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INTRODUCTION

Stephen E. Humphrey and James M. LeBreton

The domain of social science is that of interactions between people—how people think, feel, and behave, and how the collectives to which they belong do the same. In different disciplines, there is often a particular focus on one aspect of this (e.g., psychology generally begins with a focus on the individual, sociology on the system), but resident in all of these disciplines is the idea that there are multiple levels within which the focal units reside.

For example, within the organizational sciences (broadly and liberally defined), there has been a growing awareness of the importance of unpacking multilevel relationships to explain social phenomena in work contexts. Employees are frequently members of a team (or multiple teams); they exist within a social network of relationships, working under a supervisor (or multiple supervisors), within or spanning organizations (Klein & Kozlowski, 2000). Teams are composed of individuals who are embedded in multiple dyadic relationships; the teams reside within or span departments and are nested within or across organizations (Humphrey & Aime, 2014). Organizations are composed of many individuals, residing in multiple departments or functions, and the organizations themselves may be embedded within multiple joint ventures or alliances (Lepak, Smith, & Taylor, 2007). Moreover, all of these subjects exist across time. These levels define organizational research, bounding theories and shaping discourse.

Scholars often like to focus solely on one level to simplify theoretical and empirical challenges. In contrast, this handbook begins with the premise that social science is fundamentally multilevel in nature—the specific level or levels that are the focus on a particular scholar (or normatively studied within disciplines) may vary. However, the thesis of this handbook is that ignoring that multiple levels exist (and concentrating on only one level) is no longer a productive option for social scientists. For example, studying organizations without considering their industry is a fatal flaw within strategic management research; studying students without considering their classroom, their school, or their area is a nonstarter in educational psychology.

Even when scholars explicitly acknowledge the multilevel nature of the field (e.g., Chan, 1998; Klein & Kozlowski, 2000; Morgeson & Hofmann, 1999), the guidance they have produced has been isolated to a small subsection of the broader organizational domain. Surprisingly, micro research (i.e., research focused on intra- and interindividual phenomena) has had little cross-pollination with macro research (i.e., research focused on intra- and interorganizational phenomena). This lack of cross-disciplinary connections has occurred despite the fact that both micro and macro researchers are inherently interested in the multilevel nature of (organizationally relevant) phenomena. Essentially,

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what the literature has been sorely lacking is an inclusive guide to multilevel research that recapitulates and extends the current state of the science.

We thus felt that it was time for a systematic and inclusive treatment of multilevel research, one that reviews and melds the three core "silos" of multilevel research (multilevel theory, multilevel measurement, and multilevel analysis) and does so from a perspective that considers micro, meso, and macro frameworks. The purpose of this handbook is therefore to provide guidance for scholars working in the social and behavioral sciences who wish to consider the implications that multilevel research (i.e., theory, measurement, and analysis) may have for their research programs. Although the majority of contributors to this handbook have backgrounds in the organizational sciences, the chapters have been largely written in a manner that should be accessible to researchers from a wide array of research disciplines including (but not limited to) communication, education, sociology, psychology (clinical, developmental, industrial, social), management (strategy, human resources, organizational behavior), and nursing.

PART I: MULTILEVEL THEORY

In the first part of the handbook, scholars focus on providing guidance on how to improve theory by integrating a multilevel perspective. Gully and Phillips (Chapter 1) begin this part by positing the most fundamental question for multilevel research: What is the appropriate level for your research? These authors define *identifying the appropriate level* as determining which level has the most explanatory power for the particular outcome of interest; they discuss the challenges scholars face in determining the appropriate level before shifting to a more grounded process of figuring out what is appropriate to one's own research. Their chapter serves to orient readers as to how to begin thinking as a multilevel scholar.

In the next chapter, Ostroff (Chapter 2) engages readers with a discussion of how to "contextualize context." As she documents, context is omnipresent within the social and organizational sciences, and failure to consider context severely limits the application and interpretation of theoretical models. After reviewing where the study of context has been, she introduces a structure for interpreting, assessing, and analyzing context. This chapter is an important addition to the growing discussion of the importance of context in organizational research, providing a practical and user-friendly guide to integrating context into theory and empirical research.

Next, Meyer, England, Kelly, Helbling, Li, and Outten (Chapter 3) extend the previous chapter by presenting three metatheoretical frameworks for understanding context. After reviewing the three frameworks, the authors review several empirical conceptualizations of context, interpreting these papers through the lenses of the metatheoretical frameworks. They conclude by providing guidance, derived from this exercise, for conceptualizing context in one's own work.

Shifting the focus from context to dynamics, Cronin and Vancouver (Chapter 4) provide an in-depth examination of "dynamics" in the context of multilevel theory. Recognizing that behavior is a series of ongoing events and happenings (rather than a singular, static perspective of a stimulus and response), Cronin and Vancouver discuss how to theorize in a way that incorporates time and change. After developing five principles of multilevel dynamics, they apply their model to a concrete example. This chapter is extremely helpful for making sense of dynamics in social and organizational research. Despite the fact that scholars intuitively recognize that behavior is continuous, research has consistently neglected to theorize or test dynamic models. With this chapter, scholars are provided with a clear and concise set of instructions for creating dynamic models.

In Chapter 5, Aiken, Hanges, and Chen shift to a discussion of complexity science. Similar to the surrounding chapters, Aiken et al. are interested in emergence—the idea that constructs evolve and "emerge" over time. In contrast to the other chapters, however, they focus on emergence within the context of complex adaptive

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systems. In such systems, emergence is expressed in patterns of relationships that are nonlinear and nondeterministic. This chapter provides a thoughtful summary of complexity theory, particularly as it intersects with multilevel theory, giving readers a fantastic introduction to how one might better integrate concepts from complexity theory into their multilevel research.

In the next chapter, Ployhart and Hendricks (Chapter 6) begin a conversation about bottom-up theory and methods. Combining the micro and macro organizational literatures, they propose a framework for conducting microfoundations research—that is, research that connects the individual to organizational- or group-level outcomes. Their four-step process connects theorizing, measurement, and analysis in this domain. This chapter is invaluable for those scholars interested in looking "inside the box" to understand how lower level antecedents may emerge to influence higher level (e.g., organizational) outcomes.

Mathieu and Luciano (Chapter 7) integrate several themes in their chapter: construct clarification, emergence, and temporal dynamics. The goal of this integration was to propose an authentic and dynamic way of considering emergence, one that focused less on statistical processes and more on theoretical mechanisms. Within multilevel research, understanding emergence is fundamental because constructs at a higher level are dependent on, connected to, or otherwise affected by lower level phenomena, yet without a clear understanding of how focal constructs are connected to others, models are likely misspecified.

The next two chapters focus on social networks within organizational sciences. First, as Brass and Borgatti (Chapter 8) note, social networks are inherently multilevel in nature. They suggest that taking a social network approach to research will open both theoretical and empirical avenues, allowing researchers the opportunity to better specify and analyze relationships. With this as their focus, they spend the majority of the chapter orienting the reader to the complexities of social network research, particularly as they pertain to multilevel research questions.

Paruchuri, Goossen, and Phelps (Chapter 9) expand on this introduction to social network research in by presenting a guide for theorizing and specifying multilevel social networks. Whereas most social network research collapses multilevel data (e.g., individuals nested in dyads nested in departments) to a single level (e.g., individuals), Paruchuri and colleagues argue that much may be gained by scholars simultaneously examining multiple levels. In their chapter, they present a primer on social network research, moving from single-level to multilevel networks. Throughout the chapter, they couple an organizing framework with illustrative examples, grounding the reader in current science. Finally, they conclude by providing multiple avenues for future research, laying out a broad research agenda for aspiring scholars.

PART II: MULTILEVEL MEASUREMENT AND DESIGN

In this part of the handbook, we transition from focusing largely on issues related to multilevel theory, to a discussion of issues related to multilevel measurement and research design. These chapters are particularly important for those readers who have specified their theory and are now ready to set about collecting data to test it.

Zhou, Song, Alterman, Liu, and Wang (Chapter 10) present a valuable and detailed guide for collecting multilevel data. As they note, there are unique challenges associated with multilevel data collection—beyond what is required for single-level data collection—and understanding how to avoid fatal flaws is critical for anyone pursuing a multilevel research agenda. In addition to the in-depth guidance, they provide a pocket guide to their recommendations, which is likely to be a go-to handout for aspiring multilevel scholars.

Jebb, Tay, Ng, and Woo (Chapter 11) offer a primer on multilevel construct validation. Construct validation is an important component of research, serving as the bedrock on which theory testing rests. In this chapter, Jebb and colleagues walk the reader through the process of construct validation for multilevel studies, giving readers guidance for

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several construct forms. Finally, they include syntax for replicating their analyses, giving readers the opportunity to easily apply Jebb et al.'s guidance to their own work.

Chapter 12, by Krasikova and LeBreton, has three goals: to provide readers with a summary of the reliability and agreement indices that are most commonly used in multilevel research, to present a user-friendly guide to these indices, and to extend the application of these indices to the study of dyadic phenomena. In an effort to summarize this topic as succinctly as possible, the authors present a clear and interpretable set of guidelines for assessing agreement and reliability. Finally, within their illustrative example, they present syntax for replicating and extending their analyses.

Beal and Gabriel (Chapter 13) shift the focus to the unique challenges associated with measurement within the contexts of within-person research designs. Given the benefit to theory stemming from examining intraindividual development and change, understanding how to conduct these types of studies is imperative. They discuss several types of within-person research designs and highlight the strengths and weaknesses of each design. Finally, they connect the within-person methods to the between-person level, expanding the number of levels that may be studied.

Next, Scherbaum and Pesner (Chapter 14) deal with a crucial issue for multilevel research: determining whether one has sufficient power to adequately test his or her hypotheses. As the authors note, although power analysis is rather straightforward and well documented within single-level research, the issue is appreciably more complex (and less well documented) in multilevel research. After reviewing the state of the literature and discussing the central equations, they present several tools for estimating multilevel power analysis. Finally, they walk readers through the use of these tools, providing a hands-on tutorial or guide to estimating power in multilevel research.

LaHuis, Blackmore, and Bryant-Lees (Chapter 15) examine how to calculate, interpret, and present estimates of explained variance in multilevel research. Given the movement to better integrate information about effect sizes into research summaries, it is both logical and necessary for scholars to understand how variance is partitioned in multilevel research, as well as have the tools to estimate explained variance in their own research. After discussing several ways to estimate explained variance, the authors walk readers through the estimations, providing syntax for running the estimations in their own models.

In Chapter 16, Grund, Lüdtke, and Robitzsch address a common problem in multilevel research: missing data. Although scholars may be tempted to simply drop missing data from their analyses (listwise deletion), there are two clear problems: potential reductions in statistical power and the potential for biased estimates of population parameters. The authors discuss two solutions to this problem (multiple imputation and maximum likelihood estimation), followed by an illustration that walks the reader through the application of these methods. Similar to several other chapters, the authors provide their syntax for implementing these solutions.

PART III: MULTILEVEL ANALYSIS

The third part of the book deals with questions of analysis—now that you have a theory and have collected the data, how do you go about testing your hypotheses? The first chapter in this part, written by Shiverdecker and LeBreton (Chapter 17), presents a simple primer for conducting multilevel (random coefficients) regression analyses. In an effort to be comprehensive, the authors walk through both the mathematical models that underlie multilevel regression and the actual steps for running these models. Using an illustrative example and providing syntax, the authors offer even the most novice multilevel researcher the tools for modeling multilevel relationships.

Next, Knight and Humphrey (Chapter 18) discuss how to analyze dyadic data. They begin by providing a detailed introduction to dyadic data analysis, describing the different levels that exist in dyadic data structures (using both theoretical and empirical terminology). They then provide an empirical illustration of social relations modeling (one specific dyadic data analysis technique), walking the reader through each step (from

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structuring the data set to interpreting the results). After providing the syntax used in their chapter, they conclude by discussing alternative software packages for analyzing dyadic data.

In Chapter 19, Vandenberg and Richardson provide an introductory, "nuts and bolts" guide to multilevel structural equation modeling (MLSEM). After discussing the benefits of MLSEM, the authors build a testable model, walking the reader through each step necessary for eventually running an MLSEM. They not only present syntax for running an MLSEM but also discuss each component of the syntax and the output, giving readers in-depth knowledge of an MLSEM.

Going beyond the in-depth primer from the prior chapter, Zyphur, Zhang, Preacher, and Bird dedicate Chapter 20 to discussing moderated mediation in MLSEM. After discussing moderation, mediation, and moderated mediation, they provide an illustrative example of testing multilevel moderated mediation. In this example, they introduce a "Bayesian 'plausible values' approach to latent variable interactions" to avoid numerical integration (which ultimately ensures convergence in their analyses). These authors also provide the syntax they used to run the models in their chapter.

In Chapter 21, Zachary, Moore, and Ballinger focus on how to analyze nonnormal data in multilevel models. They begin by discussing the challenges associated with analyzing nonnormal data in multilevel analyses. They follow this by describing the benefits of generalized linear mixed modeling before providing an illustrative example. In walking the reader through the example, they provide relevant syntax for replicating their analyses.

Lang and Bliese (Chapter 22) offer a new statistical framework for detecting a specific form of emergence—consensus among lower level units nested in higher level collectives—over time. They develop a three-level emergence model that both provides a formal test of consensus emergence and allows researchers to include variables that might help to predict consensus. The authors conclude by demonstrating their model with two examples and again offer syntax so that others may verify and extend the results from this chapter to their own work.

In the final chapter of this part of the handbook, Newman and Wang (Chapter 23) provide an alternative method for assessing emergence through the use of network analysis. They begin by deriving the equations for their model, which they use to develop a computational model of climate emergence. They demonstrate the applicability of their model, providing useful syntax for applying their model to other contexts.

Some appendices for Chapters 11, 12, 16, 17, 18, 21, 22, and 23 include R codes. These appendices can also be found on the American Psychological Association website at http://pubs.apa.org/books/supp/humphrey/.

PART IV: REFLECTIONS ON MULTILEVEL RESEARCH

The two concluding chapters provide perspective on the development of multilevel research. In Chapter 24, Yammarino and Gooty discuss the use of cross-level models within the organizational sciences. They begin by providing a historical perspective on cross-level models, examining the similarities and differences in how the concept of "cross-level models" has been applied by various groups of researchers. They then transition to the presentation of an integrative cross-level model, discussing its applicability to theory building and testing within the organizational sciences.

The final chapter of the handbook (Chapter 25) consists of a series of interviews (conducted by Michael Hoffman) with five distinguished multilevel scholars: David Chan, Gilad Chen, Fred Dansereau, Denise Rousseau, and Benjamin Schneider. In these interviews, the scholars reflected on their experiences working on multilevel research, discussing the challenges they faced and the seminal work that influenced their thinking and their work. They then discuss where multilevel research is going, sharing their individual visions for the future.

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