



The Measurement of Entrepreneurial Orientation

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This article explores how the concept of entrepreneurial orientation (EO) has been portrayed and assessed in prior research. The challenges and decision criteria associated with formative versus reflective measurement approaches are reviewed. It is argued that, as a latent construct, EO exists apart from its measures and that researchers are free to choose whichever measurement approach best serves their research purposes, recognizing that unidimensional versus multidimensional EO measurement models are consistent with fundamentally different conceptualizations of the EO construct. Recommendations are offered regarding potentially appropriate formative and reflective measures of EO.

Introduction

The phenomenon of an entrepreneurial orientation (EO) as a driving force behind the organizational pursuit of entrepreneurial activities has become a central focus of the entrepreneurship literature and the subject of more than 30 years of research. EO has generally been conceived of as an organizational decision-making proclivity favoring entrepreneurial activities (Lumpkin & Dess, 1996). The prominence of the concept within management research stems from the assumption that EO represents a continuous variable (or set of variables) upon which all organizations can be positioned or plotted. This assumption contributes to the view that all organizations fall somewhere along a conceptual continuum ranging from conservative (the “low” end) to entrepreneurial (the “high” end) (Barringer & Bluedorn, 1999; Covin & Slevin, 1998) or in a multidimensional conceptual space that captures the domain of “being entrepreneurial” (Antoncic & Hisrich, 2003; Lumpkin & Dess). As such, investigations of EO have targeted organizations’ orientations toward entrepreneurial activity irrespective of whether they are young or old, small or large, public or private, etc. Given EO’s broad applicability it is, perhaps, not surprising that the concept has been extensively adopted in past research.

Nonetheless, EO researchers often acknowledge variations in how the latent construct is or should be conceptualized (Covin, Green, & Slevin, 2006; Lumpkin & Dess, 1996), factors that have direct measurement-related implications. Unfortunately, as discussed by George (2006), EO researchers have often explicitly or implicitly mischaracterized the

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type of measurement model employed in their studies, referring, for example, to an EO scale as a formative measure when it is not. Inappropriately inferring the nominal meaning of the EO construct from the results of data analysis (i.e., evidence pertaining to the construct's empirical meaning) is also a common occurrence. Moreover, while evidence suggests that there is a most commonly employed EO measure—namely, the Miller/Covin and Slevin (1989) scale (see Rauch, Wiklund, Lumpkin, & Frese, 2009)—and the scale itself has been the subject of careful scrutiny in several empirical investigations (e.g., Knight, 1997; Kreiser, Marino, & Weaver, 2002), little progress has been made in the development of new approaches to EO's assessment since Lyon, Lumpkin, and Dess (2000) issued this challenge to researchers a decade ago. In general, measurement concerns have not yet broadly captured the interest of EO researchers, perhaps because studies employing the Miller/Covin and Slevin (1989) scale and its variants have repeatedly yielded findings that are arguably theoretically interesting. A consequence of the scale's recognized value may be minimal felt need among researchers to explore alternative EO measures. (For a notable exception, see Short, Broberg, Cogliser, and Brigham [2009] who used computer-aided text analysis to count the number of times words related to EO's dimensions—namely, risk-taking, innovation, proactiveness, autonomy, and competitive aggressiveness—were mentioned in the CEO letters to shareholders included in the annual reports of *S&P 500* firms.)

The current article reviews the concept of EO as well as the foundations of measurement theory for the purpose of promoting a general understanding of the principal issues involved in EO's measurement. Specific attention is paid to matters such as whether EO is most appropriately assessed through formative or reflective measurement models and the limitations of various measurement models when particular conceptualizations of EO are employed by researchers. Based on lessons gleaned from the measurement theory literature (e.g., Coltman, Devinney, Midgley, & Venaik, 2008; Diamantopoulos & Winklhofer, 2001; Howell, Breivik, & Wilcox, 2007; Jarvis, MacKenzie, & Podsakoff, 2003), it will be argued that while EO is typically conceived of as having a number of "component" variables (e.g., Lumpkin & Dess, 1996; Miller, 1983), that does not make EO a formative construct. Constructs themselves are neither inherently formative nor reflective in nature. It will also be argued that reflective measurement models are often most appropriate for assessing EO, with formative measurement approaches best reserved for instances where verifying the importance of EO's causal indicators to particular outcomes is of principal concern. The final section of this paper proposes and critiques four alternative approaches to EO's measurement, and some key take-aways pertaining to EO's conceptualization and measurement are reviewed.

The Concept of EO

The notion of an orientation toward entrepreneurial activity has been given a variety of labels in past research including entrepreneurial orientation, intensity, style, posture, proclivity, propensity, and in some instances, corporate entrepreneurship (e.g., Zahra, Jennings, & Kuratko, 1999). Given the various labels attached to the phenomenon it is, perhaps, not surprising that researchers have yet to settle upon a widely accepted definition of EO. Table 1 presents a sampling of the EO definitions (as well as definitions of related constructs on which the concept of EO is based) advanced in prior research. These entries were selected for inclusion in Table 1 because they demonstrate variously subtle-to-dramatic distinctions in their portrayal of the EO concept. The following discussion

Table 1

Selected Past Definitions of (or Pertaining to) Entrepreneurial Orientation

Authors	Definition of EO
Mintzberg (1973)	"In the entrepreneurial mode, strategy-making is dominated by the active search for new opportunities" as well as "dramatic leaps forward in the face of uncertainty" (p. 45).
Khandwalla (1976/1977)	"The entrepreneurial [management] style is characterized by bold, risky, aggressive decision-making" (p. 25, [] added).
Miller and Friesen (1982)	"The entrepreneurial model applies to firms that innovate boldly and regularly while taking considerable risks in their product-market strategies" (p. 5).
Miller (1983)	"An entrepreneurial firm is one that engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with 'proactive' innovations, beating competitors to the punch" (p. 771).
Morris and Paul (1987)	"An entrepreneurial firm is one with decision-making norms that emphasize proactive, innovative strategies that contain an element of risk" (p. 249).
Covin and Slevin (1998)	"Entrepreneurial firms are those in which the top managers have entrepreneurial management styles, as evidenced by the firms' strategic decisions and operating management philosophies. Non-entrepreneurial or conservative firms are those in which the top management style is decidedly risk-averse, non-innovative, and passive or reactive" (p. 218).
Merz and Sauber (1995)	"... entrepreneurial orientation is defined as the firm's degree of <i>proactiveness</i> (aggressiveness) in its chosen product-market unit (PMU) and its willingness to <i>innovate</i> and create new offerings" (p. 554).
Lumpkin and Dess (1996)	"EO refers to the processes, practices, and decision-making activities that lead to new entry" as characterized by one, or more of the following dimensions: "a propensity to act autonomously, a willingness to innovate and take-risks, and a tendency to be aggressive toward competitors and proactive relative to marketplace opportunities" (pp. 136-137).
Zahra and Neubaum (1998)	EO is "the sum total of a firm's radical innovation, proactive strategic action, and risk taking activities that are manifested in support of projects with uncertain outcomes" (p. 124).
Voss, Voss, and Moorman (2005)	"... we define EO as a firm-level disposition to engage in behaviors [reflecting risk-taking, innovativeness, proactiveness, autonomy, and competitive aggressiveness] that lead to change in the organization or marketplace" (p. 1134, [] added).
Avlonitis and Salavou (2007)	"EO constitutes an organizational phenomenon that reflects a managerial capability by which firms embark on proactive and aggressive initiatives to alter the competitive scene to their advantage" (p. 567).
Cools and Van den Broeck (2007/2008)	"Entrepreneurial orientation (EO) refers to the top management's strategy in relation to innovativeness, proactiveness, and risk taking" (p. 27).
Pearce, Fritz, and Davis (2010)	"An EO is conceptualized as a set of distinct but related behaviors that have the qualities of innovativeness, proactiveness, competitive aggressiveness, risk taking, and autonomy" (p. 219).

focuses on that subset of entries shown in Table 1 in which fundamental changes to the description and definition of the EO concept were offered.

The roots of EO research can be traced to the work of Mintzberg (1973). In his theorizing about strategic decision-making, Mintzberg conceived of an entrepreneurial strategy-making mode as a managerial disposition characterized by the active search for new opportunities in uncertain environments through which dramatic growth might be realized. In a similarly pioneering work exploring managerial dispositions, Khandwalla (1976/1977) advanced the concept of management style as the "operating set of beliefs and norms about management held by the organization's key decision makers . . . [that] when translated into action, constitute the organization's strategy for survival and growth" (p. 22). According to Khandwalla, an entrepreneurial management style refers to a bold, risky, and aggressive approach to decision making, in contrast to a more cautious, stability-oriented approach.

The works of Mintzberg (1973) and Khandwalla (1976/1977) established EO as a managerial disposition rooted in decision making, a view widely adopted in subsequent scholarly inquiry (e.g., Covin & Slevin, 1989; Lumpkin & Dess, 1996; Miller & Friesen, 1982). Dess and Lumpkin (2001, p. 3) view EO as an “organizational-level phenomena involving key decisions made on behalf of the entire organization.” Covin and Slevin (1989, p. 77) suggest that “entrepreneurial firms are those in which top managers have entrepreneurial management styles, as evidenced by the firms’ strategic decisions and operating management philosophy.” Miller and Friesen (1982, p. 1) posit that EO captures “the nature of the innovative strategy of the firm, something that is often determined by executives on the basis of their goals and temperaments.”

The work of Miller and his colleagues introduced the notion of firm-level entrepreneurship that formed the foundation of a school of thought that EO is manifested as a collection of organizational behaviors. Miller and Friesen (1982, p. 5) posited that entrepreneurial firms “innovate boldly and regularly while taking considerable risks in their product-market strategies.” Adding the attribute of “proactivity,” Miller (1983, p. 771) posited that a firm is entrepreneurial when it “engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with ‘proactive’ innovations, beating competitors to the punch.” As such, Miller (1983) conceived of EO (although he never actually used the expression entrepreneurial orientation in this initial work) as the simultaneous exhibition of innovativeness, risk-taking, and proactiveness. Miller (p. 780) states:

In general, theorists would not call a firm entrepreneurial if it changed its technology or product line (“innovated” according to our terminology) simply by directly imitating competitors while refusing to take any risks. Some proactiveness would be essential as well. By the same token, risk-taking firms that are highly leveraged financially are not necessarily entrepreneurial. They must also engage in product-market or technological innovation.

In short, Miller (1983) conceived of EO as a construct composed of three sub-dimensions—innovativeness, risk taking, and proactiveness—that must positively covary in order for an EO to be manifested. Miller implicitly views EO as the intersection of, or shared variance among, these dimensions. In the absence of covariation among innovativeness, risk taking, and proactiveness the presence of an EO, according to Miller’s conceptualization, should not be claimed.

Lumpkin and Dess (1996, p. 136) suggest that “EO refers to the processes, practices, and decision-making activities that lead to new entry. . . . It involves the intentions and actions of key players functioning in a dynamic generative process aimed at new-venture creation.” Dess and Lumpkin (2001) describe EO as an organizational-level strategy-making process, the dimensionality of which is unable to be specified *a priori*, independent of circumstance. Expanding the number of dimensions that characterize EO, Lumpkin and Dess posit that innovativeness, risk taking, proactiveness, competitive aggressiveness, and autonomy represent five dimensions that independently and collectively define the domain of EO. Lumpkin and Dess (p. 137) state:

All of these factors—autonomy, innovativeness, risk-taking, proactiveness, and competitive aggressiveness—may be present when a firm engages in new entry. In contrast, successful new entry may also be achieved when only some of these factors are operating. That is, the extent to which each of these dimensions is useful for predicting the nature and success of a new undertaking may be contingent on external . . . or internal factors.

According to Lumpkin and Dess (1996), what it means to be entrepreneurial, or which dimensions of EO are likely to contribute to new entry, depends upon considerations that lie beyond the boundaries of the construct, such as the organizational and environmental context of a firm. Whereas Miller (1983) defines the construct of EO as requiring the concurrent exhibition of innovativeness, risk taking, and proactiveness, Lumpkin and Dess conceive of EO as not requiring an emphasis by the entrepreneurial organization on any particular dimension or set of dimensions from the five they posit as capturing the essence of EO. In short, Lumpkin and Dess suggest that the dimensions that characterize EO need not strongly and positively covary in order for an EO to be claimed to exist.

Lumpkin and Dess's (1996) conceptualization of EO is similar to others' conceptualizations of multidimensional constructs in some respects. For example, similar to Khandwalla's (1976/1977) conceptualization of the construct of top management style, Hofstede's (1984) conceptualization of the construct of cultural values, or Barrick and Mount's (1991) conceptualization of the construct of personality, Lumpkin and Dess conceive of EO as having five dimensions, each of which (by dint of being a dimension) can range from "low" to "high." However, there are a more and less entrepreneurial ends to each of the five dimensions Lumpkin and Dess identify as associated with the EO construct. As such, a more entrepreneurial firm will be positioned more toward the entrepreneurial end of, presumably, at least one of the five EO dimensions (although Lumpkin and Dess are clear that entrepreneurial firms need not be "high" on any particular dimension). By contrast, there are not greater and lesser levels of top management style, cultural values, or personality according to Khandwalla's, Hofstede's, and Barrick and Mount's respective conceptualizations of these constructs. Rather, there are simply various profiles that might exist across the dimensions implied by these constructs, and these profiles represent the realized phenomena of top management style, cultural values, and personality. As such, EO, according to Lumpkin and Dess's conceptualization, is arguably somewhat atypical as a latent construct in that "being entrepreneurial" has a specific meaning, but that specific meaning is not identified within the context of the five dimensions posited as defining the construct.

Overall, one might say that the Lumpkin and Dess's (1996) conceptualization of EO is more domain-focused—that is, it specifies where to look for EO—whereas the Miller (1983) conceptualization of EO is more phenomenon-focused—that is, it specifies what EO looks like. Notably, there have been no significant or widely acknowledged adaptations to how construct of EO can or should be conceptualized since the publication of Lumpkin and Dess's work. Moreover, researchers commonly recognize the fundamental distinction between the unidimensional (a.k.a. "composite dimension") view of EO associated most strongly with Miller and Covin and Slevin (1989) and the multidimensional view of EO associated most strongly with Lumpkin and Dess.

Of particular relevance to the current article, the way in which scholars conceptualize the EO concept has strong measurement-related implications. Following the theoretical leads of Miller (1983) and Lumpkin and Dess (1996), most discussions of EO's measurement have focused on the matter of how many dimensions EO has, the assumption being that this number should influence how the phenomenon is measured (see, for example, Covin et al., 2006; Kreiser et al., 2002). While this consideration is certainly valid, an equally valid consideration regarding EO's measurement is the matter of whether particular conceptualizations of EO imply the need to use (or avoid using) specific modeling techniques. This topic is explored below.

Measurement Models

The Characteristics of Formative vs. Reflective Measurement Models

A fundamental point of discussion within the EO literature considers whether the concept of EO is, or should be, understood as a latent construct that is most appropriately assessed using formative measurement modeling or reflective measurement modeling (see, for example, Covin et al., 2006; Lyon et al., 2000). Briefly, formative measurement models employ “explanatory combinations of indicators” as the basis for creating (for measurement purposes) the latent construct (Fornell & Bookstein, 1982, p. 292). In other words, in formative measurement modeling the latent construct is modeled as being produced by its measures. By contrast, reflective measurement models assume that “underlying factors . . . give rise to something that is observed” (Fornell & Bookstein, p. 292). In other words, in reflective measurement modeling the latent construct is modeled as producing its measures. This section provides informational background relevant to the nature and use of formative versus reflective measurement models.

Latent constructs (also known as latent variables or simply constructs) are “phenomena of theoretical interest which cannot be directly observed and have to be assessed by manifest measures which are observable” (Diamantopoulos, Riefler, & Roth, 2008, p. 1204). Latent constructs can be assessed within measurement models as well as embedded within structural models. Structural models specify relationships between different latent constructs. Measurement models specify relationships between latent constructs and their measures (also referred to as items, indicators, and indicants). The focus of the current discussion is on the measurement models used to assess latent constructs.

Measurement models differ according to the presumed direction of causality between the latent construct and its measures. Either the latent construct is assumed to lead to its measures or the latent construct is assumed to result from its measures. When the presumed direction of causality is from the construct to its measures, reflective measurement models are appropriate. The measures in such models are sometimes referred to as effect indicators or reflective indicators. When the presumed direction of causality is from the measures to the construct, formative measurement models are appropriate. The measures in such models are sometimes referred to as causal indicators or formative indicators. Thus, as observed by Bagozzi (1994), under a reflective measurement model specification the construct produces the measures; under a formative measurement model specification the measures produce the construct. Recent examples of latent constructs measured using reflective models include Lumpkin, Cogliser, and Schneider’s (2009) measure of autonomy and Anderson, Covin, and Slevin’s (2009) measure of strategic learning capability. Recent examples of latent constructs measured using formative models include Salomo, Brinckmann, and Talke’s (2008) measure of functional management competence and Marakas, Johnson, and Clay’s (2007) measure of computer self-efficacy.

In addition to the direction of causality matter, reflective and formative measurement models have other attributors that differentiate them. For example, in reflective measurement models the measures are assumed to be thematic (i.e., reflect the same, unitary latent construct) and interchangeable with one another. High correlations between the measures are desirable and internal consistency assessments (as revealed through, for example, Cronbach’s alpha coefficient) are appropriate means to assess the strength of the measurement models. Moreover, as noted by MacKenzie, Podsakoff, and Jarvis (2005, p. 710), “[i]n reflective measurement models, the latent construct is empirically defined in terms of the common variance among the indicators.”

By contrast, in formative measurement models the measures are not interchangeable, but rather, each is taken to represent an essential part of the conceptual domain of the latent construct. As such, researchers are advised to include measures covering all defining aspects of the latent construct in the pool of formative measures. Unlike the case with reflective measures, formative measures have no assumed or inherently desirable correlation with one another and therefore internal consistency assessments are not appropriate for such measures. Instead, examinations of the measures' external validity (as revealed through, for example, associations with outcome variables likely to be directly impacted by the latent construct) are advised. Moreover, as will be more fully discussed later, the strength of the linkages between formative measures and the latent constructs they produce (and therefore the empirical meanings of those constructs) will depend upon the endogenous dependent variables chosen for inclusion in the formative measurement models in order for them to be estimated (Williams, Edwards, & Vandenberg, 2003). Finally, “[i]n formative measurement models, the latent construct is empirically defined in terms of the total variance [versus common variance] among its indicators, and the indicators only capture the entire conceptual domain as a group” (MacKenzie et al., 2005, p. 710).

In the case of both reflective and formative measurement models, the models themselves can be specified as first-order models or higher-order models. Additionally, models can be pure models (comprised of only reflective or formative constructs) or mixed models (comprised of both reflective and formative constructs). First-order measurement models specify relationships between one-dimensional latent constructs and their measures. For example, the aforementioned autonomy scale proposed by Lumpkin et al. (2009) is based on a first-order reflective measurement model. Higher-order measurement models specify relationships between the levels of multidimensional constructs and their measures. For example, the corporate identity measure proposed by Witt and Rode (2005) is based on a second-order formative measurement model, with causal indicators being used to “create” the (first-order) latent variables of corporate culture, corporate design, corporate behavior, and corporate identity, and those latent variables then being used to “create” the (second-order) construct of corporate identity. A construct is multidimensional “when it consists of a number of interrelated attributes or dimensions and exists in multidimensional domains. In contrast to a set of interrelated unidimensional constructs, the dimensions of a multidimensional construct can be conceptualized under an overall abstraction, and it is theoretically meaningful and parsimonious to use this overall abstraction as a representation of the dimensions” (Law, Wong, & Mobley, 1998, p. 741). Diamantopoulos et al. (2008, p. 1205) note that “[w]hen dealing with multidimensional constructs, it is necessary to distinguish between (at least) two levels of analysis, that is one level relating manifest indicators to (first-order) dimensions, and a second level relating the individual dimensions to the (second-order) latent construct (Jarvis et al., 2003; MacKenzie et al., 2005).” If the first-order dimensions and second-order latent construct within the measurement model are both reflectively assessed (with causality flowing from those factors to their measures) or both formatively assessed (with causality flowing from the measures to those factors), the measurement model is a pure reflective or pure formative higher-order factor model. Otherwise, the higher-order model is “mixed.”

Given the above, EO can be viewed as a (second-order) multidimensional construct with three (consistent with Miller's [1983] original EO conceptualization) or five (consistent with Lumpkin and Dess's [1996] later EO conceptualization) first-order dimensions. Still, the matter of a construct's dimensionality is a function of the level of abstraction used to define the construct. Jarvis et al. (2003, p. 204) offer the construct of job satisfaction as a case in point: “job satisfaction is frequently defined as being

composed of several different facets, including satisfaction with one's pay, coworkers, supervisor, opportunities for advancement, and so forth. Although one can look at each facet as being a separate construct, at a more abstract level, they are all integral parts of a person's job satisfaction." Consistent with the observation that the level of abstraction from which a construct is being defined can affect perceptions of its dimensionality, EO was described in Covin and Slevin's (1989) early discussion of the construct as "a basic, unidimensional strategic orientation" (p. 79).

Measurement Model Equivocality

One might assume that the construct of EO inherently favors either formative or reflective measurement. In fact, this is not the case. According to Wilcox, Howell, and Breivik (2008, p. 1220), "A given research situation or research tradition may favor either formative or reflective measurement, but constructs themselves, posited under a realist philosophy of science as existing apart from their measurement, are neither formative nor reflective." As EO represents a theoretical construct, one which both Miller (1983, p. 770) and Lumpkin and Dess (1996, p. 136) posit as capturing the "process" of entrepreneurship within organizations, under a realist philosophy of science the concept of EO logically exists apart from its measurement. Thus, it would be erroneous to claim that EO is inherently either a formative or reflective construct. Put differently, there are no formative constructs or reflective constructs. There are only formative and reflective measurement models, and the construct of EO can be measured through either approach.

There are a host of complex conceptual and methodological issues that must be considered when choosing an appropriate measurement model. Researchers are advised to adopt measurement models that accurately reflect the nominal meaning of a construct, where "a construct's nominal meaning is that meaning assigned without reference to empirical information. That is, it is the inherent definitional nature of the construct that forms the basis for hypothesizing linkages with other constructs, developing observable indicators, and so forth" (Howell et al., 2007, p. 207).¹

Unfortunately, if one does not recognize that latent constructs exist apart from their measures (i.e., that there are no inherently formative or reflective constructs), the nominal meaning of the EO construct could easily be misconstrued as suggesting that formative measurement models are best suited to capturing the essence of the construct. This conclusion could be (erroneously) drawn, for example, based on Miller's description of EO as a "composite dimension," in that composites are created through combinations of elements and formative measurement models are based on theoretically pre-specified composite variables. Likewise, the conclusion that EO is inherently a "formative construct" might be (erroneously) drawn based on Lumpkin and Dess's (1996, p. 162, *italics added*) observation that "any firm that engages in an effective *combination* of autonomy, innovativeness, risk-taking, proactiveness, and competitive aggressiveness is entrepreneurial." Researchers are cautioned to recognize that while EO may be conceptualized as a "composite dimension" or require a "combination" of particular, pre-specified elements, these observations do not imply that formative models are required to accurately measure EO.

In fact, there are several intractable problems associated with formative measurement models that call into question the advisability of employing such models for EO's

1. Significantly, the nominal meaning of a construct cannot be inferred from empirical data. As such, conclusions pertaining to, for example, the "correct" number of dimensions that characterize EO (i.e., the number of dimensions that EO "has") should not and, indeed, cannot be drawn based on "what the data say."

measurement. As discussed below, while there are circumstances under which the formative measurement of EO can be highly appropriate, there are many theoretical and empirical considerations that should be taken into account when making this choice, and reflective measures of EO can often be viable or superior alternatives to formative measurement.

Challenges and Considerations Associated With Formative and Reflective Measurement Models

Several significant measurement challenges are associated with the formative modeling of constructs. These challenges, when taken together, lead Wilcox et al. (2008, p. 1227) to suggest that “in the context of theory testing, formative measurement (at this stage of development, at least) should not be considered an equally good alternative to the reflective measurement model which has served the social sciences well for many decades.” Building on the work of Wilcox et al., the following discussion explores several measurement challenges of relevance to the matter of why formative EO measures can be problematic.

First, formative measurement models are particularly susceptible to interpretational confounding. With interpretational confounding, a construct’s nominal meaning (discussed above) and its empirical meaning, which derives from its relationship with observed variables, diverge. The presence of divergence between a construct’s nominal and empirical meanings results in a situation where “the nature of the formatively measured construct changes from model to model and study to study depending upon what the formatively measured construct is predicting” (Wilcox et al., 2008, p. 1224). Interpretational confounding occurs because the causal indicators of formatively measured latent constructs are retained in formative models only if the latent construct is strongly associated with the particular outcome variables included in the model. As will be discussed later, in order for a formative model to be “identified” the focal latent construct must have multiple causal indicators that create that construct as well as reflective indicators (ideally two) that are theoretical outcomes of the construct (see Jarvis et al., 2003). The choice of different outcome variables will influence which causal indicators are used to empirically define the latent formative construct. Howell et al. (2007, p. 208) offered the following example of how interpretational confounding occurs:

Heise (1972) argued that the socioeconomic status (SES) construct is caused by education, income, and occupational prestige. If in a given model (based on the constructs SES predicts in that particular model) SES is almost entirely a function of income with little if any contribution from education and occupation, then interpretational confounding has become a problem. The construct labeled SES in the model is really just income, not the SES defined without reference to particular parameter estimates. This interpretation comes from the relative magnitude of the path from the formative indicators to the formatively measured latent construct . . . Now suppose different dependent constructs are modeled that are closely associated with education but weakly, if at all, related to income. The empirical realization of SES is still inconsistent with its nominal definition, and, in addition, SES in the second model is not the same as SES in the first model.

As Wilcox et al. (2008, p. 1224) state, “If a construct named ‘A’ in one study is substantively different from a construct named ‘A’ in another study, accumulation of knowledge regarding a construct is rendered meaningless or impossible, since the construct in one study is incommensurable with a different construct, but with the same name in another study.”

The preceding is not to suggest that interpretational confounding cannot occur in the context of reflective measurement models. For example, this phenomenon could occur in a structural model containing reflectively-measured constructs if the indicators of separate reflectively measured constructs within the larger structural model share common variance (resulting in correlated measurement error terms). Still, as discussed by Howell et al. (2007, p. 208), “[w]ith reflective measures, one can examine changes to the measurement parameters for a given construct . . . as other constructs are added to the model and thus assess the degree of potential interpretational confounding. This is not an option for constructs measured formatively with estimated parameters, because there is no strict measurement baseline from which to depart [because formative models do not have epistemic relationships that exist independently from structural relationships]. In the context of formative measurement, it is up to the researcher to compare the empirical realization of the construct with its nominal definition, assessing the degree to which the construct as estimated corresponds to the construct as defined.” As such, the challenges of interpretational confounding are typically much lower in the context of reflective measurement modeling.

Second, formative constructs do not function as unified entities or “point variables,” to use Burt’s (1976) label. According to Howell et al. (2007, p. 209), “a variable functions as a unitary entity or point variable in a model when the indicants correlate with other constructs in proportion to their (epistemic) correlation with their own construct.” However, while reflective indicators are expected to share a common cause, intercorrelate, and relate similarly to other constructs, this is *not* the case for formative indicators. As Howell et al. (p. 209) observe, “formative indicators need not covary (Bollen & Lennox, 1991; Jarvis et al., 2003), need not have the same nomological net (Jarvis et al., 2003), and hence ‘are not required to have the same antecedents and consequences’ (Jarvis et al., 2003, p. 203).” This is important because, “given the lack of any necessary correlation among formative indicators, there is in general no reason to expect that they should *not* relate differently with different constructs, suggesting that *finding a model that fits with a formatively measured construct may indeed be fortuitous*” (Howell et al., p. 212, emphasis added). In sum, measuring EO using formative indicators forgoes the conceptual grounding that allows EO to be considered a unitary conceptual entity or point variable.

Third, the common alternative to a regression-based approach to formatively modeling a latent construct is to create a summed index from the latent construct’s indicators. The summed-index approach to formative construct measurement is problematic on several counts. For example, such an approach implicitly adds more weight to construct indicators that happen to be highly correlated (see Wilcox et al., 2008, p. 1222). Moreover, as noted by Howell et al. (2007, pp. 214–215): (1) “there is a high potential for loss of information in forming the composite of uncorrelated variables”; (2) “forming a composite of potentially unrelated indicators ignores the possible effects of differing configurations that can lead to the same composite score”; and (3) “if formative indicants need not have the same antecedents and consequences, where is the logic of forming them into a single composite?”²

2. The aforementioned study by Short et al. (2009) employed a summed-index approach to formatively measuring EO (using a computer-aided text analysis (CATA)-based frequency count of words related to EO’s five dimensions, as specified by Lumpkin and Dess [1996]). Given the current observations, it is recommended that CATA-based measures of EO be reserved for separately measuring the dimensions of EO, and that those dimension-specific word counts not be summed to create overall EO indices. An exception to this recommendation would be instances in which the researcher is conceptualizing EO in the manner proposed by Miller (1983), and then only word counts relating to innovativeness, risk-taking, and proactiveness would be summed, with the inherent limitations of summed scales (see, for example, Spector [1992]) being noted.

In light of the aforementioned challenges associated with formative measurement, Howell et al. (2007) posited that if a construct is to be formatively modeled, the formative items/indicators should be examined as *independent* predictors of the outcome variable of interest. Nonetheless, Howell et al. (p. 215) acknowledge that “the lack of parsimony when modeling formative indicators as separate constructs is an issue” and that the desire of “finding a common label for disparate constructs in the name of parsimony may be part of the problem. When one gives a name to a collection of attributes or characteristics in a common realm for the sake of convenient communication and then treats them as if a corresponding entity exists, “one is reifying terms that have no other function than that of providing a descriptive summary of a set of distinct attributes and processes” (Borsboom, Mellenbergh, & van Heerden, 2003, p. 1065)” (Howell et al., p. 215). Additionally, it would be a misnomer to claim that a true “formative” measurement model is being employed if the indicators of the latent construct are examined as separate, independent constructs that are never aggregated in an overall measurement model.

Despite the severity of the aforementioned challenges to formative measurement, the preceding is not meant to imply that formative modeling is never appropriate. However, the conditions under which formative measurement is justified are quite demanding. Moreover, some of the criteria proposed for the purpose of determining whether researchers should employ formative or reflective measurement models are based on the questionable premise that constructs are either inherently formative or reflective in nature.

For example, Coltman et al. (2008) outline six considerations that can be used to assess the appropriateness and inform understanding of formative versus reflective measurement models. Consideration 1 is the nature of the construct. For reasons previously discussed, the identification of “the nature of the construct” as a criterion for choosing between formative and reflective measurement models is debatable. Nonetheless, Coltman et al. (p. 1252) observe that if the latent construct “depends on a constructivist, operationalist or instrumentalist interpretation by the scholar,” then a formative model is often used for measurement purposes. A construct commonly measured through formative modeling is socioeconomic status (SES). According to Heise (1972, p. 153), “SES is a construct induced from observable variations in income, education, and occupational prestige, and so on; yet it has no measureable reality apart from these variables which are conceived to be its determinants.” This is not to imply that constructs like SES cannot be measured reflectively. One might ask, for example, “How high are you up on the social ladder?” (Borsboom, Mellenbergh, & van Heerden, 2004, p. 1069) as a means to reflectively assess SES.

Coltman et al.’s (2008) second consideration when choosing between formative and reflective measurement models is the envisioned direction of causality between the latent construct and its indicators. In particular, in reflective models, causality flows from the construct to its indicators. That is, the construct gives rise to observable indicators (Fornell & Bookstein, 1982). For example, in Hughes and Morgan’s (2007) reflective measure of the latent construct autonomy, this construct is viewed as manifested in behaviors captured through items such as “employees are permitted to act and think without interference” and “employees perform jobs that allow them to make and instigate changes in the way they perform their work tasks.” By contrast, in formative models, the indicators are identified as “causing” the construct. The implication of this latter causal flow is that changes in the indicators cause changes in the construct. Thus, while constructs exist apart from their measures under a realist philosophy of science, a construct does not exist independent of its measures in a formative measurement model.

Nunnally and Bernstein (1994) identify the construct of faculty performance as an example of indicators causing a construct. As discussed by Nunnally and Bernstein, the

construct of faculty performance has no inherent meaning independent of its indicators, which are commonly conceived of as involving scholarly productivity, teaching, and service. In other words, when we think of the construct of faculty performance, we think of factors that contribute to or “cause” that performance. Notably, the causal flow is from the indicators we associate with faculty performance to the construct.

Coltman et al.’s (2008) third consideration when choosing between formative and reflective measurement models is the characteristics of the relevant indicators. According to Coltman et al., if the relevant indicators share a common theme, a reflective measurement model may be called for. Otherwise, formative modeling may be more appropriate. Using the example of Hughes and Morgan’s (2007) autonomy scale again, each of the proposed items (i.e., reflective indicators) is an effect or manifestation of the autonomy phenomenon. By contrast, using the faculty performance construct as an example, indicators of service efforts may have little, if anything, in common with teaching or scholarly productivity indicators, although they may collectively contribute to the “emergent variable” (to use the term employed by Cohen, Cohen, Teresi, Marchi, and Velez [1990] in referencing constructs identified through formative models) of faculty performance.

Two additional considerations suggested by Coltman et al. (2008) when choosing between formative and reflective models are empirical in nature. In particular, measurement models should be chosen in view of (1) indicator intercorrelations and (2) indicator relationships with construct antecedents and consequences. Regarding indicator intercorrelations, reflective measurement models are appropriate when high inter-item correlations are expected among the indicators. On the other hand, because the causal indicators of formative models are not expected to share a common theme, the levels of inter-item correlations among these indicators are irrelevant. To quote Coltman et al. (p. 1253), “In a reflective model, the underlying construct drives the indicators, which have positive and, desirably, high intercorrelations. In a formative model, the indicators do not necessarily share the same theme and hence have no preconceived pattern of intercorrelation. Indicators in a formative model can theoretically possess no intercorrelation or high or low intercorrelation.”

Regarding indicator relationships with construct antecedents and consequences, reflective measurement models assume that the effect indicators through which the latent construct is manifested share the same antecedents and consequences as the construct. No such assumption is made regarding the causal indicators of a formatively measured construct. As further discussed in a subsequent section of this paper, this consideration has particular relevance to the Miller/Covin and Slevin (1989) EO scale because risk taking, innovativeness, and proactiveness cannot be assumed to have the same antecedents and consequences.

Coltman et al. (2008) offer a final empirical consideration intended to inform understanding of the measurement model chosen (rather than to facilitate model choice *per se*). This consideration involves how the matters of measurement error and collinearity should be treated. In the case of reflective measurement models, the error terms associate with the indicator scores and represent measurement error. As discussed by Coltman et al. (p. 1254), “researchers can identify and eliminate measurement error for each indicator using common factor analysis. This elimination occurs because the factor score contains only that part of the indicator that is shared with the other indicators, and excludes the errors in the underlying terms (Spearman, 1904).” On the other hand, error is represented at the construct level rather than the individual indicator level in a formative model. Moreover, as argued by Diamantopoulos (2006, p. 11), the error term in a formative model is not measurement error *per se* but, rather, “represents the impact of all remaining causes

other than those represented by the indicators included in the model.” The implication of this reality for formative measurement is that researchers must strive to specify a comprehensive set of indicators when performing formative modeling in order to minimize the influence of the error term (Diamantopoulos et al., 2008). Regarding collinearity, Coltman et al. (2008) simply observe that because indicators are expected to manifest common themes in reflective measurement models, collinearity among indicators is desirable in such models. However, in formative measurement models collinearity among the causal indicators results in biased estimates of the structural relationships involving the latent construct.

In short, there are conditions under which the use of formative measurement models is appropriate. Hardin, Chang, and Fuller (2008, p. 530) conclude that formative measures can “be appropriately used in studies designed to maximize the explanation of unobserved variance at the latent construct level for a given outcome.” The key observation here is that formative indicator weights are dependent on the endogenous outcome variable used to estimate them. Therefore, “the use of formative measurement can result in the retention of different indicators and ultimately the measurement of different constructs across studies” (Hardin et al., p. 519). This qualification notwithstanding, there are some commonly recognized best practices associated with formative measurement. The work of Diamantopolous and Sigauw (2006) is exemplary in this regard.

In particular, Diamantopolous and Sigauw (2006) described in detail their development of a formative measure of the latent construct export coordination. To summarize the described index construction process, Diamantopolous and Sigauw first identified a pool of 30 items which, collectively, were identified in prior research (Cadogan, Diamantopoulos, & Pahud de Mortanges, 1999) as representing the conceptual domain of export coordination. This pool contained items such as “In our company, departments/individuals compete with each other to achieve their own goals rather than working together to achieve common goals” and “In our company, if the export unit does well, the reward system is designed so that everyone within the firm benefits.” Given the identified item pool, the next step was to assess the level of multi-collinearity among the items. Bollen (1989) observed that high levels of multicollinearity among the indicators in a formative model are problematic because the unique influence of those indicators on the latent construct cannot be identified. Diamantopoulos and Sigauw used a tolerance value of .30 to eliminate 16 items from the original 30-item pool. Following the suggestions of Diamantopoulos and Winklhofer (2001, p. 272) that causal indicators be correlated with “a global item that summarizes the essence of the construct that the index purports to measure,” the remaining 14 items were then correlated with the “global” statement “activities and individuals are coordinated in our firm.” All correlations were positive and statistically significant and, accordingly, all 14 items were retained for further analysis.

Additional analysis involved the estimation of a Multiple Indicators Multiple Causes (MIMIC) model (Joreskog & Goldberger, 1975), which included the 14 items as the causal indicators of export coordination and two additional items as reflective indicators of the export coordination construct. These reflective indicators are necessary for model identification purposes and were represented by the statements “We are effective at disseminating export information throughout our company” and “Data on export customer satisfaction are disseminated at all levels in this company on a regular basis.” These two reflective items represent the endogenous outcome variables alluded to above. The specific focus of these items on the effectiveness of the organization in disseminating export knowledge throughout the firm was chosen by Diamantopoulos and Sigauw (2006) because export coordination was expected to directly contribute to such effectiveness; that

is, export coordination can be assumed to result in the effective dissemination of export knowledge. These reflective items were not included in the original 30-item pool but, rather, were simply used to estimate the MIMIC model. Diamantopoulos and Sigauw (p. 275) advise that “provision should be made at the study design stage for the incorporation of additional items (external to the index) to enable the specification of MIMIC models, assess external validity, etc. (see Diamantopoulos & Winklhofer, 2001). Failure to make such provision is bound to cause serious problems at the index construction stage not least because, on its own, a formative indicator measurement model is statistically underidentified (Bollen, 1989; Bollen & Lennox, 1991).”

To continue with the index construction example described by Diamantopoulos and Sigauw (2006), an initial estimation of the MIMIC model was then performed and, although the model yielded a good fit ($\chi^2 = 16.46$, $df = 13$; RMSEA = .035; GFI = .99; NNFI = .97; CFI = 1.00), several of the 14 causal indicators were not significant predictors within the model. In the interests of model parsimony, indicators with nonsignificant parameters were then iteratively deleted from the model, starting with the indicator having the lowest t -value, per Joreskog and Sorbom (1989). This resulted in a final MIMIC model containing five formative indicators. Diamantopoulos and Sigauw then compared the 14-indicator MIMIC model with the 5-indicator MIMIC model and observed no significant deterioration in goodness of fit. The content of the five reflective indicators was then examined to ensure that they exhibited breadth commensurate with the conceptual domain of the export coordination construct. As noted by Diamantopoulos and Winklhofer (2001, p. 273), “indicator elimination—by whatever means—should not be divorced from conceptual considerations when a formative measure model is involved.” Given the presence of sufficient breadth in their final set of indicators, the five-item formative index of export coordination was chosen as an acceptable representation of the construct.

As demonstrated by the aforementioned example, it is possible to construct meaningful formative measures of latent constructs. Nonetheless, there are aspects of such measures that are inherently problematic when employed for theory testing purposes in relation to other constructs. Notably, the content of a formatively measured latent construct is defined by the degree of association between its causal indicators and the endogenous outcome variables used to identify the measurement model. This is why the empirical meaning of formative constructs can change from study to study depending on the outcome variable being examined (see the aforementioned interpretational confounding problem). Additionally, as noted by Wiley (2005, p. 124, emphasis in original), there is “*no mechanism by which an antecedent variable can influence a formative index.*” This is true because, by definition, the set of causal indicators chosen to estimate the measurement model along with the error term account for the total variation of a construct that is formatively measured. Therefore, it is not clear that formatively measured constructs should be (or perhaps even can be) treated as dependent variables in structural models that specify relationships between different constructs.

Taken together, the preceding observations suggest that the drawbacks of formatively modeling EO can be significant. However, while the reflective measurement of EO is in many respects a more straightforward task it, too, has its challenges. These challenges often have more to do with theoretical than empirical compromises. For example, a theoretical compromise incurred when the most commonly employed (reflective) EO scale is used (i.e., the Miller/Covin and Slevin [1989] scale) is that the assumption of EO’s unidimensionality, while simplifying measurement of the construct, precludes capturing the various gestalts that may form among EO’s sub-dimensions (Lumpkin & Dess, 1996). The compromises associated with using separate reflective scales to assess the individual sub-dimensions of the EO construct include (1) the sacrifice of parsimony and (2) the

troublesome equating of the larger latent EO construct with the sum of its individual elements. In particular, the disaggregation of EO construct into its constituent elements for the sake of measurement ease, combined with a failure to re-aggregate those elements to the level of the larger latent construct, implicitly overlooks both relationships among EO's sub-dimensions and how their interrelationships may affect (or be affected by) other variables. In short, there are, unfortunately, few easy or unqualified answers to the question of how EO might best be measured.

Recommendations for the Measurement of EO

In view of the preceding discussions, an assessment can be made and recommendations offered regarding the use and efficacy of several distinct EO measurement models. Four models are considered: (1) the Miller/Covin and Slevin (1989) EO scale; (2) an alternative first-order reflective EO scale corresponding to Miller's (1983) composite view of EO; (3) the Hughes and Morgan (2007) EO scale; and (4) a "Type II" second-order formative EO scale (i.e., reflective first order, formative second order) based on the item pool generated by Hughes and Morgan (2007) and constructed using the previously-described procedure advocated by Diamantopoulos and Sigauw (2006).

The Miller/Covin and Slevin (1989) EO Scale

In the Miller/Covin and Slevin (1989) scale (see Table 2), EO is measured as a first-order reflective construct. Covin and Slevin (1989) describe the latent construct they measure as "a basic, unidimensional strategic orientation" (p. 79), and their measure is consistent with this conceptualization. Taken as a reflective measure, there are at least two matters about which the Miller/Covin and Slevin (1989) scale might be criticized. First, inasmuch as the individual items of the scale relate to innovativeness, risk taking, and proactiveness, and these three constructs have different nominal meanings, the individual items of the measure are likely to have different antecedents and consequences. As discussed in a previous section, reflective measurement models assume that the effect indicators have the same antecedents and consequences (Coltman et al., 2008; Jarvis et al., 2003).

Second, while the Miller/Covin and Slevin (1989) scale was intended to operationalize the construct of EO as originally discussed by Miller (1983), the scale as it's commonly employed does not do this. To be consistent with Miller's original conceptualization, EO would need to be measured using a "Type I" second-order factor specification (i.e., reflective first-order, reflective second-order), to use the label given by Jarvis et al. (2003) for such a measurement model. That is, EO is reflected in innovativeness, risk taking, and proactiveness, and these constructs, in turn, are reflected in their specific indicators. The difference between measuring EO using a first-order reflective model and a reflective first-order, reflective second-order (Type I) model relates to where the indicators are aggregated. As a first-order reflective measure, the nine items of the Miller/Covin and Slevin scale are jointly aggregated at the model's initial and only step. As a reflective first-order, reflective second-order measure, the component variables of innovativeness, risk taking, and proactiveness would first be assessed through their corresponding measures, then these three components would themselves be assessed as

Table 2**The Miller/Covin and Slevin (1989) EO Scale**

Innovativeness items			
In general, the top managers of my firm favor . . .	1 2 3 4 5 6 7	A strong emphasis on the marketing of tried-and-true products or services	A strong emphasis on R&D, technological leadership, and innovations
How many new lines of products or services has your firm marketed in the past five years (or since its establishment)?	1 2 3 4 5 6 7	No new lines of products or services	Very many new lines of products or services
Changes in product or service lines have been mostly of a minor nature			
Changes in product or service lines have usually been quite dramatic	1 2 3 4 5 6 7		
Proactiveness items			
In dealing with its competitors, my firm . . .	1 2 3 4 5 6 7	Typically responds to actions which competitors initiate	Typically initiates actions to which competitors then respond
Is very seldom the first business to introduce new products/services, administrative techniques, operating technologies, etc.	1 2 3 4 5 6 7	Typically seeks to avoid competitive clashes, preferring a "live-and-let-live" posture	Is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc.
When confronted with decision-making situations involving uncertainty, my firm . . .	1 2 3 4 5 6 7	Typically adopts a very competitive, "undo-the-competitors" posture	Typically adopts a very competitive, "undo-the-competitors" posture
Risk-taking items			
In general, the top managers of my firm have . . .	1 2 3 4 5 6 7	A strong proclivity for low-risk projects (with normal and certain rates of return)	A strong proclivity for high-risk projects (with chances of very high returns)
In general, the top managers of my firm believe that . . .	1 2 3 4 5 6 7	Owing to the nature of the environment, it is best to explore it gradually via cautious, incremental behavior	Owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the firm's objectives
Typically adopts a cautious, "wait-and-see" posture in order to minimize the probability of making costly decisions	1 2 3 4 5 6 7	Typically adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities	Typically adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities

reflective indicators of the underlying second-order construct of EO. As a test of the construct's internal reliability, Cronbach alpha coefficients could be computed for the individual, three-item component variables (using scale purification techniques, as appropriate) as well as for the overall EO construct, but in the latter case only the individual scores of the innovation, risk-taking, and proactiveness scales would be used as input to computing the overall construct's alpha coefficient.

It should be noted that resolution of the latter issue through measuring EO as a reflective first-order, reflective second-order construct using items of the Miller/Covin and Slevin (1989) scale would not negate the former issue pertaining to the espoused need for reflective scales to be comprised of items having the same antecedents and consequences. However, this espoused need for common antecedents and consequences to reflective scale items is conceptually questionable and therefore may not be a valid criticism of the Miller/Covin and Slevin scale.

Consider the fact that reflective-type scales are often (appropriately) constructed to mirror factor analysis-derived dimensions identified within datasets. Dess, Lumpkin, and Covin's (1997) construction of an entrepreneurial strategy-making scale is a case in point. Briefly, Dess et al. factor analyzed a dataset containing 25 items related to a firm's strategic processes. Four factors were extracted from this analysis, one of which was

identified as reflecting the underlying dimension of “entrepreneurship.” Items that loaded on this factor included, for example, “Most people in this organization are willing to take risks” and “People are encouraged to experiment in this organization so as to identify new, more innovative approaches or products.” Notably, the first item’s “risk” focus is not conceptually interchangeable with the second item’s “innovation” focus, hence these items would likely not have the same antecedents and consequences, yet it is arguable that both of these items reflect what “being entrepreneurial” means within the context of strategy making. This example illustrates how a common theme (as reflected in the common variance) can connect a set of items, yet that theme need not be perfectly captured by any single item of the set.

The Miller/Covin and Slevin (1989) scale is analogous to Dess et al.’s (1997) entrepreneurial strategy-making scale in that entrepreneurship is recognized as the common dimension of the scales’ items. A difference between the scales is that the Miller/Covin and Slevin scale was initially constructed based on what theory suggested is meant by “being entrepreneurial,” while the Dess et al. scale was constructed and labeled based on what the factor-analyzed data were “saying.” Significantly, the process followed by Dess et al. in their scale construction conforms to accepted standards (see, for example, Hinkin [1995]). As such, it is arguable that the items of reflective scales need not have identical antecedents and consequences, and criticism of the Miller/Covin and Slevin scale on this basis is questionable.

The preceding is not meant to suggest that *any* items that do not share the same antecedents and consequences can conceivably be combined to create a reflective scale. In order for reflective scales to exhibit acceptable levels of internal reliability their measures must share common variance. So, for example, someone might theoretically propose that EO is not a composite of risk taking, innovativeness, and proactiveness, per Miller’s (1983) conceptualization but, rather, it is a composite of risk taking, innovativeness, and *participativeness*. A unidimensional, reflective-type scale might then be created in which items focused on this alternative combination of elements are included. If such a scale were to fail to exhibit acceptable internal reliability, this scale would not be defensible for measurement purposes. Significantly, because the nominal meaning of constructs cannot be inferred from empirical data, one could not conclude from such results that EO is not represented by the combination of risk taking, innovativeness, and participativeness. Instead, one could only conclude that the theoretically identified profile of attributes that constitute this alternative construct of EO does not exist in the sample used to develop/test the scale. A notable contribution of Miller’s theory pertaining to EO is that his conceptualization of the construct has been repeatedly demonstrated to align with empirical realities. Stated differently, the Miller/Covin and Slevin (1989) scale “works” not because Miller was correct about what EO means, but because his conceptualization and measure are consistent with the exhibition of a phenomenon that is broadly recognized as a manifestation of entrepreneurship.

Overall, there is little doubt that the wealth of “findings” generated using the Miller/Covin and Slevin (1989) EO scale have contributed directly to EO becoming “a central construct in both the strategic management and entrepreneurship literatures” (Short et al., 2009, p. 12). As such, it’s hard to argue that this scale has not well served our field. Recommending that it not be used in the future solely on the grounds that the indicators within the measurement model likely have different antecedents and consequences would seem ill-advised, particularly in light of the questionable validity of this reflective scale “requirement.”

As a final thought, it might be noted that in order to ensure consistency between Miller’s (1983) theory about what “being entrepreneurial” means (i.e., the simultaneous

exhibition of high levels of risk taking, innovativeness, and proactiveness) and one's approach to measuring EO, the three sub-dimensions could be measured separately, *not* be included in a single scale, and "hurdle rates" could be set for each dimension. Only firms that clear the "hurdle" on each/all sub-dimensions would be considered entrepreneurial, i.e., exhibit an EO. This measurement approach, of course, would result in tremendous information loss inasmuch as EO would be reduced to a dichotomous variable in which firms' either possess or fail to possess an EO. We believe it would not be in the best interest of EO research to accept such a dichotomization of the EO variable.

An Alternative First-Order Reflective EO Scale Corresponding to Miller's (1983) Composite View of EO

Table 3 presents an alternative first-order reflective scale of EO that stays true to Miller's (1983) original three sub-dimension composite view of the EO construct, yet incorporates mention or allusion to innovativeness, risk taking, and proactiveness within each item. Notably, the items were deliberately generated by the authors to be interchangeable and have the same antecedents and consequences, therefore they meet this espoused requirement (see Coltman et al., 2008; Jarvis et al., 2003) of a reflective measure, the aforementioned critique of this requirement notwithstanding. Individual items could also be dropped from the scale (or new items with similar features added to the scale) without changing the essential meaning of the construct being assessed. Of course, this scale is not intended for use as a "final product." Scale purification techniques (as proposed by, for example, Hinkin [1995]) would need to be applied in assessment of the measure's psychometric properties. The same approach to scale development could

Table 3

An Alternative First-Order Reflective EO Scale Corresponding to Miller's (1983) Composite View of EO

In the following scale items, the terms risk-taking, innovativeness, and proactiveness are used. As employed in these items, risk-taking refers to a *willingness to commit resources to projects, ideas, or processes whose outcomes are uncertain and for which the cost of failure would be high*. Innovativeness refers to a *the exhibition of experimentation, exploration, and creative acts as reflected in, for example, new products/services, new process technologies, new methods of operation, and new business strategies*. Proactiveness refers to *engaging in forward-looking actions targeted at the exploitation of opportunity in anticipation of future circumstances, as would be typical of firms that lead and/or pre-empt the actions of others* (e.g., *market pioneers, early adopters of new technologies*). Given these definitions, please indicate the extent to which you agree with the following statements. (All items rated on 7-point, Likert-type scales ranging from "Strongly disagree" [=1] to "Strongly agree" [=7].)

- If an entrepreneurial firm is operationally defined as "one that engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with 'proactive' innovations, beating competitors to the punch," then my firm is an entrepreneurial firm.
 - My firm characteristically exhibits high levels of risk taking, innovativeness, **and** proactiveness.
 - My firm often takes calculated risks by pursuing innovative initiatives before potential rivals recognize the opportunities at which our initiatives are targeted.
 - Risk taking, innovativeness, and proactiveness are equally inherent to my firm's overall business orientation.
 - The innovative initiatives pursued/funded by my firm are often somewhat risky and industry leading (i.e., chosen in advance of other firms' potentially similar initiatives).
 - My firm concurrently manifests risk taking, innovativeness, and proactiveness.
 - My firm often pre-empts its rivals by being an early leader with innovations whose successful outcomes cannot be assured.
 - In general, my firm is on the cutting edge when it comes to exploiting entrepreneurial opportunities because of our desire and demonstrated ability to embrace novel (and often risky) innovative initiatives ahead of our rivals.
-

conceivably be applied in the construction of a scale aimed at assessing the five-dimension concept of EO, per Lumpkin and Dess (1996). However, the explicit or implicit incorporation of all five dimensions into each scale item would create an unwieldy scale at best. Moreover, such a scale would be inconsistent with the EO concept as proposed by Lumpkin and Dess inasmuch as their conceptualization explicitly acknowledges that the five dimensions need not be simultaneously emphasized for a firm to exhibit EO.

The Hughes and Morgan (2007) EO Scale

Lumpkin and Dess (1996, p. 137) suggest that “the dimensions of EO may vary independently of each other in a given context.” Building on this observation, empirical research has often investigated the individual sub-dimensions comprising the EO domain. For example, the Hughes and Morgan (2007) EO scale (see Table 4) incorporates five separate first-order reflective scales pertaining to the EO sub-dimensions proposed by Lumpkin and Dess. While this approach to EO’s measurement recognizes the multidimensionality of the EO construct as proposed by Lumpkin and Dess, it is not a formative specification. EO is never defined as a linear sum of its five sub-dimensions’ measures or determined by a linear combination of those sub-dimensions’ measures. Moreover, EO is not modeled as an aggregated or higher-order empirical construct in any sense under the Hughes and Morgan measurement specification, and it was never intended to be. Instead, EO is deliberately treated as a disaggregated set of constructs in light of Hughes and Morgan’s intent to study the independent effects of these sub-dimensions on

Table 4

The Hughes and Morgan (2007) EO Scale

Risk-taking items

- The term “risk taker” is considered a positive attribute for people in our business.
- People in our business are encouraged to take calculated risks with new ideas.
- Our business emphasizes both exploration and experimentation for opportunities.

Innovativeness items

- We actively introduce improvements and innovations in our business.
- Our business is creative in its methods of operation.
- Our business seeks out new ways to do things.

Proactiveness items

- We always try to take the initiative in every situation (e.g., against competitors, in projects when working with others).
- We excel at identifying opportunities.
- We initiate actions to which other organizations respond.

Competitive aggressiveness items

- Our business is intensely competitive.
- In general, our business takes a bold or aggressive approach when competing.
- We try to undo and out-maneuver the competition as best as we can.

Autonomy items

- Employees are permitted to act and think without interference.
- Employees perform jobs that allow them to make and instigate changes in the way they perform their work tasks.
- Employees are given freedom and independence to decide on their own how to go about doing their work.
- Employees are given freedom to communicate without interference.
- Employees are given authority and responsibility to act alone if they think it to be in the best interests of the business.
- Employees have access to all vital information.

Note: All items rated on 7-point, Likert-type scales ranging from “Strongly disagree” (=1) to “Strongly agree” (=7).

firm performance. This approach to EO's measure is attractive in that the aforementioned limitations to formative measurement are avoided, yet those factors that make firms entrepreneurial (or, alternatively, those factors that are manifested by entrepreneurial firms) are collectively assessed. Significantly, since risk taking, innovativeness, proactiveness, competitive aggressiveness, and autonomy are distinct constructs, the strength of their relationships with particular antecedents and consequences can be uniquely identified using such a measurement model specification. Additionally, an independent examination of EO's dimensions may be particularly useful for the purpose of assessing likely variations in the stability of antecedent-to-dimension or dimension-to-outcome relationships over time.

Overall, despite the aforementioned limitation of such a "disaggregated" approach to EO's assessment (i.e., such assessments implicitly overlook both relationships among EO's sub-dimensions and how their interrelationships may affect [or be affected by] other variables), we believe that separately assessing EO's sub-dimensions using individual reflective-type scales is a reasonable measurement approach. Such an approach might be successfully employed to, for example, profile the observed patterns or configurations of EO's sub-dimensions across groups of firms using cluster analysis. The qualification we would offer regarding the use of such disaggregated approaches to EO's measurement is that any EO sub-dimensions examined must be strongly supported on theoretical grounds prior to their identification as part of the EO construct.

A "Type II" Second-Order Formative EO Scale (i.e., Reflective First-Order, Formative Second-Order)

A final type of measure that could be (but to the authors' knowledge has not been) used for EO's assessment is a true formative measure. One specification of such a measure that might be considered is a second-order formative EO scale of the Type II variety (i.e., reflective first-order, formative second-order) (see Jarvis et al., 2003). Such a scale (or, more appropriately, index) could be constructed based on the overall pool of items proposed by Hughes and Morgan (2007) for measuring EO (see Table 4). In particular, the five scales pertaining to EO's sub-dimensions could be used to create latent factors which would then be treated as formative indicators of the second-order EO construct.³ The benefit of this approach to EO's measurement over the Hughes and Morgan approach is that formative measurement as thusly specified allows the researcher to check for the proportional effects of the five factors on the theoretically linked, reflective-type outcome variables that are used to estimate the model. As observed by Franke, Preacher, and Rigdon (2008, p. 1229), formative indicators "must have effects on the outcomes that are proportional to their effects on the formative construct itself"; otherwise, those indicators are candidates for elimination from the construct.

Outcome variables that have been identified as consequences of EO and therefore might be used to estimate the model include measures of, for example, firm sales growth (e.g., Covin et al., 2006) and market orientation (e.g., Miles & Arnold, 1991). Still, these

3. An alternative would be to treat the complete set of individual items contained in Hughes and Morgan's (2007) five scales as causal indicators, use a multicollinearity assessment to eliminate collinear variables from the overall set of items (per the aforementioned example of formative index construction, summarized from Diamantopoulos and Siguaw [2006]), then construct a first-order formative measure using this reduced set of items as the causal indicators. A first-order formative measurement model such as this is particularly valuable in the case of small samples and when the relevance of particular causal indicators to the key outcomes thought to be associated with a newly proposed multidimensional construct is unclear.

are not likely the most appropriate EO outcome variables for model identification purposes, because their causal adjacency to EO is questionable. The challenge of identifying appropriate outcome variables is that they should be theoretically linked to (and consequences of) the latent construct, but not part of the construct itself. This is because, as specified in a Type II model, there should be no direct effect of the latent construct's formative indicators on its reflective outcomes. Rather, the latent construct must fully mediate the relationship between these variables. Factors that might well serve the role of EO outcome variables in a formatively specified model could include reflective measures of the various forms of corporate entrepreneurship. This is because EO leads to, but does not include, specific acts of corporate entrepreneurship (Morris, Kuratko, & Covin, 2008). Acceptable reflective-type measures could be, for example, Zahra's (1991) measures of corporate venturing and strategic renewal.

Unfortunately, the aforementioned concerns pertaining to formative measurement models would still apply. Using a Type II second-order formative specification for EO's measurement would be useful for assessing the degree of empirical support that exists for particular theoretical specifications of the EO construct (as revealed through the proportionality tests proposed by Franke et al. [2008]). Nonetheless, the EO construct as measured according to this specification becomes a different construct—i.e., has a different empirical meaning—when different reflective outcome variables are used to estimate the model. Differences in the empirical meaning of the EO construct across studies will hinder knowledge acquisition relevant to EO's relationships. Thus, while the currently described EO measurement approach may be useful for determining the empirical meaning of EO in reference to particular, defined outcome variables, employing this measurement approach would not allow for the efficient accumulation of EO knowledge across studies in which EO's observed structural relationships are altered.

As a final observation, it should be noted that a summed-index approach to formative measurement—that is, adding values of the construct's indicators to create an overall summated rating scale—while commonly employed in the social sciences (see Spector, 1992), is not an infallible alternative to formative measurement through the estimation of a MIMIC model (Joreskog & Goldberger, 1975). This is because in summed indices (like those that might be constructed using frequency counts; see Short et al.'s [2009] measure of EO) error terms are associated with the composite score (i.e., the overall scale score), but not the individual item scores (i.e., the scores on the items used to create the composite). This situation is problematic because “if the composite [scale score] is the only variable measured with error, then the coefficient estimated for that variable will tend to be low. In more realistic situations of more than one explanatory variable containing error, the coefficient estimates can tend to be downwardly or upwardly ‘biased’” (Bollen & Lennox, 1991, p. 310).

Overall, the preceding discussion is intended to reveal that although each of the aforementioned approaches to EO's measurement has its benefits, there may be no inherently superior EO measures. Researchers are advised to acknowledge the limitations of their chosen approaches and employ measures that best align with their theories and research designs.

Discussion and Conclusion

Decisions regarding how one should measure EO must be based on a firm understanding of the theoretical nature of the construct. What should be clear from the preceding observations is that measures of EO that assess the individual dimensions of EO, like

the Hughes and Morgan (2007) measure, and measures of EO that assess combinations of EO's elements via a composite dimension, like the Miller/Covin and Slevin (1989) measure, are not simply alternative approaches to assessing the same phenomenon. These are measures of different phenomena. EO according to Lumpkin and Dess (1996) is not the same latent construct as EO according to Miller (1983), and these different conceptualizations require different measures. As suggested, assessment of the separate dimensions of EO via a Hughes and Morgan-type (2007) approach well aligns with the nature of the EO construct as proposed by Lumpkin and Dess (1996). Additionally, we believe the Miller/Covin and Slevin scale is methodologically defensible approach to assessing the EO construct as initially proposed by Miller despite the fact that this scale's items likely have different antecedents and consequences.

Regarding the formative measurement versus reflective measurement decision, a key take-away from the prior discussion is that the presence of interpretational confounding in formative modeling assures that formative EO measures will only be valid predictors of those reflectively assessed dependent variables used to estimate the measurement model. If a researcher's objective is to create and/or employ a measure of EO that has value in more than one structural model, which would be necessary for subsequent theory development and testing purposes, then a reflective measure should be chosen (see Wilcox et al., 2008, p. 1222).

As a final comment, although the focus of the current essay has been on the concept of EO, many of the measurement-related observations and lessons mentioned here are applicable to other phenomena of interest to entrepreneurship researchers. For example, evidence supporting the argument that constructs are inherently neither formative nor reflective in nature (but, rather, can be modeled through either approach) can be seen in research on the concept of venture image. Witt and Rode (2005) used a Type II second-order formative measurement model (see Jarvis et al., 2003) to assess this construct. By contrast, the (firm age-independent) construct of organizational image is often assessed through multi-item, reflective-type scales (e.g., Marin & Ruiz, 2007). Research on the topic of entrepreneurial climate demonstrates how this construct (as with EO) can mean different things to different researchers, and care must be taken to employ measurement models consistent with the nominal meaning of the construct. For example, Hornsby, Kuratko, and Zahra (2002) conceive of and measure entrepreneurial climate as a multi-dimensional construct manifest through "management support," "work discretion," "organizational boundaries," "rewards/reinforcements," and "time availability." By contrast, entrepreneurial climate is conceptualized and assessed as a unidimensional construct ("climate for initiative") in the research of Michaelis, Stegmaier, and Sonntag (2010).

In conclusion, the EO phenomenon has been the subject of more than 30 years of theoretical and empirical inquiry. The promise of the EO concept lies within its ability to further our understanding of the entrepreneurial activities pursued by organizations. However, the matter of how EO should be assessed has not received research attention commensurate with the concept's acknowledged importance. Hopefully, the observations herein offered will serve as valuable reference points for future generations of EO researchers.

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The authors wish to thank ET&P editor James Chrisman and the two anonymous reviewers for their encouragement and insightful guidance throughout the review process.