ESTABLISHING THE CONVERGENT VALIDITY OF ROLE AND LEADERSHIP DIFFERENTIATION THROUGH CAUSAL MODELING

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Students of instrumental-expressive role differentiation have long confused two analytically separable phenomena under that single rubric. Previous research and experimental data support the contention that two forms of function differentiation can be identified: leadership differentiation and more generally, role differentiation.

This confusion is spread throughout the literature, and even in Bales' own work. The practical question is whether to use "top man" analysis or more inclusive correlational measures when gauging role differentiation. The implications of the decision are important. Some studies compare the top-ranked persons on hierarchies of instrumental and expressive prominence to see if they are the same person (Bales 1953; Burke 1967). If different persons hold these positions, it is defined as role differentiation. Bales' theory of equilibrium is used to explain this occurrence. Bales found that while the most active members of his experimental groups were rated highest by others on contribution of ideas, an instrumental prominence, they were not the best-liked members but were most disliked, showing excessive instrumental prominence. On average, the second-most active group member was the most popular. Bales explains that, by pushing too hard on the instrumental dimension, a task leader is apt to upset some of the expressive needs of other members. To counteract this strain, a separate social-emotional leader may emerge by taking action to reduce tension and sustain integration. But Bales' data are misleading, and there is an alternative explanation for the experimental behavior of Bales' subjects (Riedesel 1974b).

Other research has used other operations with different implications, with a form of correlation coefficient between measures of instrumental and expressive prominence to gauge role differentiation (Theodorson 1957; Turk 1961; Bales, Slater 1955). This seems a reasonable and perhaps preferable alternative to top-man analysis. But the correlational approach seems to tap a different parameter of group structure. Bales' theory explains only the ranking of the top two positions. It does not predict the instrumental and expressive ratings below the top positions. Bales seems to predict that rankings should be equilibrated, which is a hypothesis of status congruency. Yet the only specific deviation from this structure to receive attention is the inversion of the two top positions, and is the only deviation treated by the theory of equilibrium.

If just the top positions are inverted, can we really say that role differentiation has occurred? If not, what does this term mean? We maintain that Bales' theory is really one of *leadership differentiation*. Are the instrumental and expressive leader one and the same? This arises only in the top positions. In contrast, functional role differentiation should be used to refer to any group-wide differences in expressive and instrumental prominence. To what extent do rank orderings on the two criteria diverge from perfect association? Any use of correlational measures actually yields an index of role differentiation. Under certain conditions, groups may typically evolve separate task and social-emotional leaders, but still have an overall high correlation between task and social-emotional prominence. It must be noted that Bales' expressive leader is assumed to be highly task-active as well. Likewise, extensive role differentiation could occur even though one person was ranked higherst on both dimensions.

The equilibrium theory, even as amended by Burke, Turk and Theodorson, can only predict the probability of leadership differentiation as we define it. Why the two orders of functional prominence below the top positons should diverge is left unexplained. Is it plausible that the strain toward equilibrium which supposedly produces funcional specialists will affect less-active members as well.

There is also evidence that the two forms of differentiation have some common predictors. There are effects of the legitimacy of the groups's task on role and leadership differentiation (Turk 1961; Burke 1968). The impact of other predictors is uncertain. The equilibrium theory tells us why instrumental leaders have difficulty meeting expressive needs, according to Bales, but we see nothing in it to explain a total inversion of the two rank orders. We think the equilibrium theory should be augmented or replaced by propositions able to predict the total covariation of task-oriented action by members in small social systems.

In sum, we note that 1) the exact meaning of *role differentiation* is clouded;
2) two significantly different kinds of research operations have been used to measure role differentiation; 3) the equilibrium theory suggested by Bales can explain the divergence of functional specialists, but does not account for overall divergence of instrumental and expressive rankings.

METHODOLOGY

Because of these difficulties, an emprical test was designed to assess the correspondence between these two imputed variables. Data were obtained form 31 groups of previously unacquainted undergraduate students who met for one hour on three successive weeks to discuss class-related topics. Group size ranged from 3 to 6, and the mean for 86 completed sessions was 4.5. Following the discussion, subjects completed an evaluative questionnaire.

Two measures each were obtained for leadership differentiation and for role differentiation. Following the usage of Bales and Slater (1953. 1955) sociometric ratings for contributing "good ideas or solving problems" and for popularity were collected. The correlations between the scores within each group session gave the Bales-Slater measure of role differentiation (BS:RD) The Bales-Slater measure of leadership differentiation (BS:LD) took the value of 0 or 1, depending on whether the person rated highest on ideas was also rated highest on populatiry. A factor analytic procedure developed by Burke (1967), which incorporates a larger number of evaluative items, was used for the other two measures. The 8 items used in his 1968 study were used, and the factor loadings obtained in our study were similar to those which Burke found (1968). His technique provides task and social-emotional factor scores for each group member. Again, correlations of the sets of scores within group sessions provided the Burke role differentiation score (BR:RD). A continuous measure of leadership differentiation devised by Burke (BR:LD 1967) was also obtained. The signs of the correlations were reversed so positive coefficients mean high role differentiation and negative coefficients mean low role differentiation.

How closely does leadership differentiation correspond to role differentiation? We cannot give a definitive answer, but if our hypothesis is correct, analysis should show more than a weak relation between the two variables. We have four correlations between indicators of the two supposed concepts plus two within-concept correlations (Table 1).

TABLE 1: CORRELATION OF DIFFERENTION FOR ROLE (RD) AND LEADERSHIP (LD) IN GROUP CHARACTERISTICS
(Code: Bales, Slater, (BS); BURKE (BR)

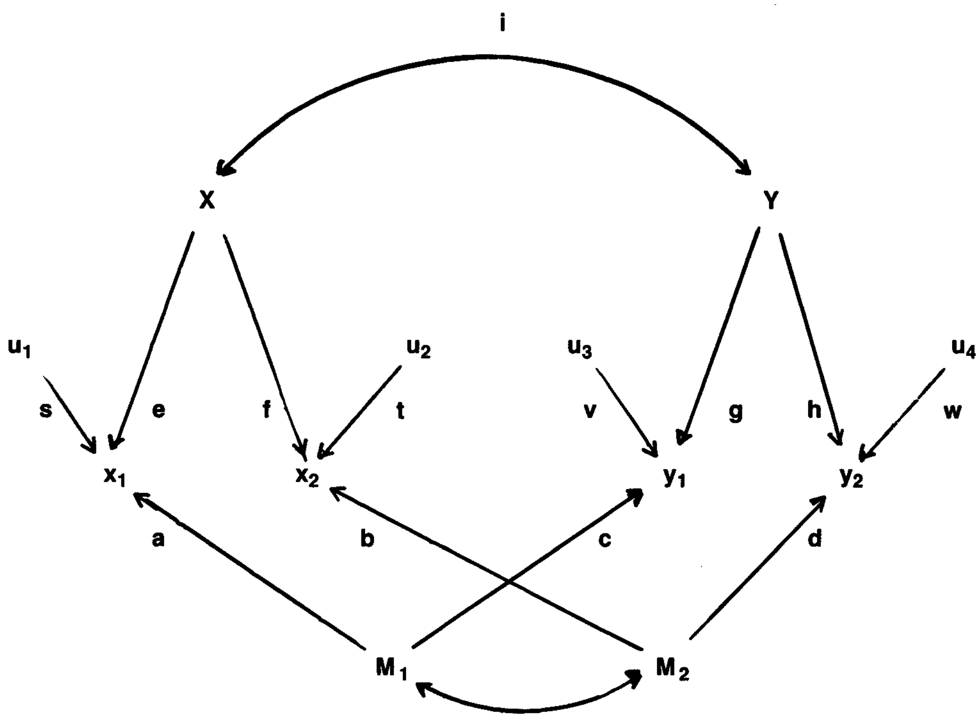
	BS:LD	BR:LD	BS:RD
BR:LD	.15		
BS:RD	.40	−.22	
BR:RD	−.02	.41	.32

$n = 86$; $r_{.05,86} = .22$; $r_{.01,86} = .28$

The coefficients constitute a multitrait-multimethod matrix (Campbell, Fiske 1959). To test our hypothesis we need a stable estimate of the correlation between role and leadership differentiation, yet Table 1 shows four coefficients. How can the range of −.22 to +.41 be accounted for and how can we identify the most accurate figure? Methods of measurement have some effect on indicators, and some covariation between indicators measured by the same method can be explained by that factor alone. Here, part of the correlation between BS:LD and BS:RD can be attributed to the common effect of using the Bales items.

But Campbell and Fiske (1959) argue that the effect of the methods of measurement can be detected. This suggests that if monomethod heterotrait correlations exceed the heteromethod correlations, a methods effect can be inferred. In our data, association between the two variables, based on the Bales-Slater items and that between the two

FIGURE 1: CAUSAL MODEL: INDICATORS, UNMEASURED CONCEPTS, AND METHODS FACTORS



Legend:

X Leadership differentiation, (LD), unmeasured
Y Role differentiation, (RD) unmeasured
x_1 Bales-Slater LD, measured
x_2 Burke LD measure
y_1 Bales-Slater LD, measured
y_2 Burke RD, measured
M_1 Methods factor (BS), unmeasured
M_2 Burke methods factor, unmeasured

Burke items variables are largest. Heterotrait coefficients based on differen methods were negative (−.02; −.22). From the correlation matrix it appears that the relation is less than .40, so the methods effect is real. But more definitive conclusions are desirable.

The multitrait multimethod problem can be resolved with causal modeling (Althauser, Heberlein 1970). The methods effects and the "real" levels of role and leadership differentiation can be explicitly related in causal models as unmeasured variables (Hauser, Goldberger 1971). Certain assumptions must be made, though the nature of one's data and theory circumscribe the possible solutions. Believing that the assumptions of existing multitrait-multimethod solutions are not appropriate, we applied another solution.

Figure 1 shows an appropriate model for the unmeasured variables and the four empirical indicators. BS:LD (x_1), BR:LD (x_2), BS:RD (y_1) and BR:RD (y_2) are the empirical variables between which correlation coefficients are known. Leadership differentiation (X) and role differentiation (Y) are the underlying concepts while M_1 and M_2 are the methods factors corresponding to the effects of using the items of Bales, and the items of Burke. Because there are many more unknown variables in the model than there are known coefficients, the system is underdefined. Thus, there is no unique solution for all necessary equations.

Our primary interest is in estimating path "i", (P_i) — the association between role and leadership differentiation, with the effect of common measurement methods, called the *coefficient of convergent validity*, removed. Despite the underidentification, a few reasonable assumptions will allow us to establish the sign of P_i through the algebraic manipulation of the present data. These assumptions are more restrictive than those necessary for the multitrait-multimethod solutions (Alwin 1974). Our most important assumption is that path "q" (P_q) is not negtive; that is, that the method effects are not negatively correlated. Little has been published about thje meaning of methods effects, but it is claimed that "... they are best conceived of as symbols for extraneous variables which are peculiar to the method of collecting data." (Althauser, Heberlein 1970 156) The methods of collecting the Bales type data and the Burke type data were generally the same. There are three differences which may be relevant: 1) the Bales data are based on only 2 items compared to 8 for the Burke data; 2) the Bales items were at the end of a 2-item questionnaire; 3) self-ratings were not obtained on the Bales *popularity* item. But all of the data were collected at the same time by paper-pencil methods, and the wording of the questions was parallel throughout. We do not assume that P_q is anywhere near perfect, but it is reasonable to assume that it is positive. For similar reasons we assume that the methods paths (a-d) are of like sign, and that the epistemic paths (e-h) are positive, as we must assume that all our measures are valid.

We now decompose heterotrait correlations:

(1) $r_{y1x2} = fig + bqc = -.22$

(2) $r_{y2x1} = eih + aqd = -.02$

(3) $r_{x1y1} = eig + ac = .40$

(4) $r_{x2y2} = fih + bd = .41$

By our assumptions, A_1 and A_2 the values of bqc and aqd will be positive except that if q = 0, both will be 0. In either case, the values of fig and eih must be negative since fig cannot exceed −.22, and eih cannot exceed −.02 by equations (1) and (2). Now, by the third assumption, A_3, *P_i must be negative* since e,f,g, and h are positive. With these conclusions, ac cannot exceed .42 and bd cannot exceed .63. Since P_i is inferred to be negative in the present data, given our assumptions, we now have more evidence for treating role differentiation and leadership differentiation as separate phenomena.

This tentative conclusion was further tested through Joreskog's maximum likelihood confirmatory factor analysis. The procedure allows us 1) to estimate the parameters of our causal model, and 2) to make an inference regarding the model's goodness of fit (Joreskog 1970; Joreskog, Gruvaeus, van Thillo 1970; Werts, Linn, Joreskog 1971). It is necessary to make more restrictive assumptions than in the first analysis, but more definitive results may be obtained. Inferences about the goodness of fit involve examination of a chi-square value. If this value equals or exceeds the corresponding figure tabulated at the chosen level of significance, we may conclude that our causal model does *not* accurately fit the observed correlation matrix. If the chi-square value is less than the criterion value for chi-square under the null hypothesis at the .05 level, we may claim support for the adequacy of our causal model. For a meaningful goodness of fit, there must be at least one degree of freedom. We can meet this condition by making two kinds of assumptions: 1) fixing certain parameters at a specified value, or 2) constraining selected parameters to equal others in the model. The remaining parameters are designated as *free*, and are estimated on the basis of the correlation matrix. We will emloy maximum likelihood confirmatory factor analysis to evaluate several forms of the causal model shown in Figure 1.

Since this model is underidentified, each test requires a set of assumptions. We assume that the two measures involving the Bales items, (x_1 and y_1) are equally valid measures of their constructs (e = g), and that the two measues employing the Burke items (x_2 amd y_2) are equally valid (f = h). This second model also includes the assumption that a methods factor equally affects the two indicators involving that method (a = c, b = d).

These assumptions allow us to constrain x to equal v, and t to equal w. Following Figure 1, we know that:

$$s = [1 - (a^2 + e^2)]^{.5};\ t = [1 - (b^2 + f^2)]^{.5}$$

$$v = [1 - (c^2 + g^2)]^{.5};\ w = [1 - (d^2 + h^2)]^{.5}$$

The second model also assumes that the two methods effects are independent and that q = 0, as shown in Table 2. Although slightly different from the Model 1 estimate. This value again suggests that leadership differentiation and role differentiation should be treated as separate phenomena. The Chi-square value lacks significance, indicating that the assumptions are realtistic in terms of observed

TABLE 2: PATH ESTIMATES BY USE OF CONFIRMATORY FACTOR ANALYSIS (Refer to Figure 1)

Model 1:

Assumptions;	e=f	a=c	q=0.0	
	g=h	b=d		
Solution:	a=.71	e=.37	i=−.63	s=.63
	b=.75	f=.37	q=0.0	t=.50
	c=.71	g=.57		v=.33
	d=.75	h=.57		w=.43

z^2 = 2.11; df = 1

Model 2:

Assumptions:	e=g	a=c	q=0.0	
	f=h	b=d		
Solution:	a=.75	e=.56	i=-.51	s=.35
	b=.71	f=.42	q=0.0	t=.57
	c=.75	g=.56		v=.33
	d=.71	h=.42		w=.43

z^2 = 5.86; df = 3

correlations.

We have maintained that the two methods effects are not negatively correlated, and have used this assumption in both models. Because this assumption is important to the solutions, we made parameter estimates for three more forms of the two models, with q fixed in the positive range: .10; .30; .50; but the value of P_i remained negative, greater than −1.00

CONCLUSION

Separation of instrumental and expressive leaders alone should not be confused with the full extent of instrumental-expressive role differentiation, for they have similar implications. Consider the advantages. If the two concpets are distinguished, we can avoid the debate over "top-man" analysis versus all-member analysis. We could more precisely identify the causes and consequences of the two phenomena. If they are not identical we would avoid the problem of inconsistencies. The evidence is that the group's acceptance of its task affects both role and leadership differentiation. But do ranking consensus and inequality of participation apply equally to both? Does group cohesiveness affect differentiation of leaders as well as group-wide role differentiation? We have seen evidence that goal attainment is enhanced by leadership differentiation, but that satisfaction of the adaptation and latency functions is elevated by role differentiation.

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