Inductive reasoning: The promise of big data

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A B S T R A C T

Theory is a cornerstone of organizational research. Recently, however, some organizational scientists have argued that there is an overemphasis on theory development in our prominent publication outlets, calling for a rejuvenation of empirically driven research. To bring empirical research back to the forefront, the organizational sciences need a shock to the system: the advent of big data analytics in organizations provides just such a shock. The purpose of the following paper is to advocate for big data analytics as tools that can be used to support inductive research methods in the organizational sciences. We then highlight areas of organizational research and practice in which big data analytics can have an impact, provide readers with a tempered perspective on big data in the organizational sciences, and suggest a number of ways that researchers, reviewers, and editors can prepare themselves for the introduction of big data research in the organizational sciences.

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Theory is a cornerstone of organizational research (Locke, 2007; Suddaby, 2006, 2014; Sutton & Staw, 1995). Recently, however, some organizational researchers have argued that there is an overemphasis on theory development in our prominent publication outlets (e.g., Hambrick, 2007; Leung, 2011), and that a strict adherence to deductive theory testing hampers the progression of organizational science (Locke, 2007; Spector, Rogelberg, Ryan, Schmitt, & Zedeck, 2014). These authors emphasize the need for a rejuvenation of empirically driven research, citing declines in the publication of empirically focused studies in many of our major journals (Ryan & Ployhart, 2014). Such observations are hardly new, given that Van Maanen (1989) suggested that we scrap new theory for a while and try to observe what actually happens in organizations.

Although such critiques are worthy of our attention, inductive reasoning in organizational science has never really gone away. Rather, empirically based research has been hidden under the "blanket" of theory (Hambrick, 2007)—where authors are frequently pressured to publish poorly defined (and often poorly tested) "pseudotheories" in the push for recognition and tenure (Cucina, Hayes, Walmsley, & Martin, 2014; Kepes & McDaniel, 2013; Locke, 2007). Although many of our journals emphasize theory generation, science requires a more tempered approach. To bring empirically driven research back to the forefront, the organizational sciences need a shock to the system: one that is happening around us—the availability of big data.

1. Inductive reasoning: a brief overview

Deductive reasoning is the dominant research model in the organizational sciences (Locke, 2007; Sutton & Staw, 1995). Under the deductive approach, hypotheses are offered a priori, data are collected, and analyses are conducted to determine the degree to which the hypotheses are supported. The hypothetico-deductive strategy is not intended for researchers who seek to identify possible alternative explanations for the patterns that emerge from data. Rather, deduction relies on "testing a single theory for

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empirical adequacy" (Ketokivi & Mantere, 2010, p. 318). This perspective is in stark contrast to inductive reasoning, wherein theories are formulated by drawing general inferences from particulars or cases of empirical data.

Despite the popularity and multitude of studies employing deductive (i.e., top-down, theory driven) strategies in organizational research, inductive (i.e., bottom-up, data-driven) reasoning provides a viable method for 'doing science' and clearly has a place in our field. Research outlets, such as the *Academy of Management Journal* and this issue of *Human Resource Management Review*, have called for the exploration of alternative methods that take advantage of empirical data (Eisenhardt & Graebner, 2007), as well as calls to consider both older (e.g., ethnography; Zickar & Carter, 2010) and newer (e.g., relationally reflexive practice; Hibbert, Sillince, Diefenbach, & Cunliffe, 2014) methods of qualitative inquiry for theory development.

In a recent example of the application of inductive methods in the organizational sciences, Berka, Olien, Rogelberg, Rupp, and Thornton (2014) surveyed the behaviors of research teams that contribute to successful journal publications. In this study, Berka and colleagues examined the qualities that differentiate successful and unsuccessful authorship teams in terms of reviewer ratings and editorial decisions for papers submitted to the *Journal of Business and Psychology* between 2009 and 2012. Using a process of "reflection", these authors identified three categories differentiating successful and unsuccessful authorship teams: team composition and experiential resources, team communication, and team publication-related development activities. First authors of papers accepted for publication and papers rejected following peer-review were surveyed on these dimensions. Findings demonstrated that research teams with richer communication patterns experience more positive outcomes than teams with "leaner" communication patterns. Importantly, Berka et al. (2014) suggest that this emergent finding is consistent with (and thus, provides empirical support for) the role of media richness theory (Daft & Lengel, 1984, 1986) for predicting successful publication outcomes.

In a second notable application of inductive research methods, Harrison and Rouse (2015) explored feedback interactions in the context of creative projects. These authors elaborated a method of iteration between theory and data as a critical aspect of the theory-building process, wherein induction occurs prior to theory framing, in order to identify the various strategies employed by creative workers and feedback providers during feedback communications. This interplay between theory and data is a form of systematic qualitative inquiry, known as Grounded Theory (Glaser & Strauss, 1967; O'Reilly, Paper, & Marx, 2012). We concur that theory does not necessarily precede data, or vice versa. Rather, inductive methods contribute to theory development that is accurate, interesting, and testable (Eisenhardt & Graebner, 2007) as a result of its foundation in data. Thus, organizational scientists should consider inductive strategies as complementary with, rather than in contrast to deductive methods. That is, theory built through induction can later be tested deductively.

Importantly, we do not argue that deductive reasoning is somehow inherently flawed or inadequate. Deductive reasoning is very good at what it is intended for: testing a priori hypotheses. Yet overreliance on deductive approaches at the expense of inductive approaches limits our understanding of organizational phenomena. Thus, we argue for a greater integration of deductive and inductive approaches as necessary for the future growth of our field. The use of big data analytics offers just such an opportunity.

The purpose of the present review is to familiarize organizational scientists with big data analytics as an inductive approach to organizational research and practice. First, we describe the qualities of big data and describe how big data may afford organizational researchers opportunities for conducting inductive research. Second, we highlight a variety of areas of organizational science in which big data can have an impact and offer our own insights for those organizational scientists seeking to adopt big data analytics in their research and practice. Third, we discuss potential pitfalls and criticisms of the application of big data in organizations, offering a tempered perspective for the usefulness of big data analytics in organizational decision-making. Fourth, and finally, we offer our suggestions for how organizational scientists can prepare themselves the introduction of inductive, big data research in our publication outlets.

2. Seeing the big picture: what is "big data?"

A defining characteristic of contemporary organizations is the rapid pace at which massive amounts of information are collected and stored. We have clearly entered the era of big data (Davenport, 2014; George, Haas, & Pentland, 2014; Parks, 2014). Despite the growing prominence of big data in organizations, research outlets, and the popular press, a definitive nomenclature for big data has yet to be firmly established (Gandomi & Haider, 2015). Because our first objective in this paper is to familiarize organizational scientists with how big data analytics differ from traditional forms of inquiry (e.g., deduction) used in organizational research, we next offer a summary of how we use the term 'big data' herein. These distinctions are intended to remedy any confusion about the conceptualization of big data and identify what trenchant characteristics of a data set qualify it as such. These features can be usefully summarized by three oft-noted qualities of big data: volume—there's *lots* of it; velocity—the pace of data collection and use is continually and rapidly increasing; and variety—data come in many forms, and from many sources both *within* and *outside* of the organization (Chen et al., 2013; Guzzo, Fink, King, Tonidandel, & Landis, 2015; Laney, 2001; Power, 2014).[1]

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[1] As big data continues to remain a hot topic in the blogosphere, Vs continue to propagate (veracity, value, visualization, volatility, etc.). At some point one has to draw the line. We believe that the Three Vs described here represent the essential qualities of big data for the organizational sciences.