

A multidisciplinary perspective of big data in management research



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ARTICLE INFO

Keywords:

Big data
Management research
Literature review

ABSTRACT

In recent years, big data has emerged as one of the prominent buzzwords in business and management. In spite of the mounting body of research on big data across the social science disciplines, scholars have offered little synthesis on the current state of knowledge. To take stock of academic research that contributes to the big data revolution, this paper tracks scholarly work's perspectives on big data in the management domain over the past decade. We identify key themes emerging in management studies and develop an integrated framework to link the multiple streams of research in fields of organisation, operations, marketing, information management and other relevant areas. Our analysis uncovers a growing awareness of big data's business values and managerial changes led by data-driven approach. Stemming from the review is the suggestion for research that both structured and unstructured big data should be harnessed to advance understanding of big data value in informing organisational decisions and enhancing firm competitiveness. To discover the full value, firms need to formulate and implement a data-driven strategy. In light of these, the study identifies and outlines the implications and directions for future research.

1. Introduction

For years, big data has been one of the biggest buzzword. In the age of the Internet of Things, data is everywhere and the term “big data” represents a large data pool with significant variety and complexity (Manyika et al., 2011). People are getting interested in big data, especially starting from the year 2011, according to the statistics of popularity for this term on Google Search (see Fig. 1). The hidden value of big data attracts scholars' attention too. Searching the term “big data” on Google Scholar returns millions of results, which span multiple disciplines, such as computer science, engineering, and social sciences.

On top of technological attempt on improvement, practitioners and academics have been exploring further implications of big data for business and other applicable fields (e.g. Akter et al., 2016; Erevelles et al., 2016; Wamba et al., 2017). Big data has not only transformed the business models but also paved the way for organisational strategic decision-makers to act in a timely manner (Beath et al., 2012; McAfee and Brynjolfsson, 2012). Past studies have demonstrated the value of big data in enhancing productivity and creating social surplus (Manyika et al., 2011). It has also facilitated making decisions with better accuracy based on solid data evidence rather than intuition (McAfee and Brynjolfsson, 2012). Nonetheless, facing the sheer amount of data and greater complexity, how to create value from big data remains to be the primary

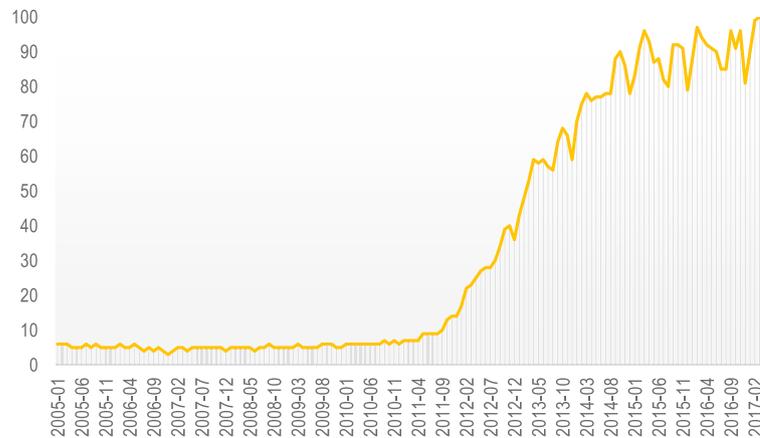
challenge to businesses. Along with the changing business environment, organisations should enhance their adaptability and dynamics by developing a data-driven management mechanism to grasp the opportunity to create values from big data. However, our understanding of how big data value has been achieved and will be achieved is still limited.

Despite the growing recognition of the importance of big data across industries and sectors (Gandomi and Haider, 2015) and the mounting body of knowledge (McAfee and Brynjolfsson, 2012), there is limited synthesis of the literature across the social science disciplines. It remains unclear what social science scholars have discussed in the past decade to address big data issues and what knowledge has been discovered to advance our understanding around big data analytics. Indeed, the lack of clarity in current research on big data stems from a lack of a comprehensive review of past studies to clarify boundaries of the subject and progress made by scholars (Sivarajah et al., 2017). Furthermore, the lack of interdisciplinary research review may have obscured past accomplishments leading to lack of clear directions for future research. Against this backdrop, the main purpose of this study is to review the literature on big data in management research, in order to identify the key themes in current big data research and clarify the research frontiers. The review intends to serve as a reference point to advance big data research in management fields.

The article offers several contributions to big data and management

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Notes: The statistics shows worldwide search interest of the term over the period from 2005 to March 2017.

Source: Google Trend.

Fig. 1. Popularity of term “big data” on Google search.

research. First, a few scholars have suggested that an integrated approach to big data can enhance our understanding of the subject (see [Amankwah-Amoah, 2015, 2016](#)), but to date the literature remains scattered across disciplines. In this direction, our paper contributes to the literature by offering a comprehensive review of the literature, which clarifies the complexities of the subject, management applications of big data, current trends and themes identified by past studies. Second, building on prior studies ([Chen et al., 2012](#); [Sivarajah et al., 2017](#)), the paper synthesises the literature from various perspectives in management, highlighting primary concerns in each academic field. In so doing, we outline the linkages between the approaches adopted by scholars in areas such as organisation, operation, marketing, and information management with regard to big data application. This work extends prior big data research by developing an integrated framework to link the current disjointed streams of research. In addition, by explicating the mechanisms and approaches adopted by scholars, we outline an approach towards better utilisation of big data in management domain. We are confident that our review provides a valuable contribution to this evolving and important research field and will serve as a platform for future research efforts in this area.

The rest of paper is organised as follows. The next sections outline the evolution of big data research and clarifies the scope of this review. This is then followed by development of an integrated framework drawing on various management perspectives. The last section discusses research gaps and promising avenues for future research.

2. Evolution of big data

2.1. What is big data?

Some scholars have suggested that big data is a “moving definition” which varies with time as well as industrial sectors ([Manyika et al., 2011](#), pp. 1). There is no fixed threshold set for measurement of what size and type of data can be treated as big data, given that the amount continues to increase. Indeed, the quantification of data takes different forms and different datasets may generate depending on various analytics forms. Although there is no universal definition of big data, there appear to be an emerging consensus about its uniqueness that distinguishes big data from what we recognise large database is like in traditional acknowledgment. Three Vs of big data, namely volume, variety and velocity, has been introduced at an early stage of the development of this notion (see [Laney, 2001](#); [Kwon et al., 2014](#); [Russom, 2011](#)), which reflect the continuous expansion of data in terms of multiplicity.

In addition to scale expansion, big datasets are far more complicated. Data is generated and collected from more diversified sources such as web sites, smart devices and social media. Moreover, data variety is greater because data comes in all types of formats. Structured data is no longer the only type we recognised, rather more unstructured and semi-structure data are identified as conveying abundant useful information. Furthermore, torrents of data are coming in near-real time. The speed of data generation and data delivery become critical elements in big data especially the high-frequency streaming data in real-time decision-making. Additional characteristics of big data including high value and low veracity (see [Gandomi and Haider, 2015](#); [Katal et al., 2013](#)) have further enriched the conceptualisation of the big data nature. The 5Vs definition of big data pinpoints the complexity that businesses are confronted by to create real value from big data.

Given the confusions over big data concept, we define big data as extremely large amount of structured, semi structured or unstructured data continuously generated from diversified sources, which inundates business operations in real time and impacts on decision-making through mining insightful information from rambling data. For research clarity, what constitute big data in this study include large structured datasets and unstructured data in the form of text (e.g. documents, natural language), web data (e.g. web structure, web usage, web content), social media data (e.g. virtual network), multimedia data (e.g. image, audio, video), and mobile data (e.g. sensor, geographical location, application).

2.2. Big data in practice

In real-world practice, the abundance of big data accelerates technology improvement. In recent decades, more advanced platforms and systems have been invented and employed to handle big data, which have advantages compared to traditional techniques in every aspect of data management and analytics. [Russom \(2011\)](#) foresees a future trend towards a growth in the adoption of visualisation, in-memory databases, SQL and other advanced analytics techniques in corporate IT commitment. As big data expands, emerging techniques will become more in demand as these advanced programs have stronger functions and flexibility, which makes business analytics more cost-effective and efficient.

Nowadays, big data analytics has become a trendy practice in business intelligence encompassing combination of massive data sets and advanced analytics techniques, and it plays a role in influencing aspects of business activities and customer choice ([Russom, 2011](#)). With extensive amount of data collected and interpreted, companies are able to identify the competitions and respond to customers' requirements. The

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