Thinking Big About Big Data

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Guzzo, Fink, King, Tonidandel, and Landis (2015) review important issues—privacy, informed consent, and data/data analysis integrity—that are critical logistical considerations in *any* program of research with human subjects, including studies utilizing big data. Overall, we agree with the cautionary sentiment conveyed throughout the focal article; industrial and organizational (I-O) psychology researchers and practitioners should not assume that big data is a panacea, and many of our established disciplinary approaches for ensuring ethical and accurate research are applicable—or modifiable—in big data contexts. However, we believe that the conversation about big data in I-O psychology is broader than that reviewed by Guzzo et al., and we would like to further elaborate on the focal article. We present this commentary from our perspective as junior scholars entering the field at a critical time—a time when I-O psychology is becoming increasingly intertwined with big data science.

The same technological advances that are enabling the collection and analysis of streams of big data have also increased the complexity and pace of 21st century organizations, requiring that the organizational sciences strive for greater creativity and innovation in research in order to aid organizational functioning. Adhering too stringently to disciplinary norms and established practices may limit the ability of psychologists to contribute effectively. Moreover, like any scientific discipline, the field of I-O psychology must continually adapt in order to remain relevant and practically useful. We provide three additional recommendations related to big data, which are meant to encourage needed adaptation in our field. We suggest that, in order to reap the potential benefits of big data, I-O psychologists need to (a)

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retrain in data analytics, (b) *reapproach* organizational theory through a big data lens, and (c) *reengage* with interdisciplinary research and teaching.

Recommendations

Retrain in Data Analytics

Guzzo et al. describe the 21st century world as "awash in data" (p. 491). We argue that the existence of large quantities of data is neither new nor particularly exciting; what makes the big data revolution so remarkable is our unprecedented ability to make sense of vast amounts of information. Contemporarily we can store, analyze, and draw meaningful conclusions based on gigantic data sets, which would have been unfeasible to grapple with using yesterday's computers. In other words, when we talk about big data, we are inherently (if not implicitly) discussing big data *analytics* (Shaw, 2014). Thus, our first recommendation for remaining relevant as I-O psychologists is to retrain ourselves in big data analytics.

As social scientists, the current big data paradigm shift invites us to reframe our cognitive architectures surrounding research methods and data analysis. Specifically as psychologists, we have been trained to use certain (arbitrary) rules of thumb, such as a minimum sample size of 20 and an alpha level of .05. Although we generally understand these heuristics to be potentially misleading and problematic (e.g., Cohen, 1994), we still unanimously cling to them, upholding them as our scientific standards. What is perhaps unsettling for some about the growing popularity of big data is that it challenges us to rethink our homegrown scientific principles. After all, 20 participants are a proverbial drop in the bucket when you have a sample size of 20,000, or 200,000, or even 2,000,000.

Consequently, I-O psychology is currently at a crossroads; as scholars, we are being challenged to explore unfamiliar research methods in order to meet the demands of big data. Big data analysis supersedes functional silos, uniting interdisciplinary scholars who study a vast array of topics using common methods. Therefore, as a discipline it is critical for us to embrace methodological innovations from outside the field of I-O; for instance, the field of network science has a plethora of analytic and visualization tools that are well suited to big data. For example, relational event network modeling provides an adaptable framework for modeling longitudinal social interaction data (Butts, 2008). Relational event models provide a look at process as though it were a continuous movie rather than several snapshots in time. These models provide the opportunity to understand the dynamics of collective interactions (Leenders, Contractor, & DeChurch, in press). We do not mean to imply that psychologists do not bring a lot to the table. Our substantial emphasis on theory-based research and aversion to data dredging (i.e., "dust-bowl empiricism"), among other things,

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make us important contributors to social science research using big data analytics.

Reapproach Organizational Theory Through a Big Data Lens

Rapid technological advancements are not only changing the way that people interact with one another but also changing the way that we can approach organizational theory. Researchers have access to data that were previously unobtainable or very cumbersome to access, process, and analyze. Access to these new informational sources pushes us to think about (a) answering questions that we have not been able to answer previously and (b) asking new questions that require us to rethink or expand our current theories.

First, we have the opportunity to answer longstanding questions. For example, researchers have struggled to understand the mechanisms that explain how social systems emerge, maintain, and dissolve. Due to heavy reliance on survey methods, we are often limited in opportunities to observe the evolution of interactions in social systems. Big data has opened a new avenue for researchers to investigate the emergence of phenomena in ways that were never before available (Lazer et al., 2009). As an example, this opportunity is clear in teams research. Although research on teams is often concerned with emergent constructs (i.e., trust, cohesion, shared mental models), researchers have been unable to measure the nature of emergence directly with traditional quantitative measurement approaches (e.g., self-report surveys; Kozlowski, Chao, Grand, Braun, & Kuljanin, 2013). Instead, measures of interactions and team processes have relied on individual perceptions, which are then aggregated to the team level to represent an emergent construct. Big data, combined with analytic techniques such as the relational event models mentioned above, can provide the means for researchers to observe how dynamic interactions among team members coalesce into emergent properties over time.

Second, we have the opportunity to *expand* our theories. For instance, imagine you are a job candidate, and you are sitting down to take an employer's selection test. However, instead of the typical paper-and-pencil intelligence or personality exams, your potential employer presents you with an app-based video game (à la Angry Birds) to play for 20 minutes. Over the course of that time, the employer collects several megabytes of data, which are subsequently analyzed to reveal your standing on a variety of job-relevant characteristics such as creativity, decision-making ability, and intelligence. This scenario, however futuristic and far-fetched it may seem, is a description of an actual employee selection process designed by the Silicon-Valley-based startup Knack. By combining innovative assessment methods and the power of big data, Knack has pioneered a new theory-driven form of employee selection (Noguchi, 2015; Peck, 2013), which—among other assets—

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all but negates the issue of job candidate social desirability. Knack is just one example of a company that has exploited big data analytics in order to augment and reengineer a traditionally time-consuming and costly human resource process. This case study highlights how big data changes how we think about fundamental I-O concepts (e.g., selection, creativity, decision making, etc.). We must continually expand our theories to include new conceptualizations and operationalizations of old constructs, as well as entirely novel social phenomena (e.g., virtual communities, online gaming).

Moreover, big data is changing the landscape of research, and it is essential that I-O psychologists embrace this change and advance current thinking about organizational phenomena. We are slowly beginning to see responses to this change in the field. For example, the recently announced journal *Academy of Management Discoveries* aims to publish empirical research that "establishes a [new] phenomenon" important for understanding organizations (Van de Ven, 2015). This journal is open to different philosophies of science, thus opening the door for research driven by new or poorly understood phenomena that are not yet explained by existing theories. *Academy of Management Discoveries* is a prime example of a platform for social scientists to explore big data analytics in order to answer longstanding questions, and we believe that it is critical that I-O psychologists actively participate and immerse themselves in this burgeoning area of exploration and discovery.

Reengage in Interdisciplinary Research and Teaching

As aforementioned, Knack is a pioneering people analytics startup that employs big data methodologies. In part, the secret to Knack's innovativeness can be found in the company's commitment to interdisciplinarity; a functionally diverse team of neuroscientists, psychologists, and data scientists designed Knack's avant-garde, big-data-analytic assessment methods (Noguchi, 2015; Peck, 2013).

According to Guzzo and colleagues, big data "is the great equalizer in terms of interdisciplinary research and practice." They suggest that sources of big data can be "of value to other disciplines, thus creating occasions for the comingling of perspectives, theories, and analytics techniques" (p. 493). We wholeheartedly agree that big data can provide a point of integration with other disciplines. However, a considerable amount of lip service arguably gets paid to the notion of interdisciplinarity without nearly as much actual, cross-functional research being carried out. Thus, our final recommendation is to leverage the big data revolution by conducting interdisciplinary research with scholars from other disciplines. To clarify, Guzzo et al. note that researchers from different disciplines may be interested in the same dataset, and thus I-O psychologists should share their data. We suggest that I-O psychologists take this a step further and conduct *interdisciplinary research,* which requires scientists from different disciplines to work together

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to ask new questions and use new approaches that could not otherwise be asked without the synthesis of two or more disciplinary perspectives (Hall, Feng, Moser, Stokols, & Taylor, 2008).

The wave of the future is clear—scientists across many disciplines are taking notice of the power of big data analytics. However, harnessing the power of big data is often easier said than done, especially for scientists trained in the social realm. Therefore, a main priority related to interdisciplinarity needs to be adjusting classical I-O psychology curricula to incorporate data science education. In order for I-O psychologists to continue meaningfully engaging with their interdisciplinary peers, we need to afford our young scholars the opportunity to learn contemporarily relevant research and analytic methods in a structured educational environment rather than dogmatically adhering solely to our traditional research and statistical methods.

The Future Has Arrived

As I-O psychologists, it is high time for us to embrace big data analytics. As social science researchers, we have a lot to potentially contribute to the burgeoning big-data-based study of the workplace. Specifically, as junior scholars we feel particularly poised to embrace the big data paradigm shift in order to ensure that our subdiscipline remains relevant over time. By perfecting the art of big data analytics, reconsidering the way we test and generate organizational theory, and reengaging with interdisciplinarity, I-O psychologists stand to provide more accurate research-based predictions and more effective interventions and solutions for the real-world organizational challenges of the 21st century than were previously thought possible.

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Little Teams, Big Data: Big Data Provides New Opportunities for Teams *Theory*

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Over the past 25 years, industrial and organizational (I-O) psychologists have made great strides forward in the area of teams research. They have developed and tested meso-level theories that explain and predict the behavior of individuals in teams and teams operating within and across organizations. The continued contributions of I-O psychologists to theory and research on teams require us to address the challenges—several of which

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