DISCRIMINANT VALIDITY

SUMMARY Discriminant validity was tested using an unsupervised learning method of cluster analysis. The PAM algorithm run with k=3,887 was able to discriminate among three groups that should be different at a $p < 10^{-29}$ significance level, a level substantially in excess of the generally accepted $p < .05$ standard of significance.

Discriminant validity is the opposite side of the coin from convergent validity. Discrimant Validity examines the degree to which the operationalization is not similar to (i.e., diverges from) other operationalizations that should be dissimilar. For example " . . . to show the discriminant validity of a test of arithmetic skills, we might correlate the scores on our test with scores on tests with verbal ability, where *low* correlations would be evidence of discriminant validity" (Trochim, 1999b). In other words, the scores are not expected to be related and they are not.

Convergent validity checks whether things that a theory says should be related are related. Discriminant validity checks whether things that a theory says are unrelated are really, in fact, unrelated. Together, convergent and discriminant validity triangulate a construct like strategic style to assure that it is operationally clear in exactly what it is measuring.

Within the bounds of Organizational Engineering theory, discriminant validity applied to individual styles and patterns is not applicable. This is because all of the strategic styles and patterns are *inherently* related. This occurs because method and mode dimensions are

exhaustive and combine to form a strategic style (Salton, 2000, pp. 24-31). A high score in one style automatically requires that another style will have a lower score—a relationship is "built in." In other words, the theory requires that all "all bases are covered" on an individual level. This comprehensive coverage is one source of the theory's power.

However, on a group level discriminant validity can be demonstrated. Organizational Engineering theory implies that different strategic styles and patterns are favored in different environments. For example, as a group, brain surgeons are unlikely to display the unpatterned spontaneity of the Changer strategic pattern. Similarly, commodity traders are unlikely to display the cautious, thorough and precise characteristics of the Conservator pattern. In other words, the theory suggests that strategic patterns will be able to "discriminate" on the basis of certain occupational categories.

The three clear professional categories tested in the construct validity section provide an opportunity for testing discriminant validity. In the construct validity section it was shown that the three occupational categories differed from the general database population in a predictable manner. It did not show that they were different from each other.

To test whether the three groups would fall into distinctly different categories, it was decided to apply an unsupervised learning method of cluster analysis using the algorithm PAM, which employs a k-medioid approach (Kaufman and Rousseeuw, 1990).

Under this method, the data was processed only with the number of clusters k = 3 known to it, without knowledge of which person was in which class or even how many people are in each class. Correctly classifying the people in each group well beyond the level expected by chance is evidence of the theory's ability to "discriminate." Viewed in this manner, the test can be considered a stringent test of discriminant validity.

The PAM algorithm was run with 887 observations and four measurements per observation (corresponding to the individual's score on each strategic style). The procedure terminated with the assignment of each observation to one of three clusters (see Figures 1 and 2).

The optimal assignment of cluster assignments to occupational categories was then obtained with the ODA system (Yarnold & Soltysik, 2000) system. The assignment was:

Cluster 1 ⟶ R & D

Cluster 2 ⟶ IT

Cluster 3 ⟶ Customer Service

The *p*-values associated with the overall classification were obtained by Fisher's exact test for 3x3 tables. Since the PAM algorithm knew

Figure 1
Job Category Membership by Cluster

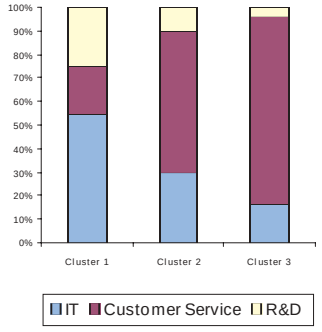
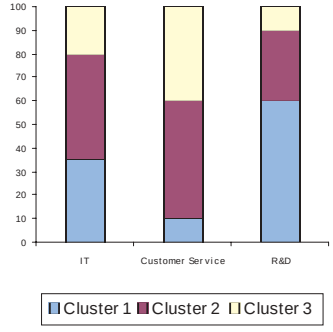


Figure 2
Cluster Membership by Job Category



only that three groups were present, and that any number of observations could have been assigned to a cluster, the correct test in this case is a contingency test without row or column marginals fixed. The use of Fisher's exact test might be questioned. It was widely held for many years that Fisher's exact probability test was limited to cross-classification tables in which both marginal frequency totals were fixed (Mielke and Berry, 1992). Research by Yates (1984) has shown this belief to be fallacious. To the contrary, Yates convincingly argued that Fisher's exact probability test is the preferred test whether both, one, or none of the marginals are fixed. Therefore, the use of Fisher's exact test is seen as appropriate for the issue at hand.

The results of the ODA analysis are summarized in Table 8. The

analysis yielded high sensitivities and predictive values for the three categories (relative to base expected values of 33.3%). The high effect strength of this analysis demonstrates three highly discriminable clusters that, in turn, correspond to the three occupational categories. In addition, the null hypothesis that the assignment of observations to categories is random was rejected by the results of Fisher's exact test for 3x3 tables.

Table 8

DISCRIMINANT VALIDITY USING THE K-MEDIOID APPROACH APPLIED TO DIFFERENT OCCUPATIONAL CATEGORIES

Information Technology	41.92%	36.75%
Customer Service	42.86%	71.17%
Research & Developement	54.08%	22.84%
Mean	46.28%	43.59%
Effect Strength	19.43%	15.38%

Overall Classification Accuracy = 43.74%
Overall Effect Strength = 17.40%
$p < .0001$ (from Fisher's exact test)

The findings of discriminant validity complement those of construct validity and triangulate with the findings in convergent validity. The evidence indicates that the theory can discriminate between unrelated factors as well as accurately predict the directional effect of related factors at the accepted .05 level of significance.