Issues and Opinions

Authors' Response to Bordoloi and Lauer: Problems of Applying OLS/Path Analysis for Estimating Structural (Multi-Equation) Models

Bordoloi and Lauer question the use of OLS regression techniques for calculating path coefficients in our article (*MIS Quarterly,* March 1988, pages 91-108). We make three points with regard to Bordoloi and Lauer's analysis.

First, according to Pedhazur (1982, p. 580), path analysis is a "method used for studying the direct and indirect effects of variables hypothesized as causes of variables treated as effects." Hence, path analysis is used to analyze hierarchical models, those in which the causal flow in the model is unidirectional. The model we developed to assess the effect of user involvement and a number of exogenous variables on system success is, indeed, a hierarchical model and therefore the use of path analysis is appropriate (see Figure 1, p. 93).

Second, Bordoloi and Lauer state: "OLS/path analysis is appropriate for estimating hierarchical multi-equation models that have independent error teams across equations . . . . With respect to the proposed model in the article — in fact for most social science models based on observational data — it is not reasonable to assume the error terms in each equation are independent of each other." Now, the critical assumption with regard to residuals in path analysis is that "(e)ach residual is not correlated with the variables that precede it in the model" (Pedhazur, 1982, p. 582). This assumption, itself,

implies independence in the residuals. Since the effect of the residual in the equation obtained by regressing user involvement on the exogenous variables is filtered out in the second equation obtained by regressing system success on user involvement and the exogenous variables, the error terms will be independent.

Third, other points Bordoloi and Lauer make, such as omission of relevant variables and the use of unreliable measures, are points that can be made of any regression analysis. They say nothing specifically about the use of OLS/path analysis (to use Bordoloi and Lauer's terms).

As a final point, we examine a further assumption of path analysis, viz., that "(t)here is a one-way causal flow in the system. That is, reciprocal causation between the variables is ruled out" (Pedhazur, 1982, p. 582). Note that this is not a statistical issue of the use of path analysis *per se,* but one of the specifications of the theoretical model under investigation. When the model under test is not hierarchical, OLS regression is not appropriate. In this case, the use of two-stage least squares regression is in order. To test this assumption, we used the reduced model that included the significant variables from our previous analysis, i.e., system complexity, which had an effect on user involvement, and resource constraints, which had an effect on system success. Two-stage least squares regression showed that the link from system success to user involvement was not significant (t-value = 0.115; p = .9091). There was, therefore, no reciprocal causation in the model and it is correctly specified as a hierarchical model.

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