

The Relationship between Big Data and Decision Making. A Systematic Literature Review

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Abstract

The increasing use of big data within the economics field has led academics and professionals to broaden the investigation of its consequences in corporate decision-making processes. Until now, scholars and managers have been focused only on the technical aspects of big data, without emphasizing the influence they exert on the effectiveness of decision-making systems. Firstly, this paper aims to review the literature which concerns the study of the relationship between the use of big data and its effectiveness in corporate decision-making system. Secondly, it provides relevant evidence to analyze whether big data acts as a facilitator for the implementation of advanced decision-making models and eventually how. In this aspect, our work identifies the key factors that support the corporate decision-making process by proposing a possible corporate governance model. The theoretical framework that we have adopted relies on big data management studies, with a specific focus on the implications which show that the use of big data can generate the decision-making dynamics of companies and organizations. The current paper provides both theoretical and managerial contributions to the literature on big data and decision making, defining future perspectives to advance knowledge in this research area.

Keywords

Big Data, Decision-Making Processes, Corporate Governance Model, Effectiveness, Relationships

1. Introduction

The growing interest in the diffusion of big data in the economic scope—business, has led academics and professionals to deepen the study of the changes induced by the use of new technologies in corporate decision-making processes. So

far, scholars and managers have put their efforts solely on the technical aspects of big data, without emphasizing the influence that the latter exert on the effectiveness of decision-making systems.

In order to be able to effectively govern company processes, managers are called upon to make strategic decisions; this is necessary to guide companies in an increasingly dynamic and competitive market. Due to the high level of uncertainty and the risk that characterizes strategic decisions (MacKenzie et al., 2011), the collection, analysis, consideration of reliable data, and information have a fundamental importance in strategic decision-making (Nicolas, 2004). Consequently, in an unstable context, organizations have to link their strategic dimension with their knowledge resources (Nonaka, 1988, 1994).

Knowledge originates in people's minds and if managed effectively it can help organizations create value. Knowledge management (KM) is generally defined as a systematic process for creating, sharing and implementing knowledge.

In this sphere, Alavi and Leidner (2001: pp. 129-130) define a KM system as an information technology (IT) system, which is developed to facilitate and support the creation, dissemination and implementation of knowledge in enterprises.

KM initiatives involve social and cultural aspects of the organization and rely on IT as an enabling factor (Alavi & Leidner, 2001: pp. 132-134). Therefore, KM systems are used to identify, share and use knowledge, but also to incorporate it into problem identification and resolution processes.

O'Leary (2013) argues that, to extract information from big data that can generate value for an organization, it is necessary to develop and apply new data mining techniques or exploit artificial intelligence. Consistent with these arguments, other scholars (Jensen, Panagiotou, & Kousk-oumvekaki, 2014; Karaa, Mannai, Dey, Ashour, & Olariu, 2016; Yang, Swaminathan, Sharma, Ketkar, & Jason, 2011) have emphasized the role of IT and, in particular, of big data in favoring the pursuit of a variety of purposes in different sectors.

Bouzembrak and Marvin (2016), for example, used a Rapid Alert System for Food and Feed (RASFF) database to identify and monitor food fraud and food safety risks. Another source of textual information is scientific databases, from which food safety hazards can be identified (Lucas Luijckx, Van de Brug, Lee-man, Van der Vossen, & Cnossen, 2016; Van de Brug, Luijckx, Cnossen, & Houben, 2014). Following these sources, Ferrandez-Pastor et al. (2016) used a new information and communication technologies to develop a low-cost sensor and actuator network platform. This platform aims to optimize production efficiency, increase quality, minimize environmental impacts and reduce the use of resources such as energy and water. Other scholars (Wolfert et al, 2017: pp. 72-74; Coble et al., 2018) have conducted a survey on the application of Big Data in the agricultural sector. They highlighted how Big Data is used in order to provide farmers predictive information on business operations and operational decisions

in real time. Liakos et al. (2018) explored the current state of machine learning techniques in agriculture, arguing that real-time artificial intelligence enables computer programs to generate recommendations and insights that can support farmers' decision-making processes. These considerations are adequately reflected in the results of a 2012 economist intelligence unit report, in which it is emphasized that most companies and organizations declare the need to incorporate big data into decision-making processes. In fact, there are still many companies that face situations of poor data quality on a daily basis. One reason could be a lack of understanding of how interrelated strategic decision-making and big data are. So far, scholars (Davenport, 2013; Hazen et al., 2014; McAfee et al., 2012; Chen et al., 2012; O'Leary, 2013) have mainly focused on the characteristics and potential of IT, without giving an adequate echo to the effective contribution that these tools are able to ensure to the decision-making dynamics of companies and organizations. Until now, no proper attention is paid to the analysis of the relationship between big data and decision making, leaving open the question of the actual levers in which, the use of big data is able to activate for the improvement of business decision-making processes.

In this sphere, this paper aims, to systematize the literature on the relationship between the use of big data and the effectiveness of corporate decision-making systems. On the other hand, it will also provide useful elements to explain if and how Big data are positioned as facilitators the implementation of advanced decision-making models. In this regard, the paper seeks, to identify the possible levers that support corporate decision making, proposing a possible model of corporate governance.

The adopted theoretical framework raises the attention in big data management studies (Wang et al., 2016; Jeble et al., 2017; Shamim et al., 2019), taking into consideration possible implications that the use of big data is able to determine the decision-making dynamics of companies and organizations. Furthermore, this paper, provides both a theoretical and managerial contribution to the literature on big data and decision making, outlining possible future scenarios capable of increasing knowledge on these lines of research. In order to pursue the stated research aims, the paper is structured as follows. The first section describes the methodology used and the main theoretical contributions analyzed. In the second section the results and discussions of the work are discussed. Finally, the third section analyzes the conclusions which the work allows us to reach, as well as the main theoretical and managerial implications.

2. Research Methodology

Considering the indications provided by Kitchenham (2004: pp. 2-4), Kitchenham et al. (2007: pp. 317-319) and Kitchenham et al. (2009: pp. 8-10), a systematic literature review was conducted by specifying the phases implemented from time to time: (i) development of the review protocol; (ii) identification of in-

clusion and exclusion criteria for relevant publications; (iii) in-depth study analysis, followed by critical evaluation, data extraction and a summary of past results.

The logic behind this systematic literature review was to describe the phases that characterize the paper selection process, through the development of a protocol. Following the approach suggested by Smith et al. (2008: pp. 12-13), the protocol has acknowledged the research questions that led the selection of documents, the research strategy, the inclusion and quality criteria, as well as the review method. They are:

- 1) *What are the fundamental aspects of the relationship between the use of big data and the effectiveness of corporate decision-making systems?*
- 2) *What are the useful elements to explain if and how big data can facilitate the implementation of advanced decision-making models?*

Since the paper selection process is relevant to provide scientific value to the systematic literature review, various inclusion and exclusion criteria have been applied. Thus, we decided to focus on studies that addressed, firstly, the role of big data to support the implementation of advanced decision-making models within companies. Secondly, only papers published from 2015 to 2020 were selected. In order to have scientific papers on the topic as up-to-date as possible, and to leverage a time period in which the associated theme, moreover, a corporate dynamic, has found a great resonance.

The systematic literature review focused on research papers published on both national and international scientific journals, as well as on reports directed to both corporate executives and a wider audience. Papers that were still in publication at the moment of selection and those not written in English were excluded. Finally, since the aim of our work is to analyze the role of big data in encouraging the implementation of appropriate decision-making models within companies, quantitative and qualitative analyses, and case study analyses have been included. Also, a wide range of epistemological approaches has been chosen to remark the interdisciplinary nature of the topic of interest.

The selection process started from arranging specific phases that have been later combined to identify precise keywords. In order to reduce the number of search stages, similar filters have been merged together. In fact, combinations of two sets of keywords were used by including “big data” as the first term and deriving the second one from terms examined by a group of industry experts. These terms are: resource management, dynamic capabilities, decision making, strategic management, big data, big data management, Ict, decision support systems, management systems, human resource. Keywords were searched within the titles, abstracts and keywords of the papers. Research was conducted using Scopus, Web of science and Emerald databases. Also, keywords were looked for in Google Scholar.

The research began on the 15th of July 2020 and ended on the 21st of October 2020. In phase one, 329 papers were identified and selected. In phase two, all authors reviewed the study titles of phase one to determine their relevance to

the work search goals. At this stage, studies that did not account for the business aspects of big data were excluded. Then, the number of selected papers was 228. In phase three, all the remaining articles were examined and evaluated, by reading the abstracts and assessing their consistency with the proposed research objective. Indeed, some papers lacked of topic-related information, while others were shown to not pertain to the stated research question. At this stage, the abstract of each article was independently reviewed by each author. Out of 228 evaluated abstracts, 130 were excluded, leaving 100 articles for further analysis.

Among these, another selection process was carried out by each author independently, classifying papers on the basis of specific quality criteria. In particular, in the name of scientific rigor, only those papers that contained appropriate research methodologies were picked; concerning credibility, only those papers presenting results correctly were chosen and, finally, relevance-wise, practicality of results for managers and academics engaged in big data projects was an important point that was accounted for. Therefore, in the last phase, 52 papers were also excluded, and only 36 papers remained available for the extraction and synthesis of data (as shown in **Figure 1**).

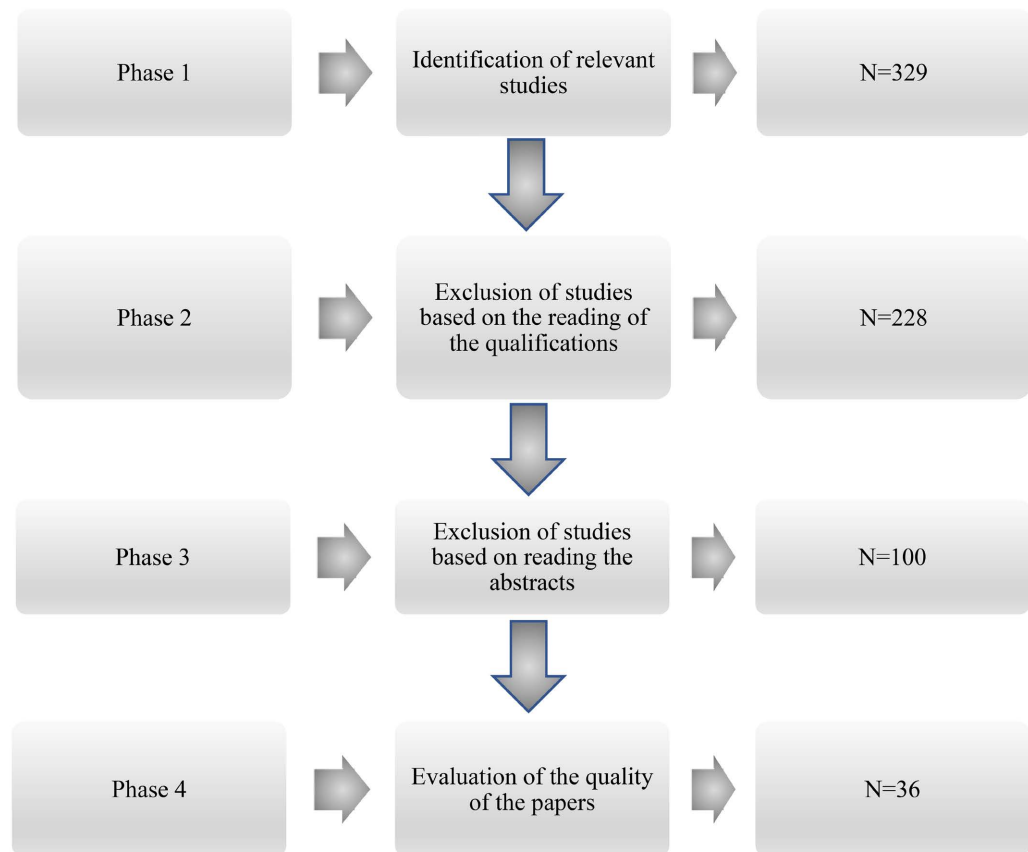
Papers have been divided according to their area of interest. The above-mentioned categories are the result of the identification of the main research areas to which the papers aim to provide a contribution. The regrouping of the papers made it possible to extract the elements necessary to answer the research questions stated.

In order to summarize the results and classify the studies according to the reference area, an analysis of the various research lines was performed. The first step was to identify the main concepts of each study, using the authors' original terms. The key concepts were organized in an excel spreadsheet, in order to allow the comparison between the studies and the translation of the results into interpretations consistent with the purposes of the study. An analysis was conducted based on the following areas of interest: 1) influence of big data on business decision-making mechanisms, 2) human skills and knowledge, 3) tangible and intangible resources, 4) adoption and dissemination of big data initiatives, 5) decision-making support tools. With reference to the empirical studies, the type of study conducted (e.g. qualitative analysis, quantitative analysis, case study analysis), the sample size, the tools used (e.g. surveys, interviews, observations), as well as the contextual factors that relate under study (e.g. industry, country, company size) have been identified.

Frequent coordination meetings among all researchers defined the data extraction phase and the categorization of publications. The remaining 36 papers were analyzed in detail according to the coding scheme, and the relevant data were extracted, analyzed and synthesized:

The full text of the selected articles was retrieved from the "Web of Science", and "Scopus" databases and, when not available, from external sources.

Table 1 shows the title, authors, journal name and publication date (descending) of each of the 36 selected papers:



Source: authors' elaboration

Figure 1. Phase of the paper selection process.

Table 1. Selected papers.

TITLE-AUTHOR(S)	JOURNAL-DATE
<i>Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation projects</i> —Wamba-Taguimdje, Serge Lopez; Fosso Wamba, Samuel Kala Kamdjoug, Jean Robert Tchatchouang Wanko, Chris Emmanuel—(Wamba-Taguimdje et al., 2020)	Business Process Management Journal-2020
<i>Data Value, Big Data Analytics, and Decision-Making</i> —(Monino, 2021)	Journal of the Knowledge Economy-2020
<i>Decision-making Technology Based on Big Data</i> —(Vissia et al., 2020)	Pattern recognition and image analysis-2020
<i>Artificial intelligence and machine learning as business tools. A framework for diagnosing value destruction potential</i> —(Canhoto & Clear, 2020)	Business Horizons-2020
<i>Self-Building Artificial Intelligence and Machine Learning to Empower Big Data Analytics in Smart Cities</i> —(Damminda et al., 2020)	Information Systems Frontiers-2020
<i>Emerging Data Sources in Decision-making and AI</i> —(Khan & Al-Badi, 2020)	Procedia Computer Science-2020
<i>Pattern detection model using a deep learning algorithm for power data analysis in abnormal conditions</i> —(Lee et al., 2020)	Electronics (Switzerland)-2020
<i>Advanced Data Collection and Analysis in Data-Driven Manufacturing Process</i> —(Xu et al., 2020)	Chinese Journal of Mechanical Engineering-2020

Continued

<i>Marketing ecosystem: An outside-in view for sustainable advantage—(Zhang & Watson IV, 2020)</i>	Industrial Marketing Management-2020
<i>Modeling of Business Intelligence Systems Using the Potential Determinants and Theories with the Lens of Individual, Technological, Organizational, and Environmental Contexts-A Systematic Literature Review—(Ahmad et al., 2020)</i>	Applied Sciences-2020
<i>Without data, you're just another person with an opinion—(Kolasa et al., 2020)</i>	Expert Review of Pharmacoeconomics & Outcomes Research-2020
<i>Artificial intelligence with multi-functional machine learning platform development for better healthcare and precision medicine—(Ahmed et al., 2020)</i>	Database: The Journal of Biological Database and Curation-2020
<i>Decision support systems for agriculture 4.0: Survey and challenges—(Zhai et al., 2020)</i>	Computers and Electronics in Agriculture-2020
<i>Utilization of text mining as a big data analysis tool for food science and nutrition—(Tao et al., 2020)</i>	Comprehensive Reviews in Food Science and Food Safety-2020
<i>The big data regime shift in real estate—(DeLisle et al., 2020)</i>	Journal of Property Investment & Finance-2020
<i>Market acceptability assessment of electric vehicles based on an improved stochastic multicriteria acceptability analysis-evidential reasoning approach—(Gong et al., 2020)</i>	Journal of Cleaner Production-2020
<i>Data-driven sustainable intelligent manufacturing based on demand response for energy-intensive industries—(Ma et al., 2020)</i>	Journal of Cleaner Production-2020
<i>Smart recovery decision-making for end-of-life products in the context of ubiquitous information and computational intelligence—(Meng et al., 2020)</i>	Journal of Cleaner Production-2020
<i>Technical considerations when implementing digital infrastructure for social policy—(Gulliver et al., 2020)</i>	Australian Journal of Social Issues-2020
<i>Multi-level governance for sustainable innovation in smart communities. an ecosystems approach—(Ciasullo et al., 2020)</i>	International Entrepreneurship and Management Journal-2020
<i>Artificial intelligence for decision-making in the era of Big Data—evolution, challenges and research agenda—(Duan et al., 2019)</i>	International Journal of Information Management-2019
<i>Big data challenges: Prioritizing by decision-making process using Analytic Network Process technique—(Zahid et al., 2019)</i>	Multimedia Tools and Applications-2019
<i>Decision-Making based on Big Data Analytics for People Management in Healthcare Organizations—(Sousa et al., 2019)</i>	Journal of Medical Systems-2019
<i>“Growth hacking: Insights on data-driven decision-making from three firms”—(Troisi et al., 2019)</i>	Industrial Marketing Management-2019
<i>Managing smart service ecosystems through technology: How ICTs enable value co-creation—(Troisi et al., 2019)</i>	Tourism Analysis-2019
<i>Sustainable business model innovation “Progetto Quid” as an exploratory case study—(Ciasullo et al., 2019)</i>	Sinergie Italian Journal of Management-2019
<i>Big data and sentiment analysis to highlight decision behaviours. A case study for student population—(Troisi et al., 2018a)</i>	Behaviour & Information Technology-2018
<i>Big data management: The case of Mulino Bianco's engagement platform for value co-creation—(Troisi et al., 2018b)</i>	International Journal of Engi. Business and Management-2018

Continued

<i>Big Data, Scarce Attention and Decision-Making Quality</i> —(Yu & Chen, 2021)	Journal of Computer Science-2018
<i>Optimization and decision-making with big data</i> —(Li & Xu, 2018)	Soft Computing-2018
<i>Big data analytics capabilities: a systematic literature review and research agenda</i> —(Mikalef et al., 2018)	Information Systems and e-Business Management-2018
<i>Information and reformation in KM systems: big data and strategic decision-making</i> —(Intezari & Gressel, 2017)	Journal of Knowledge Management-2017
<i>Factors influencing big data decision-making quality</i> —(Janssen et al., 2017)	Journal of Business Research-2017
<i>“Measuring customer value co-creation behavior”</i> —(Tommasetti et al., 2017)	Journal of Service Theory and Practice-2017
<i>Towards felicitous decision making: An overview on challenges and trends of Big Data</i> —(Wang et al., 2016)	Information Sciences-2016

Source: Authors' elaboration.

3. Results

The work shows a growing interest of scholars and practioners to all those variables considered fundamental in businesses and organizations management.

In this regard, **Figure 2** illustrates how scientific contributions, aimed at analyzing the role of technologies and, especially, big data on the effectiveness of decision-making processes, have grown exponentially in recent years.

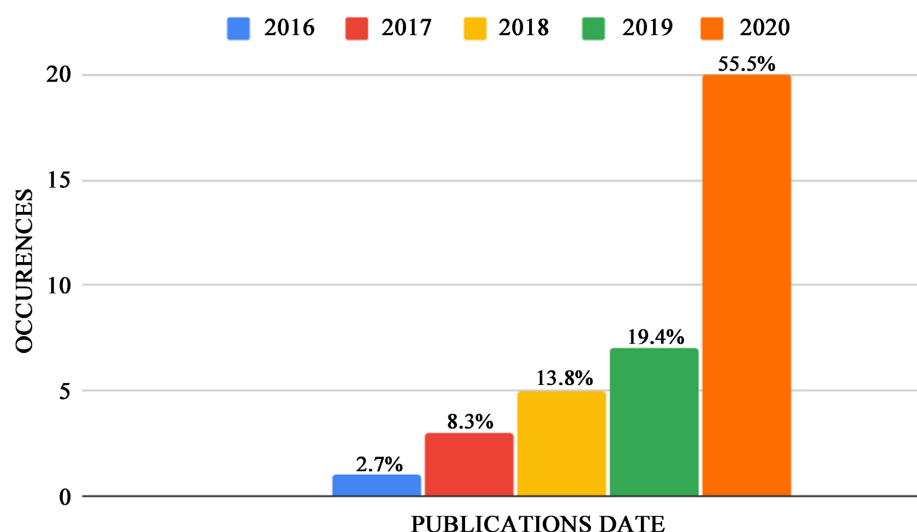
The trend emerged from **Figure 2** cannot be evaluated as a fact. Indeed, the data shown should be adequately compared to the total number of international scientific publications, which has gradually increased over time.

The number of international scientific papers published in 2016 is less than 55.5% of the total, underlying the considerable interest of academics on the role played by big data in corporate decision-making processes. Therefore, the work highlights the internationally recognized importance of big data and how fundamental it is to use these tools to determine the effectiveness of decision-making processes.

Hence, in order to guarantee the significance of results produced by the geographical distribution of the 36 selected papers, meaningful evidence derives from the comparison between the data included in **Table 1** and the total number of all scientific contributions published in the various countries.

In this light, it is worth noticing that more than half of the selected papers were published in 2020 only, which again testifies the constant and growing interest of scholars for issues related to the use of big data as facilitators of governance processes in companies.

USA with 61,512, UK with 28,029, Germany with 15,507 and India with 11,134 rank among the top positions in the world for the number of publications. Australia with 9912, China with 9541, Canada with 7945 and Russia with 5910 follow. Italy with 5910 publications occupies the ninth and penultimate place in



Source: Authors' elaboration.

Figure 2. Trend of the selected papers about the relationship between big data and decision making.

this special ranking, while Spain occupied the tenth position with 5868 publications (Newton et al., 2020).

4. Discussion and Conclusion

The analysis of contents of the 36 selected articles showed that there are different theoretical approaches which are able to analyze the relationship between big data and decision-making, depending on the sector (i.e., public or private) to which they belong. Some scholars (Troisi et al., 2018b: pp. 539-540; Yu & Chen, 2021) underlined the decisive impact that big data exert, both in the private and public sector, acting as facilitators of corporate decision-making processes.

Most of the selected studies agree on the idea that the use of information necessary for decision-making can be facilitated by developing and adopting innovative and advanced tools (Mikalef et al., 2018; Ma et al., 2020; Meng et al., 2020).

The need to move towards more flexible and effective decision-making models has progressively confined the attention of scholars to identify the possible levers, both economic and technological, capable of improving the decision-making processes of companies and organizations.

In this regard, the main purpose of technological innovations and the use of big data is also to provide a useful information to guide decision-making activities in an effective and sustainable way (Vissia et al., 2020).

Also, other scholars (Li & Xu, 2018) state that, for the purpose of their effectiveness, technologies, with particular reference to corporate information systems, should be congruent with the objectives pursued by companies, effectively manageable and controllable by managers, to influence the behavior of the organization and provide timely, accurate, and cost-effective information. Consistently, Duan et al. (2019: pp. 65-66) argue that big data and artificial intelligence

techniques, if used correctly, can contribute in a decisive way to the improvement of organizational learning, impacting, and, ultimately, on the effectiveness of decision-making systems.

In the light of the considerations given by prior literature (Meng et al., 2020: pp. 13-14; Li & Xu, 2018: pp. 5199-5200; Troisi, Grimaldi, & Monda, 2019; Troisi et al., 2019), the work specifically presents what are the levers on which big data act, consequently allowing a more effective governance of decision-making processes. In other words, the work allows the identification of the regrouping of the main characteristics of big data, as well as synthesizes, for each of them, the variables representing structural conditions. These are potentially able to facilitate the improvement of organizational learning and increase effectiveness of decision-making processes.

The work seeks to identify potential variables that can actually improve business processes, through a systematization of the literature on the potential relationship between, the use of big data and decision-making. Four variables are presented to be considered advantageously in the management of decision-making systems, especially in light of the potential influence they seem to exert on the effectiveness and flexibility of the governance processes of companies and organizations (Ciasullo et al., 2020: pp. 1170-1172; Ciasullo et al., 2019: pp. 215-217; Yu & Chen, 2021: pp. 25-26; Wang et al., 2016: pp. 753-756; Sousa et al., 2019: pp. 288-290; Tommasetti et al., 2017: pp. 942-944).

Efficiency

This variable is defined as the ability to manage the resources available in a rational and advantageous way (Yu & Chen, 2021). In this regard, Troisi et al (2019) define the skills of companies and organizations as the ability of the people involved in organizational processes to improve the offer of programs and services. Precisely, the systematic literature review emphasizes the need to take into account, in corporate governance processes, as well as elements such as cost, quality and cycle times of critical processes, also other factors such as: staff satisfaction, staff training, skills operational and operational personnel. Therefore, a great importance is attributed to the staff of the organization, intended as the fulcrum of organizational success (Wang et al., 2016).

Timeliness

This variable is defined as the propensity to offer quality products and services in an objectively quick time. In particular, timeliness concerns the ability to satisfy all the possible needs of the interlocutors so that, by responding in a timely manner to requests coming from outside (Troisi et al., 2018a; Tommasetti et al., 2017: pp. 935-937). In this regard, the ability to easily manage large amounts of data allows company managers to pursue significant results in terms of services offered; number of users served; user response times; frequency of services provided and, above all in terms of quality of services provided (such as physical and cultural accessibility, timeliness, courtesy of operators and the state of the facilities).

Precision

The prent factor defined as the ability to innovate through an adequate use of data. In fact, innovation is linked to technology both in the form of technical progress and also, with reference to the economic market. However, it is not limited to the technical field, but exists in every sector: the vital lymph of competitiveness of obtaining an added value is sensitivity and precision to innovation. In this sense, innovation represents an incentive to consumption and, therefore, to the demand for goods capable of stimulating economic growth within a market economy (Troisi et al., 2019; Sousa et al., 2019: pp. 286-287; Latif et al., 2019: pp. 27132-27133). The accuracy guaranteed by the use of big data favors the increase in productivity, improving the efficiency of data collection, optimizing costs and reducing the possibility of making potential errors. Within this framework, Ciasullo et al. (2020) argued that the most effective way of managing the company's data, is guaranteed only by the correct use of big data. This allows a direct support that will be provided to company managers, promptly detecting any process errors or malfunctions and planning interventions with great ease and precision. Furthermore, in this way, it is possible to guarantee the transparency of the processes, making all the subjects involved, in various capacities, an active part of the company processes.

Effectiveness

This aspect is defined as the ability of big data and new technologies to allow a change of perspective in business management (Zhai et al., 2020: pp. 13-14; Ahmed et al., 2020: pp. 21-23; Mikalef et al., 2018: pp. 551-552; Yu & Chen, 2021: pp. 21-22). Following this trend, several scholars (Intezari & Gressel, 2017; Duan et al., 2019; Yu & Chen, 2021: pp. 24-25; Sousa et al., 2019: pp. 284-285; Latif et al., 2019: pp. 27130-27131; Gulliver et al., 2020; Meng et al., 2020: pp. 15-16) argue that thanks to big data and new technologies the attention has shifted from the intuition of top management to a culture of decision-making supported by data, thus determining a real turning point within the managerial culture. The above-mentioned considerations are in line with the arguments of other scholars (Troisi et al., 2019; Ciasullo et al., 2020: pp. 1168-1169; Li & Xu, 2018: pp. 5201-5202), highlighting how the advent of big data has led to a vision in which an important role is played by the experience and the ability to make correct forecasts on sector developments by top management, to a concept according to which the main drivers in making decisions will be the results of the data analyzes. These analyzes are carried out by analysts and industry experts (for this reason a strong increase in demand for statisticians and data analysts to be included in companies is expected).

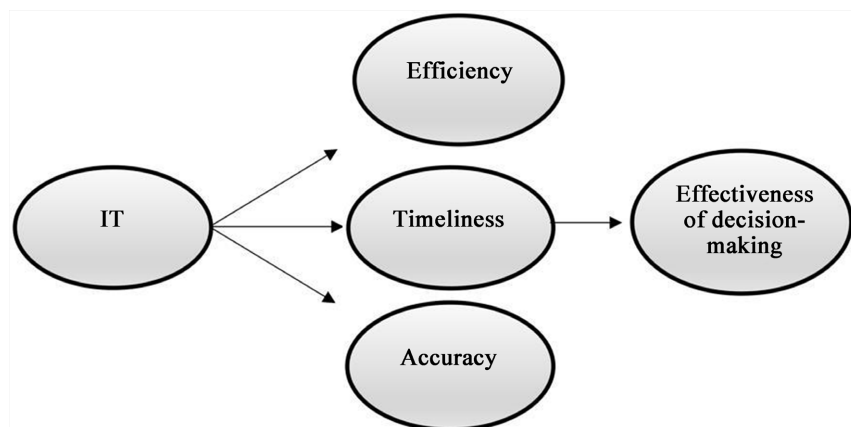
Therefore, these considerations allow the identification of some factors capable of stimulating the effectiveness of decision-making processes. In particular, through the above arguments, the study, tries to suggest to management scholars, business and organization managers, a possible model of governance, that is capable of increasing the effectiveness of business decision-making processes (Figure 3).

Implications

The purpose of this study is to investigate how scholars have previously analyzed the influence of big data on decision making and whether there is a lack of information on the topic (Bury, 2012). Through a systematic literature review, it has been possible to systematize the research related to a topic that still attracts particular attention due to its impact on the behavior of companies and, consequently, on performance. The aim of this study is to have a better understanding of the observed phenomenon, both from a practical and operational point of view.

Furthermore, compared to what has been said, the paper can be considered a useful tool for both managers and scholars (professors, researchers, students, etc.), focusing on the identification of the advantages deriving from adequate management of decision-making processes. However, these statements are validated only from a theoretical point of view, therefore, there may be some or all of different practical implications. In other words, the broad consensus accorded by prior literature (Volkova et al., 2017; pp. 728-730; Hilorme et al., 2019) to the importance that these variables cover from a theoretical point of view, for effectiveness of decision-making processes. In reality, it could happen that, with regard to the management of companies and organizations, they are rarely considered or even completely ignored. This consideration introduces the main limitation of this study, attributable to the lack of an empirical analysis capable of providing practical confirmation to the considerations formulated. In fact, the generalization of the results emerged, comes only from a theoretical point of view, without giving space to stresses and supports derived from practice.

The work, whose objective is to analyze the relationship between the use of big data and the effectiveness of corporate decision-making processes, presents a further weak point: the systematic literature review with which the survey was carried out. In fact it does not take into account the so-called “gray literature” or books or book chapters, but only articles published in journals, extrapolated, among other things, from some databases. Therefore, in future research, it might



Source: Authors' elaboration

Figure 3. A possible model of government.

be appropriate to support the theoretical analysis with publications on multiple databases, through an empirical observation of business plans, in order to concretely identify all those variables that affect the results that can be obtained by adequately managing companies and organizations.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Table A1. Selected papers.

TITLE-AUTHOR(S)	JOURNAL-DATE
<i>Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation projects—(Wamba-Taguimdje et al., 2020)</i>	Business Process Management Journal-2020
<i>Data Value, Big Data Analytics, and Decision-Making—(Monino, 2021)</i>	Journal of the Knowledge Economy-2020
<i>Decision-making Technology Based on Big Data—(Vissia et al., 2020)</i>	Pattern recognition and image analysis-2020
<i>Artificial intelligence and machine learning as business tools. A framework for diagnosing value destruction potential—(Canhoto & Clear, 2020)</i>	Business Horizons-2020
<i>Self-Building Artificial Intelligence and Machine Learning to Empower Big Data Analytics in Smart Cities—(Damminda et al., 2020)</i>	Information Systems Frontiers-2020
<i>Emerging Data Sources in Decision-making and AI—(Khan & Al-Badi, 2020)</i>	Procedia Computer Science-2020
<i>Pattern detection model using a deep learning algorithm for power data analysis in abnormal conditions—(Lee et al., 2020)</i>	Electronics (Switzerland)-2020
<i>Advanced Data Collection and Analysis in Data-Driven Manufacturing Process—(Xu et al., 2020)</i>	Chinese Journal of Mechanical Engineering-2020
<i>Marketing ecosystem: An outside-in view for sustainable advantage—(Zhang & Watson IV, 2020)</i>	Industrial Marketing Management-2020
<i>Modeling of Business Intelligence Systems Using the Potential Determinants and Theories with the Lens of Individual, Technological, Organizational, and Environmental Contexts-A Systematic Literature Review—(Ahmad et al., 2020)</i>	Applied Sciences-2020
<i>Without data, you're just another person with an opinion—(Kolasa et al., 2020)</i>	Expert Review of Pharmacoeconomics & Outcomes Research-2020
<i>Artificial intelligence with multi-functional machine learning platform development for better healthcare and precision medicine—(Ahmed et al., 2020)</i>	Database: The Journal of Biological Database and Curation-2020
<i>Decision support systems for agriculture 4.0: Survey and challenges—(Zhai et al., 2020)</i>	Computers and Electronics in Agriculture-2020
<i>Utilization of text mining as a big data analysis tool for food science and nutrition—(Tao et al., 2020)</i>	Comprehensive Reviews in Food Science and Food Safety-2020
<i>The big data regime shift in real estate—(DeLisle et al., 2020)</i>	Journal of Property Investment & Finance-2020
<i>Market acceptability assessment of electric vehicles based on an improved stochastic multicriteria acceptability analysis-evidential reasoning approach—(Gong et al., 2020)</i>	Journal of Cleaner Production-2020
<i>Data-driven sustainable intelligent manufacturing based on demand response for energy-intensive industries—(Ma et al., 2020)</i>	Journal of Cleaner Production-2020

Continued

<i>Smart recovery decision-making for end-of-life products in the context of ubiquitous information and computational intelligence—(Meng et al., 2020)</i>	Journal of Cleaner Production-2020
<i>Technical considerations when implementing digital infrastructure for social policy—(Gulliver et al., 2020)</i>	Australian Journal of Social Issues-2020
<i>Multi-level governance for sustainable innovation in smart communities: an ecosystems approach—(Ciasullo et al., 2020)</i>	International Entrepreneurship and Management Journal-2020
<i>Artificial intelligence for decision-making in the era of Big Data-evolution, challenges and research agenda—(Duan et al., 2019)</i>	International Journal of Information Management-2019
<i>Big data challenges: Prioritizing by decision-making process using Analytic Network Process technique—(Zahid et al., 2019)</i>	Multimedia Tools and Applications-2019
<i>Decision-Making based on Big Data Analytics for People Management in Healthcare Organizations—(Sousa et al., 2019)</i>	Journal of Medical Systems-2019
<i>“Growth hacking: Insights on data-driven decision-making from three firms”—(Troisi et al., 2019)</i>	Industrial Marketing Management-2019
<i>Managing smart service ecosystems through technology: How ICTs enable value co-creation—(Troisi et al., 2019)</i>	Tourism Analysis-2019
<i>Sustainable business model innovation” Progetto Quid” as an exploratory case study—(Ciasullo et al., 2019)</i>	Sinergie Italian Journal of Management-2019
<i>Big data and sentiment analysis to highlight decision behaviours. A case study for student population—(Troisi et al., 2018a)</i>	Behaviour & Information Technology-2018
<i>Big data management: The case of Mulino Bianco’s engagement platform for value co-creation—(Troisi et al., 2018b)</i>	International Journal of Engi. Business and Management-2018
<i>Big Data, Scarce Attention and Decision-Making Quality—(Yu & Chen, 2021)</i>	Journal of Computer Science-2018
<i>Optimization and decision-making with big data—(Li & Xu, 2018)</i>	Soft Computing-2018
<i>Big data analytics capabilities: a systematic literature review and research agenda—(Mikalef et al., 2018)</i>	Information Systems and e-Business Management-2018
<i>Information and reformation in KM systems: big data and strategic decision-making—(Intezari & Gressel, 2017)</i>	Journal of Knowledge Management-2017
<i>Factors influencing big data decision-making quality—(Janssen et al., 2017)</i>	Journal of Business Research-2017
<i>“Measuring customer value co-creation behavior”—(Tommasetti et al., 2017)</i>	Journal of Service Theory and Practice-2017
<i>Towards felicitous decision making: An overview on challenges and trends of Big Data—(Wang et al., 2016)</i>	Information Sciences-2016

Source: Authors’ elaboration.