

An empirical study of the rise of big data in business scholarship



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ABSTRACT

Big data has captured the interests of scholars across many disciplines over the last half a decade. Business scholars have increasingly turned their attention to the impact of this emerging phenomenon. Despite the rise in attention, our understanding of what big data is and what it means for organizations and institutional actors remains uncertain. In this study, we conduct a systematic review on “big data” across business scholarship over the past six years (2009–2014). We analyzed 219 peer-reviewed academic papers from 152 journals from the most comprehensive business literature database. We conducted the systematic review both quantitatively and qualitatively using the data analysis software NVivo10. Our results reveal several key insights about the scholarly investigation of big data, including its top benefits and challenges. Overall, we found that big data remains a fragmented, early-stage domain of research in terms of theoretical grounding, methodological diversity and empirically oriented work. These challenges serve to improve our understanding of the state of big data in contemporary research, and to further prompt scholars and decision-makers to advance future research in the most productive manner.

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1. Introduction

Over the last five years, there has been a remarkable increase in scholarship on big data across various academic disciplines including management, business and information systems. As big data technologies emerge in our networked society, a new synthesis of real-time, user-generated information and communication creates a constant flow of potential new insights for business, government, education and social initiatives. Digitally-savvy organizations are already using big data in a variety of strategic ways: to do what they have always done but better; to do something differently; to do something completely new; to co-create value with customers, or to monetize data (Petter & Peppard, 2013). But the vast majority of large and mid-sized organizations are still struggling to integrate big data into their organizational cultures. Big data represents a significant shift in thinking about data infrastructure, business intelligence and analytics, and information technology strategy, which are all key areas of impact for business and management scholars (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013; Chen, Chiang, & Storey, 2012).

Mayer-Schönberger and Cukier (2013) argue big data is all about predictions, connections, and relationships amongst vast data sets.

Beyond bigger, better, networked information, big data is chiefly defined by its novel applications. There are plenty of examples in the pages of business journals, industry magazines, and financial media. Sentiment tracking of Twitter posts has been shown to predict stock market indicators (Bollen, Mao, & Zeng 2011). Smartphone data is used to determine supply chain management and highway traffic alerts for corporate chains (Demirkan & Delen, 2013). Search query tracking has been used to predict sickness prevalence through Google Flu Trends (Lazer, Kennedy, King, & Vespignani 2014). While the term *big data* has become rapidly incorporated into the lexicon of industry, academia, science, and medicine, it remains an uncertain and ambiguous concept in terms of scholarship and practice.

Big data is a buzzword with a number of meanings. Some refer to big data as very large sets of data that are impossible to analyze by hand or through traditional methods, such as a spreadsheet. Massive amounts of data are generated from various sources including genomics, social media, professional sports, and weather sensors, just to name a few. Data is also moving, analyzed, and utilized at a faster and faster pace. This popular definition is called the 3 Vs: volume, variety, and velocity definition of big data (Laney, 2001; McAfee, Brynjolfsson, Davenport, Patil, & Barton, 2012). Others point out big data is more than the sum of its technical parts. It represents a social movement or cultural shift in organizations to data driven decision making (Chow-White & Green, 2013). Despite this explosion of interest the concept is uncertain and ambiguous and the applications are wide and varied.

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According to the Gartner (2015) Hype Cycle methodology, once an important new technology is introduced, it progresses through a sharp peak in visibility and inflated expectations, followed by a downward slope into disillusionment, and eventually stabilizes back upwards through enlightenment and ultimately widespread productivity. The concept of big data has moved through the initial hype and disillusionment phases in public discourse, and is still in the preliminary stages of the disillusionment stage in academic research across a wide range of disciplines. This is a predictable trend based on academia's lengthy process of review before publishing.

We explore the state of research about big data in business scholarship to understand how scholars are defining big data, where they are investigating it, and what they are finding so far. Big data is the newest example of a 'disruptive innovation' (Christensen, 1997, 2016; Christensen & Raynor, 2003; Hwang & Christensen, 2008) across all sub-fields of business and this creates a lot of noise. The academic literature is the space to separate scholarly signals from popular noise to understand what big data is, who is using it, and what benefits, opportunities, and risks does it present to organizations and firms? In this study, we describe the process and findings of our systematic review of big data research within business literature from 2009–2014. Systematic reviews are a form of meta-analysis designed to "summarize in an explicit way what is known and not known about a specific practice-related question" (Briner, Denyer, & Rousseau, 2009, p. 19). The field of business has been at the forefront of experimenting with big data technologies and techniques, and this study is designed to support leaders, scholars and decision-makers in thinking about the benefits, risks and gaps in our current knowledge to do with big data.

1.1. The need for a systematic review

Research-based studies of big data's impact on business are beginning to proliferate. However, each study in this rapidly developing area is inevitably limited in scope and reflective of diverse findings. This poses a risk to the accumulation of knowledge and the integration of findings among business leaders and researchers (Briner et al., 2009). Beyond the few data-rich giants such as LinkedIn, Facebook and Google, leaders of most large and mid-sized companies remain perplexed by the highly fragmented landscape of big data technologies now available (Goes, 2014). Systematic reviews are a powerful way of addressing fragmentation as a "means of evaluating and interpreting all available research relevant to a particular research question or topic area or phenomenon of interest" (Kitchenham, 2004, p. iv). Systematic reviews are most commonly used in the medical domain. However, scholars have recently been adopting them across business, marketing and management studies as a tool for bridging the "research-practice gap" (Rousseau, 2006). We rigorously gathered, assessed, and analyzed relevant empirical studies on big data in the business literature, in order to conduct an objective synthesis of the results, which may be integrated into professional practice (Sackett et al., 2000). Our research found these relevant discussions in the journals increasing rapidly over the last six years. The research articles we review are a systematically collected set of primary studies. Our subsequent analysis of these papers is a valuable secondary study offering a more holistic view and new insights on the latest uses of big data technologies in the field of business.

2. Methods

We conducted a systematic review—an in-depth investigation of the existing knowledge about big data across the business lit-

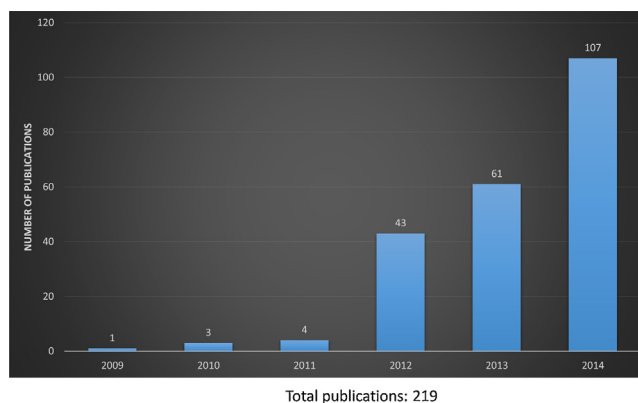


Fig. 1. Number of publications on big data per year (Total: 219).

erature. There are a number of steps involved in conducting a systematic review: (1) research design, (2) data collection, and (3) coding and analysis.

In phase 1 (research design) we developed 10 research questions (see Table 1) to guide our analysis. These include: How does the literature define (or not define) big data? What is the ratio of conceptual papers to empirical papers? What types of big data tools are represented in the studies? Which types of organizations, industries, business divisions, and countries are represented in the studies? What are some of the main benefits and challenges of big data for firms?

In phase 2 (data collection), we consulted several business scholars and business librarians to identify the top business databases. Our search term was simply "big data." We first conducted an advanced search within Business Source Complete (BSC), which allowed us to narrow the search to journal articles from 2009–2014, yielding 552 results. BSC is considered one of the most comprehensive databases with 5117 journals and magazines indexed and abstracted. Next we consulted the Journal of Citation Reports (JCR) for the top business journals as of 2013, as a cross-reference to ensure we had captured results from the top journals as ranked by impact factor. There were 111 journals listed in JCR and we searched them individually. We chose the starting point of January 2009 as it coincided with the emergence of the first few scholarly papers on big data. We collected published peer-reviewed, English-language, academic journal articles in business. Our final data-set included 219 papers sourced from 152 different journals, published from 2009 to 2014 (see Figs. 1 and 2). We collected the data from 2009 to 2013 in September and October of 2014, and did a secondary search for the data from 2014 in March 2015 to ensure we captured everything published up to December 2014.

Prior to coding and meta-analysis, four researchers including an associate professor, a doctoral candidate, and two masters students, reviewed the extensive search results and manually assessed the papers for relevant papers (intercoder reliability score: 96.9%). Any disagreements were discussed and reconciled prior to analysis. Any articles we could not agree on were removed from the sample. Our main criterion for inclusion was the use of the term "big data" as the core technology analyzed or part of the core argument developed in the paper, typically evidenced by its emphasis in the title, abstract and/or keywords. In a few exceptional cases; papers did not explicitly mention big data in those areas yet included a substantial discussion of the topic within the paper itself; and thus were included in the sample population. From BSC; we identified 184 papers that fit our criteria; and from JCR we identified 35 additional papers beyond those that were cross-listed in both databases. We identified 184 unique papers in BSC and an additional 35 unique papers in JCR for a total of 219 papers in our population.

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