the Enhancement of Human Performance, Commission on Behavioral and Social Sciences and Education. In its 1991 report published under the title, In the Mind’s Eye: Enhancing Human Performance, the Committee indicates that despite the MBTI’s popularity, this popularity is not “coincident with supportive research results.” Reported is a 1983<sup>14</sup> study in which only 47% of respondents to the MBTI retained their initial “types” over a period of 5 weeks. It is noted that “changes...of these magnitudes suggest caution in classifying people in these ways and then making decisions that would influence their careers or personal lives (page 97).”

In terms of vocational choice, conclusions made by the Committee regarding the MBTI include comments regarding three methodological problems:

1. “there is weak discrimination among occupations due to an overlap between types and preferred occupations,”
2. “attention to basic normative data [is lacking],” and
3. “no evidence has been presented on the relationship [of type] to performance” (emphasis added).

In terms of employee selection, the third conclusion is paramount. EEOC Guidelines for Selection require that a statistically significant relationship be established between a given selection procedure and job performance criteria. The MBTI, while useful in regard to providing an interesting framework for conceptualizing individual affective preferences, should not be considered valid for use in predicting successful job performance.

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<sup>14</sup> McCarley, N. and Carskadon, T.G. Research in Psychological Type, 1983, 6:24-36.

## Appendix B - The 17 Natural Advantages™

Individual Kolbe results yield 17 natural “insistence patterns” which are called “Natural Advantages.” These patterns, named for their singular or combined attributes, DO NOT imply what would necessarily be appropriate job titles. Rather, they describe MOs.

<b>MO</b>	<b>Natural Advantage</b>	<b>MO</b>	<b>Natural Advantage</b>
FF	RESEARCHER	FF/FT	STRATEGIC PLANNER
	Probes		Studies trends
	Prioritizes		Evaluates sequences
	Proves		Puts priorities into context
	Specifies		Organizes curricula
	Calculates		Explains procedures
	Defines		Justifies policies
FF/QS	MANAGER	FF/IM	TECHNOLOGIST
	Explains bottom line		Studies tangibles
	Calculates risk		Demonstrates probabilities
	Justifies intuition		Allocates space
	Specifies challenges		Evaluates quality
	Qualifies sales		Tests materials
	Allocates variables		Strategizes for safeguards
FT	DESIGNER	FT/FF	SYSTEMS ANALYST
	Plans		Structures data
	Charts		Concentrates on details
	Coordinates		Programs specifics
	Arranges		Plans appropriately
	Graphs		Charts probabilities
	Budgets		Concludes thoroughly
FT/QS	PROGRAM DEVELOPER	FT/IM	MANUFACTURER
	Focuses options		Designs models
	Graphs changes		Coordinates equipment
	Designs originals		Structures manually
	Sequences diverse elements		Concentrates materials
	Coordinates flexibility		Patterns work flow
	Tracks experiments		Maintains quality
	Schedules alternatives		Plans for space utilization
QS	INNOVATOR	QS/FF	ENTREPRENEUR
	Challenges		Promotes appropriateness
	Brainstorms		Challenges status quo

	Originates		Changes priorities
	Risks		Revises standards
	Promotes		Improves presentations
	Intuits		Converts data
QS/FT	THEORIST	QS/IM	PIONEER
	Innovates systems		Competes physically
	Reforms plans		Challenges endurance
	Reverses trends		Explores new territory
	Modifies procedures		Alters environment
	Originates concepts		Defies the elements
	Instigates transition		Invents tangibles
IM	DEMONSTRATOR	IM/FF	INVESTIGATOR
	Builds		Handles meticulously
	Molds		Builds precisely
	Constructs		Demonstrates thoroughly
	Forms		Physically protects
	Shapes		Establishes standards
	Repairs		Transports sophisticated equipment
			Makes complex maneuvers
IM/FT	QUALITY CONTROLLER	IM/QS	ADVENTURER
	Installs systems		Remodels
	Builds structures		Explores
	Enforces regulations		Constructs futuristics
	Guards facilities		Renders uniquely
	Maintains equipment		Sculptures freeform
	Mechanically designs		Shapes intuitively
	MEDIATOR/FACILITATOR		
	(No Insistences)		
	Accommodates in a variety of ways		Avoids being in the limelight
	Gains cooperation by mediation		Commits to group progress
	Provides back-up support		Responds as needed for success

## **Appendix C - Summary of Analyses of Inter-correlations between Action Modes™ and Correlations between the Kolbe index™ and the MBTI**

Two hundred sixty eight individuals completed both the Kolbe index and the Myers-Briggs Type Indicator (MBTI). Preference scores for the MBTI were not used in the classification of results in this study. Rather, for each continuum, “if not, then” statements were employed for classification purposes.

Mean intensities and standard deviations for each Action Mode are listed below:

<b>Mode</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>Fact Finder</b>	5.963	1.584
<b>Follow Thru</b>	4.668	1.664
<b>Quick Start</b>	5.828	2.305
<b>Implementor</b>	3.560	1.379

Pearson coefficients for inter-correlations between Action Modes are as follows:

<b>Modes</b>	<b>Correlation</b>
Fact Finder & Follow Thru	.322
Fact Finder & Quick Start	-.529**
Fact Finder & Implementor	-.385
Follow Thru & Quick Start	-.768++
Follow Thru & Implementor	-.033
Quick Start & Implementor	-.288

\*\* Moderately strong negative correlation between Fact Finder and Quick Start, that is, in this study, those scoring toward insistence in Fact Finder tended to score toward resistance in Quick Start, and vice versa.

++ High negative correlation between Follow Thru and Quick Start, with highly accommodating or insistent Follow Thrus likely to be resistant in Quick Start.

Correlations between Kolbe index and MBTI Indices:

<b>MBTI Type</b>	<b>Fact Finder</b>	<b>Follow Thru</b>	<b>Quick Start</b>	<b>Implementor</b>
<b>Introversion</b>	.082	.244	-.254	.145
<b>Extroversion</b>	-.082	-.244	.254	-.145
<b>Sensing</b>	.285	.368*	-.434**	.054
<b>Intuiting</b>	-.285	-.368*	.434**	-.054
<b>Thinking</b>	.301	.142	-.163	-.168
<b>Feeling</b>	-.301	-.142	.163	.168
<b>Judging</b>	.420 <sup>xx</sup>	.375+	-.451++	-.059
<b>Perceiving</b>	-.420 <sup>xx</sup>	-.375+	.451++	.059

\*, \*\*, <sup>xx</sup>, +, ++ As can be seen, correlations between MBTI dimensions and Kolbe Action Modes are of only moderate degree. Examination of individual MBTI items reveals an unclear mixture of cognitive, affective and conative statements. It is conjectured that some portion of the items which score to the Intuiting scale and the Perceiving scale relate to the intuitive instinct and behavioral adaptability of the insistent Quick Start. Items which score to the Judging scale may relate to the detailed, orderly approach of the Fact Finder/Follow Thru.

It is noteworthy that of the four dimensions of the MBTI, the two involved here (S-N and J-P) are the two least stable when considered in the context of test-retest reliability studies. The history of variability along these dimensions may be at least partially explained by the influence of changing emotional experiences on our life perceptions.

A second study, done in May 1992, substantiates the findings above, with the exception of a somewhat higher correlation (.590) between Follow Thru insistence and the Judging dimension of the MBTI. A positive correlation of .406 was found between Follow Thru and Sensing, .398 between Quick Start and Intuiting, and .439 between Quick Start and Perceiving. The sample of 44 individuals was made up of a combination of managers in a large corporation and consultants enrolled in a graduate program of the Pepperdine University School of Business.

# Appendix D - Legal Opinion on the Use of the Kolbe System in Selection

## LEGAL OPINION

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January 7, 1993

**re: Legal Opinion on use of the Kolbe A™ Index - in Employment Testing and Classification**

### **The Kolbe A Index**

The Kolbe A Index is a forced-choice instrument that requires subjects to choose one of four responses reflecting how they would be most and least likely to respond to 72 single-sentence problem-solving or behavioral scenarios. It is part of the Kolbe RightFit™ System, based on the theory of conation, which premises an human behavior on the interaction between the cognitive (knowledge), the affective (feeling or belief), and the conative (instinct or will). The Kolbe A Index raw scores are translated into a set of four scales that reflect the subject's conative instincts.

Kolbe Corp research has shown that successful employees in similar jobs tend to have Kolbe A Index results that fall within a well-defined range. These ranges, the studies suggest, tend to be consistent with the conative expectations of the job as identified by supervisors and cohorts. The use of the Kolbe A Index in selection and classification of employees is premised on the theory that by determining the relative consonance between a job applicant's conative instincts and the conative requirements of a specific job, employers can accurately predict employee success.

### **Legal Requirements of Employee Testing**

The federal legislative enactments which impact the employment selection process date from the Civil Rights Act of 1866 which, in section 1981, provides a right of action when anyone acting "under color of state *law*" deprives another of a civil right. Title VII of the Civil Rights Act of 1964 proscribes anyone whose business impacts interstate commerce from discriminating on the basis of "race, creed, color or national origin." Gender-based discrimination is also proscribed. The 1964 Civil Rights act was followed by the 1967 Age Discrimination in Employment Act that prohibited discrimination on the basis of age for those over age 40. Protection for the disabled was provided by the Vocational Rehabilitation Act in 1973. That protection was extended by the Americans with Disabilities Act of 1990 which protects all "qualified persons with a disability," defined as any applicant or employee with a disability who, with or without accommodation, can perform the essential functions of the job.

The most important case impacting employee testing is Griggs v. Duke Power, 401 US 424 (1971), in which the United States Supreme Court held that the employer, Duke Power, had established unlawful racially discriminatory criteria for employment and advancement including testing and educational requirements. The legal principles emerging from that case and its legal progeny are:

- 1) Any testing or other system of selection or classification, even if facially neutral, which has a "disparate impact" on a protected group including religion, national origin, age,



gender and handicap will be the basis for an action for employment discrimination unless the employer can demonstrate that there is a substantial "business necessity" for the practice. See James v. Stockham Valves and Fittings Co., 559 F.2d 310 (5th Cir. 1977), cert. den. 434 U.S. 1034 (1978) (evidence of disparate impact of employment test on Blacks combined with gross disparities between numbers of Whites and Blacks in positions requiring high scores sufficient to establish adverse impact). However, the impact must be shown in the specific job setting. See Adams v. Texas & Pacific Motor Transport Co., 408 F. Supp. 156 (E.D. La. 1975), (employer's use of the same test found inappropriate in Griggs was not held to be facially invalid without a showing of disparate impact among employer's job applicants). Disparate impact has been defined in the EEOC Guidelines to constitute, "A selection rate for any race, sex, or ethnic group which is less than four fifths(4/5)(or eighty percent) of the rate for the group with the highest rate." 41 C.F.R. section 60-3.4(d). However, this "four-fifths rule" has been criticized by some courts. See Clady v. County of Los Angeles, 770 F.2d 1421 (9th Cir. 1985).

2) In order to satisfy the "business necessity" requirement, a test or requirement must be proven to be "Job related." See Brunet v. City of Columbus, 642 F. Supp. 1214 (S.D. Ohio 1986) (employer established job-relatedness of mechanical reasoning test) and United States v. LLJLAC, 793 F.2d 636 (5th Cir. 1986) (lower court erred in not considering the job-relatedness of a biased test).

3) Tests used for employment selection and classification can not be validated as job related in the abstract, but the inferences which are drawn from the test results used by an employer in employment decisions may only be validated within a specific employment context. See Albemarle Paper Co. v. Moody 422 U.S. 405 (1975) (citing EEOC Guidelines, "Discriminatory tests are impermissible unless shown, by professionally acceptable methods, to be 'predictive of or significantly correlated with important elements of work behavior which comprise or are relevant to the job or jobs for which candidates are being evaluated.' 29 CFR section 1607.4(c).")

4) A facially discriminatory pattern can be established by showing a statistically significant difference between the hiring patterns of an employer and an appropriate reference group (usually adult population in the geographical area). See International Brotherhood of Teamsters v. United States, 431 U.S. 324 (1977). However, courts have sometimes allowed general population statistics to be used to prove disparate impact. See Dothard v. Rawlinson, 433 U.S. 321 (1977) (national statistics on height and weight used to show disparate impact on females of Alabama requirements for prison guards).

5) Once a facially discriminatory pattern is established, the employer has the burden to establish the "business necessity" or "job relatedness" of the test or other selection procedure. Additionally, the employer must show that the employment practice which selects or classifies, even if it measures a "job-related" "business necessity," does so in a way which is less discriminatory than other available alternatives and does not inappropriately use scores of those near the top of a line of progression to exclude applicants without considering the effect of work experience and on-the-job training. See Albemarle Paper Co. v. Moody, supra, (use of tests proscribed where they had not been validated for all jobs for which they were used and where scores of experienced workers were used to establish cut scores without considering on-the-job development).

In summary, valid employment testing must meet the following minimum legal requirements:

1. Only job-specific inferences from tests, not tests in the abstract, can be validated.
2. "Disparate impact" occurs when a minority group is selected less than 80% as frequently as the most frequent group selected.
3. Criterion-based tests are generally preferred to other forms of employment testing, although content and construct testing may be validated.
4. Employers must keep records of testing and must prove no disparate impact or 'Job-relatedness,' "business necessity" and lack of viable alternatives to a biased selection practice.
5. When distinguishable, specific employment or testing practices, rather than the entire selection or classification process, are subject to judicial review.
6. Neither testing, nor any other process of selecting or classifying may be differentially normed for race or other protected category.

### **Conclusion**

Consistent with the requirement for job-specific validation, the Kolbe A Index is a non-subjective criterion-based test which has been validated in a number of job settings. The studies done by Kolbe Corp and independent researchers show the Kolbe A Index to be free from bias when appropriately applied. Consistent with the Civil Rights Act of 1991, there are not separate norms for any groups. Test-retest studies have shown that the Kolbe A Index results are relatively constant over time, and do not appear to be impacted by on-the-job training.

It is my legal opinion based on the studies provided to me by Kolbe Corp and my review of the relevant law, that the Kolbe A Index could be used as an element of a system of employee selection and classification which may, assuming all other elements to be minority neutral, comply with federal law.

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Attorney at Law  
/lt

## Appendix E - Personnel Selection and Kolbe RightFit™

### Definition

Any procedure utilized to predict the probability that a job candidate will be successful in a given job position.

Kolbe RightFit predicts the probability that a job candidate will perform a job in ways proven to be successful.

### Purpose

Selection procedures are employed in an effort to hire or accept only those candidates who have the greatest likelihood of succeeding. Selection procedures are used to decide which candidate is best qualified among a group of qualified individuals. They also are used to separate qualified from unqualified candidates.

With Kolbe RightFit, employers are provided with information indicating which job candidates will perform job tasks in a manner associated with success. It identifies the instinctive requirements of the job and the applicants with the right mix of instincts to perform successfully.

### Key Issues

1. Reliability -- the degree of stability, consistency, and accuracy of the procedure. A reliable selection procedure would produce the same result if a candidate were to go through the procedure on different occasions. In personnel selection, reliability is most often connected to the standardization of the procedure. The selection procedure must therefore be applied in a consistent manner across time and candidates. Reliability ensures the results are equally meaningful for all candidates and for any time period. The Kolbe RightFit selection procedure is based on the 36-item Kolbe A™ index. The test-retest reliability of the Kolbe A index ranges from .69 to .85. More importantly, 90% of test takers show no changes in modes of insistence on retest.
2. Validity -- the degree to which the procedure accurately measures what it is intended to measure. Selection procedures must yield results that accurately relate to the probability of success in a given job position. While there are many types of validity (e.g., content, construct, conceptual), personnel selection involves criterion or predictive validity. A valid selection procedure must accurately predict success on the job. The validity of the Kolbe RightFit selection procedure is based on the empirically derived Range of Success. This range is based on the Kolbe A index scores for the successful performers in the job position, as well as the Kolbe C™ index of job requirements as specified by direct supervisors and evaluators.
3. Criterion -- what you are trying to predict. This is typically success in a job. The actual criterion definition will vary by job position because success will be defined differently for different jobs.

4. **Cutting Score** -- the probability level chosen for the procedure, above which candidates are selected and below are rejected. For example, a medical school will only admit candidates with MCAT scores above a certain level.

### Selection Decisions

	<b>Cutting Score</b>	
<b>Criterion</b>	<b>False Negative</b>	<b>True Positive</b>
	<b>True Negative</b>	<b>False Positive</b>

This graphic represents how decisions are made and the consequences of those decisions in every personnel selection scenario.

- The CRITERION represents what you are trying to predict. In most cases, this is success in the job. Everything above the CRITERION line represents success in the job, and everything below represents failure to meet the definition of success.
- The CUTTING SCORE results from the selection procedure. Everything to the right of the CUTTING SCORE is above the predetermined probability for success level, and everything to the left is below that level.
- In a selection scenario, the employer would hire everyone who falls on the right of the CUTTING SCORE. These candidates are labeled “positives.” All those on the left would be rejected, and are labeled “negatives.”
- A “True Positive” falls above the cutting score and is hired. This candidate goes on to be a successful employee.
- A “False Positive” also falls above the cutting score and is hired. This candidate does not go on to be a successful employee.
- A “True Negative” does not achieve the cutting score and is not hired. Theoretically, this candidate would not have been able to be successful if given the chance.
- A “False Negative” also does not achieve the cutting and is not hired. Theoretically, this candidate would have been able to be successful if given the chance.

## **Building an Effective Selection Procedure Using Kolbe Right Fit**

If personnel selection procedures are used to predict success on the job, the first step in building such a procedure is to define “success.” This is most effectively accomplished with an objective, empirical measure of success. For example, success in a sales position might be defined by achieving sales above a certain dollar amount.

The first step with the Kolbe RightFit procedure is to identify successful employees in the job position based on an objective measure of success. This could include past and present successful employees.

Once we have defined success, we can then set about determining which factors are most closely related to it. For example, high sales volume may be due to cognitive abilities, interpersonal skills, sales training, or sales experience. This is where the *content* of the selection procedure is determined, and it is most often based on common sense. We would ask the question, “Is success in sales related to how well a salesperson interacts with customers?” The common sense answer would be “yes.” When selecting factors associated with success, the strategy must focus on selecting only those which can be measured reliably and practically.

With the Kolbe RightFit procedure, this part of the process is simple. The natural method for accomplishing tasks, solving problems, and making decisions is significantly related to success in any job position. Conative style as measured by the Kolbe A index provides that information, and the Kolbe A index is reliable and simple to administer.

After deciding on which factors are conceptually related to success, we must validate the relationship. It is not enough to believe that interpersonal skills are related to sales success, we must obtain empirical proof of the relationship. Validating a selection procedure is the most difficult, but also the most critical part of the process. The most thoughtful and creative selection procedures are useless if they cannot be proven valid.

The most practical method for validating a selection procedure involves *profiling* current employees in the job position. The profiles would then be sorted based on the definition of success. For example, we would empirically relate sales success to our chosen measures of cognitive ability, interpersonal skills, and training. If we can demonstrate a significant difference between employees who meet our success definition from those who do not, we have validated the procedure. Successful sales people may prove to have cognitive skills above a certain level, to be extroverted and assertive on the measure of interpersonal skills, and to possess at least 3 years of sales training/experience. Validation is accomplished using employees who have proven to meet the definition of success. The selection procedure is therefore focused on hiring only those candidates who have the same profile as the successful current employees.

With the Kolbe RightFit procedure, the profile is referred to as the “Range of Success™.” The Range of Success is empirically derived from the Kolbe A index results from the identified successful employees in the job position, as well as the conative requirements for the job as defined by supervisors completing Kolbe C indexes. The Range of Success defines a Kolbe A index profile with the greatest potential for success in the job. Candidates with Kolbe profiles that match the Range of Success will perform in a manner most likely to result in success.

The validation process also involves determining the cutting score of the procedure. This is perhaps the most difficult to understand part of the validation process. The cutting score will be set based on the degree to which a profile is related to success. Let's say that 90% of our current sales people who meet the definition of success have at least a 4-year college degree. Is a 4-year college degree required for success? The answer is no because we are aware that 10% of our successful current sales force does not possess this degree. Should we set possession of a 4-year college degree as part of our cutting score? The answer is probably yes because the percentage of successful people without such a degree is so small. If we apply this cutting score, our false negative rate would be only 10%.

On the other hand, suppose we empirically determined that only 50% of our successful sales people profile as extroverts? That of course means the other 50% profile as introverts. Would we want to use introversion/extroversion as part of our success profile? The answer is probably "no" because we would have a false negative rate of 50%. Even though we conceptually believe an extroverted interpersonal style is predictive of sales success, in this example the data proves we are incorrect. No matter how much sense something makes, if the data does not prove it true, you must not include it as part of the selection procedure.

The Kolbe RightFit selection system assigns letter grade ratings (ranging from "A" to "F") to each candidate to signify the probability of performing successfully in the job. A candidate with an "A" rating matches the Range of Success exactly. This person will perform job functions in a manner consistent with the methods of high performers and in accord with the requirements of job supervisors. Conversely, a candidate with a "D" or "F" rating will employ a conative methodology that significantly differs with either proven methods or supervisory requirements.

The exact cutting score utilized in the Kolbe RightFit procedure will vary on a case-by-case basis. It is essential to understand that the Kolbe RightFit rating should never be the only factor considered in personnel selection. Employers must also use a proven method for assessing cognitive and affective factors associated with job success. For example, a candidate may receive a Kolbe RightFit letter grade of "A", yet not have the requisite skill set or experiences to be successful in the job. On the other hand, a candidate with a letter grade of "C-" may have the appropriate skill set, vast experience in similar positions, and the appropriate interpersonal style for success.

Building an effective selection procedure also involves reliability. Without reliability, there can be no validity. As we determine our success factors and shape the profile, we need to create procedures that are standardized and yield consistent data. We would put every candidate through exactly the same procedures. The timing, questions, and perhaps even the interviewer would have to remain constant in order to ensure reliability.

The reliability of using the Kolbe RightFit is ensured through standard Kolbe index administration and scoring. Kolbe WAREwithal® software is the tool for calculation of the Range of Success, as well as the candidate ratings. This completely eliminates the threat of rating bias. Additionally, the Kolbe A index has been demonstrated to be free from any gender, age, or race bias. With Kolbe RightFit, you have selection methodology that is reliable, valid, and meets EEOC guidelines.

In summary, the steps for building an effective selection procedure are:

1. Define success
2. Determine conceptual success factors
3. Validate the factors against proven success
4. Determine the appropriate cutting score
5. Ensure the procedure is reliable

### **Selection Decision Errors**

In every selection scenario, an employer must decide which type of error they are most willing to tolerate. False positives and false negatives are the two types of decision errors.

- False positives are employees who ultimately cannot be successful in the job. These employees make up a sizable percentage of turnover in the company. Employers also lose resources devoted to the training and management of these candidates. Additionally, these types of errors can significantly damage a company if the job is in a sensitive or high-visibility area. False positives in an executive position can prove especially costly.
- False negatives are the ones that get away. These are candidates who could have been successful if given the chance, but they are not hired. A company in need of employees, particularly those with difficult-to-acquire skills, may not be able to tolerate a high number of false negatives.

As the Selection Decisions matrix illustrates, an employer can “adjust” the cutting score in an effort to reduce the number of errors.

		<b>Cutting Score</b>	
		<b>False Negative</b>	<b>True Positive</b>
<b>Criterion</b>		<b>True Negative</b>	<b>False Positive</b>

By shifting the cutting score to the right, the employer reduces the number of potential false positives. What also results from this is the reduction in the number of true positives and an increase in false negatives.

An example within the Kolbe RightFit selection system might involve an employer deciding to fully consider candidates with RightFit ratings of “A”, “A-”, or “B+”. This would significantly narrow the number of high potential candidates (candidates who would be above the criterion), but the main benefit is the reduction of potential false positives.

By shifting the cutting score to the left, the employer decreases the number of false negative, but also increases the potential number of false positives.

Using the Kolbe Right Fit selection system, an employer may decide to give serious consideration to candidates with ratings even in the "C," "C-" and "D+" range. This expands the pool of potential hires, but opens up a greater probability of a false positive.



## Appendix F - Selection Study Data

### FF by Race

	Count Exp. Val Residual	RACE				Row Total
		White 1	Black 2	Hispanic 3	Asian 4	
<b>Prevent</b>	1	4 3.2 .8	0 .8 -.8	1 .5 .5	0 .6 -.6	5 3.3%
<b>Accommodate</b>	2	46 45.9 .1	11 10.9 .1	6 6.6 -.6	9 8.5 .5	72 47.4%
<b>Initiate</b>	3	47 47.9 -.9	12 11.3 .7	7 6.9 .1	9 8.9 .1	75 49.3%
	# of Respondents	97	23	14	18	152
	% of Total Respondents	63.8%	15.1%	9.2%	11.8%	100.0%

Chi-Square	Value	DF	Significance
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Pearson	2.32911	6	.88708
Likelihood Ratio	3.50314	6	.74355
Mantel-Haenszel test for linear association	.13126	1	.71713

Minimum Expected Frequency -.461  
 Cells with Expected Frequency < 5 - 4 of 12 (33.3%)  
 Number of Missing Observations: 0

### FT by Race

	Count Exp Val Residual	RACE				Row Total
		White 1	Black 2	Hispanic 3	Asian 4	
<b>Prevent</b>	1	11 10.8 .2	3 2.6 .4	1 1.6 -.6	2 2.0 .0	17 11.2%
<b>Accommodate</b>	2	63 63.2 -.2	15 15.0 .0	11 9.1 1.9	10 11.7 -1.7	99 65.1%
<b>Initiate</b>	3	23 23.0 .0	5 5.4 -.4	2 3.3 -1.3	6 4.3 1.7	36 23.7%
	# of Respondents	97	23	14	18	152
	% of Total Respondents	63.8%	15.1%	9.2%	11.8%	100.0%

Chi-Square	Value	DF	Significance
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Pearson	2.18646	6	.90178
Likelihood Ratio	2.21033	6	.89937

Mantel-Haenszel test for linear association .14634 1 .70205

Minimum Expected Frequency -.1566  
 Cells with Expected Frequency < 5 - 5 of 12 (41.7%)  
 Number of Missing Observations: 0

**QS by Race**

	Count Exp Val Residual	RACE				Row Total
		White 1	Black 2	Hispanic 3	Asian 4	
<b>Prevent</b>	1	36 37.7 -1.7	9 8.9 .1	7 5.4 1.6	7 7.0 .0	59 38.8%
<b>Accommodate</b>	2	46 46.6 -.6	11 11.0 .0	6 6.7 -.7	10 8.6 1.4	73 48.0%
<b>Initiate</b>	3	15 12.8 2.2	3 3.0 .0	1 1.8 -.8	1 2.4 -1.4	20 13.2%
	# of Respondents	97	23	14	18	152
	% of Total Respondents	63.8%	15.1%	9.2%	11.8%	100.0%

Chi-Square	Value	DF	Significance
Pearson	2.38997	6	.88057
Likelihood Ratio	2.62383	6	.85436
Mantel-Haenszel test for linear association	1.06619	1	.30181

Minimum Expected Frequency -.1842  
 Cells with Expected Frequency < 5 - 3 of 12 (25.0%)  
 Number of Missing Observations: 0

### IM by Race

	Count Exp Val Residual	RACE				Row Total
		White 1	Black 2	Hispanic 3	Asian 4	
<b>Prevent</b>	1	46 41.5 4.5	8 9.8 -1.8	4 6.0 -2.0	7 7.7 -.7	65 42.8%
<b>Accommodate</b>	2	49 54.2 -5.2	15 12.9 2.1	10 7.8 2.2	11 10.1 .9	85 55.9%
<b>Initiate</b>	3	2 1.3 .7	0 .3 -.3	0 .2 -.2	0 .2 -.2	2 1.3%
	# of Respondents	97	23	14	18	152
	% of Total Respondents	63.8%	15.1%	9.2%	11.8%	100.0%

Chi-Square	Value	DF	Significance
Pearson	4.24266	6	.64388
Likelihood Ratio	4.94943	6	.55031
Mantel-Haenszel test for linear association	.93180	1	.33439

Minimum Expected Frequency - .184

Cells with Expected Frequency < 5 - 4 of 12 (33.3%)

Number of Missing Observations: 0

### FF by Gender

	Count Exp Val Residual	Gender		Row Total
		Female 1	Male 2	
<b>Prevent</b>	1	1 1.1 -.1	4 3.9 .1	5 3.3%
<b>Accommodate</b>	2	17 15.6 1.4	55 56.4 -1.4	72 47.4%
<b>Initiate</b>	3	15 16.3 -1.3	60 58.7 1.3	75 49.3%
	# of Respondents	33	119	152
	% of Total Respondents	21.7%	78.3%	100.0%

<b>Chi-Square</b>	<b>Value</b>	<b>DF</b>	<b>Significance</b>
Pearson	.29073	2	.86471
Likelihood Ratio	.29038	2	.86486
Mantel-Haenszel test for linear association	.17544	1	.67532

Minimum Expected Frequency – 1.086  
Cells with Expected Frequency < 5 - 2 of 6 (33.3%)  
Number of Missing Observations: 0

**FT by Gender**

	Count Exp Val Residual	<b>Gender</b>		Row Total
		Female 1	Male 2	
<b>Prevent</b>	1	4 3.7 .3	13 13.3 -.3	17 11.2%
<b>Accommodate</b>	2	19 21.5 -2.5	80 77.5 2.5	99 65.1%
<b>Initiate</b>	3	10 7.8 2.2	26 28.2 -2.2	36 23.7%
	# of Respondents	33	119	152
	% of Total Respondents	21.7%	78.3%	100.0%

<b>Chi-Square</b>	<b>Value</b>	<b>DF</b>	<b>Significance</b>
Pearson	1.18224	2	.55371
Likelihood Ratio	1.14716	2	.56351
Mantel-Haenszel test for linear association	.40588	1	.52407

Minimum Expected Frequency – 3.691  
Cells with Expected Frequency < 5 - 1 of 6 (16.7%)  
Number of Missing Observations: 0

**QS by Gender**

	Count Exp Val Residual	Gender		Row Total
		Female 1	Male 2	
<b>Prevent</b>	1	15 12.8 2.2	44 46.2 -2.2	59 38.8%
<b>Accommodate</b>	2	12 15.8 -3.8	61 57.2 3.8	73 48.0%
<b>Initiate</b>	3	6 4.3 1.7	14 15.7 -1.7	20 13.2%
	# of Respondents	33	119	152
	% of Total Respondents	21.7%	78.3%	100.0%

<b>Chi-Square</b>	<b>Value</b>	<b>DF</b>	<b>Significance</b>
Pearson	2.48095	2	.28925
Likelihood Ratio	2.48227	2	.28906
Mantel-Haenszel test for linear association	.02406	1	.87674

Minimum Expected Frequency – 4.342  
 Cells with Expected Frequency < 5 - 1 of 6 (16.7%)  
 Number of Missing Observations: 0

**IM by Gender**

	Count Exp Val Residual	Gender		Row Total
		Female 1	Male 2	
<b>Prevent</b>	1	15 14.1 .9	50 50.9 -.9	65 42.8%
<b>Accommodate</b>	2	18 18.5 -.5	67 66.5 .5	85 55.9%
<b>Initiate</b>	3	0 .4 -.4	2 1.6 .4	2 1.3%
	# of Respondents	33	119	152
	% of Total Respondents	21.7%	78.3%	100.0%

<b>Chi-Square</b>	<b>Value</b>	<b>DF</b>	<b>Significance</b>
Pearson	.64028	2	.72605
Likelihood Ratio	1.06374	2	.58750
Mantel-Haenszel test for linear association	.24996	1	.61710

Minimum Expected Frequency – .434  
 Cells with Expected Frequency < 5 - 2 of 6 (33.3%)  
 Number of Missing Observations: 0

## Appendix G - Glossary

**Kolbe Range of Success™** is derived with an algorithm that determines the average level of intensity in each of the action modes plus and minus the standard deviation of the scores. This range reflects the conative characteristics which best match the Kolbe A™ indexes of high and low performers as well as the expectations of supervisors for how the job should be done.

**Kolbe Cut Scores** apply another algorithm that assesses the degree of variance from the Range of Success in each mode and assigns one of 15 letter grades from “A” (best fit) to “F” (worst fit). Kolbe A results which fit within the range in all four modes generate an “A” score. Results outside the range in one or more mode lowers the score according to the degree of variance and the frequency of modes where this variance occurs.

**Kolbe A Index** is a forced-choice instrument, which requires subjects to choose one of four responses reflecting how they would be most and least likely to respond to 288 options for problem-solving within 36 behavioral scenarios. The raw scores are translated into a set of four scales that reflect the subject's conative instincts to act in terms of the tendency to initiate, respond or prevent action in each of the conative modes: Fact Finder, Follow Thru, Quick Start and Implementor. Index results are always processed by computer.