

Where Are You Going Big Data?

Completed Research

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Abstract

Big data applications combined with analytical tools foster prediction techniques that impact societal, economic, and political changes. After almost one decade of studies, this paper proposes to carry out a literature review on big data analytics (BDA), recognizing major debates in the topic, presenting its evolution over the past years, and identifying its research tendencies. We delimit our research to the eight top journals on information systems. Out of the 135 candidates in the initial pool, we selected 41 papers that met the selection criteria. Our finding suggests that BDA is apparently reaching a plateau, which might be confirmed by the following years of publications. Additionally, other perspectives on BDA might include a new wave of studies; and finally we conclude that new paths can be explored beyond productivity gain, but from a social perspective.

Keywords

Big data, analytics, business intelligence, datification, data science, literature review.

Introduction

The term big data refers to data whose size goes beyond the ability of regular database software to capture, store, manage, and analyze (Manyika et al., 2011). Big data applications combined with analytical tools (or big data analytics) foster prediction techniques that impact societal, economic, and political changes. After almost one decade of studies, this paper proposes to carry out a literature review on big data, recognizing major debates in the topic, presenting its evolution over the past years, and identifying its research tendencies.

Big data analytics (BDA) is a breakthrough technological development (Gunther et al., 2017). A couple of decades ago, the generation of data was costly and time consuming, but today we are swamped by a data deluge (Muller, Fay & Brocke, 2018). The spectacular success of companies such as Google, Facebook, eBay, and Amazon arouses interest and draws attention to the big data phenomenon both in the academic and business worlds. These corporations, just to name a few, are hallmarks of big data applications.

BDA allows companies to gather billions of customer reviews of their products from multiple websites, contemplating review platforms, blogs, discussion forums, among many others (Zhou et al., 2018). In a socioeconomic environment heavily influenced by mobile application (apps), each transaction of any text, digital procedure, tactile command, voice, and other user inputs over an app is data. Additionally, due to the maturity level of sensor technologies and individuals contributing data to databases, more digital records have been registered than ever (Clarke, 2016). Computers embedded in products such as cars, vacuum cleaners, or video consoles give rise to large amounts of digitized data (Loebbecke & Picot, 2015). The location-based process and internet of things also contribute to data generation (Lyytinen & Grover, 2017); therefore, with all these resources, technology enables the opportunity to transform data into 'actionable insights' (Saboo, Kumar & Park, 2016; Kitchens et al., 2018).

However, the advances originated by BDA technologies raise new issues. While the strategic value of data processed by algorithms is incontestable from the business point of view, the implications for society and

individuals are still not clear (Newell & Marabelli, 2015). Aspects such as privacy, surveillance, and democracy arouse debates that still need further investigation. In this sense, digitization and big data analytics—or ‘datification’ (Galliers et al., 2015; Newell and Marabelli, 2015; Loebbecke & Picot, 2015), are embedded in all areas of life. The interaction with objects with sensors and IP addresses provide a mass of data sources, and humans have become ‘walking data generators’ (McAfee & Brynjolfsson, 2012; Loebbecke & Picot, 2015). Furthermore, decision models leveraged by sophisticated algorithms can replace the judgements of complex analyses, invading knowledge occupation professions. Therefore, jobs, institutions, and industries established today might be affected in uncertain ways. These enabling technologies may modify markets all over the world, leading to impacts that are still unknown. Thus, so many benefits can uncover negative consequences.

In this scenario, a systematic analysis of the field evolution is lacking, clarifying topics already investigated and pointing out issues that still need further researches. To fill that gap, the following research question is stated: what are the current debates in big data analytics and what are its researches trends? The study synthesizes major challenges and concerns regarding BDA, presents its development over time, and points out gaps that need further investigation. Although others literature reviews have been conducted in the area, the present analysis, basing its review on the eight major Journals in Information Systems (IS), provides a new perspective. From academic point of view, this study presents a clear picture of BDA development over time and uncovers gaps not addressed yet. Such analysis provides a better understanding of big data analytics applications and its consequences, generating reflections on the possibilities and the boundaries in the field. To practitioners, it congregates BDA techniques, models, and a mindset that have been successfully applied, as the same time it warns about limits and attention in its applications. To achieve this, we first present a literature review, introducing the understanding of big data through the eight top journals in information systems and its current concerns and challenges. Then, we describe the method applied in the research. Next, we discuss the production of articles, retrospective of major contributions, and expectations of new studies in the topic. Finally, we present our conclusion, as well as the limitations of the study and future study suggestions.

Theoretical Foundation

The use of analytics to extract value from big data gave rise to big data analytics (Muller, Fay & Brocke, 2018), which emerged to describe analytical technologies employed and the large and complex amount of data required to manage it. The term intelligence has been used in academic literature since the 1950s, but only in the 1990s it has become popular in business and IT communities (Chen, Chiang & Storey, 2012). Hoping not to commit a heresy, we understand the big data analytics concept as very similar to the more famous (and less sexy)—as put by Newell & Marabelli (2015)—business intelligence. Hence, one can consider big data as a close successor of business intelligence (Abbasi, Sarker & Chiang, 2016). More recently, ‘big data analytics’ (or just big data) have been adopted to refer to data sets and analytical techniques for large and advanced applications, requiring complex techniques in its usage.

BDA has significantly advanced since its early stage of business intelligence 1.0—marked by structured data, dashboards, data mining, OLAP, and statistical analyses—to 2.0—distinguished by unstructured online data, social network analyses, web analytics and intelligence, social media analytics—until the current 3.0 era—characterized by mobile and sensor-based content, mobile analytics and location, and context relevant analyses (Chen, Chiang & Storey, 2012; Grover et al., 2018). There are some big data features and functionalities that are commonly called ‘Vs’, ‘volume’, ‘variety’, and ‘velocity’, which means data that are too large, fast, or hard to process. More recently, some authors have incorporated other ‘Vs’ in this construction, such as ‘variability’, ‘value’, and ‘veracity’.

In BDA, advanced technologies are employed to analyze data to discover useful information that is hidden, such as unknown correlations, or to uncover patterns (Chen, Preston & Swink, 2015), providing answers to questions that have not even been considered yet (Grover et al., 2018). In contrast to research, in which data is collected for a specific end and measured by validated instruments, big data often just happens (Muller et al., 2016). While traditional systems such as enterprise resource planning (ERP) aim to improve the efficiency of established business processes, BDA explores new products, processes and service innovations (Muller, Fay & Brocke, 2018).

BDA involves the analyses and interpretations of all kinds of digital information (Loebbecke & Picot, 2015) and arises from major sources, including large-scale enterprise systems, online social graphs, mobile devices, the internet-of-things, and open data (Baesens et al., 2016). BDA borrows techniques grounded in statistics, machine learning, and econometrics, among others. It contemplates unstructured data, which consists of data tokens that are not alphanumeric, such as images and videos, whose development is far from trivial (Constantiou & Kallinikos, 2015). Since large samples are becoming more common in the IS field, researchers are increasingly working with big data (Chatla & Shmueli, 2017). However, Zuboff (2015) criticizes the passive position assumed regarding the topic, saying that the literature view of BDA as a technological phenomenon disregards its social origin. According to Zuboff's view, big data have an intentional sense and severe consequences, predicting and modifying human behavior through a logic that he refers to as 'surveillance capitalism'.

In the following table we highlight the major challenges and concerns identified in the literature review.

Challenges / Concerns	Brief Description	Authors
Qualified Professionals	Professionals with experience and expertise are the core for developing and implementing BDA strategies, including data scientists, programmers, developers, and analysts.	Baesens et al. (2016); Grover et al. (2018).
Privacy	Although the advantages of the network economy are notorious, concerns about privacy have emerged in studies and still need further investigation.	Lowry, Dinev & Willison, (2017); Newell & Marabelli (2015); Zuboff (2015).
Little Data	The usage of big data can direct knowledge in a targeted way that is potentially unfair, predicting the behavior of a particular individual.	Newell & Marabelli (2015).
Labor Market	Machines are progressively starting to replace humans in cognitive tasks since big data-based systems are becoming more cost-effective with a higher hit rate.	Loebbecke & Picot (2015).
Algorithms Complexity	Although some algorithms are very good on predictions, they are unable to provide explanations, being incomprehensible; therefore, they are unlikely to be adopted in strategic business decisions.	Baesens et al. (2016); Lyytinen & Grover (2017); Muller et al. (2016).
Infrastructure	BDA infrastructure encompasses data sources (e.g., clickstream, transactional, user-generated, social media) and proper platforms to collect, ingrate, share, process, and manage big data.	Grover et al. (2018); Kitchens et al. (2018);
Data Quality	Often data is noisy, erroneous, and missing; and without proper data quality, inevitably, resources will be misallocated.	Clarke (2016); Grover et al. (2018); Park et al. (2012).

Table 1. Major Challenges and Concerns in BDA

Research Approach

To address the aim of this paper, we adopt a literature review of big data analytics in the IS field. This type of study involves classifying and analyzing papers according to a relevant theme (Webster and Watson, 2002). In order to provide a systematic review, we delimit our research to the eight top journals based on the Association for Information Systems (AIS) Senior Academic Collegiate, which includes the European Journal of Information Systems, the Information Systems Journal, Information Systems Research, the Journal of AIS, the Journal of Information Technology, the Journal of MIS, the Journal of Strategic Information Systems, and MIS Quarterly. The selection of these Journals is due to the fact that they are the

most respected and recognized in the area, besides contemplate geographical, methodological, and topical diversity.

We assume that not all the papers approaching 'big data' adopted that specific term. Therefore, we first expand our searches by looking for papers containing the terms 'analytics' and 'intelligence' (Chen, Chiang & Storey, 2012; Luvizan & Diniz, 2017) in the key words, title, or abstract. However, the papers analyses show that 'datification' and 'data science' are quite common in related fields, which leads us to include both terms in our searches. The time limit defined was the year 2010 since we understand that the big data phenomenon was only able to emerge after technology enablers arising from that period on. The papers were collected between November 1st of 2018 and January 15th of 2019, including all papers published until 2018.

In an initial analysis by a superficial reading, the papers were selected, discarded, or subjected to a fine-grained analysis to ensure that they were related to big data. Out of the 135 candidates in the initial pool, we selected 41 papers that met the selection criteria. Our analyses focus on summarizing the main findings of the papers, highlighting current debates, and finding aspects that could characterize and classify articles. Nevertheless, the intention in this study is more than merely describing the area but actually contributing to new research, pointing out gaps and trends in the literature.

Discussion

Global Production

The first factor that drives attention toward the selected articles in this research is the country with which the authors were associated when they published. As we can see in the next figure, the publications are virtually entirely from within the Northern Hemisphere; Australia is the only exception. We see no publications on BDA at all in the totality of South America and in the entire African continent, and we realize that authors whose institutions are based in the United States (26 of 60) originate nearly half of the publications.



Figure 1. 'Basket of Eight' World Production in BDA

After the United States, China, the United Kingdom, and the Netherlands were tied with four publications, followed by Denmark, Liechtenstein, and Taiwan, with three publications. Germany, Hong Kong, India, Israel, and South Korea follow with two; finally, there are Australia, Belgium, and Switzerland with one publication each. We assume that this scenario—in which publications originated by United States and European countries prevail—is probably not a privilege of BDA publications but a continuum of the global production in the 'Basket of Eight'. One fact, however, attracts our attention. Except for China and India, the other members of BRICS (Brazil, Russia, and South Africa) also have no publications in the field in the leading journals. This fact catches our attention, considering the size and economic influence of the countries that compose the BRICS. One of the major potential of BDA precisely regards fostering economic

gains—not to mention all the social and political aspects. Conversely, countries with a more modest global presence—such as Liechtenstein, Taiwan, and Israel—share the stage with large, developed nations. The notable accomplishment of these countries perhaps encourages professionals and academics from the rest of the world who still have not reached such a ‘title’ in the field.

Another interesting fact to observe regards the institutions with which authors were associated when publishing their articles related to BDA. The only institution that has published four times in the leading journals in the field was the University of Liechtenstein, from the Principality of Liechtenstein. The monarchy is situated between Austria and Switzerland and has a population of nearly 38,000. The University is the leading producer of BDA in the ‘Basket of Eight’. Although almost half of the publications in the area originate in the United States, only the University of Cincinnati shares the stage, with three publications, in addition to the City University of Hong Kong and Erasmus University. Fifteen institutions have two publications, and the others are well spread out. The expectation with this global view of big data publications in the leading journals is to provide a big picture of the field in which efforts could be directed or rethought.

The Big Data Move: A Retrospective of Major Contributions

To the best of our knowledge, the publication of the remarkable article by Chen, Chiang & Storey (2012) is a hallmark of big data in IS, clarifying concepts, channeling the term, and providing guidance for future studies. This paper identifies the evolution, applications, and emerging research areas of BI&A (1.0, 2.0 and 3.0). In the same year, Chau & Xu (2012) developed a technique to effectively collect, extract, and analyze blogs related to a specific topic, and Park et al. (2012) created an inference model based on patterns of social ties that assess the validity of self-reported customer profiles.

In the following years, the big data analytics potential was explored in business. It starts to show implications for strategy making (Constantiou & Kallinikos, 2015) and demonstrates that its adoption influences business growth (Chen, Preston & Swink, 2015). Moreover, Constantiou & Kallinikos (2015) drive attention to unstructured data—such as the media of text, image, and sound—which cross alphanumeric systems that have prevailed in organization management. Additionally, in 2015, the first studies pointing out big data analytics consequences were published, and the terms ‘datification’ and ‘digitization’ emerged. In this sense, Loebbecke & Picot (2015) demonstrate the side effects of big data analytics in business and society; Newell & Marabelli (2015) show economic, legal, organizational, ethical, cultural, and psychological consequences of digitization—including issues related to privacy, control and dependence; and Zuboff (2015) questions the new global architecture of computer mediation.

However, the year of big data is 2016—and its engine is at full steam. Almost 40% of the articles in the ‘Basket of Eight’ are published in 2016. Considering the growth of publications and interest in the topic, several studies guiding BDA research gain space. In an editorial in the *Journal of the Association of Information Systems*, Abbasi, Sarker & Chiang (2016) discuss the emerging implications for theory and methodology arising due to big data’s disruptive effects. In line with this, in that very year, *MIS Quarterly* publishes its second editorial related to big data (Rai et al., 2016)—drafting opportunities for IS research—and publishes a special issue on BDA, leveraging the number of articles in the topic. Moreover, Ketter et al. (2016) present a conceptual and methodological approach by which IS research can address BDA issues, while Baesens et al. (2016) provide a perspective of the emerging research opportunities regarding big data, and Muller et al. (2016) set guidelines for conducting BDA studies in IS.

At the same time, 2016 is also marked by studies introducing new models and techniques. In this regard, we highlight the works of Brynjolfsson, Geva & Reichman (2016), who demonstrate a crowd-squared approach for predicting search trend data; Lash & Zhao (2016), who create a system able to predict movie profitability in the preproduction stage; and Lau et al. (2016) and Shi, Lee & Whinston (2016), whose works enhance decision making in mergers and acquisitions through BDA techniques. Furthermore, Menon & Sarkar (2016), present a scalable approach to solve privacy concerns when sharing transactional databases, and the system developed by Li, Chen & Nunamaker (2016) is capable of identifying underground economy sellers. Finally, Clarke (2016) draws attention to the moral and legal responsibilities of computing researchers and professionals.

Apparently, big data analytics crossed its apex in 2017. The large number of publications is replaced by a reduced (but not less notable) quantity of articles. In fact, the works produced in 2017 bring out novel insights. Kelly & Noonan (2017), through the Indian public health service, show how systematic practices

of working with data prevail and the challenge of conceiving new forms of data continue to appear in familiar ways. Furthermore, Guo et al. (2017) innovated with a system framework capable of extracting a small number of articles that could represent the diversified content generated on an organizational blogging platform. Finally, Gunther (2017) clarifies how organizations realize value from big data—which is a concept further investigated by Müller, Fay & Brocke (2018), providing objective estimations of BDA business value.

The publications of 2018 are marked by a few exotic studies and novel contributions. In this regard, we mention the work of Aversa, Cabantous & Haefliger (2018), wherein, by means of a Formula 1 race, the authors determine that decision support system (DSS) potential failure is exacerbated under pressure and time constraints. Additionally, Deng et al. (2018) and Li, Dalen & Rees (2018) analyze sentiment within big data. The former authors show the influence of microblog sentiment on stock returns, while the latter authors verify that stock microblog features serve as proxies for market sentiment. Furthermore, Lehrer et al. (2018) clarify how BDA technologies enable service innovation, and Zhou et al. (2018) encounter boundaries for BDA; they verified that increasing review volume reduces customer agility.

According to the number of publications and the field exploration it seems that BDA is reaching a plateau—which might indicate its maturity level. The next figure shows the number of publications per year, demonstrating the evolution of the field in terms of articles published in the ‘Basket of Eight’.

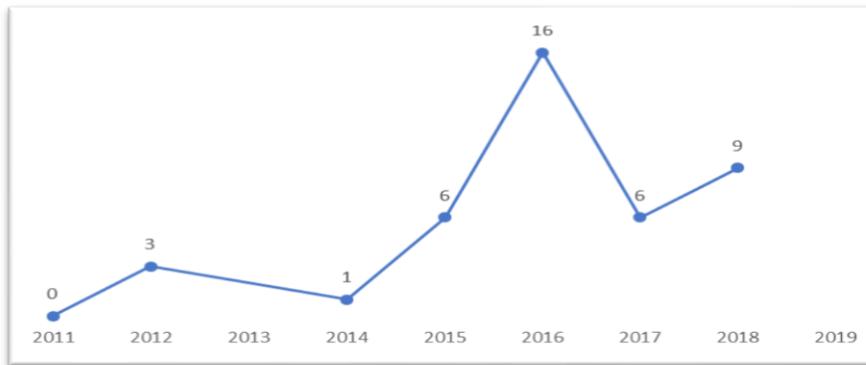


Figure 2. BDA Production in the ‘Basket of Eight’

Based on the published content since 2010, it is possible to realize different waves of BDA, as shown in the following figure. The analyses clarify diverse moments, which includes its first studies, potential in business, social media data, BDA consequences, research concerns, information security and privacy concerns, new models and techniques, sentiment analyses, and finally a (apparently) plateau.

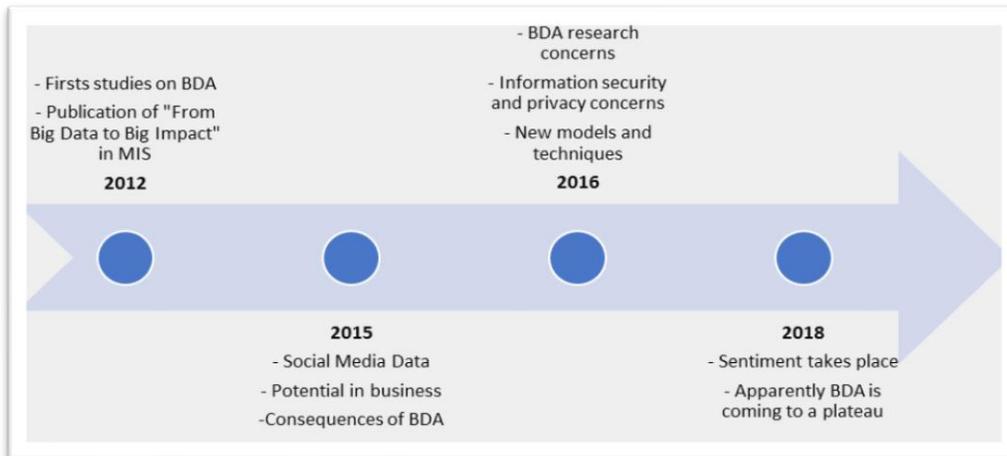


Figure 3. BDA Evolution

So, Now What?

Several highlights from articles from a few years ago have already been addressed, which makes us focus on those ideas we consider more relevant and that are still in need of further research. We also choose not to highlight issues regarding specific topics from other areas (e.g., merger and acquisition, stock market, customer behavior); without depreciating the value of these formidable works, their scope goes beyond the IS field. Therefore, we try to gather future studies signalizations in a broader sense, bringing out findings that may be applicable in the information systems field as whole. Similarly, we do not focus on broader variations of similar studies (e.g., allowing the generalizability of research results, enhancing study validity, or approaching other—but similar—dimensions or domains). Rather, we mostly choose insights we believe somehow shake-up BDA in the IS field. In the following table, we compile promising research opportunities on this topic based on the analysis of the selected articles.

Research Opportunities	Brief Description	Authors
Theories and Methods	BDA is not merely a data process change but is highly disruptive for academic studies, making it necessary to reassess our research methodologies, assumptions, and substantive questions.	Abbasi, Sarker & Chiang (2016); Baesens et al. (2016); Lyytinen & Grover (2017).
Interdisciplinary Studies	Researchers should consider searching for collaboration with other areas, which could result in the advance of the IS field through the advent of new methodological tools.	Aversa, Cabantous & Haefliger (2018); Breuker et al. (2018); Gunther et al. (2017); Loebbecke & Picot (2015); Muller et al. (2016).
Privacy, Ethic, Security, and Surveillance	There is a need for studies on surveillance by private and public authorities, which includes the protection of individual rights, privacy, ethical issues, and risk concerns.	Breuker et al. (2018); Gunther et al. (2017); Lowry, Dinev & Willison (2017); Zuboff (2015).
Service Innovation	There are missing studies on approaching BDA materiality and how it enables service innovation.	Kelly & Noonan (2017); Lehrer et al. (2018).
New BDA applications	Several are the research opportunities on BDA applications, including: sentiment, perspectives outside of the data, and meaning and relevance of images and videos.	Aversa, Cabantous & Haefliger (2018); Constantiou & Kallinikos (2015); Deng et al. (2018); Guo et al. (2017); Saboo, Kumar & Park (2016); Kitchens et al. (2018).
Governance	There is a need to broaden our understanding of information governance, identifying how antecedents (enablers or inhibitors) apply to it and its effects on organizational performance.	Tallon, Ramirez & Short (2014)
Social Impacts	Studies in the broad social issues generated by BDA are missing, including how digitization (as an actor) affects social relationships.	Loebbecke & Picot (2015); Newell & Marabelli (2015).
BDA Value	There is still a gap in reliable empirical evidence of its business value, making it necessary to explore how organizations effectively convert big data potential to economic and social value.	Abbasi, Sarker & Chiang (2016); Grover et al. (2018); Gunther et al. (2017); Muller, Fay & Brocke (2018).

Table 2. Research Opportunities

Conclusion

After an apex of publications in 2016, apparently BDA will soon reach a plateau—which might be confirmed by the following years of publications. In part, BDA may be being replaced by new terminologies (e.g., data science, datification), but mostly transformed into new, complex and deep ramifications. It seems that we are arriving at a land of big data impacts. We are going through a moment of transition in which a new analytical mindset is taking place, and the boundaries of what we can and cannot do are still obscure.

With the availability of data, different kinds of devices, machine learning, algorithms, sensors, and clouds provide endless possibilities. Many solutions have been made. Perhaps other perspectives now can be more explored. According to the analyzed papers of this research, there are topics that still need further investigation. In this regard, we highlight that privacy concerns and ethical aspects, impacts on society, new applications, and interdisciplinary researches might be new waves of studies, defining and limiting boundaries.

Concerning privacy and ethical aspects, we can say that nobody wants to live in a Big Brother environment, but we want the privileges that the ‘sharing’ of data allows. There is a need to rediscuss various aspects of the social pact considering technology, where more transparency and information are needed. What is our relationship to data, and how can it help or harm? People need to understand where they are heading and what it means for the market. When accepting cookies to access certain data, for instance, how many people actually know what a cookie is? There is a need to educate and inform to make people understand the tradeoffs, that their contribution comes from the data they provide.

Furthermore, most of the related works focus on increasing efficiency, mainly supporting the private sector. Perhaps opportunities to explore gains to society and other areas are being left behind. How can BDA effectively help lives in cities? How might BDA help with water consumption in less assisted regions, agriculture, or governments—generating value for society? In part, this result may have occurred because of the nature and purpose of the searched journals. However, these are still issues that might be more deeply explored. That is, studies regarding BDA could explore how to improve people's quality of life, not just increase business results. We mean that big data analytics can go beyond cost reduction, optimization, productivity gain, increased efficiency, and so on—by providing analyses from a social perspective.

Besides, it seems that new techniques will form a continuum in BDA, especially congregating data. We understand that integrating silos of data might be a great path to explore. Future works might expand the area, combining IS academic and professionals with other fields, integrating advances such as machine learning and human interaction, and developing systems to integrate others. Furthermore, studies from other disciplines share the IS field. As researchers, we can (and should) join forces with other areas to increase BDA possibilities.

In addition, the absolute absence of publications from South America and African, as well as the modest participation of BRICS, in which Brazil, Russia, and South Africa are still mute in the leading journals, is frightful. Professionals, researchers, and even government agents from these large nations might lose the opportunity to explore a field full of possibilities. We hope that this finding encourages them to expand their research in this area. At the same time, the University of Liechtenstein, for example, might be an outstanding place for the development of data science professionals.

This study contributes to the academy by synthesizing major challenges and concerns regarding big data analytics, presenting its waves and development over time, and indicating research tendencies that can be further explored—that go beyond business efficiency. For practitioners, it presents techniques and models that have been successfully applied and that are rapidly being disseminated. At the same time, it warns about limits and attention to be considered.

We suppose that, in ten years' time, enormous data capacity with a huge processing dimension, accompanied by even more sophisticated and assertive algorithms, will change the world to an exponential degree. Although one tends to be fearful, there is a no way to return. Nevertheless, we believe the scenario is optimistic. Is the technology going to ruin our lives? We strongly believe not. To realize that, we just need to compare our lives with those from a few decades ago. The more technologies develop, the more possibilities there are. It might be an endless race: each time faster, each time better. Big data analytics are good for those who produce and for those who consume. However, it does not give us the right to ignore the impact that technology generates. Debates regarding machines taking our jobs are pertinent and essential,

of course, but it is another chapter of the industrial revolution—which is now performed by other kinds of technology. Further debates and studies are needed to understand (and forecast) changes, defining proper boundaries—whether through ethical, cultural, legal, or other means. However, we believe that, in the end, BDA will help us to make our lives more productive. When the elevator was invented, the obligatory figure of the elevator operator was created. Disruptive technologies go through this process of acceptance in the various spheres of society.

Limitations and Future Research

Although this research enables the accomplishment of a broad picture of BDA among the most acknowledged journals, this study is limited by the method adopted, contemplating only the eight major journals in IS. More studies expanding this perspective could provide a broader view of the field.

References

- Abbasi, A., Sarker, S., and Chiang, R. H. L. 2016. “Big Data Research In Information Systems: Toward an Inclusive Research Agenda”, *Journal of the Association of Information Systems* (17:2), pp. 1–32.
- Aversa, P., Cabantous, L., and Haeffliger, S. 2018. “When Decision Support Systems Fail: Insights for Strategic Information Systems from Formula 1”, *Journal of Strategic Information Systems* (27:3), pp. 221–236.
- Baesens, B., Bapna R., Marsden J. R., Vanthienen, J., and Zhao J. L. 2016. “Transformational Issues of Big Data and Analytics in Networked Business”, *MIS Quarterly* (40:4), pp. 807–818.
- Breuker, D., Matzner, M., Delfmann, P., and Becker, J. 2016. “Comprehensible Predictive Models for Business Process”, *MIS Quarterly* (40:4), pp. 1009–1034.
- Brynjolfsson, E., Geva, T., and Reichman, S. 2016. “Crowd-Squared: Amplifying the Predictive Power of Search Trend Data”, *MIS Quarterly* (40:4), pp. 941–961.
- Chatla, S. B., and Shmueli, G. 2017. “An Extensive Examination of Regression Models with a Binary Outcome Variable”, *Journal of the Association for Information Systems* (18:4) pp. 340–371.
- Chau, M., and Xu, J. 2012. “Business Intelligence in Blogs: Understanding Consumer Interactions and Communities”, *MIS Quarterly* (36:4), pp. 1189–1216.
- Chen, D. Q., Preston, D. S., and Swink, M. 2015. “How the Use of Big Data Analytics Affects Value Creation in Supply Chain Management”, *Journal of Management Information Systems* (32:4), pp. 4–39.
- Chen, H., Chiang, R. H., and Storey, V. C. 2012. “Business Intelligence and Analytics: From Big Data to Big Impact”, *Journal of Management Information Systems Quarterly* (36:4), pp. 1165–1188.
- Clarke, R. 2016. “Big Data, Big Risks”, *Information Systems Journal* (26:1), pp. 77–90.
- Constantiou, I. D., and Kallinikos, J. “New Games, New Rules: Big Data and the Changing Context Of Strategy”, *Journal of Information Technology* (30:1), pp. 44–57.
- Deng, S., Huang, Z., Sinha, A. P., and Zhao, H. 2018. “The Interaction Between Microblog Sentiment and Stock Returns: An Empirical Examination”, *MIS Quarterly* (42:3), pp. 895–918.
- Galliers, R. D., Newel, S., Shanks, G., and Topi, H. 2017. “Datification and its Human, Organizational and Societal Effects: The Strategic Opportunities and Challenges of Algorithmic Decision-Making”, *Journal of Strategic Information Systems* (26:3), pp. 185–190.
- Grover, V., Chiang, R. H. L., Liang, T., and Zhang, D. 2018. “Creating Strategic Business Value from Big Data Analytics: A Research Framework”, *Journal of Management Information Systems* (35:2), pp. 388–423.
- Gunther, W., Mehrizi, M., Huysman, M., and Feldberg, F. 2017. “Debating Big Data: A Literature Review on Realizing Value from Big Data”, *Journal of Strategic Information Systems* (26:3), pp. 191–209.
- Guo, X., Wei, Q., Chen, G., Zhang, J., Qiao D. 2017. “Extracting Representative Information on Intra-Organizational Blogging Platforms”, *MIS Quarterly* (41:4), pp. 1105–1127.
- Kelly, S., and Noonan, C. 2017. “The doing of Datification (and What this Doing Does)”, *Journal of the Association for Information Systems* (18:12), pp. 872–899.
- Ketter, W., Peters, M., Collins, J. , and Gupta, A. 2016. “Competitive Benchmarking: An IS Research Approach to Address Wicked Problems with Big Data Analytics”, *MIS Quarterly* (40:4), pp. 1057–1080.
- Kitchens, B., Dobolyi, D., Li, J., Abbasi, A. 2018. “Advanced Customer Analytics: Strategic Value Through Integration of Relationship-Oriented Big Data”, *Journal of Management Information Systems* (35:2), pp. 540–574.

- Lash, M. T., and Zhao, K. 2016. "Early Predictions of Movie Success: The Who, What, and When of Profitability", *Journal of Management Information Systems* (33:3), pp. 874–903.
- Lau, R. Y. K., Liao, S.S. Y., Wong, K. F., and Chiu, D., K., W. 2012. "Web 2.0 Environmental Scanning and Adaptive Decision Support for Business Mergers And Acquisitions", *MIS Quarterly* (36:4), pp. 1239–1268.
- Lehrer, C., Wieneke, A, Brocke, J. V., Jung, R, Seidel, S. 2018. "How Big Data Analytics Enables Service Innovation: Materiality, Affordance, and the Individualization of Service", *Journal of Management Information Systems* (35:2), pp. 424–460.
- Li, W., Chen, H., and Nunamaker, J. F. 2016. "Identifying and Profiling Key Sellers in Cyber Carding Community: AZSecure Text Mining System", *Journal of Management Information Systems* (33:4), pp. 1059–1086.
- Loebbecke, C., and Picot, A. 2015. "Reflections on Societal and Business Model Transformation Arising from Digitization and Big Data Analytics: A Research Agenda", *Journal of Strategic Information Systems* (24:3), pp. 149–157.
- Lowry, P. B., Dinev, T., and Willison, R. 2017. "Why Security and Privacy Research Lies at the Center of the Information Systems (IS) Artefact: Proposing a Bold Research Agenda", *European Journal of Information Systems* (26:6), pp. 546–563.
- Lyytinen, K., and Grover, V. 2017. "Management Misinformation Systems: A Time to Revisit ?", *Journal of the Association for Information Systems* (18:3), pp. 1–44.
- Luvizan, S., and Diniz, E. 2017. "Big Data e o Uso Secundário de Dados: Desafios para a Qualidade de Dados e a Inovação", *Conference Paper: ENANPAD*.
- Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., and Byers, A. H. 2011. "Big Data: The Next Frontier For Innovation, Competition, And Productivity", *McKinsey Global Institute*.
- Menon, S., and Sarkar, S. 2016. "Privacy and Big Data: Scalable Approaches to Sanitize Large Transactional Databases for Sharing", *MIS Quarterly* (40:4), pp. 963–981.
- McAfee, A., and Brynjolfsson, E. 2012. "Big Data: The Management Revolution", *Harvard Business Review*, pp. 1–9.
- Muller, O., Junglas, I., Brocke., J., and Debortoli, S. 2016. "Utilizing Big Data Analytics for Information Systems Research: Challenges, Promises and Guidelines", *European Journal of Information Systems* (25:4), pp. 289–302.
- Muller, O., Fay, M., and Vom Brocke, J. 2018. "The Effect of Big Data Analytics on Firm Performance: An Econometric Analysis Considering Temporal Dynamics and Industry Characteristics", *Journal of Management Information Systems* (35:2), pp. 488–509.
- Newell, S., and Marabelli, M. 2015. "Strategic Opportunities (and Challenges) of Algorithmic Decision-Making: A Call for Action on the Long-Term Societal Effects of 'Datification'", *Journal of Strategic Information Systems* (24:1), pp. 3–14.
- Park, S., Huh, S., Oh, W., and Han, S.P. 2012. "A Social Network-Based Inference Model for Validating Customer Profile Data", *MIS Quarterly* (36:4), pp. 1217–1237.
- Saboo, A. R., Kumar, V., and Park, I. 2016. "Using Big Data to Model Time-Varying Effects for Marketing Resource (Re) Allocation", *MIS Quarterly* (40:4), pp. 911–939.
- Shi, Z., Lee, G., and Whinston, A. 2016. "Toward a Better Measure of Business Proximity: Topic Modeling for Industry Intelligence", *MIS Quarterly* (40:4), pp. 1035–1056.
- Tallon, P., Ramirez, R., and Short, J. 2014. "The Information Artifact in IT Governance: Toward a Theory of Information Governance", *Journal of Management Information Systems* (30:3), pp. 141–177.
- Webster, J., and Watson, R.T. 2002. "Analyzing Past to Prepare for Future: Writing Literature Review", *MIS Quarterly* (26:2), pp. xiii–xxiii.
- Zhou, S., Qiao, Z., Du, Q., Wang, G. A., Fan, W., Yan, X. 2018. "Measuring Customer Agility from Online Reviews Using Big Data Text Analytics", *Journal of Management Information Systems* (35:2), pp. 510–539.
- Zuboff, S. 2015. "Big Other: Surveillance Capitalism and the Prospects of an Information Civilization", *Journal of Information Technology* (30), pp. 75–89.