Chapter 23
Developing Multilevel Models for Research

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ABSTRACT

In the past, a large number of research efforts concentrated on single-level analysis; however, researchers who only conduct this level of analysis are finding it harder to justify due to the advancements in statistical software and research techniques. The validation of research findings comes partially from others replicating existing studies as well as building onto theories. Through replication and validation, the research process becomes cyclical in nature, and each iteration builds upon the next. Each succession of tests sets new boundaries, further verification, or falsification. For a model to be correctly specified, the level of analysis needs to be in congruence with the level of measurement. This chapter provides an overview of multilevel modeling for researchers and provides guides for the development and investigation of these models.

DEVELOPING MULTILEVEL MODELS FOR RESEARCH

Researchers analyze hierarchical or nested structures, when conducting applied research in organizations, schools, health care facilities, and family settings. Hofmann (2002) indicated that ignoring these simple hierarchical structures can lead to incomplete and misspecified models. These hierarchical structures "shape, create, encourage, and reward behavior in organizations" (Hofmann, 2002, p. 248). Including this hierarchical structure into conceptual and theoretical models allows researchers to better capture the level of complexity because hierarchical systems increase our levels of understanding.

In the past, a large number of research efforts concentrated on single-level analysis, primarily

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studies concentrating on one level of analysis (i.e., personality studies, evaluation of manager's leadership abilities). Researchers who only conduct a single-level analysis are finding it harder to justify because of advancements in statistical software and research techniques. Today, researchers replace the single-level research studies with the more complex multilevel analysis techniques. For example, researchers who study hierarchical systems, such as organizations and schools, want to consider multiple impacts within the system. In these hierarchical systems, when a change is made in one part of the system each adjoining system is also affected, changing the whole system. By concentrating only on a single-level study, researchers ignore the surrounding environment, the effect that the individual has on the group and the organization / school. Alternatively, changes at the organization / school level also affect the team and the individual levels. To better understand the complex nature of hierarchical systems Kozlowski and Klein (2000) proposed that researchers utilize "approaches that are more integrative, that cut across multiple levels, and that seek to understand phenomena from a combination of perspectives" (p. 77).

In theoretical and applied research, the level of analysis is typically ill defined (Kozlowski & Klein, 2000). Literature often contains errors when individual-level data is incorrectly applied to team, organization, or school levels (Kozlowski & Klein, 2000). Some common errors in organizational and school research include misspecification errors, such as:

- Blind aggregation of individual-level measures to represent unit-level constructs;
- Use of unit-level measures to infer lower-level relations (the well-known problems of aggregation bias and ecological fallacies); and
- Use of informants who lack unique knowledge or experience to assess unit-level construct (Kozlowski & Klein, 2000).

This chapter takes a look at some of the key components involved with developing multilevel models. Considerations to the different levels of analysis and the selection of constructs for each level of analysis, including any potential interactions, are discussed. Steps to avoid producing misspecification errors will be presented along with some specific examples from current literature. This chapter addresses the call to researchers, from Kozlowski and Klein (2000), in which the trend toward single-level models "need to be broken" (p. 77), promoting the utilization of multilevel research methods. In conclusion, readers will be better able to build multilevel models and build correctly specified models for their research endeavors. This chapter primarily focuses on building multilevel models conceptually. Readers have a variety of other resources regarding the statistical analysis methods for multilevel research. Additionally, this chapter provides readers with a clearer understanding of when to use single-level models and when to consider multilevel models. Readers will also have a better understanding of how to prevent misspecification errors in their own models, and the benefits for conducting multilevel research as it applies to small group and school research. The materials provided in this chapter are primarily for those who subscribe to the positivists, postpositivists, and some naturalists perspectives. While the material presented in the current chapter may not be applicable to those who follow the perspectives of constructivism or interpretivism, it could, however prove to be highly beneficial to those planning on conducting research using mixed-methods, grounded theory building or case study research methods

THE RESEARCH CYCLE

"With human observers in the center of the stage, the world is viewed from the human vantage point.... In short, theories serve human purposes; their creation is motivated and their logic organized by the skills and limitations of human capabilities" (Dubin, 1978).

The primary goal of research is to "construct a cumulative body of knowledge and theory" (Gall, Gall, & Borg, 2010). For these 'bodies of knowledge' and 'theories' to take root into a disciplines knowledge base they must first pass the test of *systematic empirical validation* (Jaccard & Jacoby, 2010). In order to pass the rigors of systematic empirical validation, Jaccard and Jacoby (2010) indicated that research efforts must pass both the *conceptual realm* as well as the *empirical realm*. The conceptual realm involves the theoretical perspective in which the research model is grounded. This theory provides the structure and the foundation for the hypotheses that are tested during theory testing. Alternatively, the empirical realm subjects the research model to empirical tests, either supporting the theory or not supporting the theory given the contextual setting. The combination of both the conceptual realm and the empirical realm constitutes new knowledge and identifies the research process in its basic form.

Leedy and Ormrod (2005) identified eight characteristics when conducting research:

- Research originates with a question or a problem.
- Research requires clear articulation of a goal.
- Research requires a specific plan for proceeding.
- Research usually divides the principal problem into more manageable sub-issues.
- Research is guided by the specific research problem, question, or hypothesis.
- Research accepts certain critical assumptions.
- Research requires the collection and interpretation of data in an attempt to resolve the problem that initiated the research.
- Research is, by its nature, cyclical or, more exactly, helical (p. 2-3).

A secondary goal of research is to resolve real-world problems by deriving pragmatic solutions to common problems that exist in nature. Including this *pragmatic realm* to research, in addition to the conceptual and empirical realms, adds to the systematic empirical validation criteria by incorporating Polanyi's (1966) model of *knowing*. Polanyi identified knowing to include both the intellectual (knowing what) and the practical (knowing how) dimensions. Having similar, but distinct characteristics, *knowing* is never present without the combination of both dimensions (Polanyi, 1966/2009). Research also needs to meet the practical dimension in order to be accepted by a specific discipline or industry. Research must meet the requirements, as specified by both scientists and practitioners, of being both relevant and rigorous (Van de Ven, 2007). Relevance determines how well the theory and research addresses real-world problems or issues (Van de Ven, 2007), whereas rigorous research meets the requirements dictated by systematic empirical validation.

The validation of research findings comes partially from other's replicating existing studies as well as building onto theories. Through replication and validation, the research process becomes cyclical in nature, and each iteration builds upon the next. Each succession of tests sets new boundaries, further verification, or falsification. The research cycle allows complex issues to be broken down into smaller sub-issues to be analyzed by different researchers. Collectively, a clearer understanding of the complex issue emerges as each additional finding is collected from the research relating to the sub-issues. Ultimately, a more complex model can be theorized and tested as a result from the individual research studies. Research findings from these smaller sub-issues would be comparable to single-level research models, whereas research involving the more complex model would replicate multilevel models. Multilevel models involve more than one level of analysis and specify relationships across these levels. These multilevel models are discussed further in this chapter beginning with a description of the levels of analysis and measurement.

LEVEL OF ANALYSIS/ MEASUREMENT

Theoretical models consist of dependent and independent variables. Prior to testing a theoretical model, researchers ensure each variable is *operationalized*, or made measurable. Likewise, when selecting variables for a theoretical model the *level of analysis* first needs to be determined, followed by identifying the *level of measurement* for each respective variable included in the model. For a model to be correctly specified, the level of analysis needs to be in congruence with the level of measurement.

Specifying the Levels

Rousseau (1985) identified level of analysis as "the unit to which the data are assigned for hypothesis testing and statistical analysis" (p. 4). Since the level of analysis refers to hypothesis testing and statistical analysis, this criterion becomes a critical component when testing theoretical models. The level of measurement refers to "the unit to which the data are directly attached" (Rousseau, 1985). For example, in the model depicted in Figure 1, if individuals are measured and these measures are analyzed without any changes to these measures, the level of measurement is at the individual level and the level of analysis is at the individual level (X1). Alternatively, if group measurements are taken and used in an analysis, the level of measurement is at the group level and the level of analysis is at the group level (Z1); however, there are times when individual measures are aggregated to the group level. In this case the level of measurement is at the individual level and the level of analysis is at the group level (X2). In addition, there are some occasions where group measures are disaggregated to the individual level. In this case the level of measurement is at the group level and the level of analysis is at the individual level (Z2).

Class-Level and Cross-Level Effects

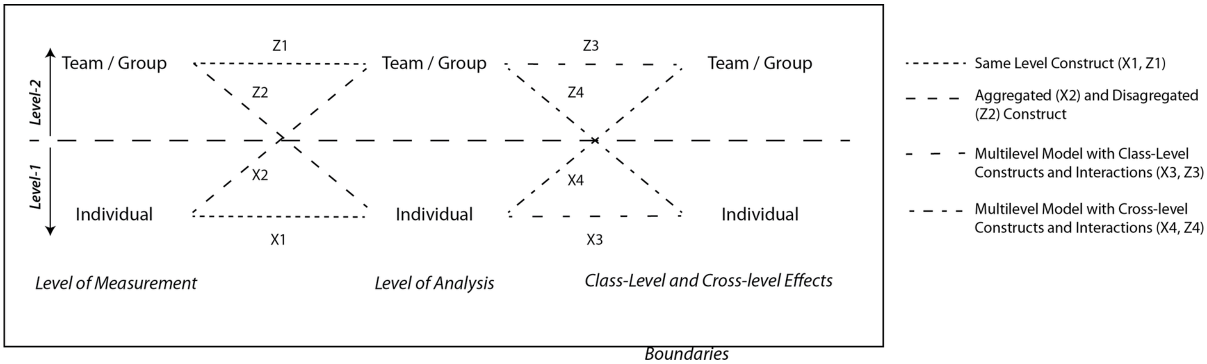
Where the level of measurement differs from the level of analysis, more than one hierarchical level is present in the model, producing a multilevel model. In these multilevel models additional effects can be analyzed such as the class-level effects and the cross-level effects. Class-level effects represent variance measured at the same level, whereas cross-level effects represent variance measured across levels. The class-level effects for the multilevel model in Figure 1 include individual class-level effects (X3) and group class-level effects (Z3). The cross-level effects in Figure 1 include the cross-level effect from the individual level to the group level (X4) and the cross-level effect from the group level to the individual level (Z4). Incorporating both class-level effects and cross-level effects into a single model, having more than one hierarchical level, leads to the development of multilevel models. "This leads to research into the relationships between variables characterizing individuals and variables characterizing groups, a kind of research that is generally referred to as *multilevel research*" (Hox, 2010).

The current example uses individuals in groups, but any hierarchical order would also fit. In educational research the focus is on students in schools, in districts, in states, and so on. In organizational research the focus is on individuals in either groups or departments, in organizations, in industries, and so on. The number of levels is unlimited in a multilevel model; however, as the number of levels in one model increases, the analysis becomes more complex and complicated.

Model Specification

Aggregation occurs when a lower-level measure is combined (e.g., indices of variation, maximum

Figure 1. Multilevel models with level of measurement, level of analysis, and multilevel constructs/interactions

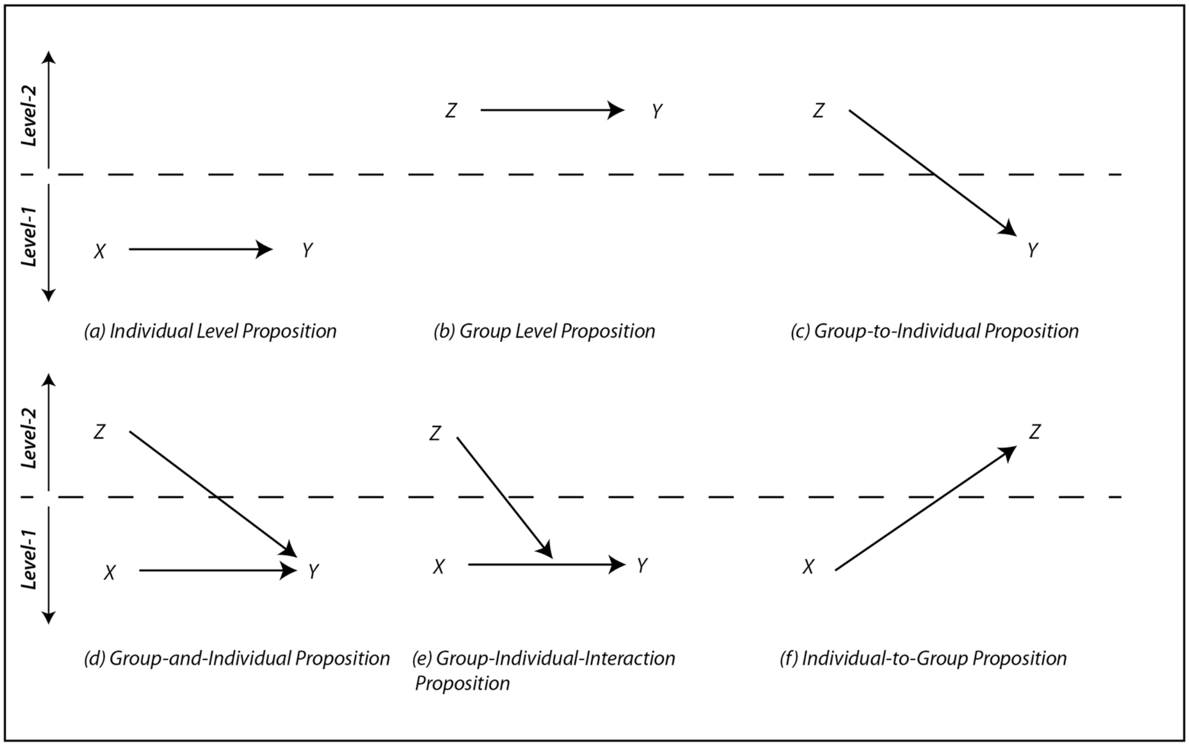


or minimum value) (Kozlowski & Klein, 2000) to represent an attribute or a structural variable at a higher-level (Hox, 2010; Rousseau, 1985). When a lower-level variable is assigned a value from a higher-level unit this is known as *disaggregation* (Hox, 2010; Rousseau, 1985). Caution arises when researchers try to generalize any findings involving aggregated or disaggregated variables. When generalizations are made from a higher-level aggregated unit back to the originating lower-level unit, *ecological fallacy* occurs (Cohen, Cohen, West, & Aiken; Hox, 2010; Klein & Kozlowski, 2000). Likewise, if generalizations are made from a lower-level disaggregated unit to a higher-level unit, researchers are committing an error termed *atomistic fallacy* (Cohen et al., Hox, 2010; Klein & Kozlowski, 2000). When either fallacy occurs the model is considered *misspecified*. Rousseau (1985) defined misspecification as attributing "an observed relationship to a level other than the actual behavioral or responsive unit" (p. 5).

To prevent models from becoming misspecified, researchers must carefully select the constructs and determine how they will be measured because these decisions are critically important. The primary level of reference for the theoretical model, known as the *focal unit* (Rousseau, 1985), is the level of analysis in which the researcher is interested. The dependent variable becomes the focal unit and is often at the lowest level of analysis for multilevel models. The focal unit relates to the level in which generalizations from a study are made (Rousseau, 1985). Figure 2 shows the relationships between the focal unit, the level of analysis, and the level of measurement that is typical for single-level models.

In Figure 2, for example, if a researcher was interested in researching the personality of team members, the focal unit would be at the individual level (Level of Analysis, DV, LL). In this case the dependent variable is measured at the individual level (Level of Measurement, DV, LL). With the focal unit at the individual level the independent variable needs to also be at the individual level to prevent model misspecification from occurring (Level of Analysis, IV, LL). In order to keep the level of analysis at the individual level the researcher has two options. The first option is to measure the independent variable at the individual level (Level of Measurement, IV, LL). The second option would be for the researcher to measure an independent variable at the group level and disaggregate it to a lower level variable (Level of Measurement, IV, HLd). A cautionary note is warranted at this stage: not all constructs/variables can be disaggregated to represent a lower level unit. The same is also true that not all lower level constructs/variables can be aggregated successfully to represent a higher level unit. More

Figure 2. Multilevel model propositions



information on aggregation and disaggregation is provided later in this chapter.

Alternatively, for Figure 2, if the researcher was interested in researching the personality of a team as a whole, the focal unit (dependent variable) would be at the group level (Level of Analysis, DV, HL). The dependent variable would be measured at the group level (Level of Measurement, DV, HL), and the independent variable would also need to be at the group level to prevent model misspecification from occurring (Level of Analysis, IV, HL). To achieve this, the researcher has two options: measure the independent variable at the group level (Level of Measurement, IV, HL), or

Table 1. Relationship between focal unit, level of analysis, and level of measurement for single-level models

Focal Unit	Level of Analysis		Level of Measurement	
	DV	IV	DV	IV
Individual Level	LL	LL	LL	1) LL
				2) HL_d
Group Level	HL	HL	HL	1) LL_a
				2) HL

Notes: DV = Dependent Variable. IV = Independent Variable. LL = Lower Level Variable. HL = Higher Level Variable. d = disaggregated. a = aggregated.

measure the independent variable at the individual level and aggregate it to represent the group level (Level of Measurement, IV, LLa). Both options require critical selections of the focal unit and the level of measurement. These selections must correctly match the level of analysis. These previous examples highlight the necessary alignment between the levels of measurement, the levels of analysis, and the focal unit when the theoretical model covers more than one hierarchical level (i.e., individual, group, organization). By correctly specifying the theoretical model, researchers can move more easily to the analysis phase for testing the model.

Defining the Levels of Constructs

Multilevel models provide the advantage of being able to present a "more integrated understanding of phenomena that unfold across levels" (Kozlowski & Klein, 2000). Multilevel models incorporate top-down processes (higher-level units influencing lower-level units) and bottom-up processes (lower-level units influencing higher-level units) that single-level models are unable to address (Kozlowski & Klein, 2000). By incorporating top-down and bottom-up processes multilevel models utilize three main types of collective constructs: global, shared, and configural (Hofmann, 2002; Klein & Kozlowski, 2000; Kozlowski & Klein, 2000). Similarly, Hox (2010) identified collective constructs as global, structural, and contextual, in which structural variables were similar to configural constructs. This section will distinguish between the two components of emergence (composition and compilation) and identify the different types of collective constructs (global, shared, and configural). Additionally, this section will look at the different forms of aggregating constructs to higher levels and the various methods used to aggregate these constructs.

Collective Constructs

Before distinguishing between top-down and bottom-up processes, the concept of emergence needs to be discussed along with its components of composition and compilation. Emergence operates on the Gestalt's principle that the whole is greater than the sum of the parts (Ball, 2004). When trying to understand emergence, it is best to think about things from a general systems theory perspective in which systems are composed of inputs, processes, outputs, and feedbacks. A concept's attributes must change prior to the output stage to be considered an emergent concept. During the process, the attributes change between the input stage and the output stage. An example of this change is provided in BOX-1, which shows the process of sharing information, the interactions among group members, and the transactive memory systems. The inputs involve the unique knowledge that each individual group member carries with them. The outputs involve the process of sharing this information through group member interactions. These outputs emerge into a team cognitive construct called transactive memory systems.

When constructs emerge they transform into one of two emergent constructs: compositional or compilational. Composition follows the assumption of isomorphism in which the lower-level construct remains essentially the same as its higher-level construct (Kozlowski & Klein, 2000). Composition constructs indicate that lower-level and higher-level constructs are linked, even though they are not identical to one another (Hofmann, 2002). Alternatively, compilation follows the assumption of discontinuity in which the lower-level construct transforms into a distinctively different construct as its higher-level construct (Kozlowski & Klein, 2000). Where composition constructs transform in a linear fashion, compilation constructs transform in a nonlinear manner (Hofmann, 2002). Examples of composition constructs include team cohesion, team norms, and team climate (Klein & Kozlowski, 2000). Examples of compilation constructs include transactive memory systems and team performance (Klein & Kozlowski, 2000).

Unit-Level Constructs

Theory development and theory testing require each construct to be defined as a global, shared, or configural unit-level construct. Global constructs originate at the higher-level as opposed to shared and configural constructs which originate at a lower-level. Global constructs relate to descriptive or easily observable characteristics of the unit itself (Kozlowski & Klein, 2000). Examples of group level constructs include group size and group function (Kozlowski & Klein, 2000). For example, a theory involving virtual teams would include the group construct *virtual team*. This construct identifies the type of team and does not originate from the individual-level member's experiences, perceptions, or demographics; the identification is solely a descriptive property of the higher-level unit.

Shared constructs originate at a lower-level unit and represent the characteristics of the members from the lower-level unit. Shared constructs include collective efficacy, organizational climate, and group norms (Kozlowski & Klein, 2000). Operating as a compositional emergent construct, shared constructs assume isomorphism between the two levels sharing "the same content, meaning, and construct validity across levels" (Kozlowski & Klein, 2000). Configural constructs also originate at a lower-level unit but the capture the transformational processes that make the higher-level unit distinctly different from its lower-level unit (Hofmann, 2002). Configural constructs capture the "array, pattern, or variability" (Klein & Kozlowski, 2000) of the members that make up the lower-level unit from which the configural constructs originated. Team personality composition and team age diversity are two examples of configural constructs provided by Klein and Kozlowski (2000). Shared constructs have similar or homogenous properties as their lower-level unit, whereas configural constructs do not have homogeneity with their lower-level unit (Hofmann, 2002). To help determine whether a construct is either a shared construct or a configural construct Hofmann (2002) provided the following determining question: "Does the construct emerge from shared actions/perceptions/attitudes among collective members or a more complex combination of individual actions/perceptions/attitudes" (p. 255)? The former represents a shared construct while the later represents a configural construct.

Forms of Aggregation

In order to aggregate individual-level variables into higher-level variables Chan (1998) identified five basic forms of composition: additive, direct consensus, referent-shift, dispersion, and process composition. Additive models simply combine the individual-level components to represent the higher-level unit, disregarding any variability across these measures. For additive models, Hofmann (2002) identified the focus as the final aggregate, but the interest is not on the agreement within the levels or the within-group agreement. The direct consensus model includes the within-group agreement with the aggregate, thus representing the phenomena that transformed the emerging construct (Hofmann, 2002). The distinction between these two models is that the additive model only represents constructs that do not emerge into a distinctively different construct, whereas the direct consensus model includes the sharing and interaction processes that cause the construct to emerge into a distinctively different construct. Regardless of the model used to represent a higher-level construct, the researcher needs to indicate why one model of aggregation is representative as opposed to the other model. Ultimately, the combination of the within-agreement coefficient, the conceptual definition of the construct (Chan, 1998), and the theory helps validate the new aggregated higher-level construct.

Referent-shift models represent a change in the focus of the survey items. Hofmann (2002) indicated that this shift changes from a focus on the individual to a focus on the group, or higher-level unit. As an example, one survey item for measuring the construct team psychological safety utilized by Schepers, de Jong, Wetzels, and de Ruyter (2008) was: "I'm not afraid to express my opinions in my group" (p. 766). As an individual-level item, this survey question could be referenced 'I'm not afraid to express my opinions', which would provide researchers with an individual perception reference. By incorporating 'in my group' to this survey question, the researchers conducted a form of referent-shift to the group level. This example is used for descriptive purposes only, and further details are unknown about the survey item or possible alterations from its original form. When utilizing referent-shift models, Hofmann (2002) cautioned researchers "to consider which form is consistent with their theory" (p. 254).

Dispersion models focus on two representations of the same construct simultaneously. One construct represents the level of agreement and the other construct focuses on the dispersion or variability of the measure - each at different levels (Hofmann, 2002). Chan (1998) indicated that within-group agreement is a necessary precondition for dispersion models. Cole, Bedeian, Hirschfeld, and Vogel (2011) provided an example in which group cohesion was represented by two constructs: cohesion level, representing group member aggregated measures, and cohesion dispersion, representing the variation among individual cohesion measures. Lastly, process models describe the "function and structure of constructs across levels" (Hofmann, 2002). Chan (1998) presented process models as "composing some process or mechanism from the lower level of conceptualization to the higher level" (p. 241). By identifying similar outputs or effects at different levels, Hofmann (2002) described that a theory can be derived to explain the processes at the different levels.

Justifying Aggregation

Aggregated constructs are justified through agreement, reliability, and validity indices. Justification on whether a particular construct can be aggregated, or not, is heavily dependent on the type of construct as well as the agreement, reliability, and/or validity measures. For composition constructs the higher-level unit is an isomorphic resemblance of the lower-level unit. In this instance, prior to supporting aggregation of the lower-level unit, compositional constructs need to differ between groups while being identical within each group. For a measure of within-group agreement one could utilize the within-group agreement coefficient, r_{wg}. Klein and Kozlowski (2000) indicated the r_{wg} coefficient assessed the "extent of consensus, agreement, or within-unit variability within a single unit for a single measure" (p. 222). To utilize the r_{wg} coefficient for aggregation, the coefficient for each group needs to be calculated. Then the overall mean or medium is reported along with the range of the r_{wg} values for all of the groups (Klein & Kozlowski, 2000). Typically, an r_{wg} value of .70 or higher is acceptable for aggregating a construct (Klein & Kozlowski, 2000). The r_{wg} coefficient provides a within-group measure but does not provide any indication of between-group variability. For direct consensus composition constructs, the r_{wg} coefficient provides the required within-group agreement measure. One problem with the r_{wg} coefficient is that it can result in unreliable estimates when response bias is present (Bliese, 2000).

When both within-group agreement and between-group variability are called for, interclass correlation measures can be used. The ICC(1) coefficient represents the proportion of total variance explained by group membership, whereas the ICC(2) coefficient provides an estimate of the group means (Bliese, 2000; Klein & Kozlowski, 2000). ICC coefficients are calculated using one-way random-effects ANOVA with the construct of interest as the DV and the grouping variable as the IV (Bliese, 2000). ICC(1) coefficients support aggregation when the F-test is shown to be significant while the ICC(2) coefficients support aggregation when their value is .70 or greater (Klein & Kozlowski, 2000). Recommendations are to report multiple measures when justifying aggregation of composition constructs. Equally important, Klein and Kozlowski (2000) highlighted that theory and prior research should equally support aggregation of a composition construct.

When dealing with compilation constructs the higher-level unit represents a different phenomenon from the lower-level unit from which it was derived. Compilation constructs are not isomorphic and the higher-level unit does not require similarity, or within-group agreement, at the lower-level unit before justifying aggregation (Bliese, 2000). Rather, aggregation is justified through theory and within previous research found in the literature.

Constructs for Theory and Constructs for Testing

Identifying which constructs to include in a multilevel theoretical model requires a different process compared to identifying which constructs to keep when testing a multilevel model. For theoretical models, inclusion should be made using past research, previous theoretical models, and expert experiences on including variables in a theoretical model. Past research will also assist the researcher to determine which constructs should be included as lower-level constructs and which should be included as higher-level constructs. Also, researchers will be guided by past research that determines any interactions between the lower- and higher-level constructs.

When testing a theoretical model, researchers should have a general idea of which constructs are lower-level or higher-level, and which interactions are being tested through a-priori hypotheses; however, given the advancements in multilevel analysis tools made available to researchers today, during theory testing the researcher is not too concerned with measuring the r_{wg} coefficients or the ICC(1) and ICC(2) coefficients for each construct in the model. Multilevel software has the capability of separating both the within group and between group variances for each construct as well as determining if that variance is statistically significant. Experts still recommend researchers report the r_{wg}, ICC(1), and ICC(2) for each construct included in the tested model. When conducting a multilevel analysis, researchers are responsible for identifying which constructs to analyze as a fixed effect, as a random effect, or both. These decisions are based on the type of construct that is being analyzed. The researcher should be able to identify whether the constructs are compositional or compilational to assist in theory testing. Although testing multilevel models was not the focus of this chapter, further information relating to multilevel analysis methodology can be found in the following sections (Hox, 2010; Raudenbush & Bryk, 2002; Snijders & Bosker, 2012) .

The types of constructs as well as the different levels of analysis / measurement during the theory development stage extend to the theory testing stage. The next section provides a short preview of different multilevel models that can be theorized, showing their advantages over traditional single-level models.

MULTILEVEL MODELS

Multilevel models are better able to capture the complexity in today's environment compared to single-level models. As shown in Figure 2(a), single-level models capture the effect that an individual predictor (X) has on an individual outcome (Y). Single-level models also capture the effect that a group level predictor (Z) has on a group level outcome (Y) as shown in Figure 2(b).

Box 1. An example of a configural construct

One construct within the team cognition literature is transactive memory systems (TMS). TMSs exist in small groups where the unique knowledge of each member is used to benefit the team. These groups know that each group member has different and unique knowledge relating to the groups task and they utilize this knowledge to achieve their task. TMS relates to the information that a group member stores, encodes, and retrieves separately from the other group members (Lewis, 2003). Group interactions allow each group member's unique knowledge to be shared with the other group members then utilized for the collective goal of task achievement. TMSs are manifested from three distinct group behaviors: specialization, credibility, and coordination (Lewis, 2003). The knowledge needs to be unique and specific to the group's task (specialization), come from a trustworthy source (credibility), and shared with the right group members (coordination).

TMSs are examples of configural variables. A TMS is based on individual measures (level of measurement) which emerges into a different construct after group members interact and share their knowledge (level of analysis). Hollingshead, Gupta, Yoon, and Brandon (2012) identified TMSs as a group level construct: "It is a property of a group and not traceable to any of the individuals alone" (p. 423). Additional configural constructs that originate with an individual level of measurement include team learning, team knowledge, group performance, class diversity, and school culture.

Single-level models remain single-level because the level of measurement remains at the same level of analysis. (Exceptions include aggregation or disaggregation, as previously discussed.) For example, when measuring an individual group member's perception about their personal performance the measurement cannot be used to predict group performance due to the cross-level analysis. This cross-level analysis includes individual perceptions at the individual level of analysis and group performance at the group level of analysis. Researchers must associate single-level models to the same level of analysis (i.e., individual to individual, group to group).

Multilevel models expand further than the limited reach of single-level models. One advantage that multilevel models provide, compared to single-level models, is the ability to capture the effect that a group level construct (Z) has on an individual level (focal unit) outcome construct (Y), as shown in Figure 2(c). In addition, multilevel models have the ability to analyze the effect that both individual level (X) and group level constructs (Z) have on an individual level outcome construct (Y), as shown in Figure 2(d). As shown in Figure 2(e), multilevel models have the advantage of identifying moderation effects across levels. For example, Figure 2(d) shows the group level construct (Z) having an effect on the outcome construct (Y), and the individual level construct (X) having an effect on the outcome construct (Y). Lastly, researchers use multilevel models to analyze the effect that any individual level construct (X) has on a group level construct (Z), as shown in Figure 2(f).

For further descriptions relating to the multilevel models provided in Figure 2, readers are referred to Snijders and Bosker (2012). Snijders and Boskner introduced similar models with the addition of causal chain models, which are models that span across both levels to explain a group level construct. In describing the benefits that multilevel theories can provide to researchers, especially with the advancements in software packages that are made available to researchers today, Snijders and Boskner presented the following: "The methodological advances in multilevel modeling are now also leading to theoretical advances in contextual research: suitable definitions of context and 'levels', meaningful ways of aggregating variables to higher levels, conceptualizing and analyzing the interplay between characteristics of lower- and higher-level units" (p. 12). The previous discussion provided information for each of these methodological advances identified by Snijders and Boskner. The next section will provide general information pertaining to theory, including various theory development processes, theory testing, and guidelines for theory dissemination.

THEORY DEVELOPMENT

Theory development methods have been presented by many scholars as a means to guide authors and to inspire new thought processes. McLean (2011) proposed six sources of input for theory development: experience, observation, literature, intuition, practice, and reasoning. McLean presented: "Integrating [these] sources into a theory is critical for a theory that will be useful moving forward" (p. 213). Theory building should expand what is already known from research and should also be worthwhile for everyday application. A successful theoretical framework can be shocking as well as being logical at the same time. In order to better understand a phenomenon, theory development allows researchers to question relationships (Corley & Gioria, 2011) among constructs.

The theory development process also provides a logical explanation (inductive or deductive) of the associations between the various constructs and variables that describe the phenomenon. Results from the empirical research do not provide an explanation for the associations between variables (Sutton, 1995). This process provides much more than evidence that the constructs and variables are related. The theory development process provides a logical explanation for these associations, including why the associations occur.

Explanations of logic can be realized through the interpretations of multiple paradigms. Paradigms differ from theories because theories include a description of the research problem but paradigms do not; however, paradigms are an important part of building theory (Petty, 2001). Consideration for multiple viewpoints allows the theorist to gather solutions outside of the individual problem. The following sections present theory development processes commonly used in theory-building research. The first theory-building model (Dubin, 1978) practices a single theorist paradigm, while other models (Lynham, 2002; Van de Ven, 2007) suggest a multiple paradigm including both the practitioner and theorist (Storberg-Walker, 2002).

Dubin's Theory-Building Model

Dubin's (1978) hypothetico-deductive model consists of a commonly used eight-step methodology:

1. Units of the theory,
2. Laws of interaction between units,
3. Boundaries within the theory,
4. System states in which units interact,
5. Propositions,
6. Empirical indicators,
7. Hypothesis,
8. Testing (p. 78).

The first four steps in the model are referred to as the theory development phase, while the last four steps support the theory testing phase. This theory development method allows the theorist to build statements and analyze them through observations that prove or disprove statement validity. The theory development phase identifies the units (concepts, constructs, variables, and events; Dubin, 1978) that best describe phenomenon. Next, this phase provides any interactions that may exist between these units. Boundaries are then specified, indicating where these units are valid. During step four, the states of the system identify instances when the units interact different from expectations (Dubin, 1978). In the system states step the multilevel interactions (class-level and cross-level) are identified. In addition, this step identifies the different effects for each level.

During step four, the states of the system identify instances when the units interact different from expectations. The operationalization of these variables transforms each construct to the level of its variable, making the constructs testable. These measureable variables are then used to make hypotheses, acting as extensions of the previous propositions. These hypotheses are measureable and can be tested empirically. Once hypotheses are generated, empirical research can be conducted using multiple types of methodologies.

While Dubin's (1978) method provides a specific and comprehensive process for theory development, some scholars suggest that the model lacks the flexibility to address complex social phenomena (Stroberg-Walker, 2003). The linear track of the model implies that theorists should create theory and then conduct empirical research. This limits the theorist's ability to augment the possible relationships throughout the research process (Torraco, 2002). Dubin provides a distinct research path that would be beneficial to novice theorists by eliminating ambiguity commonly found in research.

Lynham's General Model

The general model developed by Lynham (2002) consists of "five interdependent, interacting phases of theory building, namely: conceptual development, operationalization, confirmation, application, and continuous refinement and development of the theory" (p.22).

Lynham (2002) incorporates both theory development and theory testing in one model, similar to Dubin's (1978) model. One main difference between these models is that Lynham presents-five phases as a cyclical model, allowing for theory adjustments through testing, adjusting, and retesting. The general model developed by Lynham (2002) consists of "five interdependent, interacting phases of theory building: conceptual development, operationalization, confirmation, application, and continuous refinement and development" (p. 22)."

Theory development begins with the conceptual development phase and continues through multiple phases (operationalization and confirmation/disconfirmation of the theory from testing) before reaching the last phase: application of the theory. The cyclical process involves testing and retesting, which allows researchers to develop theories that have been confirmed through empirical testing. An essential component of the confirmation or disconfirmation phase lies in the direct correlation of theory and practical use (Storberg-Walker, 2003).

This conceptual model allows the researcher to begin at any phase, depending on the maturity of the model being testing. According to Storberg-Walker, "theory building can start at any step, validate contributions of multiple paradigms, recognition of conceptual development, and both inductive and deductive reasoning" (2003, p.218).

Van de Ven's Engaged Scholarship Model

The engaged scholarship model was developed as a participative form of research aiming to gain viewpoints from critical stakeholders (Van de Ven, 2007). Scholars and practitioners come together in this model to define the problem and devise possible solutions. A direct relationship exists between engagement and problem resolution as the level of complexity increases (Van de Ven, 2007). Van de Ven (2007) suggested that theory building consists of discovering alternative solutions within the problem's setting. Theorists develop solutions through assessment of problems with the aid of shareholders and subject specific literature. Current research designs assume unobtainable organizational stability. Two general theory development models aimed to aid in addressing dynamic research problems are the variance and process models.

Variance Model

The variance model concentrates on problems as outcomes. This model is often used in practical studies that emphasize organizational conditions that generate change. For example, profit-driven businesses demand explanations for fluctuations in revenue. The researchers and key stockholders derive the reasons for these fluctuations through theory development. In this case, theory is formed by discovering the problem's antecedents, circumstances, and outcomes (Van de Ven, 2007), providing an explanation of these fluctuations.

Process Model

Process models are based on event sequencing or categorical changes in variables. "Two key definitions of 'process' are used to explain change: (1) a category of concepts or variables that pertain to actions and activities, and (2) a narrative describing how things develop and change" (Van de Ven, 2007). Process models use events that are fixed in time or in category to describe change. Order and sequence of the variables are essential to understanding the phenomenon. Practitioners and scholars seek to understand how the sequence of events impacts change. Theorists develop process models by investigating a variables increase or decrease from a specific time or sequence.

Variance models best represent experimental and field research, measuring variables at one single time point (e.g., survey, interview, and focal group interview). Alternatively, process models best represent studies that repeatedly measure the same variables at multiple time points. Process models are referred to as longitudinal studies and repeated measure studies. Depending on the type of study, either of these two models can be used to develop and test multilevel theories.

THEORY AND THEORY TESTING DISSEMINATION

Highlighting specific areas where articles submitted for publication often fail to meet expectations and get rejected, Colquitt and George (2011) identified that many rejections begin at the topic of the article. Colquitt and George (2011) presented that topics must incorporate the following criteria: significance, novelty, curiosity, scope, and actionability. The significance criterion requires the topic to contribute important issues to a discipline, or to address a specific problem with an existing discipline (Colquitt & George, 2011). The novelty criterion relates to the 'turning-of-heads' measure. Does the topic replicate the opinions of others, or does the topic create new and innovative discussions on the discipline? Colquitt and George's (2011) curiosity criterion keeps the reader engaged, providing a deeper level of information processing that "counter a reader's taken-for-granted assumptions" (p. 433). The scope criterion requires relevant constructs and actionability. This criterion considers the relevant and pragmatic dimensions discussed previously.

Theory is one common theme that is found throughout all research mediums. Theory can be reported as a stand-alone manuscript that either presents a new theory or adds to an existing theory. In quantitative research, theory provides the foundation for the research study. Creswell (2014) identified the importance of theory in quantitative research in the following: "Theory becomes a framework for the entire study, an organizing model for the research questions or hypotheses and for the data collection procedure" (p. 59). For qualitative research, theory can be either used as the foundation for the study, much like in quantitative research, or it can be derived from the data or from the researcher's experiences. Whereas quantitative research is primarily deductive, most qualitative research is inductive, placing the development of a new theory as the outcome of a qualitative study (Creswell, 2014). Lastly, theory is a key component in a thesis or a dissertation. The role that theory plays in these two types of mediums are the same as in quantitative and qualitative research, with one exception: a thesis and a dissertation require a more elaborate description of the theory.

When reporting a theory, whether as a stand-alone manuscript or some form of a quantitative or qualitative research effort, the theory must meet the relevance criterion as outlined by Van de Ven (2007). Additionally, the theory must meet either the connectivity or transformational criteria that

Bacharach (1989) provided. For a theory to meet the relevance criterion, Van de Ven (2007) states that the theory must address the problem that it intended to address. The theory must be pragmatic and presented clearly so that the audience realizes the theory addresses a real problem. In addition, the theory must present the problem in a manner that the audience can understand and put to use in a real-world setting. The relevance criterion helps cross the bridge between what Van de Ven (2007) calls, "the relationship between academic quality and practical relevance" (p. 237).

The connectivity criterion requires the new theory to provide information that's missing from existing theories (Bacharach, 1989). The new information will provide knowledge for the field and discipline, or both. If the theory does not meet the connectivity criterion then it must meet the transformational criterion. The transformational criterion identifies theories that either add to, or alter, existing theories, causing "preexisting theories to be reevaluated in a new light" (Bacharach, 1989, p. 511).

One method to meet the transformational criterion is to take an existing linear theory and make it a multi-level theory – assuming the relevance of this type of transformation is practical. As discussed earlier in this chapter, multilevel theories can expand the practicality of linear theories by identifying new associations across the different levels. These new associations contribute new knowledge in which researchers can test, and confirm or dis-confirm these newly identified relationships.

Having met the relevance criteria and the connectivity or transformational criteria, researchers will complete the next critical task: clearly and concisely report these multilevel theories as the theories are supported from literature. In order to report on the development of multilevel theories and to report research testing these multilevel theories this last section provides guidelines for theory and theory testing dissemination. These guidelines will also benefit those who are involved in the review and editing processes for academic publications.

Multilevel Theory Development Dissemination

A theoretical paper should "build original theory, add value to existing ideas, push forward hitherto unexplained questions, or challenge conventional thinking" (Kilduff, 2006, p. 253-254). In identifying reasons why submitted articles go unpublished, Kilduff (2007) indicated a main deficit was the articles had "no theory". Kilduff (2007) warned against a 'collection of thoughts' in place of theory. Theoretical contributions should be capable of keeping ahead of current empirical research (Kilduff, 2006), by forging new relationships and by creating new knowledge that can be tested in future empirical studies.

Good theoretical papers, according to Kilduff (2006), "should have a beginning, a middle, and an end" (p. 253). The reader should be captured from the beginning due to the importance and uniqueness of the theory. In addition, the reader should remain in the story throughout, from the beginning to the end, including the introduction of the constructs, their relevance, and the final connections when the theoretical model is presented, along with potential research implications. Writing good theoretical articles "is hard work" according to Kilduff (2007, p. 702) and many other researchers.

Theoretical and conceptual papers do not have specific structural requirements, compared to other types of research papers (McLean, 2011). Reviewing articles from the previous 10 years in the journal of the *Academy of Management Review,* Fulmer (2012) identified that researchers differed in the formal structure of their articles. One researcher used traditional research article headings, while the remaining researchers created headings about the concepts or theoretical model that was being presented (Fulmer, 2012).

The only commonality was that each article had discussion and conclusion sections.

Without a writing format for theoretical or conceptual articles, researchers must rely on communicating clear and concise theoretical models. This point is highlighted in Fulmer's (2012) statement that "structuring the paper *well* [emphasis added]" (p. 327) is of upmost importance.

In general, each theoretical article must have four basic components: introduction, method, results, and discussion sections. Researchers have the flexibility to name these four sections as they relate to the presented theory - often the names reflect the theory's development process. Regardless of the section headings, the researcher must provide a clear description of the problem being addressed, the literature that identifies the constructs that are defined in the theory, the different levels the theory addresses, the associations between each construct, the cross-level associations or interactions, the relationship showing how everything connects into one coherent theoretical model, a portrayal showing how the theory can be operationalized for testing, the boundaries for the presented theory, and evidence that shows how the theory addresses the problem that was identified previously. As a guide to improve theoretical articles, Whetten (1989) identified the following questions that researchers must answer in their theoretical article:

- What's new? How different is this from existing knowledge/theories?
- So what? A theoretical paper should be able to alter research practice, not simply tweak an existing model leading too little to no consequential difference.
- Why so? Theory development papers should be built on a foundation of convincing argumentation and grounded in reasonable, explicit views of human nature and organizational practice.
- Well done? Complete; thorough; are multiple theoretical elements (what, how, why, when, where, who) covered; conceptually well-rounded as opposed to being superficial; broad; propositions; propositions derived appropriately; etc.
- Done well? Well written; flow; [parsimony].
- Why now? Is this theory interesting to current scholars, will it advance discussions?
- Who cares? Who will be interested (p. 494 – 495).

Provided below are recommendations for the main sections of a theoretical article.

Title and Abstract

Fulmer (2012) highlighted the importance of the structure of a theoretical paper and emphasized that this structure was as important as a theory's concept. A theoretical paper, or published article, begins with a title and abstract – both of which need to incite the reader's interest. Potential readers only have access to the title and abstract from the publisher's web page, and existing readers see the title and abstract before reading anything else. In addition, both the title and abstract provide the main information retrieved from any online search. The search terms used in an online search must connect to key terms in your theoretical article. Appropriate key terms in the title and abstract help draw readers to your article. Potential readers only have access to the title and abstract from the publisher's web page, and existing readers see the title and abstract before reading anything else. Once readers are drawn to the article, the content provided in the abstract will either attract or detract them to continue reading the article.

The title is supposed to be designed so that the reader can identify with the "core construct or idea of the paper in simple language" (Fulmer, 2012, p. 328). Rather than encouraging researchers to impress readers, Fulmer (2012) recommends researchers utilize the title to draw in the right readers - those readers that are more likely to appreciate the content provided in the article. The requirement for the abstract is to relate the core constructs with the purpose of the article. Readers are also interested in the methodology, which is used to develop the theory and to identify the problem the theory addresses. Abstracts for journals have specific requirements, including the maximum length for the abstract. Before submitting articles, identify the requirements for the journal and adhere to those requirements. Also, some journals offer guidelines as to what information they want in their abstract. Adhering to these journal specific requirements and guidelines will increase the chances of your articles being accepted.

Introduction and Problem Statement

The introduction usually includes identifying the problem, its setting, its significance, along with the purpose for the theoretical paper. The introduction usually identifies the problem, explains the significance, and clarifies the purpose of the theoretical paper. Ellinger and Yang (2011) identified that the introduction should present a problem requiring further research. The introduction should conclude with a purpose statement as it relates to the present study (Ellinger & Yang, 2011).

Jacobs (2011) identified three major functions of problem statements:

- Problem statements establish the existence of two or more factors that, by their interactions, produce a perplexing or troublesome state that yields an undesirable consequence.
- Problem statements justify the usefulness of the information that might be gained by investigating the problem.
- Problem statements present the purpose of the study to address the troubling or perplexing situation, that is, what the researcher has planned in response to the existence of the opposing factors (p. 127-128).

Formulating the Research Problem

Four basic activities of formulating a research problem include situating, grounding, diagnosing, and resolution (Van de Ven, 2007). These four activities involve:

1. Recognizing and situating a problem;
2. Gathering information to ground the problem and its setting;
3. Diagnosing the information to ascertain the characteristics or symptoms of the problem; and
4. Deciding what actions or questions to pursue to resolve the research problem (p. 72).

Van de Ven (2007) defined a *research problem* as "any problematic situation, phenomenon, issue, or topic that is chosen as the subject of an investigation" (p. 73). One's perception of a problem differs from the perception perceived by another person. Problem identification requires researchers to present the problem from different reader perspectives, identify different levels of analysis, place the problem within the context being studied, identify a timespan if required, and identify the complexity of the problem (Van de Ven, 2007).

Researchers may experience the following challenges when creating problem statements:

- Deciding which persons or stakeholder groups to serve through the research, and accurately describing the perspectives of those persons or stakeholders.
- Avoiding short-cuts or heuristics that produce biased judgments. Avoiding a solution for the 'wrong' problem with the 'right' method.
- "Avoiding imaginary pseudo-problems that lack reality. Avoiding elaborate theories based on insufficient problem diagnosis."
- "Failing to produce a statement that leads to a creative theory and failing to advance

the understanding of the problem (Van de Ven, 2007, p. 73)."

Concepts, Constructs, and Variables

A critical part of the theory's foundation is presenting the overall concept addressed by the theory. A concept represents generic ideas, thoughts, experiences, and instances (Jaccard & Jacoby, 2010). Likewise, Van de Ven (2007) described a concept as being defined by its associations with other terms, not directly observable. Each concept is identified by its underlying constructs, representing mid-range terms that reference components of a concept (Van de Ven, 2007). Each construct is measured, or made observable, through the variables that are representations of the said construct. The level of abstraction increases when moving from a variable to a construct, and finally to the overarching concept - with the concept being the most abstract. The concept represented by a body of constructs and measured by specified variables is collectively known as the *conceptual system*. Jaccard & Jacoby (2010) identified this conceptual system as: (1) the identification of the concepts, constructs, and variables, and (2) the description of the relationships between the concepts, constructs, and variables. This conceptual system provides insights into a phenomenon researchers call "explanation" (Jaccard & Jacoby, 2010, p. 15).

A theoretical paper must successfully identify the concepts, constructs, and variables that compose the theory, as well as provide literary support that these parts belong together in the same theory. Most importantly, literature must support the interactions and associations between the constructs across different levels of analysis in multilevel theories. Lastly, the presented conceptual system will only be applicable to the environment and or the body of knowledge pooled from, placing the responsibility of identifying the theories boundaries on the researcher. The boundaries identify where the theory is expected to hold true. The boundaries also determine lack of support, indicating that the theory needs further testing.

To support theory papers, researchers should address the following questions: What concepts, constructs, variables, or theories does your discipline use to identify with the presented theory? How does your discipline define and relate the presented concepts, constructs, and variables? What are the different levels of analysis and are they supported from the literature? What evidence is provided showing the interactions among the constructs across the different levels? What are the boundaries to the presented theory?

Propositions/Hypotheses

In their basic form, theories are abstract representations of phenomena, whereas empirical studies that test theories are required to convert from abstract to observable. One method of completing this conversion, from the abstract to being more concrete, is to convert propositions to hypotheses. *Propositions* are introduced in theoretical papers in which the cause and effect relationships are stated in abstract terms, often in the form of 'if-then' statements (Van de Ven, 2007). Alternatively, *hypotheses* are concrete, measurable, representations of propositions. In order to test a theory, its proposition must be converted into an observable hypothesis, "transforming a theory into an operational research model" (Van de Ven, 2007, p. 161).

Propositions make specific statements about the relationships among constructs. Van de Ven (2007) presented four common types of propositions: categorical, disjunctive, conjunctive, and conditional:

- A *categorical proposition* denotes or assigns things to classes (i.e., categories)…. We make categorical propositions when assigning observations into categories.
- A *disjunctive proposition* classifies things into mutually exclusive categories….

Disjunctive propositions are divergent; they differentiate classes of things or theories.

- A *conjunctive proposition* classifies things into multiple categories that things reflect…. Conjunctive propositions are integrative; they connect things or bridge terms.
- A *conditional proposition* consists of two simple statements joined by the words 'if' and 'then'….In a conditional proposition, the 'if' statement is the *antecedent* and the 'then' statement is the *consequent*. A conditional proposition asserts that the antecedent implies the consequent. The consequent is true if the antecedent is true. In scientific discourse, conditional propositions are often used to specify relations between the antecedent and the consequent either by definition or by cause (p. 117-118).

Not all theoretical articles include propositions, nor are propositions a requirement for theory. Theoretical articles without propositions will commonly contain a conceptual synthesis, an analytic classification scheme, an illustration and definition of a process, or a summary of configurations and theoretical examples with figures (Fulmer, 2012). Regardless of whether propositions are used or any other method the following basic characteristics, summarized from Fulmer (2012), should be included:

- Propositions need to be clearly worded (clarity is critical).
- Propositions need to use the same terminology as used in the remaining article.
- Propositions need to describe the expected direction (positive or negative) of relevant relationships.
- Moderating relationships need to be clearly explained (especially for multilevel theories).
- The effects of moderators on underlying relationships need to be clearly explained (especially for multilevel theories).
- Propositions need to be an organic part of the article (where logical arguments build upon each other).
- Propositions need to have a logical and coherent flow (p. 329).

Review of Literature

Although no formal literature is required for theoretical articles, researchers need to provide a review of the knowledge. The current knowledge needs to identify any research in the area and describe any competing or similar theories. If competing or similar theories are available, researchers must explain why their theory should be considered by providing information showing how the presented theory differs from the other theories. At the beginning, researchers must provide readers with a "road map" (Jaccard & Jacoby, 2010, p. 339) containing information pertaining to how the pieces relate to one another, as well as providing an overall perspective of how the pieces operate given the pre-defined boundaries. This road map should provide "an overview of the structure of the theoretical presentation" (Jaccard & Jacoby, 2010, p. 339).

The primary focus of the review of the literature is to present current knowledge and to clarify what is known about the phenomenon addressed in the article. In addition, the review should support the definition of the different constructs in the theoretical model, as well as show the relationships among the constructs. For multilevel models, the literature must identify and support the interactions between constructs at different levels. Overall, the review of literature should present an effort to "set the stage for describing how your theory will make a contribution relative to this body of work" (Jaccard & Jacoby, 2010, p. 339).

Diagram

The best method to aid readers while explaining a theoretical model is to provide a diagram of the proposed theory. In empirical studies path diagrams are typically used to identify the hypotheses that are incorporated in the diagram. Similarly, a diagram similar to a path diagram could be utilized with each proposition identified in the diagram, similar to hypotheses in empirical studies. Other descriptive aids useful in multilevel theories include diagrams that identify the different levels and present each construct in their respective level (lower-level constructs below a dotted line, higher-level constructs above a dotted line). These diagrams would be similar to those presented in Figure 2 with the exception that more constructs would be included in a complete model. The main goal when using diagrams or is to aid readers in their overall understanding of the theoretical model being presented.

DISCUSSION

The discussion section should be where the whole theoretical model is presented. This section could be titled more appropriately ‘The Theoretical Model’ to give readers a better description of what is being presented. This section builds upon the previous sections, tying all of the different parts of the model into one coherent model. Each previous section should be included into the final model identifying how each part fits together as one. The discussion section presents a picture that is grander than previously perceived by the various presentation parts – similar to the way pieces of a puzzle fit together.

CONCLUSION

The final section should extend the final theoretical model into the practical realm. This section describes the importance of the presented theoretical model and identifies why researchers and practitioners in the same discipline should consider this theory. In addition, other researchers will benefit from the details as these researchers test the presented theoretical model. One of the best compliments that a theorist can have is for researchers to test a model that has been presented. By testing a theoretical model, researchers begin the cyclical process of either providing support for the model or providing areas or additional boundaries in which the theoretical model is not supported. This cyclical model is critical to the theory development process. Theories which are untested or unrefined become stagnant and diminish the theory’s usefulness over time. The final section concludes the theoretical article and provides motivation for others to test the model due to its importance in the addressed field of study.

Guidelines for Writing Theory

In summary, the Appendix section provides a list of questions identifying key items to include in a theoretical article. In addition, Jaccard and Jacoby (2010) provided the following key points for writing theoretical articles:

- Attend not only to what you say but also how you say it.
- Be brief and to the point, but not at the expense of good scholarship.
- Work from outlines.
- Provide readers with an overview of the organization of the paper.
- Make liberal use of headings.
- Provide a succinct review of the literature and characterize the current state of knowledge about the phenomena you are studying.
- Discuss the implications and importance of your theory.
- Give credit for ideas where credit is due.

- Always keep in mind the target audience and reviewers.

Multilevel Theory Testing Dissemination

Research reports present the development and implementation of new ideas. This presentation of new ideas is what Van de Ven (2007) identified as knowledge transfer. This knowledge transfer occurs when researchers publish articles for a particular audience to report research findings (Van de Ven, 2007). Effective communication in research comes from the following propositions presented by Van de Ven:

- Research findings are likely to be understood and adopted if other researchers consider the findings to be explicit, observable, and already tried. These findings need to communicate an advantage over the status quo and a compatibility with current understandings.
- Research reports are more likely to be adopted when they engage and reflect the views of leading members of the adopting community.
- Research reports are more likely to be adopted by a specific audience when they are presented in an argument that is rhetorically persuasive (pp. 241-242).

In testing theory, each construct needs to be operationalized, transferring each construct into its own variable. These variables are the measures used in the empirical research study. This operationalization has been mentioned previously in the chapter so there is no need to elaborate on this process any further. Measuring constructs requires a creative skillset. This practice is a learned skill supported by previous research efforts. Researchers need to remain familiar with research efforts in their area of expertise, because this familiarity will help transfer constructs to variables for the purpose of testing theory. The key point that needs to be made when transferring constructs to variables is that the meaning must remain throughout the transformation. The measured variable used to test a specific theory must represent, in whole, the construct that is identified in the theory being tested.

For testing theories, the research report differs from the theoretical article because the theory is only one portion of the total research report. The theory provides the structure for the research report in which the key variables are identified, providing support for the selection of variables used in the research study. For multilevel theories, the theoretical perspective presents different levels included in the research study, identifies which variables are associated to each level, and identifies cross-level interactions to be tested.

The general research format for testing multilevel theories remains the same as other empirical studies. Typically, research reporting includes the following sections: introduction, theoretical perspective, sample, instruments, methodology, results, future research recommendations, limitations and delimitations, discussion, and conclusion. This chapter does not cover the vast details about these sections, but Creswell (2014), Huck (2008), and McCoach (2010) provide full descriptions.

To extend the typical research report format to that of reporting testing for multilevel models, Dedrick et al. (2009) provided the following recommendations for reporting multilevel research.

- Clearly describe the process used to arrive at the model(s) presented. Include discussions about selecting predictors, choosing the covariance structure, and determining the number of models examined. Readers can more carefully consider the presented models if they clearly understand how the models were developed.
- Clearly state whether centering was or was not used. If used, provide details on which

variables were centered and how these variables were centered. Knowledge of centering decisions will aid in the interpretation of regression coefficients and variance estimates.

- Clearly state whether or not distributional assumptions were considered and whether or not data were screened for outliers. If such checks were made, state both the method used and what was found. With this type of information, it is easier to evaluate the credibility of the results.
- Clearly state whether the provided data were or were not complete. If not complete, describe any missing data and provide the possible effects on the results.
- Provide details on the analysis methods and software used. Include the method of estimation, convergence results, admissibility of variance and covariance estimates, and the software version.
- For interpreted models, provide a complete list of all parameter estimates. In addition to providing critical result interpretation, the parameter estimates help communicate the precise model estimated.
- Provide either standard errors or CIs for the parameters of interest. This recommendation is consistent with the general reporting guidelines provided by the APA Task Force on Statistical Inference (Wilkinson & Task Force on Statistical Inference, 1999). Statistical significance tests provide limited inferential information and can be difficult to interpret when large numbers of tests have been conducted, a typical occurrence in the reviewed application (p. 96).

CONCLUSION

This chapter viewed the advantages of developing multilevel theories compared to traditional single-level theories. In developing multilevel theories hierarchical, or nested, structures were identified as providing a better level of understanding. Although multilevel theories provide us with a better understanding of complex structures, the literature has produced multilevel theories that have been ill defined (Kozlowski & Klein, 2000) with misspecified models. The focus of this chapter was to address issues that cause misspecification errors when developing multilevel theories as well as identify guidelines in determining whether to use single-level models or multilevel models.

Theory provides the structure for empirical research, the foundation for the hypotheses that are tested during research. By providing a properly specified theoretical model as the foundation for research, a researcher can pass the rigors of systematic empirical validation while producing more accurate results compared to when a misspecified theoretical model is used. One key contributor to misspecification comes from the misalignment of the level of analysis with the level of measurement. Further errors come from predicting individual level behavior from group level data, from predicting group level behavior from individual level data, or from ignoring cross-level interactions due to having a nested structure. Each of these issues were identified in the chapter along with specific criteria on how to categorize different variables as being either a lower level variable or a higher level variable. Additional guidelines, as well as cautions, were also provided for aggregating and disaggregating variables.

A few theory development models were presented to provide some guidelines for readers to follow when developing their theories. These models highlight the research cycle in which both the theory development phase and the theory testing phase are separate functions. Theory development is a process of identifying the constructs related to a phenomenon and any interactions between these constructs. Theory testing involves operationalizing these constructs and producing hypotheses that test each of the interactions between these constructs.

Testing a theory also aids in the research cycle, allowing researchers to make adjustments to theories and retesting these changes, ultimately producing an empirically supported theory. As part of this process researchers are required to publish their theoretical models and research results from testing their theories. This theory dissemination was touched upon in this chapter with a focus on multilevel theories. Guidelines for presenting theory papers were provided along with some criteria for evaluating theory articles. These guidelines and criteria are of extra benefit to graduate students who are looking to submit their theoretical article for publication. These guidelines and criteria are also beneficial to those who are involved in teaching graduate students to write theoretical articles as well as benefitting those who are involved in reviewing and editing theoretical articles for scientific journals.

While most of the information and guidelines presented in this chapter could be applicable to single-level theories, the primary focus was on multilevel theories. Specific criteria were presented that relate specifically to multilevel theories rather than to single-level theories. While both single-level and multilevel theories are critical to contributing knowledge to a field of study, multilevel theories are showing to be more effective at identifying complex structures. Producing multilevel theories can be a very effective skill to have for anyone involved in research, regardless of whether that person is a student, a professor, a researcher, a reviewer, or an editor. Combining these skills with the knowledge of statistical methods to test multilevel theories (not the focus of this chapter) can prove to be valuable to the researchers of tomorrow.

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KEY TERMS AND DEFINITIONS

Construct: An abstract representation describing a component of a theory (i.e., cognition, meta-cognition, conscience, perception, instinct, synaptic gap) that is not directly observable.

Level of Analysis: The hierarchical level in which data are representative. For example, team measurements represent a team level of analysis, whereas individual measurements represent an individual level of analysis.

Level of Measurement: The level the data are measured. For example, if individuals from a team or organizational division are measured, the level of measurement is at the individual level.

Multilevel Theory: A theory that models complex relationships across different levels of analysis.

Operationalization: The transition of a construct (not directly observable) to a variable (observable).

Single-Level Theory: A theory that maintains the same level of analysis.

Theory: A synthetic or abstract representation, explanation, or prediction of a phenomena.

Variable: A measureable representation of a construct or an event.

APPENDIX

Due to many advances in both quantitative and qualitative methodologies, theoretical representations of phenomena require more complex representations. Where single-level theories still have their place in certain research arenas, most fields of study have come to expect more elaborate explanations of phenomena. These elaborate, complex, explanations come from developing and testing multilevel theories rather than from the more traditional single-level theories. When developing multilevel theories the literature has provided theoretical models composed of misspecification errors, producing models in which the level of analysis in not in congruence with the level of measurement. By adhering to the basic rules of identifying the correct level of analysis in alignment with the correctly specified level of measurement, multilevel theories can produce more elaborate explanations of phenomena, further providing new knowledge a field of knowledge.

Table 2. Theory dissemination evaluation form

Problem Statement
What problem is being addressed?
Has this problem been researched before? If so, identify how the current theory is different.
Why is this problem important at this time?
By addressing this problem, what changes to the status quo are expected?
What audience is most affected / interested in this problem, who is the targeted audience?
Is the problem statement clearly described?
Does the problem statement address each of the following: who, what, where, why, how, and the so what?
Purpose
Is the purpose of the current theory specified clearly?
Does the purpose of the current theory address the problem statement?
Does the current theory build upon other theories or does the current theory contribute a new theory to the literature?
Is the contribution to the field / literature specified?
Theory Building
Are the concepts, constructs, and variables identified and defined?
Is literature used to identify the relationships between the concepts, constructs, and variables used in the theoretical model?
Are boundaries specified (where is the current theory not applicable)?
Is it clear, from support provided by the literature, that the identified concepts, constructs, and variables address the problem statement?
Are the levels of analysis provided and supported from the literature?
Are the class-level interactions identified with support from the literature?
Are the interactions, between higher-level and lower-level constructs, provided and supported by the literature?
If propositions or research questions are used, are they supported by the literature?
Do the propositions or research questions, if used, relate to the research problem?
Theory Conceptualization

Problem Statement
Are the concepts, constructs, and variables in the current theoretical model shown to be associated to each other, justifying that they fit into the same model?
Is a figure provided showing the current theoretical model, including any associations and interactions between constructs and/or variables?
If propositions or research questions are used, are they provided in the theoretical model?
Does the theoretical model identify the different level of analysis?
Does the theoretical model include the class-level and cross-level interactions?
Are alternative theories identified?
Is there sufficient evidence providing support for the current theoretical model compared to other theoretical models already available in the literature?
Does the current theoretical model address the problem statement?
Is the contribution to the literature clear from the presentation of the current theoretical model?
Future Research
Given the boundaries, are recommendations made as to the current theories, contributions, and applicability to the field of study? Are recommendations made to the audience?
Are potential measures provided for each variable in the current theoretical model (is enough information provided to operationalize the theoretical model)?
Are recommendations made relating to the best type of statistical methodology to be used to test the theory? For multilevel theories, testing will require either HLM, multilevel regression, multilevel SEM, to only name a few.
Conclusion
Is the problem statement summarized?
Is the theoretical model summarized, included all of the parts?
Does the theoretical contribution address the problem?
Are potential uses and barriers of the current theory identified?
Are the advantages of the current theory, compared to other existing and similar theories, provided?