

USING MULTILEVEL MODELING AND MIXED METHODS TO MAKE THEORETICAL PROGRESS IN MICROFOUNDATIONS FOR STRATEGY RESEARCH

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Abstract

The microfoundations research agenda presents an expanded theoretical perspective because it considers individuals, their characteristics, and their interactions as relevant variables to help us understand firm-level strategic issues. However, microfoundations empirical research faces unique challenges because processes take place at different levels of analysis and these multilevel processes must be considered simultaneously. We describe multilevel modeling and mixed methods as methodological approaches whose use will allow for theoretical advancements. We describe key issues regarding the use of these two types of methods and, more importantly, discuss pressing substantive questions and topics that can be addressed with each of these methodological approaches with the goal of making theoretical advancements regarding the microfoundations research agenda and strategic management studies in general.

Keywords

Microfoundations for strategy, methodological advances, multilevel modeling, mixed methods, quantitative methods, qualitative methods.

Introduction

The *Strategic Organization* article by Teppo Felin and Nicolai Foss published in 2005 is often considered the “opening salvo” of microfoundations in strategy (Winter, 2013). As summarized by Devinney (2013), ‘microfoundations can be a key platform in moving the management field forward. It opens up the possibilities of bridging the macro-micro divide that pervades management research by serving as a conceptual forum to debate whether it is possible for us [to] come up with a more unified and parsimonious characterization of our field’ (p. 84).

Because theoretical advancements regarding microfoundations, and strategic management studies in general, require an examination of bottom-up (i.e., individual influences on the firm) as well as top-down (i.e., firm influences on the individual) effects, empirical research faces unique challenges because processes take place at different levels of analysis and these multilevel processes must be considered simultaneously (Aguinis et al., 2011). Accordingly, the goal of our article is to address these challenges by describing two types of methodological approaches, *multilevel modeling* and *mixed methods*, that have been developed in fields outside of strategy (e.g., organizational behavior, psychology, education, health sciences) and are particularly suited to carry out an empirical research agenda on microfoundations. For each of these two types of methodological approaches, we offer a description of key issues that need to be considered and sources that can be consulted for more in-depth technical details.¹ More importantly, we discuss specific substantive topics and questions that can be addressed effectively by each—and difficult if not impossible to be studied effectively using more traditional tools. In other words, we describe these methodological approaches and then address

¹ Our goal is not to offer a tutorial on methodological issues. Rather, we focus on methodological challenges that are particularly relevant in terms of making theoretical advancements regarding microfoundations. Also, although methodology experts are likely to be familiar with some of the issues described in our article, our main targeted audience involves substantive as opposed to methodology researchers, for whom these issues are novel and useful for the purpose of conducting empirical research leading to theoretical advancements.

specific areas of application that are likely to serve as conduits for important theoretical advancements.

Multilevel modeling

A key characteristic of microfoundations research is that, although not usually acknowledged explicitly, the domain is inherently multilevel in nature (Felin and Foss, 2006). As noted by Aguinis and Edwards (2014), there are two important and negative consequences when dependence caused by multilevel data structures is not properly acknowledged and modelled. First, covariation of variables across levels leads to gross errors of prediction if a researcher uses popular statistical approaches not designed to model data structures that include dependence due to clustering of entities. Specifically, when using techniques that rely on the independence assumption, as is the case for ordinary least squares regression, the resulting standard errors will be downwardly biased, resulting in Type I statistical errors. Second, when dependence is not acknowledged explicitly researchers miss an opportunity to examine cross-level direct effects such as the effect of an individual-level variable on a firm-level variable (or vice versa). Similarly, not adopting a multilevel approach precludes researchers from examining cross-level interaction effects such as whether the relation between two firm-level variables depends on the value of an individual- and higher-level variables (Aguinis and Culpepper, 2015).

Multilevel modeling has been developed and used mainly in micro management areas such as organizational behavior and psychology (Mathieu et al., 2012). In these micro areas, the essence of the multilevel approach is that an outcome of interest at the individual level is conceptualized as resulting from a combination of influences emanating from the same level as well as higher levels of analysis such as teams or firms. Multilevel modeling can help advance microfoundations because it allows for a consideration of effects from and at different levels of

analysis simultaneously. When conducting research that includes variables measured at different levels (macro and micro), researchers explicitly recognize that lower-level entities such as individuals are nested within higher-level collectives such as teams or firms. As a result, data structures usually contain built-in dependence because entities within the same collective are exposed to similar processes, which lead to greater similarity regarding outcome variables, compared to entities across collectives. In other words, there is covariation between higher- and lower-level variables (Aguinis et al., 2013).

From the perspective of variance decomposition, a key question in microfoundations research is the following: at what level of analysis does most of the performance-related variance exist (Barney and Felin 2013)? As noted by Barney and Felin (2013), we need comparative theories and associated empirical analyses that consider different levels of analysis in terms of their relative contribution to firm performance. Multilevel modeling allows us to do just that by examining relations at different levels simultaneously and allowing us to understand the relative effect of each. For example, is firm performance more strongly affected by employees' human capital, or by a firm's routines and capabilities? Moreover, we can assess outcomes also at different levels of analysis (e.g., individual, team, firm). Furthermore, we can assess not only direct effects of variables at different levels but also interactions involving variables at different levels, without being forced to choose one level over the other.

Figure 1 shows a generic multilevel model that includes an individual-level outcome. The early origins of multilevel management theory evolved in the organizational behavior and psychology areas and, consequently, as shown in Figure 1, were focused on individual-level outcomes. In this area, researchers have been more interested in downward cross-level influences and less about upward cross-level influences (Mathieu and Chen, 2011; Snijders and Bosker,

1999). Together with same-level and cross-level direct effects (H1 and H2, respectively), H3 is a hypothesized moderating effect of a level 2 (firm-level) predictor on the relation between a level 1 (individual-level) predictor and a level 1 outcome. H4 shows a moderating effect of a level 1 predictor on the relation between a level 2 predictor and a level 1 outcome.

[Insert Figure 1 and Figure 2 here]

Although our illustration in Figure 1 examines a level 1 outcome, it is certainly possible to test multilevel models including level 2 outcomes as well (Aguinis and Edwards; 2014; Croon and van Veldhoven, 2007; Lüdtke et al., 2008; Zhang et al., 2012). Figure 2 includes a generic multilevel model with an outcome at the higher level of analysis (i.e., level 2). This outcome could be firm performance or firm competitive advantage. The level 2 predictor could be the firm's executive compensation system. The level 1 predictor could be individual characteristics of members of the top management team. Together with direct effects (i.e., H1: same-level direct effect and H2: bottom-up cross-level direct effect), the model also allows for tests of cross-level interaction effects between two variables at different levels on a level 2 outcome. Specifically, Figure 2 shows H3, which is a hypothesized moderating effect of a level 2 predictor on the relation between a level 1 predictor and a level 2 outcome. Researchers can also test a hypothesized moderating effect of a level 1 predictor on the relation between a level 2 predictor and a level 2 outcome (H4). This generic model included in Figure 2 can be used to conduct empirical work based on the many conceptual models available in the literature in which there is a firm-level outcome and firm- as well as individual- and team-level antecedents.

To analyze bottom-up or micro→macro relations, prior research has often used the aggregated means of an individual-level measure. In this regard, each of the procedures commonly used to justify aggregation provides an assessment of the extent to which lower level

data (e.g., individual-level data) are homogeneous within units, as assumed of shared unit-level constructs (Klein and Kozlowski, 2000). However, in the last few years some advances have been carried out in the analysis of micro→macro situations. For example, Croon and van Veldhoven's (2007) latent variable multilevel approach provides more accurate and robust results. Their approach is a two-stage, step-wise method using limited information maximum likelihood estimation. Extending this procedure, Lüdtke et al. (2008) proposed a one-step, full information maximum likelihood approach as a more efficient way of testing bottom-up relations as shown in Figure 2. In fact, multilevel modeling is also advancing through multilevel structural equation modeling (MSEM) (Bauer, 2003; Cheung and Au, 2005; Kostopoulos et al., 2013) that incorporates the analysis of multilevel mediation. Although multilevel mediation can be examined through traditional multilevel modeling (Zhang et al., 2009), MSEM can address some limitations of traditional multilevel modeling when multilevel mediation hypotheses are tested (Preacher et al., 2010; Preacher et al., 2011). Traditional multilevel modeling requires outcomes and mediators to be measured at level 1 due to its inability to treat upper-level variables as outcomes or mediators (level 2 dependent variables are not permitted). However, MSEM can accommodate higher-level mediators and outcomes. For example, using the notation suggested by Krull and MacKinnon (2001), MSEM can analyze L1-L1-L2, L2-L1-L2 and L1-L2-L2 designs.² This statistical analysis of multilevel mediation through MSEM can be implemented using software programs such as MPlus.

Mixed methods

Greene et al. (1989) defined mixed methods designs as those that include at least one quantitative method (designed to examine numbers) and one qualitative method (designed to examine text).

² L1 is level 1 and L2 is level 2. Thus, for example, L1-L1-L2 denotes a design in which both the independent and the mediator variables are assessed at level 1, whereas the outcome is assessed at level 2.

This methodological approach has developed rapidly in the last few years in other fields, mainly in education and health sciences, and has led to important theoretical advancements (Creswell and Plano Clark, 2007; Denscombe, 2008; Johnson and Onwuegbuzie, 2004; Tashakkori and Teddlie, 1998, 2003, 2010). The central premise of mixed methods is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of complex multilevel phenomena than either approach alone. Better understanding can be obtained, for example, by triangulating one set of results with another and thereby enhancing the validity of inferences (Jick, 1979). Greene et al. (1989) described additional useful features particularly pertinent to microfoundations: complementarity (elaboration or clarification of the results from one method with the findings from the other method), development (when the researcher uses the results from one method to help develop the use of the other method), and expansion (seeking to extend the breadth and range of inquiry by using different methods for different inquiry components).

There are two main factors that help researchers determine the type of mixed methods design that is best suited to their study (Morgan, 1998; Morse, 1991; Tashakkori and Teddlie, 1998): priority and implementation of data collection. Regarding priority, the mixed methods researcher can give equal priority to both quantitative and qualitative parts, emphasize qualitative more, or emphasize quantitative more. This emphasis results from the research question, practical constraints regarding data collection, and the presumed preference of the intended audience. Mixed methods designs can therefore be divided into (a) equivalent status designs (the researcher conducts the study using both the quantitative and the qualitative approaches about equally to understand the phenomenon under study), and (b) dominant-less dominant studies or nested designs (the researcher conducts the study with a dominant method and a small

component of the other method). In addition, options regarding the data collection sequence consist of gathering the information at the same time (i.e., concurrent or simultaneous design) or introducing the information in phases (i.e., sequential design). When qualitative data collection precedes quantitative data collection, the intention may be to first explore the problem being studied and then to follow up on this exploration with quantitative data that are amenable to studying a large sample.

Similar to multilevel modeling, mixed methods research includes variables at different levels of analysis such as managers and the firm. For example, an important issue in strategic management studies is the analysis of sources of heterogeneity and differences among firms. Illustrating the potential of mixed methods, Rouse and Daellenbach (1999) advocated a participant selection mixed methods design where groups are formed based on quantitative data, outliers or extreme members of these groups are selected and then these extreme members are studied through qualitative research (Aguinis et al., 2013). Thus, they proposed a design that begins with a quantitative four-step firm selection process: 1) selecting a single industry, 2) clustering firms by strategic type or group within this industry, 3) comparing performance indices within strategic groups, and 4) identifying those firms within each strategic group that are the high and low performers. Then, these firms would be selected using qualitative, in-depth fieldwork or ethnographic study methods. This qualitative approach may help to gain an in-depth knowledge and understanding of the organization, its micro-processes, and the specific characteristics of individuals, their actions and interactions.

Theory building and testing in microfoundations would benefit from a greater integration of process- and outcome- oriented research and mixed methods can yield important insights regarding both aspects (Molina-Azorín, 2012). Giving more attention to process-related research

can help improve our understanding of content-related issues. Thus, process studies can clarify which variables are important and why they might influence relevant outcomes. The quantitative portion of a mixed methods study may focus on the statistical effects of several antecedent variables at different levels (e.g., individuals and organizational capabilities) on some outcome (e.g., competitive advantage or firm performance). Complementing and expanding upon this perspective, the qualitative portion may focus on process-related characteristics such as how collective variables (organizational routines and capabilities) emerge through a process of social aggregation of individual variables.

Using multilevel modeling and mixed methods to make theoretical progress

Table 1 and Table 2 include a list of selected substantive research questions that could be addressed effectively adopting multilevel modeling and mixed methods, respectively. These tables also refer to sources that provide theoretical rationale for each of those questions. Mainly, those sources are conceptual articles and, from our perspective, empirical research aimed at assessing the veracity of the proposed relations and models is unlikely to be carried out successfully with currently available methodological approaches that do not consider the multilevel issues inherent in microfoundations.

[Insert Table 1 and Table 2 here]

Table 1 shows that multilevel modeling can be used to investigate cross-level direct effects involving the direct relation between a variable at one level and another variable at a different (i.e., higher or lower) level. For example, what is the impact of individual and collective variables on firm performance (Coff and Kryscynski, 2011)? At what level of analysis does most of the performance-related variance exist (Barney and Felin, 2013)? How do emotions (anger, guilt, shame, dread) influence firm-specific resource formation and deployment, and what are the

psychological and behavioral microfoundations of resource formation in firms (Powell et al., 2011)? Table 1 also offers examples of specific applications of multilevel modeling to address cross-level interaction effects—whether the relation between two variables residing at the same level depends on the value of a third variable residing at a different (i.e., higher or lower) level. As examples of hypothesized moderator variables residing at the firm level of analysis, multilevel modeling allows to empirically assess the moderating role of organizational routines and capabilities on the influence of individuals’ emotions on firm performance and the moderating role of organizational structure and firm culture on the influence of individuals’ behavior and motivations on firm competitive advantage and performance. Regarding moderator variables residing at the individual level of analysis, Table 1 lists several substantive questions that can be addressed using multilevel modeling such as the possible moderating role of individuals’ motivations in the influence of firm human capital on firm performance and the possible moderating effect of individuals’ learning capacity in the impact of organizational knowledge on firm innovation. Finally, Table 1 also includes specific questions that can be addressed to investigate conceptual models including multilevel mediation. Note that several types of multilevel mediation can be assessed when we examine upper level outcome variables: (1) L1-L1-L2: the antecedent and mediator reside at the lower level and the outcome at the higher level, (2) L2-L1-L2: the antecedent and outcome variables reside at the higher level and the mediator at the lower level, and (3) L1-L2-L2: the mediator and the outcome variables reside at the higher level and the antecedent at the lower level.

Table 2 offers specific guidance in terms of substantive topics and questions that can be addressed empirically by using mixed methods. As shown in Table 2, the qualitative portion may help determine the key groups of individuals in a firm depending on industry context and then a

quantitative analysis can assess the impact of these key individuals on firm competitiveness and performance compared with collective variables (firm resources, capabilities or routines).

Another alternative is to first implement a quantitative approach (e.g., cluster analysis) to determine which firms are high and low performers in an industry and their strategic groups, and then use a qualitative approach to analyze the microfoundations of performance and competitive advantages in each strategic group comparing high and low performers (Rouse and Daellenbach, 1999). In addition, a quantitative approach may determine the most important collective and macro variables (capabilities, routines, structure, culture) for explaining firm performance in a specific industry, and next the qualitative approach may address follow-up questions such as how these collective variables influence individual actions and interactions, how these collective variables emerge through a process of aggregation of individual variables, or how individual-level factors (actions, decisions, interactions, emotions, motivations, behaviors, cognition, traits, abilities) aggregate to create collective capabilities (Barney and Felin, 2013; Foss, 2009).

Furthermore, individual actions are recognized as the foundational block of microfoundations. Individuals within organizations, however, do not think and act in a social vacuum. Their actions and behaviors are affected and bounded by the surrounding context within which they operate, and thus the acceptable range of their actions is shaped by a variety of situational or contextual factors (Kostopoulos et al., 2013). Accordingly, a qualitative approach would be appropriate to examine how these contextual factors shape individual actions and how social processes and contextual factors shape aggregation of individual actions to develop collective variables. Table 2 includes a list of questions that can be addressed using mixed method with the goal of advancing our knowledge of microfoundations. Examples of such questions are the following:

What are the micro-level origins of organizational capabilities and knowledge? How do

knowledge-sharing behaviors aggregate to the organizational level? How do situational and contextual factors shape individual actions, behaviors and cognition? How do insights on individual traits and processes enrich our understanding of organizational routines, learning and capability development?

Conclusion

Microfoundations research poses unique challenges because that it involves processes and variables at multiple levels of analysis. Our article described multilevel modeling and mixed methods, which have great potential in terms of providing answers to pressing substantive questions such as the ones included in Tables 1-2. It is unlikely that these and other important empirical questions will be answered unless methods like multilevel modeling and mixed methods, which include multilevel considerations explicitly, are used. Accordingly, these methodological approaches hold great promise in terms of being used to make important contributions to the microfoundations research agenda, and strategic management studies in general, which will also lead to practical applications.

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Table 1. Illustrations of microfoundations topics and questions that can be investigated empirically using multilevel modeling

** Cross-level direct effects:*

- What is the impact of individual and collective variables on firm performance (profitability, competitiveness, competitive advantages)? (Coff and Kruscynski, 2011)
- At what level of analysis does most of the performance-related variance exist? (Barney and Felin, 2013)
- How do emotions (anger, guilt, shame, dread) influence firm resource formation and deployment? How do they influence firm efficiency? What are the psychological and behavioral microfoundations of resource formation in firms? (Powell *et al.*, 2011)
- How do emotions and beliefs inform risk preferences and firm strategic decisions such as market entry and competitive imitation? (Powell *et al.*, 2011)
- How do individuals' interpretations of their environment shape organizational responses and performance? (Eggers and Kaplan, 2013)
- What are the cognitive, motivational and behavioral antecedents of organizational learning rates and capability development? (Felin *et al.*, 2012)

** Cross-level interaction effects with moderator variable residing at the firm level:*

- What is the moderating role of organizational routines and capabilities on the influence of individuals' emotions on firm performance?
- What is the moderating role of organizational structure and firm culture on the influence of individuals' behavior and motivation on firm competitive advantage and performance?
- What is the moderating effect of organizational learning and knowledge on the relation between individuals' cognition and firm innovation?
- What is the moderating role of firm human capital on the impact of individual actions on firm profitability?

** Cross-level interaction effects with moderating variable residing at the individual level:*

- What is the moderating role of individuals' motivation in the relation between firm human capital and firm performance?
- What is the moderating effect of individuals' learning capacity in the relation between organizational knowledge and firm innovation?
- What is the moderating role of individuals' behavior on the influence of organizational competitive strategy on firm profitability?
- What is the moderating effect of individuals' emotions on the influence of firm culture on firm competitive advantage?

** Multilevel mediation:*

- L1-L1-L2: What is the impact of individual characteristics on individual performance, and then what is the impact of this individual performance on firm performance?
- L2-L1-L2: What is the mediating role of individual actions, characteristics or performance in the influence of firm characteristics (e.g., management practices, capabilities) on firm performance (Wood *et al.*, 2013)? What is the mediated role of individual-level processes between firm integration mechanisms and firm absorptive capacity (Distel, 2014)?
- L1-L2-L2: What is the impact of individual attributes on firm capabilities, and then what is the impact of these capabilities on firm performance? What is the mediating role of firm strategic choice in the influence of individuals' intentions on firm performance (Devine, 2014)? What are the psychological foundations of firm strategic learning, and how does this learning influence firm performance? (Powell *et al.*, 2011)

Note. L1: Level 1, L2: Level 2.

Table 2. Illustrations of microfoundations topics and questions that can be investigated empirically using mixed methods

* *Qualitative approach followed by a quantitative approach:*

- How does industry context affect which groups of individuals and functions within a firm (e.g., R&D vs. marketing) become critical for the firm's success and what is their relative impact compared to such variables and processes as organizational capabilities and routines?

* *Quantitative approach followed by a qualitative approach:*

- Which are the high and low performing firms within a particular industry and what are the microfoundations of performance and competitive advantage that may account for such difference? (Rouse and Daellenbach, 1999)

* *Quantitative approach may determine the most important collective or macro variables (e.g., capabilities, routines, structure, culture) in terms of explaining firm performance, and then the qualitative approach may address follow-up questions such as:*

- How do these collective variables influence individual actions and interactions (Foss, 2009)?
 - How do these collective variables emerge through a process of aggregation of individual variables? How do individual characteristics lead to collective behavior and outcomes? How do individual-level factors (actions, decisions, interactions, emotions, motivations, behaviors, cognition, traits, abilities) aggregate to create collective capabilities (Barney and Felin, 2013; Felin *et al.*, 2012; Foss, 2009)?
 - What are the origins of these collective-level variables? What are the micro-level origins of organizational capabilities and knowledge? Where do routines originate? What is the individual-routine link? What role do exceptions and intentionality play in the potential emergence of routines (Felin and Foss, 2006, 2011; Felin *et al.*, 2012)?
 - How do knowledge sharing behaviors aggregate to the organizational level (Foss, Husted and Michailova, 2010)?
 - How do insights on individual traits and processes enrich our understanding of organizational routines, learning and capability development (Felin *et al.*, 2012)?
 - How do situational and contextual factors shape individual actions, behaviors, and cognition (Kostopoulos *et al.*, 2013)?
 - How do social processes help and shape aggregation of these individual actions to develop collective variables?
 - How do individuals interact and influence each other in developing collective learning? What are the sociocognitive processes that underlie these interactions? How does learning become a collective-level property that transcends individual members? (Felin and Hesterly, 2007)
 - How do microprocesses at the individual level relate to organizational-level outcomes? What is the relation between microprocesses and macro-outcomes following a logic of temporal recursion (Kouame and Langley, 2014)?
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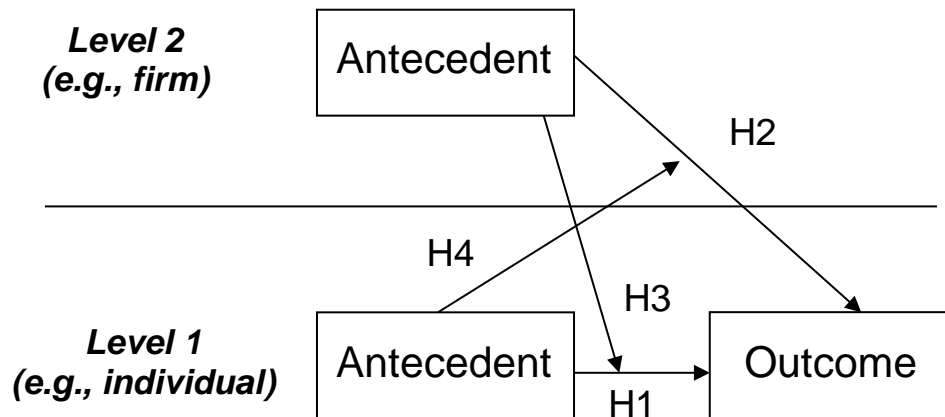


Figure 1. General top-down multilevel model including a lower-level outcome

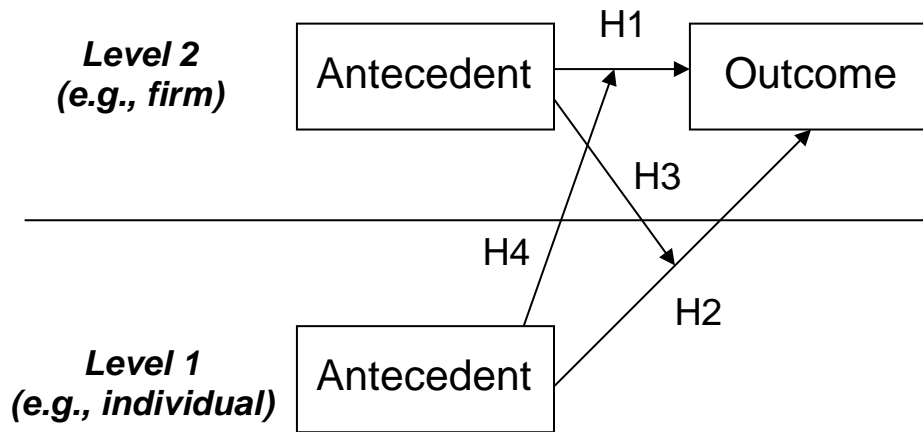


Figure 2. Generic bottom-up multilevel model including a higher-level outcome

Author Biographies

Herman Aguinis is the John F. Mee Chair of Management in the Kelley School of Business, Indiana University. His multi-disciplinary, multi-method, and multi-level research addresses human capital acquisition, development, and deployment, and research methods and analysis. He has published about 130 journal articles (e.g., AMJ, AMR, SMJ, JAP) and five books including *Performance Management* (3rd edition), *Applied Psychology in Human Resource Management* (7th edition), and *Regression Analysis for Categorical Moderators*. He is a Fellow of the Academy of Management (AOM) and received the AOM Research Methods Division Distinguished Career Award for lifetime contributions and the AOM Entrepreneurship Division IDEA Thought Leader Award. He also received best-article-of-the-year awards from *Academy of Management Perspectives*, *Organizational Research Methods*, *Journal of Organizational Behavior*, and *Personnel Psychology*. His research has had impact inside and outside the academy and has been featured by Forbes, The Economist, Bloomberg Businessweek, and USA Today, among other media.

José F. Molina-Azorín is an Associate Professor at the University of Alicante, Spain. His research focuses on strategic management, specifically competitive strategy, strategic groups, determinants of firm performance, microfoundations, and the relations between competitive strategy, organizational structure, quality, and environmental management. His research also focuses on mixed methods and uses them to study his substantive interests in strategic management. In addition, he has examined the application and added value of mixed methods research in strategy and other management fields through systematic methodological reviews. His research on mixed methods has been published in several book chapters and in methodological journals including *Organizational Research Methods*, *Journal of Mixed Methods*

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