Big Data and Decision-Making: A Structured Literature Review

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Abstract
This study provides a structured literature review on the role of Big Data (BD) and Big Data Analytics (BDA) in supporting the decision-making. The study aims to systematize the knowledge, the primary results and research gaps related to BD and BDA in strategic management and in decision-making, providing a future research agenda. Adopting the methodology of Massaro et al. (2015), the review investigates this phenomenon through a longitudinal approach, analyzing a sample of 97 articles published in high-level scientific journals ranked in ABS list, in the Marketing, Strategic Management, Ethics, Gender, and Social Responsibility area. The study unveils the subject of decisions, factors influencing good decisions and the main effects of using BD and BDA in decision-making. Public sector, non-profit organizations and SMEs deserve more attention. Similarly, new organizational factors, data chain dynamics and inhibitors must be explored to remove the obstacles in decision-making.

Keywords: Big Data Analytics, Big Data, strategic management, decision-making, structured literature review, bibliometric analysis

Introduction
Big data (BD) research has grown over the last few years intensively. However, the ambiguity about their complete taxonomy and their real effectiveness deserves more studies (Hartmann et al., 2014; George et al.,

2016). Literature shows multiple definitions of BD, the absence of a shared theoretical framework in managerial disciplines and high level of interdisciplinarity (Elia et al., 2020). The first descriptive approach to BD was formalized by Laney (2001), who proposed the common Vs properties of the velocity, volume, and variety of big data, which expanded into more characters during the time (Wamba et al., 2015; Gandomi and Haider, 2015). Many studies define BD a massive and complex amount of data sets (Volume), acquired and delivered in real time (velocity) through different sources, structured and unstructured (Variety), such as social media, web pages, commercial transactions, image and video downloads, clinical trials, geotagging, output from sensors and other smart technologies (Laney, 2001; Johnson, 2012; McAfee et al., 2012; Fredriksson, 2015; Gandomi and Haider, 2015; Wamba et al., 2015;). Some studies define BD as a cultural, technological and academic phenomenon based on the interaction of technology and analysis (Boyd and Crawford, 2012). This definition refers both to the tools and processes that can transform such data into strategic resources with high potential but also to the mythological belief, partially validated in literature, that «large data sets offer a superior form of intelligence and knowledge capable of generating previously impossible insights, with the aura of truth, objectivity, and accuracy» (Boyd and Crawford, 2012). Considering the managerial implications of BD paradigm, a second set of properties emerges in literature: veracity and value (White, 2012; Gandomi and Haider, 2015). Veracity refers to the integrity and accuracy of data that can be uncertain or problematic (Alles and Gray, 2016), whatever not monitored by proper analytic tools. Value in Big Data studies refers the potential in supporting the decision-making (Goes, 2014) and the business model design (Wamba et al., 2015), in improving the performance (McAfee et al., 2012) and product innovation (Mayer-Schönberger and Cukier, 2013). However, many firms have not yet successfully leveraged Big Data (BD) to transform their business functions (Chen et al., 2015; Sanders, 2016). Other BD's ontological properties have been added during the time (Kitchin and McArdle, 2016), but even associated to technological aspects. Takin into account the organizational and strategic context, many factors and processes, which may affect the BD and the BDA implementation in the firm, call more debate. BD offer a wide range of social and economic knowledge, which emphasizes the value of perceptive and predictive models to support business decisions (Dubey et al., 2019). Strategic decision-making is a process of making choices under different levels of uncertainty (Milliken, 1987; Petrakis et al. 2016) and the lack of information enhances this uncertainty (Merendino et al., 2018). BD can reduce this lack providing a large set of information, offering the potential to reduce cognitive bias and improve decision-making. However, directors need to develop new

capabilities to perceive, analyse and use this data in strategic decisions. The real value of BD is extracted through the Big Data Analytics (BDA), a branch of Business Intelligence that is structured in technologies, analysis processes, and architectures designed to implement BD, allowing companies to develop innovative managerial approaches and decision-making that improve the organizational performance (Davenport, 2006; Chen et al., 2012). BD and BDA are independent but interrelated concepts (Alles and Gray, 2016). There is a widespread belief that the implementation of BD generates, above all, many organizational benefits, such as operational efficiency and innovation (McAfee et al., 2012; Gobble, 2013), and the competitive advantage (Sivarajah et al., 2017). However, how BD could improve the strategic decisions require further validation and exploration (Abbasi et al., 2016; Erevelles et al., 2016), which makes it possible to verify empirically the potential of these resources, analysing the factors influencing their efficient use in the decision-making. Literature shows that BD increase the automation of operations and strategic decision-making (Markus, 2015). However, these processes required human judgment and they are influenced by managers' behaviour (Newell and Marabelli, 2015). Some authors unveil the risk of confirmation bias, which occurs when managers use data only to confirm their hypotheses and mainly to justify their already taken decisions (Namvar and Cybulski, 2015; Bholat, 2015). Research efforts have been mainly focused on technological issues and, recently, on the value creation processes which represent the real benefit of BD and BDA (Günther et al., 2017; Mazzei and Noble, 2017; Elia et al., 2020). The fragmented nature and the high interdisciplinarity of these subjects call for a systematization of the research carried out along time on BD, BDA and strategic management, especially about the implementation of these technologies in supporting the strategic decision-making. Therefore, this study aims to provide a structured literature review (SLR) to unveil the scientific knowledge on this topic, the research gaps and to provide future research. This analysis contributes to the literature taking a longitudinal perspective anchored to the evolution of strategic management studies shared through the relevant scientific journal in management area. The research findings inform practitioners and academics about the main application and factors influencing the BD implementation for strategic decisions, providing some insights about future research needs. The remainder of the paper is structured as follows: Section 2 shows the methodology; Section 3 presents the results in term of descriptive statistics and bibliometric analysis; Section 4 details critical discussions about the main research themes, gaps, implications and future research. Finally, we drawn some conclusions.

Methods

To systematize the scientific knowledge, content analysis and structured reviews are functional tools to investigate BD phenomenon, considering the high level of interdisciplinarity of this subject and the information asymmetry generated between different conceptual frameworks (Tranfield et al., 2003). We adopted the methodology codified by Massaro et al. (2015), to perform a replicable study. This methodology is articulated in the following phases:

1) Definition of the research questions.
2) Development of research protocol for conducting the review.
3) Development of the coding framework.
4) Selection of articles to be included in the revision.
5) Codification of the Articles.
6) Analysis and critical discussion of the results.

The first research question aims to reconstruct the current knowledge; the second will outline the theoretical approaches adopted over time and the emerging gaps; finally, the third question opens to the possible directions of future research (Massaro et al., 2015). Following this codified approach, the following research questions were identified:

RQ1: How is BD/BDA literature developing according to the role of these technologies in orienting the business strategies and the decision-making?

RQ2: What are the scientific implications and emerging gaps in Strategic Management studies?

RQ3: What are the possible future directions for research?

In the second step, a research protocol was defined, identifying sources, tools, and methods of extraction of the articles to be included in the study (Massaro et al., 2015), applying the principles of the PRISMA protocol (Page et al., 2021). We defined a coding framework to analyse the articles, following these categories: a) timing of publication; b) geographic distribution of authors; c) academic and professional papers; d) journals; e) relevance of paper, through citation analysis; f) relevant keywords and themes. A bibliometric analysis has been performed to verify the co-occurrence between relevant keywords, identifying the main links between concepts and the relevant thematic clusters in BD and BDA research. This analysis has been processed using VOSViewer software to reduce errors at methodological level (Van Eck and Waltman, 2014).

The keywords identified for the first extraction are the following: "big data" OR "business analy*" OR "big data analy*" which leads back to "business analytics", "business analysis" and "big data analysis" or "big data analytics". The research was conducted using the keywords entered in "anywhere", "title", "abstract", and "keywords", to allow the reviewers to have a first perception of the relevance of the articles. To collect the relevant

contributions, we decided to limit the extraction of the sample to the international journals, ranked at 3, 4, and 4 stars, in the Academy Journal Guide provided by the Charted Association of Business Schools (ABS) to include only high-level scientific contributions, classified according to the well-known ranking ranging from one to four stars. In addition, we have considered only the academic journals in the areas of Marketing (MKT), Strategies (STRAT), and General Management, Ethics, Gender and Social Responsibility (ETHICS-CSR-MAN) summarized in Table 1.

Table 1 – Journal sample

Strategy (STRAT):
• Ranking 4*: Strategic Management Journal.
• Ranking 3:Global Strategy Journal; Long Range Planning; Strategic Organization.
Marketing (MKT):
• ranking 4*: Journal of Consumer Psychology; Journal of Consumer Research; Journal of Marketing; Journal of Marketing Research; Journal of the Academy of Marketing Science; Marketing Science.
• Ranking 4: International Journal of Research in Marketing; Journal of Retailing.
• Ranking 3: European Journal of Marketing; Industrial Marketing Management; International Marketing Review; Journal of Advertising; Journal of Advertising Research; Journal of Interactive Marketing (formerly JDM); Journal of International Marketing; Journal of Public Policy and Marketing; Marketing Letters; Marketing Theory; Psychology and Marketing; Quantitative Marketing and Economics.
General Management, Ethics, Gender and Social Responsibility (ETHICS-CSR-MAN)
• ranking 4*: Academy of Management Journal; Academy of Management Review; Administrative Science Quarterly; Journal of Management.
• Ranking 4: Academy of Management Annals; British Journal of Management; Business Ethics Quarterly; Journal of Management Studies.
• Ranking 3: Academy of Management Perspectives; Business and Society; California Management Review; European Management Review; Gender and Society; Gender, Work and Organization; Harvard Business Review; International Journal of Management Reviews; Journal of Business Ethics; Journal of Business Research; Journal of Management Inquiry; MIT Sloan Management Review.

Article have been extracted through EBSCO, Scopus and Web of Sciences platforms, to include all items of selection. In the query we aimed to explore, in the first step, all papers related to BD and BDA in these research areas, and we have not limited the research to a defined period, to have a longitudinal vision of the phenomenon. The extraction has been conducted considering papers published up to January 2021, collecting 2,310 articles. We have excluded editorials, comments, abstract collections,

interviews, book reviews, and documents containing only information relating to the authors and editorial editors present in the sample extracted, reducing at 1,543 contributions. The keyword for the second extraction has been "decision-making" OR "strategic decision*", reducing the sample to 203 articles. Then we read the abstracts, eliminating those articles not related to strategic management and decision-making, leading to a final sample of 97 articles. We provide some descriptive analysis, following the coding protocol, to identify the evolution of scientific contributions over time, the distribution between countries, the analysis of the impact of the citation index (CI), and the citations per year (CPY), the relevant authors. Through the bibliometric analysis we have explored the co-occurrences between keywords, identifying the main thematic clusters and the relevant conceptual networks (Massaro et al., 2015). Using the authors' keywords, the network analysis of co-occurrence (van Eck and Waltman, 2009) have been performed, visualising articles where these keyworks occur together almost 3 times at least. We have combined this technique with the cluster analysis (Kessler, 1963), visualising those articles with high number of similar references and similar subject. Finally, we have identified the thematic networks (Newman, 2004), unveiling the distances between nodes (themes) and visualising those thematic clusters that reduce this distance. Finally, content analysis has been processed to the final sample (Broadbent and Guthrie, 2008; Massaro et al., 2015), defining the theories applied, methodology, the main research themes, research findings and limitations.

Results

This section aims to answer RQ1, about the development of literature on BD/BDA in management studies. The scientific production on BD and BDA, in the sample, presents a fluctuant distribution of publications from 2012 to 2021 (Fig.1), with a relevant growth in 2016 and 2019. This discontinuity reflects the contextual weak implementation of BD and BDA in the firm (Ardito et al., 2019).
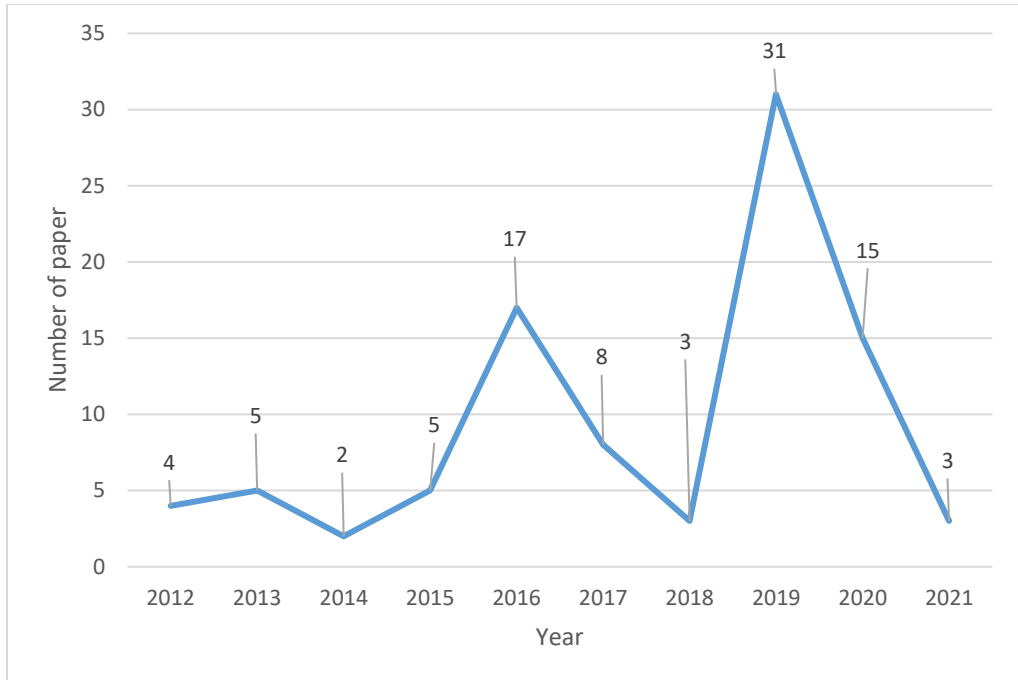
Figure 1 – Evolution of scientific production per Year

The main part of articles (Tab. 2) of the sample (57%) has been published in General Management, Ethics, Gender, and Social Responsibility area (ETHICS-CSR-MAN), followed by Marketing (MKT) and Strategic Management area (STRAT). The most prolific journals (Tab.3) are the Journal of Business Research, with 22 scientific papers, followed by Industrial Marketing Management (21 articles), and by the professional journals Harvard Business Review and MIT Sloan Management Review, with 14 and 9 contributions, respectively. Journals belonging to the STRAT area, in ten years, show only 2 contributions, published in the Journal of Strategic Organization and 1 article in Long Range Planning. This distribution is attributable to the interdisciplinarity of the subject and its practical implications, which results in its treatment being more linked to the transversal General Management, Ethics, Gender, and Social Responsibility area and Marketing.

The citations analysis allows us to understand better the impact that scientific production on BD and BDA has in management literature, unveiling the quality of research (Crossan and Apaydin, 2010).

Table 2- Research fields

Field	No.papers	4*	4	3	%	No.citations
		Journal ranking				
STRAT	3	0	--	3	3%	2253
MKT	37	6	5	26	40%	1460
ETHICS-CSR-MAN	53	0	6	47	57%	16909
Total	93	6	11	76	100%	20622

**Table 3** - Distribution of papers across the Journals in management area

Journals	Research Field	ABS Ranking	No. of articles
Journal of Consumer Research	MKT	4 *	1
Journal of Marketing	MKT	4 *	3
Journal of the Academy of Marketing Science	MKT	4 *	1
Marketing Science	MKT	4 *	1
International Journal of Research in Marketing	MKT	4	2
Journal of Retailing	MKT	4	3
British Journal of Management	ETHICS-CSR-MAN	4	5
Business Ethics Quarterly	ETHICS-CSR-MAN	4	1
Long Range Planning	STRAT	3	1
Strategic Organization	STRAT	3	2
European Journal of Marketing	MKT	3	2
Industrial Marketing Management	MKT	3	21
International Marketing Review	MKT	3	1
Journal of Advertising	MKT	3	1
Marketing Letters	MKT	3	1
California Management Review	ETHICS-CSR-MAN	3	2
Harvard Business Review	ETHICS-CSR-MAN	3	14
Journal of Business Research	ETHICS-CSR-MAN	3	22
MIT Sloan Management Review	ETHICS-CSR-MAN	3	9

The distribution of citations until 2021, updated at April 9, 2022 (Fig.2), unveils a decreasing trend of three peaks in 2012, 2016, and 2019; the most cited studies are linked to General Management, Ethics, Gender, and Social Responsibility area that is the most productive too. The Strategic area shows studies with a greater influence, with 2253 total citations, in contrast with the most prolific marketing area that receive 1460 citations. Using CI index (Tab. IV), the most influential paper is McAfee et al. (2012), followed by Sivarajah et al. (2017), Wamba et al. (2016), Erevelles et al. (2016) and Davenport et al. (2012). These studies focus on investigating the challenges that affect organizations in implementing techniques, technologies and analysis methods in BD, extracting the strategic skills in capturing value and opportunities from data. These results are partly confirmed by the use of the citation parameter per year (CPY). The only

variation is the ranking for the article of Wedel and Kannan (2016), with a study that focuses on examining the analytics available in organizations to support marketing decision-making.
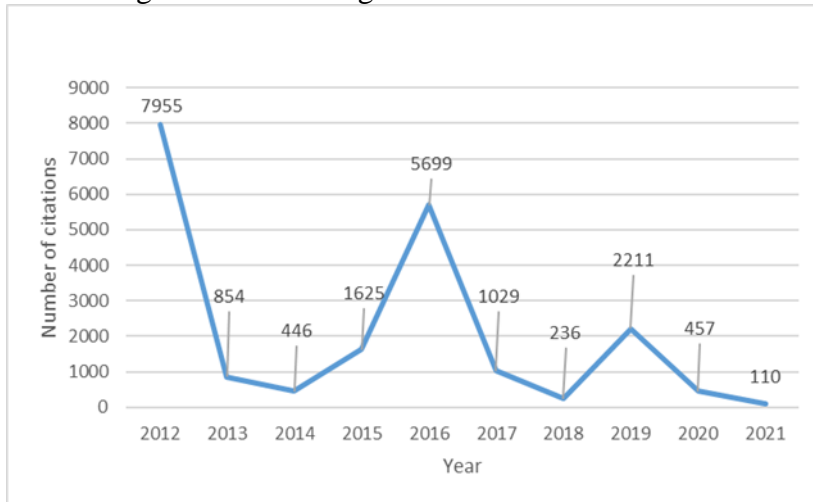

Fig. 2. No. of Citations

Table 4 - Most cited papers

Author (-s)	Title	CI	CYP	Journal
McAfee *et al*. (2012)	Big data: the management revolution	6793	672,67	Harvard business review
Sivarajah *et al.,* (2017)	Critical analysis of Big Data challenges and analytical methods	1919	314,80	Journal of Business Research
Wamba *et al*. (2016)	Big data analytics and firm performance: Effects of dynamic capabilities	1517	225	Journal of Business Research
Erevelles *et al.* (2016)	Big Data consumer analytics and the transformation of marketing	1388	184,50	Journal of Business Research
Davenport *et al.* (2012)	How big data is different	1195	102	MIT Sloan MR
Wedel and Kannan (2016)	Marketing analytics for data-rich environments	861	138	Journal of Marketing

Observing the authors' affiliation, we have analysed the geographical distribution of the countries based on the collaborations between the authors (Fig. 3). The most productive country is the USA with 50 articles, followed by UK and France, respectively with 28 and 10 references. This data unveils the mature experience of Anglo-Saxon' scientific community in this research field. However, considering the size of geographical macro-regions, Europe, with 66 articles, is a relevant scientific community on this theme, followed by North America (56 articles) and Asia (16 articles).
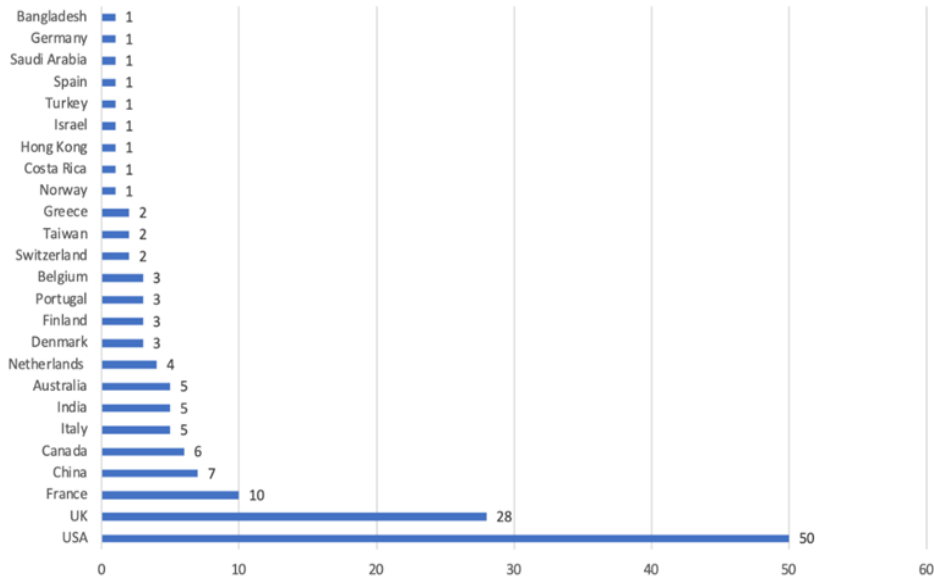
Fig. 3 Geographic distribution of research

This observation has been integrated distinguishing between academics and professionals. In the sample, 22% of the studies involves authors from the non-academic world. Specifically, 9.7% of the sample presents one professional author, while 4.2% is composed of two and more non-academic authors. However, the large part of literature derives from academics, showing a strong scientific footprint in the knowledge development in this subject.

Discussion: the main research themes

We have conducted a cluster analysis by carrying out a study of the co-occurrences of the keywords belonging to the contributions of our sample. The analysis of the occurrence of keywords can be used to create co-words maps (Fig. 3) that show the correlations between the main themes investigated in this research domain. We performed the cluster technique (Van Eck and Waltman, 2009; 2014), using the VOSviewer software, setting the counting method as "full counting" and considering the documents in which the keywords occurred at least twice (threshold). Tabe V shows the 25 keywords merged according to the recurrence in the sample, and 4 different clusters. The most used keywords are Big Data (30), Big Data Analytics (15), Firm performance (6), and Decision Making (4). Figure 5 shows the ties between the research themes and the distance between them. We have found an association between the themes "decision making", "value creation", "capabilities" and the "Knowledge-based view". The blue cluster

connects with the red and yellow clusters with the term "Big Data" (red cluster) which is the central element of our survey. The red cluster includes the words "Analytics", "Artificial intelligence" and "Machine Learning" and it focuses on technological factors of this subject. The yellow cluster connects "Firm performance", "Marketing analytics" and "Customer relationship management", while the "Dynamic capabilities" (purple cluster) turns out to be a concept more tied to the studies concerning "Firm performance", "Data analytics" (purple cluster), and the "Big data Analytic" (green cluster). This distribution highlights that the elements allow the "Capabilities", the "Decision making" and the "Value creation" are investigated distantly compared to those technological factors such as "Artificial intelligence" and "Machine learning" and the items related to " Business Performance "and" Marketing Analysis". This analysis unveils that the main theoretical issues that have been highlighted by authors' keywords are the knowledge-based view, the dynamic capabilities and the complexity theory.
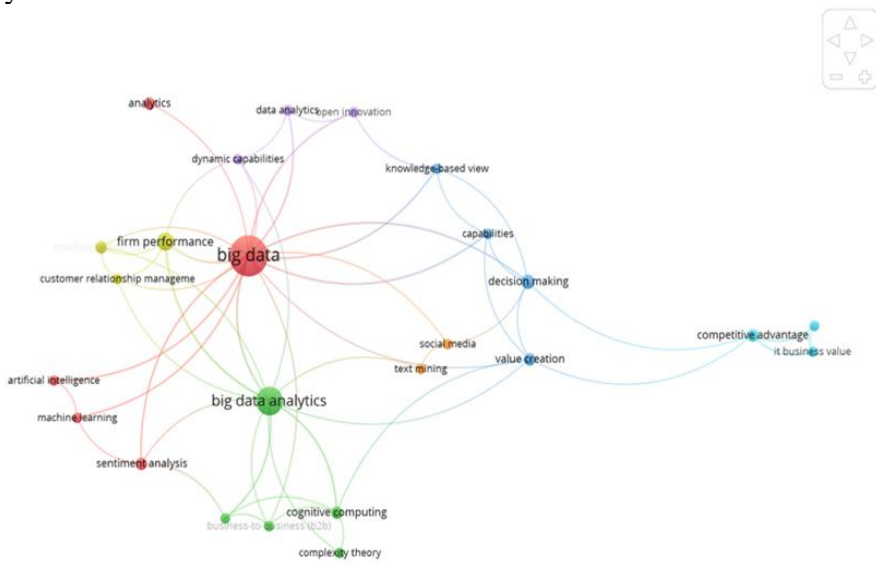

Figure 3 – Keyword analysis

The content analysis, performed through Nvivo Software and reading the papers, shows two main research themes: a) the organizational benefits generated through the BD/BDA applications; b) the relationship between the BD/BDA and the decision-making process (Tab. 5).

Table 5 - Main themes in management studies

Themes	Key features	Main papers
BD/BDA and organizational benefits	Market responsiveness Competitive advantage Cost saving	*Woerner and Wixom, 2015; Erevelles et al., 2016; Bradlow et al., 2017; Côrte-*

	Customer relationship Management	*Real et al., 2017, 2019; Ren et al., 2017; Sumbal et al.,*
	Customer experience Revenue growth Supply chain management and retailing Knowledge management Open innovation Pricing Decision-making Human resource management Decting crisis	*2017; Toubia and Netzer, 2017; Wamba et al., 2016; Chen et al., 2019; MIkalef et al., 2019a; 2020; Ghasemaghaei and Calic (2019); Elia et al., 2020; Holmlund et al., 2020; Yasmin et al., 2020; Zhang H. and Xiao, 2020; Zheng et al., 2020; Zhang C. et al., 2020; Stourm et al., 2020; Hajili et al., 2020; Holland et al., 2020; Hung et al., 2020; De Luca et al., 2020; Farrokhi et al., 2020; Steinberg et al., 2020; Brinch et al., 2021; Du et al., 2021; Zhang Y et al., 2021*
BD/BDA and decision-making process:		
a) *effects*	Cognitive overload and cognitive bias Greater individual skills Internal tension managing excess of data Greater responsibilities in the board Predictive decisions Corporate governance dynamics	*Merendino et al., 2018; Janssen et al., 2017; DalleMule and Davenport, 2017; Troisi et al., 2020; Van Rijmenam (2019); Kauffman et al., 2020; Liu et al., (2017; 2020); Jabbar et al. (2020)*
b) *factors influencing good decisions*	Internal co-ordination between decisors Strong collaborations with external experts and BD providers High individual BD capabilities Knowledge transfer on BD and BDA Clear contracts and procedures in BD sourcing Integration and standardization in BD chain Accurate data	*Tobaccowale and Gupta (2016); Janssen et al., (2017); Davenport and Bean (2018); Merendino et al. (2018), Lin and Kunnathur, 2019; Mikalef et al., (2019b);Parra-Moyano (2020); Yasmin et al. (2020)*

		Structural factors (infrastructures, organizational culture)	
c)	subject of decisions	Marketing strategies Organizational strategies Sustainable policies Human Resource Management Innovation policies	*Chen et al. (2019); Hajili et al. (2020); Jabbar et al. (2020); Gnizi (2019); Kauffman et al. (2020); Toubia and Netzer (2017).*

Managerial literature considers interrelated the concepts of BD and BDA, neglecting technological differences related to the resources (BD) and the processes (BDA). A large set of articles explore the contribution of BD and BDA in marketing decisions and marketing activities. Both theoretical and empirical papers unveil many uses of these technologies and the related dynamic capabilities in improving customer experience (Holmlund et al., 2020), market analysis, market sensitiveness and customer loyalty programs (Erevelles et al., 2016; Liu et al., 2017; 2020; Holland et al., 2020; Kauffman et al., 2020; Stourm et al., 2020; Zhang C. et al., 2020, Du et al., 2021). Other studies exploit the contribute of BD and cognitive computing in managing supply chain relationships and retailing (Sanders, 2016; Bradlow et al., 2017; Dekimpe, 2020; Hung et al., 2020; Martin et al., 2020;; Zheng et al., 2020), in promoting open innovation, in orienting pricing policy and product development (Toubia and Netzer., 2017; Chen et al., 2019; Mikalef et al., 2019b, Steinberg, 2020; Zhang H. and Xiao, 2020), and in detecting crisis (Farrokhi et al., 2020). The rationale of these studies is to explore the usefulness of BD and BDA in contributing to business performance, verifying the mediating role of dynamic capabilities. Few papers verify empirically this relationship, through survey or multiple case study methods. Even if these researches show that BD amplify the dynamic capabilities useful to improve the financial performance, there are ambiguous findings around the nature of these capabilities: some papers unveil the greater role of infrastructures and human resources skills (Wamba et al., 2016; Hajli et al., 2020; Salvi et al., 2021); other papers consider relevant only managerial skills and organizational factors (Mikalef et al., 2019b; Parra-Moiano et al., 2020; Yasmin et al., 2020; Brinch et al., 2021). Recent literature reviews (Günther et al., 2017; Batistič and van der Laken, 2019; Elia et al., 2020) systematize the literature on BD and performance, showing other organizational benefits that refer to cost saving and productivity (Ren et al., 2017) profitability, cost leadership and revenue growth (Woerner and Wixom, 2015; Côrte-Real et al., 2017, 2019; Mikalef et al., 2019a; 2020), in improving the knowledge management activities (Sumbal et al., 2017), in

promoting innovation capabilities (Ghasemaghaei and Calic, 2019). Other conceptual papers explore new research agenda in managerial sciences about the role of BD on innovation strategies (Sheng et al., 2017; 2020). These studies suggest exploring new trends in human resource work conditions, customer behaviours and web marketing experiences, and to observe how BD could enhance sustainability in supply chain management and product development.

Only a paper in the sample refers to public sectors, exploring the ability of BD in improving the quality of care in health organizations (Wang et al., 2019). Private company remains the main organizational setting explored.

Focusing the attention on the role of BD and BDA in supporting the strategic decisions, this research confirms a large set of conceptual papers that exploit the potential of BD in improving decision-making. Many papers refer to the relationship between these technologies and the decision-making in uncertain contexts (Van Rijmenan et al., 2019; Gnizy, 2019), exploring factors fostering good decisions (Shah et al., 2012; Schrage, 2016; DalleMule and Davenport, 2017; Janssen et al., 2017; Davenport and Bean, 2018; Zeng and Glaister, 2018; Merendino et al., 2018) or suggesting new theoretical perspective anchored to BD capabilities (Lin and Kunnathur, 2019). Oldest papers provide theoretical contribution about the cause-effect relationship between BD, BDA and good decisions, while the recent studies explore empirically this relationship, adopting qualitative research methods that involves CEO or IT managers. The main findings show the presence of inertia and a cognitive overload on individual directors generated by the excess of data. To solve this situation, a common BD culture among decision-makers and strong internal co-ordination and BD capabilities are essentials. Scepticism on data, team compositions and historical knowledge (Schrage, 2016) influence managers in the decision making. Sometimes, organisations respond proactively, developing internal BD capabilities or collaborating with external experts and providers of data (Merendino et al., 2018; Lin and Kunnathur, 2019).

Janssen et al. (2017), through a case study, highlight many factors that could influence the decision-making process based on BD and BDA. These factors are the followings: BDA capabilities and knowledge transfer about data; collaboration between BD providers, decision-makers and BD analysts; clear contracts, transparent procedures and responsibilities between the firm and the BD providers; integration and standardization of BD chain; accurate data and skilled decision-makers. Other qualitative papers on data strategy provide theoretical framework (DalleMule and Davenport, 2017) or case study (Troisi et al., 2020). The professional paper of DalleMule and Davenport, published on Harvard Business Review, show a theoretical

framework that aims to address companies in strategic data management, considering the trade-off between the defensive and the offensive approach. The authors define the offensive strategies more flexible and focused on supporting the organizational performance, through activities such as data analysis and data modelling, that aim to improve the customer insights and to support the decision-making. Conversely, defensive strategies are standardized and aimed to ensure the data security and quality and to reduce the data risks, through activities such as data privacy, the use of analytics to detect the data fraud and the control of data structure. However, this contingent approach, developed on a single case study, is not verified in literature. Using the action research methodology, Troisi et al. (2020) confirm the usefulness of BD in accelerating innovations, strategic decisions and improving managerial capabilities. However, the large amount of data is difficult to be managed and understood and decision makers may loss relevant knowledge when it's not clear how BDA generates certain results (Günther et al., 2017). Other papers explore the role of BD and BDA in addressing the organizational strategies (Nunan and Di Domenico, 2017), specific marketing strategies (Jabbar et al., 2020; Kauffman et al, 2020; Hallikainen et al., 2020), human resource management policies (Zhang Y et al., 2021; Gupta et al., 2020) and sustainable policies (Sivarajan et al., 2020). The main theories applied in interpreting this phenomenon are the Knowledge Based view of the firm, the dynamic capabilities theory, and the resource-based view. These theories focus the analysis on the internal factors that can sustain the firm's competitive advantage. Other managerial theories refer to affordance theory of Gibson (1979), the actor network theory, the complexity theory and the organizational learning theory.

Research gaps and future directions

Literature in the main scientific journals in management studies unveils few longitudinal research and few quantitative studies, to generalize the findings. Several studies explore single or multiple case studies, providing contingent research findings. A recent paper, not included in the sample, show the positive relationship between dynamic capabilities and decision-making quality in a sample of 240 agricultural firms (Li et al., 2022). However, this quality has been measured using a static model and through categorical variables with a mean value close to neutral value of 3, using a Likert scale that ranged from 1 to 5. The main perspective is the application of BD/BDA observing the internal processes, neglecting the supply chain of data and the external dynamics between managers and data suppliers. Many papers explore the customer engagement in BDA to gain usefulness in decision-making, while the role of providers remain underexplored. Other limitation refers the overlap between similar themes,

such as machine learning and artificial intelligence, cognitive computing, analytics and BD, that requests an integrate perspective of the phenomenon, keeping a clear taxonomy of these technologies. Few studies observe this subject in the developing countries or explore the relationship between BD/BDA and the social and environmental issues. Private company remains the main organizational setting explored, while the support and the dynamics of BD/BDA in decision-making in public administration or non-profit organizations are unclear. Similarly, the SMEs or the family firms are underexplored.

The mediating effect of some organizational factors, such as the corporate governance features, the organizational culture or the leadership style might be explored, to verify how they contribute to leveraging BD and BDA to improve decision-making. Organizational theories might constitute a fertile area to explore the cultural drivers or barriers in the BD/BDA application for decision-making. Similarly, Intellectual Capital perspective might provide a strategic and systemic point of view of this phenomenon (Secundo et al., 2017). BD and BDA are relevant intellectual assets that might generate profitability and the Intellectual Capital perspective considers both the internal capabilities and the external relationships between the firm and the strategic stakeholders.

Inhibitors factors deserve attention to remove the obstacles in decision-making, especially those factors related to the difficult in managing the overload of data and the integration between the providers and the firm's infrastructures in the BD chain. Opportunistic behaviours and resource-dependency dynamics in BD supply chain might be explored in future studies.

Conclusion

Nowadays, big data cover a growing interest in the research agenda of academics and practitioners. How BD and BDA improve the decision-making process and the competitive advantage of the firm deserves an in-deep exploration. Behind the high potential theoretically stated, the knowledge related how these technologies and resources are implemented is linked to few case studies related to big companies, while in the SMEs there is a small percentage of success. Therefore, the main inhibitory factors and which managerial and organizational approaches could make efficient the decisional processes deserve more investigations. This SLR's contribution is twofold: a) to systematize the relevant literature and research findings for academic, inspiring future research issues on this subject; b) to identify useful operational implications to managers engaged in implementing and exploiting BDs, highlighting both the main results and inspiring new behaviours regarding their use. This SLR shows that the literature on BD and

strategic decisions is still in a stage of understanding the phenomenon, trying to capture the impact of the characteristics, factors, applications, and dynamics related to their use in strategic decision-making. Some conceptual papers have been validated through empirical surveys, suggesting a new research stage in BD literature. Future studies need to maintain the interdisciplinarity perspective, considering the technical factors, organizational and managerial factors that influence the effective implementation of BD and BDA in decision-making. However, this subject suffers a research trap: many papers try to introduce new theoretical lens and managerial approaches generating an overload of theory without strong validations and practical usefulness of these models.

Practical implications of this study refer to those factors that have to be managed to make the firms more agile in implementation of BD, focusing the attention on BD chain and on individual BD capabilities. Internal co-ordination between technical staff and the decision team, more investments in BD education, agile organizational structure, more distant from silos structure, and co-production with providers of data are essentials to make more effective the implementation of BD in decision-making.

Some limitations of this study can be traced back to the methodological choices made in the literature review, that has considered only the top journals in the ABS ranking. A second limitation concerns the exclusion of conference papers and book chapters, in which different and interesting research perspectives can be found. Despite using a structured approach to the literature analysis, the inclusion of some articles in the data strategy area in the final sample suffer to subjective judgment by operators, which may be subject to known decision biases (Wamba et al., 2015). Considering these limitations, it is an interesting prospect to repeat this study, considering a less stringent selection approach, creating a complete overview of the phenomenon.

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Appendix A – List of reviewed articles

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