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Have your cake and eat it too: Achieving scientific legitimacy☆

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ABSTRACT

LaPlaca alone and with colleagues has contributed > 100 insightful studies focusing in advancing science in industrial marketing management (IMM).His body of work constitutes a remarkable scholarly legacy in identifying the milestones in advances in the pursuit of scientific contributions in IMM and in informing scholars of what the field must tackle successfully to achieve scientific legitimacy—that is, engagement in a true paradigm shift, one that advances discovery in this area from sheer descriptive analysis and reporting to the development of explanatory schemata and theoretical frameworks of a kind that allow for accurate prediction of underlying B2B phenomena.The present article is a tribute offering to LaPlaca for this central insight and LaPlaca's body of work generally.The essay here identifies research advances in theory and analytics that contribute successfully to the primary need LaPlaca and colleagues identify for IMM to achieve scientific legitimacy.An explosion in case-based predictive model-building occurred in the teen years of the 21st century that responds to the challenge of achieving accurate prediction of B2B phenomena.A few scholars became renowned through their scholarly contributions, LaPlaca is one of these few because of his mapping of IMM paradigm shifts taking the field closer to the overarching objective of scientific legitimacy.

1. Introduction: achieving scientific legitimacy

LaPlaca and colleagues (Hadjikhani & LaPlaca, 2013; LaPlaca, 1997; LaPlaca & da Silva, 2016) described in-depth the first paradigm shift in B-to-B research from description and explanation of business exchanges based on transactions to description and explanation of business exchanges based on relationships.Equally important, they identify what is still necessary to accomplish for B-to-B research to achieve scientific legitimacy, "B2B relationships as a subject of scientific enquiry will need to seriously engage into what can be termed a true paradigm shift, one that advances discovery in this area from sheer descriptive analysis and reporting to the development of explanatory schemata and theoretical frameworks of a kind that allow for more accurate prediction of underlying B2B phenomena" (LaPlaca & da Silva, 2016: 232).

LaPlaca and colleagues' provide foundation insights on the steps necessary to take to achieve scientific legitimacy including embracing prediction and control as necessary objectives in B-to-B research—research focusing on description and explanation is necessary but insufficient for advancing science in the B-to-B discipline."In conducting scientific investigations, researchers, particularly scientists studying physical phenomena, progress through a hierarchy of types of research: descriptive, explanatory, predictive, and control (LaPlaca, 2013). The ultimate goal of science is to control events where possible… Improved understanding and predictive capabilities will reduce marketing errors and improve overall marketing effectiveness and efficiency.In this way, B-to-B marketing research will truly make a contribution to society" (LaPlaca & da Silva, 2016: 232).

The present study pays tribute and expands on LaPlaca's wisdom.The following discussion focuses on how to accomplish the true paradigm shift that LaPlaca and colleagues call for achieving.The study here provides examples of research contributing to knowledge and theory that advance prediction and control in B-to-B contexts. The study indicates that shifting beyond linear model construction and symmetric tests (i.e., multiple regression analysis (MRA) and structural equation modeling (SEM)) and embracing complexity theory and asymmetric tests (i.e., constructing and testing algorithms by "computing with words," Zadeh, 1996, 2010) are necessary steps to take to accomplish the true paradigm shift.Researchers in B-to-B research benefit from recognizing that the current dominant logic of performing null hypothesis testing (NHST via MRA and SEM) is "corrupt research" (Hubbard, 2016) practice and from recognizing that predicting by algorithms via somewhat precise outcome testing (SPOT) advances B-to-B research toward achieving scientific legitimacy.

Following this introduction, the second section answers the question, "Predicting what—directions or outcomes?"The third section provides examples of predicting precise outcomes in the B-to-B research literature.Section four expands on prior calls (Misangyi et al., 2017; Woodside, 2014) to embrace complexity theory as the foundational

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philosophy in B-to-B research—the expansion includes a description of "four-corner modeling" via predictive algorithms of complex (versus the currently dominant single condition) outcomes.The fifth section concludes this tribute by elaborating on how to overcome naysayers and "the forces of inertia" (Huff, Huff, & Barr, 2001) that usually serve to prevent adoption of superior theory and method.The fifth section addresses the question, what steps are helpful for overcoming these forces to gain acceptance of research using SPOT rather than NHST by reviewers and editors in scholarly journals?The essay here and conclusion support the conclusion that the teen-years of the 21st century bear witness to B-to-B researchers' successful responses—finally—to LaPlaca's call for a truly new paradigm shift.

2. Predicting what—directions or outcomes?

Along with convincingly demonstrating that the significance difference paradigm is methodologically impaired and statistically broken and "embedded in an academic social structure whose publication biases complete the institutionalizing this corruption" (Hubbard, 2016: 9), he raised the point that "there is no reason why theories in the management social sciences cannot yield precise (or interval) predictions…this line of thinking flies in the face of conventional wisdom that theories in these areas are unable to specify point predictions" (Hubbard, 2016: 192–193).In his demonstration of the null value of NHST, Hubbard (2016) reviews more than 50 studies that are consistent with Schmidt's (1996: 116) conclusion:"We must abandon the statistical significance test." Trivial findings include findings that a difference between two means is not zero, partial regression weights for variables in a regression model are not equal to zero (cf. Cohen, 1994: 1000), or two variables have a positive or a negative relationship."Thus asking, 'Are the effects different?' is foolish. What we should be answering first is, "Can we tell the direction in which the effects of A differ from the effects of B?" (Tukey, 1991:1000).However, what Tukey (1991) proposed also turns out to be foolish as well.The better, more informative questions to ask and answer include, "Within what complex conditions does high A indicate high B, low A indicate high B, low A indicate high B, and low A indicate low B." If both are continuous variables, converting each to quintiles and cross-tabulating the two sets of cases almost always demonstrates that cases occur in all 25 cells.Even when a main effect is large indicating "A" associates with "B", cases found to be in the cells indicating associations contrary to the main effect are not merely unexplainable blips—such "seeming anomalies" are deserving of explanation and predictive modeling.

Directional findings (e.g., $r = 0.57$, $p < 0.01$) are qualitative predictions offering scant substantive information leading McCloskey (2002: 55) to describe almost all the harm such studies inflict on the discipline—what she labels the "Two Sins of economics" (i.e., being content with only qualitative predictions in both theory and applied work):

> The progress of economic science has been seriously damaged. You can't believe anything that comes out of the Two Sins. Not a word. It is all nonsense, which future generations of economists are going to have to do all over again. Most of what appears in the best journals is unscientific rubbish. I find this unspeakable sad. (McCloskey, 2002: 55)

Directional testing and tests of significance differences are bad science for additional reasons.As practiced in articles in the best journals, they fail to indicate when exceptions occur to the directions supported by the statistical tests.Given that in real-life exceptions almost always occur to a statistically significant main effect, modeling the causes leading to the contrarian directional outcomes would likely provide important findings.Also the current practice in the dominant paradigm of testing the relative size of influence of independent variables in linear regression and SEM research represents a mismatch between theory and analytics (Fiss, 2007) whereby the variables' weights are competing with one another for indicating that each variable has a significant positive or negative influence in these models—and if the associations among two independent variables are both large between them and with the dependent variable, one of the two appears to be non-significant in the resulting model due to this "multicollinearity."

In human resources research attempting to construct models predicting highly competent managers (mangers in the top quintile of competence), McClelland's (1998) frustration with the severely limited usefulness of regression findings and his decades of experience and insights in working in data analysis, lead him to try discretizing variable data into quintiles and creating algorithms.Thus, McClelland (1998) shifted his theory construction and analytics from variable-based to case-based reasoning.McClelland (1998) was able to construct somewhat precise outcome tests (SPOT) ("SPOT" is not a term used by McClelland) that were highly accurate in identifying highly competent managers among samples of managers not used in the construction of the models (i.e., the algorithmic model had high predictive validity).-While McClelland's (1998) work has had high impact (1000+ citations by 2017), his method has been widely ignored.When SPOT findings are "useful" (avoiding "statistically significant" here), all or nearly all cases having high scores in the asymmetric model have high scores in the outcome.For example, cases (managers) with high scores across all causal conditions in McClelland's antecedent conditions were identified to be highly competent managers.McClelland's (1998) hit (accuracy) ratios for identifying highly competent managers were frequently above 7-to-1.McClelland's analytics are an example of statistical sameness tests of precise outcomes—a case-based approach to data analysis—rather than using NHST.Hubbard (2016: 5) points out, "Looking for reproducible results is a search for significant sameness, in contrast to the emphasis on the significant difference form a single experiment" (Nelder, 1986: 113).

The great power in using MRA and SEM to generate models having high fit validity cannot be denied.In fact, because these analytics make use of all the information available in the data, highly significant terms ("paths") in these models occur even when using a table of random numbers for data (Armstrong, 2012). But the proof is in eating of the pudding that is, the proof is in testing for predictive validity of models by seeing how well they predict outcomes for cases in separate samples from the cases used to create the models."Achieving a good fit to observations does not necessarily mean we have found a good model, and choosing the model with the best fit is likely to result in poor predictions. Despite this, Roberts and Pashler (2000) estimated that, in psychology alone, the number of articles relying on a good fit as the only indication of a good model runs into the thousands" (Gigerenzer & Brighton, 2009). These studies are examples of shallow analysis that are accurately describable as examples of the rubbish that saddens McCloskey (2002).

The pervasive practice of researchers using NHST is to universally fail to examine the occurrence of reversals in relationships that occur almost always in data sets for 10–20% of the cases in a data set—even when the effect size is large ($r^2 \geq 0.25$) for a relationship.Complexity theory (Urry, 2005; Wu, Yeh, Huan, & Woodside, 2014) indicates that the occurrence of such cases (e.g., X decreases indicate Y increases) even though the main relationship is that X increases associate with Y increases. Such contrarian cases are verifiable easily by creating quintiles for both X and Y variables and cross-tabulating the quintiles (Woodside, 2016).

3. Predicting precise outcomes in the B-to-B literature

A few studies are identifiable in the literature that include the use of SPOT and predictive validation of the predictions.These studies are illustrative of several good science principles.For examples, these studies construct asymmetric causal models—that is, they recognize that causal