On Building Better Construct Measures: Implications of a General Hierarchical Model

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ABSTRACT

Four problems occur in the scale development process: (a) defining the construct, (b) drawing items from multiple domains, (c) identifying dimensions, and (d) showing nomological validity. In order to minimize these problems, the authors propose a general hierarchical model (GHM) that provides an organizational structure for placing many of the individual difference constructs used in marketing and consumer behavior. Three principles, which were derived from the GHM, add to the current scale development paradigm: (a) Define and test the construct within a hierarchical network that includes antecedents and consequences, (b) define and test the construct's dimensionality, and (c) match the construct's items to its level in the hierarchical system. By using these steps in scale development, researchers can build more precise measures possessing higher levels of validity and reliability.

Over the past 25 years, a growing literature has developed on how to create and test construct measures (e.g., Nunnally & Bernstein, 1994; Churchill, 1979; Gerbing & Anderson, 1988; Rossiter, 2002). Despite these advances, however, the quality of measures developed by marketing and consumer researchers continues to be criticized. For example, MacKenzie (2003) argued that poor construct

Psychology & Marketing, Vol. 25(6): 485–505 (June 2008)
Published online in Wiley InterScience (www.interscience.wiley.com)
 DOI: 10.1002/mar.20221

validity and statistical conclusion validity continue to plague many manuscripts. A number of key issues in scale development can be found in the following story.

AN ILLUSTRATIVE STORY

Imagine that you are interested in investigating the effects of financial conservatism on consumer decision-making. You conceptualize the construct as a personality trait, and a literature review indicates that no one has developed a scale to measure it. In order to obtain feedback on your ideas, you make a presentation to your colleagues. During your talk, it becomes clear that, while enthusiastic about the topic, your colleagues have divergent views about how financial conservatism should be measured. After the meeting, you outline the alternative views.

Perspective 1: Composite approach. The construct is a function of multiple other constructs, including gambling propensity, value consciousness (Lichtenstein, Netemeyer, & Burton, 1990), and risk taking. Therefore, you should measure each construct and mathematically combine them to create a formative measure of financial conservatism.

Perspective 2: Second-order approach. The construct is a higher-level construct that causes risk taking, gambling propensity, and investment conservatism. Thus, you should measure gambling propensity, arousal, and value consciousness as dimensions and fit them to a second-order factor model.

Perspective 3: New construct approach. Financial conservatism is a separate construct. Therefore, using the Churchill (1979) paradigm along with advances in structural modeling (e.g., Gerbing & Anderson, 1988), you should go through a lengthy process to build a new scale. You should employ the domain sampling model and develop a lengthy set of items in order to assess the full domain of the construct. In addition, as part of the process of testing construct validity, you should investigate the nomological validity of the measure by assessing its bivariate correlation with the related constructs of risk taking propensity, value consciousness, and gambling propensity.

As you puzzle through these alternative perspectives, the authors of this paper wander by and you ask us what we think. We propose that you place the construct within the framework of a general hierarchical model that includes its antecedents and outcomes. Skeptically, you list our approach as follows.

Perspective 4: General hierarchical approach. The construct should be conceptualized within a hierarchically arranged nomological network of constructs, including: (1) a new measure of financial conservatism, (2) a set of antecedent constructs (including the need for arousal), (3) a set of consequent constructs (including value consciousness and gambling propensity), and (4) outcome measures (e.g., the number of times gambling in the past year).

The issues that emerge from this example are fundamental to the question of how to develop scales to measure constructs. What began as a simple question (i.e., how to measure financial conservatism) quickly became a difficult problem that caused a surprising level of emotion among your colleagues. Perspectives 1, 2, and 3 summarize the key elements of the current scale development paradigm. In this article, the authors argue that the current paradigm is incomplete. As a result, many of the scales appearing in the behavioral science literature have critical shortcomings. More specifically, the current paradigm fails

to provide clear guidelines on how to establish boundaries for a construct's domain. This paper advocates the adoption of Perspective 4, which requires that researchers go beyond the current paradigm and conceptualize constructs within a hierarchically arranged network of constructs that includes the focal construct's antecedents and consequences. Further, three principles are proposed that supplement the current paradigm. If adopted, these principles will improve the scale development process by minimizing four common problems: (a) developing a definition, (b) specifying a nomological net, (c) drawing the items from multiple domains, and (d) identifying the dimensions of a construct.

The next section reviews previous research on scale construction and discusses the four problems that result from the incompleteness of the current scale development paradigm. The following section discusses the general hierarchical model (GHM) approach advocated by the authors. Based upon the GHM approach, three principles are proposed for addition to the current scale development paradigm. The paper concludes with a discussion of limitations and future research directions.

FOUR PROBLEMS IN THE CURRENT PARADIGM

Within the marketing literature, the current scale development paradigm is based upon Churchill's (1979) classic work. While calls have been made for its replacement (e.g., Rossiter, 2002), it remains the dominant scale development approach employed by marketing and consumer researchers. The paradigm consists of a series of steps: (a) specify the theoretical domain of the items, (b) develop items that sample from the full domain of the construct, (c) collect data, (d) purify the measure by eliminating items that have low item-to-total correlations, (e) collect data again, (f) assess reliability, (g) assess validity, and (h) develop norms. A key advance in the Churchill paradigm was made by Gerbing and Anderson (1988), who introduced confirmatory factor analysis (CFA) into the approach. This advance provided an improved means for examining the convergent and discriminant validity of constructs.

A key component of the current paradigm is the domain sampling model. Domain sampling theory proposes that every construct has an infinite, or finite but large, pool of items (Nunnally & Bernstein, 1994). It proposes that a construct may consist of a single dimension or several dimensions. Further, domain sampling theory states that each dimension can be measured by a large pool of scale items. The totality of items comprises the domain of the construct/dimension. Nunnally and Bernstein (1994, p. 226) "strongly favor" domain sampling theory, and Churchill (1979, p. 68) called it the "most defensible" approach to scale development.

Despite these advances, however, some researchers are critical of current scale development efforts. Thus, Rossiter (2002) observed that published scales in marketing have omitted needed items and included unneeded items. Bruner (2003) noted that scale proliferation is becoming a problem for many marketing constructs. For example, there are multiple measures of consumer involvement, which Mittal's (1995) research showed to be problematic. Meta-analyses of marketing scales' reliability and validity have repeatedly called into question the merits of many published scales (Bruner & Hensel, 1993; Churchill & Peter, 1984; Peterson, 1994; Voss, Stem, & Fotopoulos, 2000).

This section identifies four problems with published scales—issues of construct definition, items drawn from multiple domains, dimensionality, and nomological validity. These problems are the cause of many, if not most, of the shortcomings of scales found in the marketing and consumer behavior literatures. After these problems are identified, a GHM is presented. Then three principles will be derived from the GHM that are proposed to minimize the four problems in scale construct.

The Construct Definition Problem

A recognized weakness with current scale development practice is the apparent inattention given to construct definition (Finn & Kayande, 2005; Summers, 2001; MacKenzie, 2003; Rossiter, 2002). While Churchill's (1979) approach includes construct definition and domain specification, his discussion of these ideas is limited. Churchill states (1979, p. 67) that the researcher ". . . must be exacting in delineating what is included in the definition and what is excluded" and ". . . must be exacting in the conceptual specification of the construct." Two questions arise, however: (a) how is "exacting" operationalized? and (b) how does one determine what is "excluded"? Summers (2001) warned against two types of inadequate construct definitions: defining the construct in terms of its antecedents or outcomes and defining the construct through examples. MacKenzie (2003) suggested that a good construct definition should specify the construct's conceptual theme in unambiguous terms so it is clearly distinguished from other constructs. Rossiter (2002) provided the most specific recommendations in his proposal that constructs should be defined in terms of the focal object, the dimension (or attribute) of evaluation, and the rater.

The argument that constructs should be defined as precisely as possible is sound. Without adequate construct definitions, it is impossible to adequately specify relationships among the constructs. Moreover, a precise definition provides clear guidance for the selection of items and specifies how the items relate to the construct. Despite the advances made by Churchill, MacKenzie, Summers, Rossiter, and others, however, construct definition remains problematic. To be more specific, clear guidelines have not been provided for determining what should be included—and what should be excluded—when defining the construct.

The Multiple Domain Problem

While the current scale development paradigm states that items should be drawn from a single domain, there is no guidance on how to define the scope of the domain. The multiple-domain problem occurs when the items assessing a construct are drawn from different domains and thus measure multiple constructs instead of a single construct. One example is a measure developed by Sin et al. (2005) of inter-firm trust, which was conceptualized as a dimension of relationship marketing orientation. Sin et al. (2005, p. 187) define trust as ". . . a component of a business relationship that determines the level to which each party feels he/she can rely on the integrity of the promise offered by the other party." The items in the scale actually represent two types of trust. One type is the degree to which the parties trust each other (e.g., "We trust each other"), and the other is the degree to which

one firm trusts its partner (e.g., "They are trustworthy on important things"). Thus, the scale appears to be drawing items from two separate domains. The criticism can be made of many other scales, including complaint responsiveness (Richins, 1983), the conformity motivation scale (Bearden, Netemeyer, & Teel, 1989), and the romanticism-classicism scale (Holbrook & Olney, 1995).

The Dimensionality Problem

Modern scale development procedures often result in measuring dimensions of a construct. Regrettably, there is little guidance within the literature on how to determine whether a construct is a dimension of a broader construct. Thus, a third issue in scale development occurs when distinct constructs are mistaken to be dimensions of a parent construct. An example of a dimensionality problem is the vanity scale developed by Netemeyer, Burton, and Lichtenstein (1995). These authors identified four dimensions of vanity: concern for physical appearance, view of physical appearance, concern for achievement, and view of achievement. No relationship is specified, however, between the four dimensions and the parent construct. Without this specification, it is impossible to assess whether the four dimensions are indeed dimensions or distinct constructs. The pattern of low inter-construct correlations presented in their paper strongly suggests that the dimensions represent multiple constructs rather than dimensions of one construct. When scale development procedures omit both the specification of dimensional hypotheses and guidelines for testing these hypotheses, the dimensionality problem is manifest.

The Nomological Validity Problem

While current scale development procedures require tests of nomological validity and predictive validity, these rarely include the assessment of a system of hypothesized antecedents and consequences. Thus, the construct's antecedents and consequences may not be identified. If they are identified, tests are often performed piecemeal in which bivariate correlations are used to assess nomological validity. If a construct's antecedents are not included when investigating its nomological validity, it is possible to conclude erroneously that an expected association is present. That is, when both antecedent and consequent constructs are included, it is possible that the antecedent will correlate directly with the consequent, causing the relationship of the focal construct and the consequent to become nonsignificant. Discussed in more detail later in the article, the authors call this error "illusory prediction."

An example of the nomological validity problem is found in the development of the female role orientation scale (Sin & Yau, 2004). The authors focus their discussion on the changing role portrayals of Chinese females in advertisements. While the authors imply that female role orientation varies over time and over level of economic development, there is very little discussion of the antecedents of female role orientation. Because the construct's antecedents are not included in the analysis, it is difficult to assess the construct's causal relationship with its hypothesized consequences. Thus, explicating a hierarchical arranged nomological network that includes antecedents and consequences is critical for construct conceptualization, definition, and measurement.

In order to minimize the occurrence of the four scale development shortcomings, the current scale development paradigm is supplemented with three principles that are derived from a hierarchical model approach. Prior to identifying and discussing these principles, however, a description of the structure of such an approach is required.

A GENERAL HIERARCHICAL MODEL APPROACH

The general hierarchical model approach that is proposed in this paper provides an organizing framework within which constructs are distinguished from each other, not only by definitional differences, but also by their ordering based upon their level of abstractness. The idea that constructs are arranged hierarchically has a long history. Psychologists proposing hierarchical models include Allport (1937), Carver and Scheier (1990), Paunonen (1998), and Buss (1989). In the marketing literature, Lastovicka (1982) and Zeithaml (1988) proposed hierarchical models. In more recent work Mowen (2000) developed the 3M Model, which is a four-level hierarchical model of motivation and personality. Because the 3M Model provides the clearest definitions of the hierarchical levels, it was employed as the basis for developing a broader approach that can be used to build measures for most constructs employed in marketing research. In this section, the 3M Model is described and then expanded into the GHM.

The 3M Model

The 3M Model (Mowen, 2000) has been utilized as a structure to investigate a variety of phenomena, such as customer orientation (Brown et al., 2002), job resourcefulness (Licata et al., 2003), competitiveness (Mowen, 2004), volunteerism (Mowen & Sujan, 2005), superstition (Mowen & Carlson, 2003), and word-of-mouth communications (Mowen, Park, & Zablah, 2007). Based in part on the work of Allport (1937), the 3M Model proposes that enduring dispositions to respond (e.g., traits) can be arranged into four levels based upon their level of abstraction. Figure 1 diagrams the expanded version of the 3M Model proposed in this paper. This expanded version is called a *general hierarchical model* of which the 3M Model is a special case.

In Figure 1, the 3M Model is represented by the respondent hierarchy found in the lower portion of the figure. In the hierarchy, elemental traits reside at the most abstract level. Using a physical chemistry metaphor, Mowen (2000) identified eight elemental traits, which are defined as cross-situational, enduring dispositions to respond that result from genetics and the early learning history of the individual. The eight elemental traits are: openness to experience, conscientiousness, introversion, agreeableness, emotional instability, need for material resources, need for arousal, and need for body resources. (For a rationale of the placement of these constructs at the elemental level, see Mowen, Park, & Zablah, 2007.)

At the next level in the hierarchy are compound traits. Like elemental traits, they are cross-situational in nature. Continuing the physical chemistry metaphor, compound traits are defined as enduring dispositions that result from the effects of subsets of elemental traits as well as from cultural and sub-cultural influences.

Examples include: competitiveness, the need for learning, the need for play, and the need for activity (Mowen, 2000).

Situational traits are the third type of constructs in the 3M Model. Defined as enduring dispositions to behave within a general situational context, they are influenced by the pressures of the situational environment and by the effects of the elemental and compound traits. For example, health motivation (Moorman & Matulich, 1993) was identified as a situational trait by Mowen (2000) because it is manifest only in situations that deal with health, broadly defined.

The most concrete traits identified in the 3M Model are surface traits. These constructs represent highly specific enduring dispositions to behave that result from the effects of elemental, compound, and situational traits as well as from the pressure of the context-specific environment. Surface traits occur in narrow contexts that fall within the more general context of the situational traits. For example, Mowen (2000) found that the surface trait of healthy diet lifestyles resulted in part from the more general trait of health motivation (Moorman & Matulich, 1993) as well as the elemental traits of need for body resources and need for arousal (negative relationship). It should be added that because surface traits are context specific, they have a strong relationship with behavioral measures. That is, they are associated with specific behaviors that occur within a specified time period.

A General Hierarchical Model

In this section, the 3M Model structure is expanded to propose a GHM. As shown in Figure 1, the GHM contains a respondent hierarchy, an effects (i.e., outcome) hierarchy, environmental stimuli, and the situational context. As in the 3M Model, the respondent hierarchy contains four levels of enduring dispositions that are distinguished based on their level of abstraction. Thus, Level 4 constructs are the most abstract and Level 1 constructs are the most concrete. The effects hierarchy results from the interaction of three sets of constructs: (a) the respondent, as represented by the respondent hierarchy; (b) the situational context, and (c) environmental stimuli such as a persuasive communication. In sum, the GHM takes a stimulus-respondent-situation interaction approach for understanding the factors influencing behavior.

The Respondent Hierarchy. In the GHM, the constructs in the respondent hierarchy are not limited to traits and can include a variety of constructs that represent enduring propensities to act, such as values, functional motives (Mowen & Sujan, 2005), lifestyle measures, and enduring involvement. For example, Rokeach (1960) distinguished terminal from instrumental values. Both types of values are cross-situational in nature. Because terminal values are more abstract than instrumental values, they would be identified as Level 4 constructs, and instrumental values would then be placed at Level 3 in the hierarchy. On the other hand, functional motives represent reasons for engaging in highly specific behaviors, such as volunteering in the community. Mowen and Sujan (2005) conceptualized functional motives as residing at Level 1 (the surface level). In their study of volunteerism, the functional motive of "making friends" was placed at the surface level and identified as a predictor of behavioral

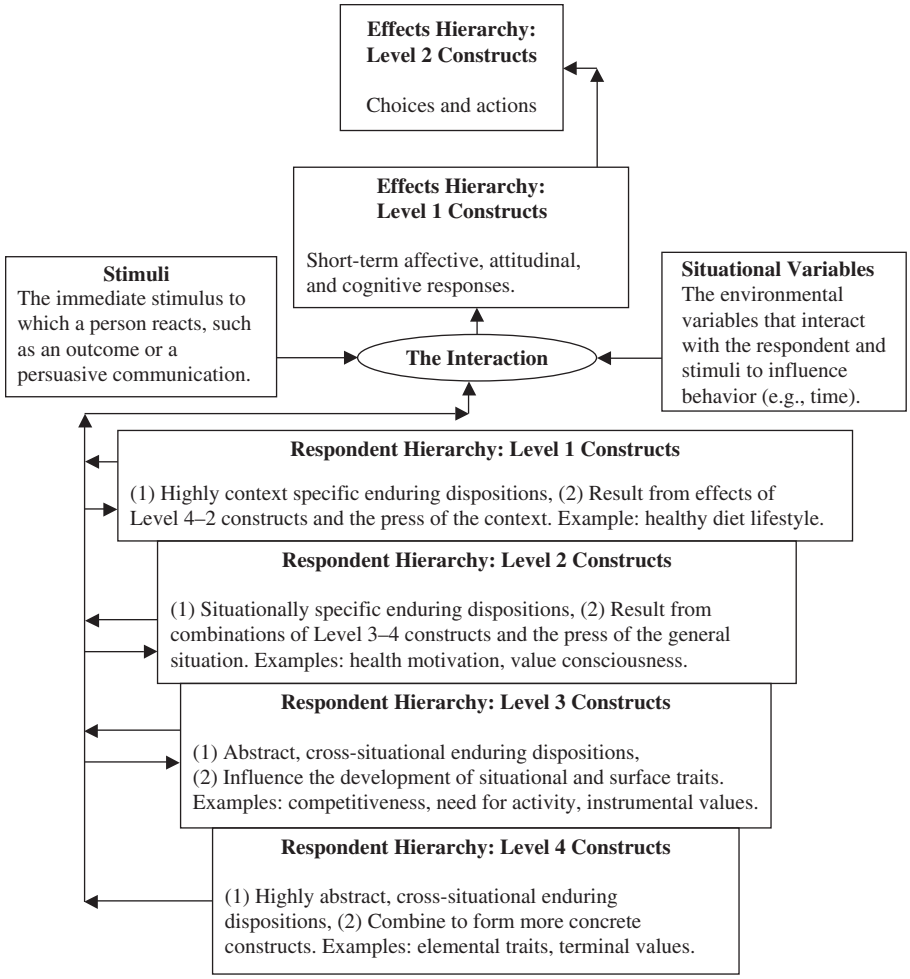

Figure 1. A general hierarchical model.

outcomes such as the number of volunteer organizations a person joins. Lifestyle measures and enduring involvement measures can also be conceptualized as residing at Level 1, or the surface level, and represent enduring dispositions that are highly context specific.

The Effects Hierarchy. In the GHM, the effects hierarchy has two levels. Level 1 represents the immediate intrapsychic responses to the interaction among environmental stimuli, the situational context, and the respondent hierarchy. Level 1 effects include measures of emotions, mood states, and cognitive responses. Level 2 effects are the choices and behaviors of the individual. These include actions such as product choice or word-of-mouth communications. The difference between Level 1 and Level 2 effects is illustrated by the work of Soscia (2007), who investigated the relationship of Level 1 effects (i.e., the emotions of happiness, sadness, anger, guilt, gratitude, and pride) to Level 2 effects (i.e., complaining and negative word of mouth communications). She found that

different Level 1 effects had divergent impact on the Level 2 effects. Thus, gratitude rather than happiness influenced repurchase intentions.

The Respondent-Situation-Stimulus Interaction. The GHM approach moves beyond previous hierarchical models by including in its structure the interaction among situational variables, person variables, and environmental stimuli to influence outcomes in the effects hierarchy. The interaction can be illustrated through an example. Suppose that a survey identified two sets of individuals. One group is highly financially conservative and the other is composed of financial risk takers. The GHM predicts that situational forces will moderate the relationship between the person-variable of financial conservatism and outcomes. Imagine that each receives a communication from a stock broker, who has found an undervalued stock that is recommended for purchase. How will the two groups react to this stimulus? The answer is that it will likely depend upon situational variables, such as the state of the economy. Thus, if the economy is good, both the financial conservative and the financial risk takers may respond positively to the investment idea. However, if the economy is in a recession, the financially conservative are likely to respond negatively. In contrast, financial risk-takers may still react positively.

The structure of the GHM provides a means for organizing constructs within a theoretically based hierarchy. In addition, the hierarchical approach provides a basis for identifying three key principles for developing construct measures. The principles are discussed in the next section, and represent additions to the current scale development paradigm.

THREE PRINCIPLES FOR DEVELOPING CONSTRUCT MEASURES

Three principles for scale construction can be derived from the GHM. These are the hierarchical net principle, the dimension principle, and the item-matching principle.

Principle 1: The Hierarchical Net Principle

The authors advocate placing the focal construct within a multi-level hierarchical net composed of its antecedents and consequences. When specifying the hierarchical net, a statement should be made identifying its level within the proposed hierarchical net, as well as its expected antecedents and consequences. For example, if a construct is identified as residing in the respondent hierarchy of the GHM, its definition should state whether it is at Level 1, 2, 3, or 4. Such specification is vital for ensuring that each item assessing the construct is taken from the same domain. In addition, by identifying the construct's antecedents and consequences, its nomological network is defined.

A critical component of the hierarchical net principle is that, when assessing the nomological validity of the construct, the full multi-level hierarchical model should be tested using simultaneous regression estimation programs, such as

structural models or three-stage least squares. Thus, the hierarchical net principle goes beyond the common statement that the construct should be located within a nomological network (Cronbach & Meehl, 1955). Nomological validity involves using theory and empirical findings to specify the relationships among constructs (Peter, 1981). Because of a lack of precision in identifying what it means to specify the relationships among constructs, the current paradigm is often operationalized by simply assessing bivariate correlations with other constructs. As will be discussed later, using bivariate correlations to assess nomological validity can be misleading.

By specifying the construct's location within a hierarchical network, researchers lay the foundation for defining the construct and for developing hypotheses regarding its antecedents and consequences. The hypotheses will emerge from previous empirical and theoretical work, as well as from the investigators' theorizing. The construct's definition will emerge from the analytical work and from where it is placed in the hierarchical network. Because the construct's antecedents and consequents are explicitly stated, this process of placing a construct within a hierarchical network prevents theorists from falling into the trap of defining the construct in terms of its antecedents and consequences (Summers, 2001; MacKenzie, 2003).

The inclusion of the construct's antecedents in a full nomological net also allows the investigator to test the possibility that a Level 4 or Level 3 construct is acting as a suppressor variable (Cohen & Cohen, 1975). That is, adding a Level 4 or 3 variable may allow a Level 2 trait, whose bivariate correlation with a Level 1 trait is not significant, to become significantly related to the Level 1 trait. This can occur because the Level 4 or 3 trait accounts for variance in the Level 2 trait that is not associated with the Level 1 trait. The inclusion of a construct's antecedents also provides a means for assessing the possibility that a phenomenon, which the authors call "illusory prediction," is occurring. (This phenomenon is discussed after the next section.)

Guidelines for Placing Constructs Within a Hierarchical Net. A key question concerns how to identify where to place a construct within the hierarchy. The process involves four steps. First, the researcher identifies in which of four broad categories a construct should be placed (i.e., respondent hierarchy, effects hierarchy, situational constructs, or environmental stimuli). Second, if the construct is placed in the respondent hierarchy, the researcher identifies whether it operates cross-situationally (Level 4 or Level 3) or is situationally specific (Level 2 or Level 1). As a general rule, if the construct is cross-situational, and not a Level 4 construct that has an early learning history/genetic component, it is assumed to be a Level 3 measure. [Mowen (2000) provided guidance on how to determine whether a construct resides at Level 4 or Level 3.] The distinction between Level 2 and Level 1 constructs is that Level 2 constructs are more abstract. Level 2 constructs also act as goals that influence the emergence of Level 1 constructs. Third, if the construct is an effects hierarchy outcome variable, the researcher identifies whether it is a Level 1 intervening variable (an attitude, belief, cognitive response, etc.) or a Level 2 behavioral outcome (e.g., a choice). Fourth, if the construct is identified as an external situation (e.g., an organizational variable such as market orientation),

it should be investigated as a potential moderator of the relationship among the respondent hierarchy constructs, the stimulus, and the effects hierarchy variables.

Illusory Prediction. Illusory prediction is a type of missing variable problem that is exposed by the hierarchical model perspective and, to the authors' knowledge, has not previously been discussed. The opposite of a suppressor effect, illusory prediction occurs when the addition of an antecedent construct in the hierarchical net eliminates the relationship between two constructs that are at more concrete levels in the model.

Minimizing the likelihood of illusory prediction is important when testing the nomological validity of a construct. As noted earlier, researchers advocate nomological validity testing (e.g., Churchill, 1979), which uses theory to propose antecedents and consequences of a construct. When put into practice, however, testing is often done in a piecemeal fashion by assessing the bivariate correlations between the focal construct and other constructs to which theory suggests it is associated. For example, in their development of a measure of vanity, Netemeyer, Burton, and Lichtenstein (1995) assessed nomological validity by investigating the bivariate correlations of constructs that were predicted to be associated with the dimensions of vanity. Supporting their conceptualization, they found "physical view vanity" to be negatively associated with a variable labeled "considering having cosmetic surgery." Because Netemeyer, Burton, and Lichtenstein (1995) assessed bivariate relationships, it is possible that the associations were illusory. That is, if constructs that are antecedent to physical view vanity were included in the their analysis, the positive relationship with "considering having cosmetic surgery" could be lost.

The authors conducted a study to test the influence of these factors on the propensity to have cosmetic surgery. In the study, physical view vanity, plastic surgery interest, and the elemental traits from the 3M Model were measured. The results revealed that the bivariate correlation of physical view vanity with interest in plastic surgery was significant ($p < .05$). However, when the elemental traits were added in a structural equation modeling analysis, the effect was lost ($p > .25$). Additional analysis revealed that the elemental trait of need for material resources was positively associated with both vanity view and interest in plastic surgery. Thus, when material needs was added to the analysis, the relationship between physical vanity concern and interest in plastic surgery was lost. Using the Baron and Kenny (1986) criteria for mediation, it appears that material resource needs mediates the relationship between vanity view and interest in plastic surgery. Mediation is not a possible explanation in this case, however, because material needs is an antecedent to vanity concern in the hierarchical model. As a result, the relationship between vanity view and plastic surgery interest is illusory. That is, it resulted from the association of an antecedent to physical vanity view (i.e., need for material resources). In sum, because of the possibility of illusory prediction, when investigating the consequences of an individual difference construct, its antecedents should be included as control variables. In addition, elemental traits are also recommended for inclusion in the model as control variables, because they are the most basic individual difference constructs.

Contributions to Scale Construction. The hierarchical net principle deals directly with Problems 1 and 2. First, the identification of the construct's hypothesized hierarchical net position becomes a part of the definition of the construct (Problem 1). Second, by identifying the construct's antecedents and consequences, a theoretical structure is provided for proposing a nomological net (Problem 2). For one-dimensional constructs, nomological validity is established if two conditions are met. First, a construct's nomological validity is supported if the network of antecedent measures has statistically significant relationships with the focal construct. Second, nomological validity is established if the focal construct is significantly related to the predicted consequent variables while controlling for the effects of its antecedent constructs and the elemental traits.

Principle 2: The Dimensionality Principle

The dimensionality principle states that a construct's definition should include a statement of proposed dimensions and that a set of tests should be conducted to support or reject the dimensional hypotheses. The principle helps to solve Problem 1 (definitional problems) by including the construct's expected dimensionality in the definition. It ameliorates Problem 4 by assessing whether dimensions represent facets of a construct or entirely different constructs.

Any construct has the potential to be measured with either a one-dimensional or a multi-dimensional approach. Thus, the decision to model a construct as multi-dimensional is a choice made by the researcher. This choice is driven both by the theorist's conceptualization of the construct and by the research question(s) at hand (Hogan & Roberts, 1996; Schneider, Hough, & Dunnette, 1996). Because dimensions have the potential to serve as stand-alone constructs, each dimension must be defined and tested as if it were a stand-alone construct.

If it is hypothesized that a construct has two or more dimensions, a model should be specified that defines the relationship between the construct and its dimensions (Law, Wong, & Mobley, 1998). Three potential models are the factor model, the composite model, and the profile model (Law, Wong, & Mobley, 1998). The factor model is analogous to a reflective measurement model and holds that the higher-order construct underlies the correlation matrix of lower-order constructs. The factor model assumes that the dimensions are specific manifestations of the more general higher-order construct (Edwards, 2001). General mental ability has been cited as an example of a construct that is appropriately modeled using a factor model (Law, Wong, & Mobley, 1998).

The composite model is analogous to a formative measurement model (Law, Wong, & Mobley, 1998). It holds that the parent construct is a mathematical function of the lower-order constructs. The composite model requires that the dimensions be assigned weights that reflect their contribution to the parent construct. Thus, it is appropriate to think of the parent construct in a composite model as a summary construct. For example, social readjustment has been modeled as the extent to which forty-three life changing events occurred within a calendar year (Law, Wong, & Mobley, 1998).

Finally, a profile model holds that the higher-level construct is defined by the set of dimensions (Law, Wong, & Mobley, 1998). As such, the parent construct is not explicitly included in the theoretical model. Personality type models such as

the Myers-Briggs Type Indicator fall into this category (cf. Law, Wong, & Mobley, 1998). Importantly, this implies that under a profile model, dimensions of constructs should be treated as *independent constructs* within the theoretical model (cf. Edwards, 2001).

Because of these starkly different relationships between the dimensions and the higher-order construct, and because of the differences in how relationships between the construct and its antecedents and consequents are modeled, researchers should provide a rationale for their choices regarding which of these three basic approaches are implemented within their specific study (Law, Wong, & Mobley, 1998; Edwards, 2001). For example, Tian, Bearden, and Hunter (2001) did not specify the relationship of the dimensions to the underlying construct of need for uniqueness. They modeled the construct as three first-order factors whose intercorrelations were explained by a single second-order factor. The three first-order factors were combined into a composite measure, which represented the need for uniqueness construct in their empirical analyses. This approach combines the factor model (through the use of the second-order factor analysis) with the composite model (i.e., using the summed scale in the empirical studies). It leaves open the possibility, as mentioned above, that the observed relationships to other constructs are due to one or two of the dimensions rather than to the overall composite (Hull, Lehn, & Tedlie, 1991).

One reason for the *a priori* hypothesis of an underlying dimensional model is to distinguish whether a construct is truly a dimension of a higher-order construct or a different construct. Criteria are needed to assess the relationship between the dimensions and their higher-level parent. Three theoretical criteria can be employed to identify whether hypothesized dimensions are antecedent or consequent constructs.

The first criterion is a comparison of the abstractness of the dimension(s) to the abstractness of the underlying construct. To be consistent with a dimensional approach, the construct and its proposed dimensions must be at the same level of abstractness (cf. Bacharach, 1989; Fisher, 1980; Long, 1985). The second criterion concerns relationship consistency in the model. Any antecedent or consequent that is associated with a dimension should also be associated with the higher-order construct. An antecedent that is correlated with a dimension, but not correlated with the higher-order construct, would suggest a mediated relationship. However, since dimensions are manifestations of the parent construct, they cannot mediate a relationship between the parent and another variable. Mediation suggests that the proposed dimension is in fact an independent construct. Note that the reverse is not necessarily true. If the higher-order construct correlates with an antecedent/subsequent, it cannot be asserted that all of the dimensions must correlate with the antecedent/subsequent. One of the primary motivations for dimensionalizing a construct is to analyze relationship differences that might not emerge from a one-dimensional approach.

The third criterion is an assessment of the temporal relationship of the dimensions to the focal construct. Dimensions represent aspects or manifestations of the parent construct. Thus, they should be temporally coincident with their higher-order parent. This argument is consistent with Edwards (2001), who proposed that dimensions should not be causally related to the parent construct. However, caution is warranted. As will be described below, even if a possible dimension is temporally coincident to the parent construct, it may still represent a different construct because it has unique antecedents and/or consequences.

The first step in the process of understanding a construct's dimensionality begins with a confirmatory factor analysis. If the dimensionality is consistent with the hypothesized measurement model, the next issue is whether the dimensions actually represent different constructs. Thus, a model is run in which no higher-order construct is included and paths are placed between the construct's dimensions and its proposed antecedents and consequences. The results of this analysis indicate whether the construct's dimensions represent facets of one higher-order construct or are completely different constructs. There are four possible outcomes. The first is that each of the dimensions has different antecedents and consequences. If this occurs, the dimensions should be treated as different constructs. A second possibility is that each of the dimensions has different antecedents but a similar relationship with the outcome variables. A third possibility is that each dimension has the same antecedents but different relationships with the outcome variables. The final possibility is that each dimension has the same antecedent and outcome variables. If this final possibility occurs, it is appropriate to model the construct in a manner consistent with the dimensional hypothesis. It should be noted that if either the second or third outcomes occur, it is recommended that the dimensions be modeled as different constructs.

A high threshold should be set for the validation of a dimensional construct. When modeling and measuring constructs, researchers should develop a bias for one-dimensional measures and reserve the use of *n*-dimensional measures to circumstances in which it is absolutely necessary. In those circumstances when *n*-dimensional measures are used, the most defensible approach is to perform tests to assess whether or not the dimensions represent separate constructs. This recommendation is consistent with Edwards (2001), who concluded that using dimensions as a set of independent constructs within the model (relative to using them as indicators of a higher-level construct) is the best choice in many circumstances.

Principle 3. The Item-Matching Principle

The item-matching principle provides guidance for selecting the items that measure a construct. As noted above, details on item selection are largely missing from the literature. The item-matching principle takes two forms. First, there is abstraction-level matching. That is, items should be selected from the same level of abstraction as identified in the construct's definition. Second, within-level matching holds that items from two different constructs at the same level in the hierarchy should *not* be combined to form a single measure. Violations of both forms of item-matching will lead to difficulty in fitting models and in testing the nomological, construct, and predictive validity of constructs.

Abstraction-level and within-level matching relate directly to Problem 3, in which the scale items assess multiple domains rather than a single domain. This problem is found in many scales. For example, consider the Mehrabian and Russell (1974) optimum stimulation level scale from the perspective of the hierarchical model shown in Figure 1. This 40-item instrument contains items at Level 1 (e.g., "I like to shop around and look at displays"), Level 2 (e.g., "designs and patterns should be bold and exciting"), and Levels 3 or 4 (e.g., "I like continually changing activities," "I like surprises"). Not only does the scale have items from multiple levels of abstraction, it also contains items assessing different

constructs within the same level of abstraction. Thus, at Level 1 it has items dealing with shopping (i.e., "I like shops with thousands of herbs"), with job preferences (i.e., "I would like the job of a foreign correspondent for a newspaper"), and with dangerous sports (i.e., "I wouldn't enjoy dangerous sports such as mountain climbing, airplane flying, or sky diving"). As can be seen by this wide gamut of items, each of these three types of behavioral preferences represents a different Level 1 construct.

The Item-Number Corollary. In addition to carefully matching items, researchers should limit the number of items that assess a construct and its dimensions. A number of researchers (e.g., Rossiter, 2002; Gerbing & Anderson, 1988; Burisch, 1997; Mowen, 2000) advocate the use of short scales. Indeed, Burisch (1997) empirically showed that short scales (three to eight items) can outperform much longer scales.

It is recommended that researchers set a goal of developing scales that have between four and eight items. Further, if a scale has dimensions, each dimension should have from three to five items. There are both conceptual and pragmatic reasons for the recommendations. From a conceptual perspective, it is difficult to create scales containing a large number of items and simultaneously adhere to the three principles identified in this article. From a pragmatic perspective, short scales are necessary when a hierarchical approach is taken. For example, if a 3M approach is employed, the researcher will collect data on the eight elemental traits, from multiple compound traits, one or more situational traits, one or more surface traits, and one or more outcome variables, resulting in a minimum of 13 constructs. In addition, most surveys will include demographic variables as well. As a result, including scales containing a large number of items (e.g., 9-plus items) results in impractically long surveys.

The development of long scales for construct measurement is a legacy of an earlier era in social science. Prior to the mid-1980s and the widespread adoption of structural modeling procedures, researchers did not think in terms of multiple constructs working together in a nomological net to influence behavior. Two examples of extremely long scales are arousal seeking (40 items, Mehrabian & Russell, 1974) and dogmatism (40 items, Rokeach, 1960).

GENERAL DISCUSSION

This article began with a story about a researcher interested in developing a new measure. The story is a foil for the proposal that the current scale development paradigm is incomplete. As a result, four problems occur in the development of measures, namely, problems in: (a) defining the construct, (b) drawing items from multiple domains, (c) understanding dimensions, and (d) showing nomological validity. In order to minimize these problems, a GHM is proposed. Derived from the GHM are three principles that minimize the likelihood of the four problems occurring during scale construction. Principle 1 (the hierarchical net principle) states that the construct's definition should identify where the construct resides in a hierarchically arranged network of hypothesized antecedents and consequences. Using Principle 1 will lead to more precise construct definitions and

facilitates testing nomological validity and dimensionality. In addition, testing the full hierarchical model prevents illusory prediction, which occurs when a construct appears to predict a consequent, when in fact one of its antecedents is responsible for the relationship.

The second principle derived from the GHM (the dimensionality principle) states that the hypothesized dimensionality of a construct should be specified *a priori*. Principle 2 also requires that each dimension be assessed separately during nomological validity testing. If the antecedents or consequences of the dimensions are different, the conservative choice is to model them as different constructs.

Principle 3 (the item-matching principle) states that researchers should select items so that the items reflect the same level in the hierarchy and assess only the focal construct within that level. For example, if the construct is at Level 2, each item should assess only one construct within that level. The goal is to avoid building measures that tap multiple domains. A corollary of Principle 3 holds that the number of items in a unidimensional scale should range from four to eight. Voss, Spangenberg, and Grohmann (2003) present an algorithm for reducing a qualified set of items to a parsimonious few.

Contributions, Limitations, and Future Research

This article makes several contributions to the literature. First, four shortcomings in the current scale development paradigm are identified. Second, a GHM is proposed. Third, from the GHM approach, three principles are derived for improving the scale development process. In addition to these contributions, a fourth advance emerges. That is, the GHM provides a theoretically based structure for ordering the relationships among constructs.

An example of how the GHM can assist researchers in arranging constructs within a model is found in research investigating materialism and self-monitoring. Rose and DeJesus (2007) proposed that materialism is a consequent of self-monitoring. In contrast, from a GHM perspective, materialism is an antecedent to self-monitoring. This arrangement is based upon the GHM proposal that materialism is an elemental trait (i.e., a Level 4 construct) and self-monitoring is a situational trait (i.e., a Level 2 construct). Evolutionary psychological principles provide the rationale for placing materialism at the elemental level. That is, without a basic need to create and possess material things (e.g., tools, clothing, weapons, and shelter) the human species would have become extinct. The proposal that self-monitoring resides at the situational level is based upon the wording of the scale items, which constrains the construct to situations in which other people are present. Support was found for the GHM ordering in research by Mowen (2000). In the study material needs, the seven other elemental traits, and competitiveness (a compound trait) served as predictors of self-monitoring. The results revealed that material needs ($p < .001$), openness to experience (negative relation, $p < .001$), agreeableness ($p < .04$), and competitiveness ($p < .001$) predicted self-monitoring. These results support the GHM ordering, which states that material needs is an antecedent to self-monitoring, rather than a consequent, as suggested by Rose and DeJesus (2007). Further, the results support using the GHM as a means for specifying the ordering of constructs within a hierarchical model.

A number of arenas for future research are also evident. One involves the investigation of alternatives to the six-level GHM model. There is no agreement

in the literature as to how many levels a hierarchical model should possess. While the six-level conceptualization is recommended, additional levels may exist—particularly on the effects side of the hierarchy. Competing hierarchical models in which the levels are not based upon abstraction and/or that allow the number of levels to vary would represent a contribution to the literature. It should be added that a limitation of the hierarchical approach is that the system of constructs becomes more complex as the number of levels increase.

A second research question is whether the GHM can serve as a general organizing structure for constructs in the marketing and psychology literatures. Hundreds, if not thousands, of constructs have been developed by marketers and psychologists. How can they be organized? There have been a number of proposals. For example, Bearden and Netemeyer (1999) arranged scales into the general categories of traits, values, involvement, reactions to advertising stimuli, attitudes toward firms and the marketplace, and measures pertaining to organizations. These categories, however, can be organized within the GHM. First, as proposed earlier in the paper, values can be conceptualized as cross-situational enduring dispositions (Respondent Levels 4 and 3). Second, because measures of enduring involvement, lifestyles, and enduring attitudes are highly context specific, they are Respondent Level 1 constructs. Reactions to advertising stimuli, brief attitudinal reactions to stimuli, as well as measures of emotions and cognitive responses reside in Level 1 of the effects hierarchy. Finally, measures pertaining to organizations can represent a form of situational variable that moderates the relationships among the person constructs. In sum, an important research agenda is testing whether extant constructs in the literature can be organized within a hierarchical structure such as the GHM.

A related question is whether relationships flow monotonically from more abstract constructs to more concrete constructs. A reviewer gave the following example. "In one case an individual is an optimist, so she is satisfied with her job, which places her in a good mood and as a result she buys a convertible. In another case, a person buys a convertible, which places him in a good mood, which increases his satisfaction with his job, which in turn makes him an optimist." This analysis suggests a reciprocal flow in which an outcome (i.e., buying a car) influences a trait (i.e., optimism). While previous research (Allport, 1937; Guttman, 1982) is consistent with the GHM and posits effects that flow from the more abstract to the less abstract, there are occasions when a reciprocal flow of effects may occur. For example, self-perception theory (Bem, 1970) proposes that a person can observe his or her own behavior, which then influences that person's beliefs, emotions, and attitudes. Thus, the individual may purchase a convertible and, as a result, see himself as an optimist. From a 3M Model perspective, however, Level 3 traits (e.g., optimism) change slowly over time because they are molded early in life from culture and the learning history of the person. Thus, any change in optimism that results from purchasing a convertible would be short in duration. Thus, a change in optimism would represent a change in a state (i.e., mood) and not a trait (i.e., trait optimism).

The reviewer's point about reciprocal flows is important, however. The GHM proposes that Level 2 and Level 1 constructs (i.e., situational and surface traits) are influenced by the reinforcement structure of the environment. As a result, situational factors (e.g., organizational climate) may impact them. For example, consistent with self-perception theory (Bem, 1970), service employees may act in customer-oriented ways because the actions of managers and other employees

reinforce behaviors that help customers fulfill their buying needs. As time passes, these employees may come to believe that they, themselves, are customer oriented. The GHM proposes that such reciprocal flows are more likely to be found among constructs found in respondent hierarchy Levels 2 and 1. Of course, this is a question that requires empirical testing.

This article focuses on developing measures for individual difference constructs. Future research should investigate whether the ideas generalize to situational and/or organizational constructs. A critical need is the development of classification systems for organizational and situational constructs. Consistent with David McClelland's (1987) work on social needs, individual difference constructs can be, and often are, adapted to assess organizational and societal characteristics. Thus, an interesting research question is: Can the person hierarchy found in the 3M Model be extended to organizational and/or societal phenomena?

One possible criticism of the GHM is that it employs constructs that are either too general (i.e., Level 4 scales) or too narrow (i.e., Level 1 scales). For example, Kassarjian and Sheffet (1991) proposed that researchers should avoid the broad scales created by psychologists and develop scales that measure specific consumer behaviors. Indeed, prior to their proposal, researchers had already begun to develop extremely narrow measures such as coupon proneness (Lichtenstein, Netemeyer, & Burton, 1990). In contrast, others may argue that extremely narrow scales provide little understanding of the underlying motives for behavior. Both arguments have merit. It is important to develop highly specific construct measures (i.e., Levels 1 and 2) because these are excellent predictors of behavior. However, it is also important to measure the more abstract antecedents of Level 1 and Level 2 constructs (i.e., constructs at Levels 3 and 4) because these identify the underlying motives for behavior. In sum, it is simply good science to identify the full nomological net of constructs within a hierarchical model.

Conclusion

The three scale development principles proposed in this article are consistent with the paradigm currently in use by most researchers today, which is based upon the work of Churchill (1979) and Gerbing and Anderson (1988). Thus, the principles represent additions to the current scale development process and focus on the process of building in validity and reliability during the early stages of the scale development process. In addition, the principles provide guidance for making stronger tests of nomological and construct validity. Finally, the addition of the principles to the current paradigm will enable researchers to build measures that are relatively more precise, reside within a tightly knit system of constructs, and better predict behavior.

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The research was supported by funds from the Noble Foundation Chair of Marketing Strategy. The authors contributed equally to the paper. They wish to thank the reviewers, and their colleagues Alex Zablah, Tom Brown, Todd Arnold, and Karen Pappas for their insightful comments on the paper.

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