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An examination of the organizational impact of business intelligence and big data based on management theory

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ABSTRACT Big data and big data analytics have been considered to be a disruptive technology that will rebuild business intelligence. The purpose of this study is to enrich the literature on the organizational impact of business intelligence and big data based on management theory. While the majority of the organizational theories have had research dedicated to enhance the understanding of the impact of business intelligence and big data on organizational performance and decision-making, the research lacks scholarly work capable of identifying the other main organizational outcomes. To achieve this goal, a semi-systematic literature review was carried out to find all studies related to the research topic. Then, an analysis was conducted to understand the use of the organizational theory in accordance with business intelligence and big data. Finally, a grouping was developed to assign each organizational theory the related impact. The main findings of this work, after examining thirty-three related organizational theories, was that there are other important organizational impacts including innovation, agility, adoption, and supply-chain support.

KEYWORDS Big data, big data analytics, business intelligence, management theory, organizational theory

1. INTRODUCTION

With the data explosion from clicks, sensors, and technological innovations, new fields have become more and more in need, especially in the field of big data (BD; Mazzei, & Noble, 2020). Every person is currently considered a "data generator" and organizations become "information processors" (Mazzei, & Noble, 2020).

Most of the scholars agree on the fact that BD enables organizations to create entirely new innovative products, and new business models. They also agree on the fact that BD helps achieving competitive advantages (Holmlund, Van Vaerenbergh, Ciuchita, Ravald, Sarantopoulos, Villarroel-Ordenes, & Zaki, 2020; Sadovskyi, Engel, Heininger, Böhm, & Krcmar, 2014).

BD still represents, for a large number of companies, a tool that can enhance their reporting and monitoring capabilities (Bischof, Gabriel, Rabel, & Wilfinger, 2016). For a limited number of companies, BD represents an opportunity to create innovative business models (Mazzei, & Noble, 2020). In the latter case, BD can be integrated within the company's structure, processes, infrastructure, technologies and strategy (Bischof, Gabriel, Rabel, & Wilfinger, 2016).

Scholars argue that there is a close relationship between BD, business intelligence (BI), and big data analytics (BDA) because BI provides the methodological and technological capabilities for data analysis (e.g. Llave, 2018; Sun, Zou, & Strang, 2015). BI supports a firm's decision-making with valuable data, information, and knowledge (Alnoukari &

Hanano, 2017), hence BDA can be seen as a part of BI (Sun, Zou, & Strang, 2015). In addition, both BI and BDA share some common tools supporting the decision-making process. Both BI and BDA are common in emphasizing valuable data, information, and knowledge and both involve interactive visualization for data exploration and discovery. BI is currently based on four technology pillars: cloud, mobile, big data, and social technologies, which are also supported effectively by BDA as a service and technology (Passlick, Lebek, & Breitner, 2017; Sun, Zou, & Strang, 2015).

From the data viewpoint, knowledge discovery is the core of BDA and BI systems (Sun, Zou, & Strang, 2015). Jin & Kim (2018) consider BI's "raw data" to have been expanded into "big data" due to the advanced technology capability. Therefore, it is logical to consider that BI, BD, and BDA are not independent concepts. Consequently, it is beneficial to integrate all of them into an integrated DSS, incorporating all processes from data gathering to data analytics and insights to decision making (Calof & Viviers, 2020; Jin, & Kim, 2018). However, analytical models based on single data sources may provide limited insights that consequently lead to biased business decisions. Using multiple and heterogeneous data sources can provide a holistic view of the business and result in better decision-making (Fan, Lau, & Zhao, 2015). Fan et al. (2015) conclude that big data and its applications on BI have great potential in generating business impacts.

According to Braganza et al. (2017), BI and BD are more than technology, and to be fully effective, they should be incorporated into corporate strategy (Calof, Richards, & Santilli, 2017). Many current researches highlight the need to tackle the strategic incorporation of BI and BD technological development, and the link between BI, BD and SM theories (Mikalef, Pappas, Giannakos, Krogstie, Lekakos, 2016). Wang et al. (2018) address the lack of understanding of the strategic implications of BD by examining the historical development, architectural design, and components functionalities of BD analytics.

Organizational theory (OT) provides the basis to understand and define all of an organization's activities, processes, and environments (Sarkis, Zhu, & Lai, 2011). While BD technologies have been developed rapidly, academic research on the use of OT to explain BD impact on the organizational level is still in its infancy. Recent researches have started to highlight organizational-level outcomes after applying big data initiatives (Braganza, Brooks, Nepelski, Ali, & Moro, 2017; Côrte-Real, Oliveira, & Ruivo, 2019; Mikalef, Pappas, Krogstie, & Pavlou, 2020; Wang, Kung, & Byrd, 2018). Fiorini et al. (2018) argue that certain organizational theories support the findings about the implications of big data in an organizational context.

Therefore, considering the importance of OT to better understand the implications of BI and BD in an organizational context, the lack of an all-encompassing view of the BI and BD organizational impact based on OT, and the emerging role of BI and BD as tools for organizational innovation and transformation, this study will consider the following research question that guides this work: how can OTs be used to provide an all-encompassing view of the BI and BD organizational impact?

Thus, in light of this, the main goal of this study is to analyze recent literature on OT related to the BI and BD domains, and to find the main organizational impacts of BI and BD based on OT.

To achieve this goal, a semi-systematic literature review was carried out to find all studies that relate OT with BI and BD domains. Then, an analysis was required to understand the core use of each OT in accordance with BI and BD domains. Finally, a grouping was conducted to assign each OT its related impact.

This work is inspired by recent related studies tackling OT with BD including Walls & Barnard (2020), Fiorini et al. (2018), Hazen et al. (2016), and Erevelles et al. (2016).

The remainder of this paper is organized as follows. The next section presets the research method. Section 3 looks at the theoretical background of BD and OT. Section 4 presents the core work of this study by analyzing the application of OT on BI and BD, then identifying the list of all related OTs, and then groups the resulting OTs according to the BI and BD organizational impact. Section 5 discusses the study's findings and provides discussions about the results. The last section explains the study's outcomes as well as the conclusions drawn from the findings, the study implications and limitations, and finally the suggested future research directions.

2. RESEARCH METHOD

Inspired by Sarkis et al. (2011) and Fiorini et al. (2018), this study revises literature on BI and BD, and highlights how management

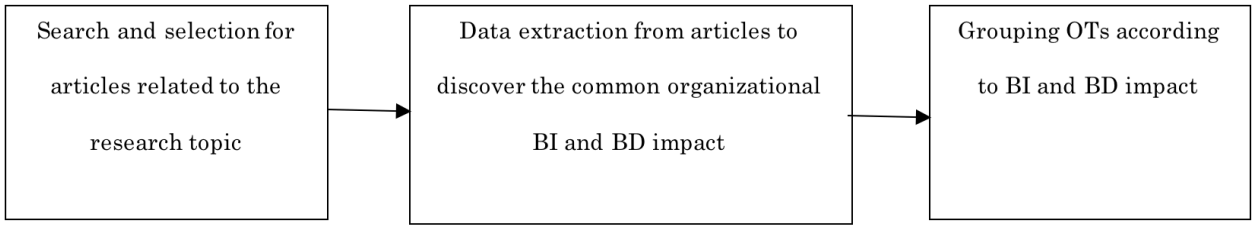


Figure 1 Steps for this study's semi-systematic literature review.

theory can be applied to enhance BI and BD research. The research method adopted was a semi-systematic literature review, as this approach is suitable for emerging topics such as BI and BD. The main purpose of a semi-systematic literature review is to provide an overview of the research area. The research questions can be broad, the research strategy may or may not be systematic, and the analysis and evaluation can be quantitative or qualitative (Snyder, 2019). This study uses this approach to classify the literature on the use of OTs with BI and BD domains, to understand this topic in a comprehensive perspective, and to highlight the research gaps on this topic. The three steps of our literature review are presented in Figure 1.

The first step was the definition of the research question as presented in Section 1. Based on the research question, the search and selection of articles was conducted based on the recent findings from Fiorini et al. (2018), which cover the literature till 2018, and the recent studies that have been published till 2020. The search for recent studies was carried out on the Scopus database. The final number of selected articles after a full reading was 65 articles that are closely related to the research question. These articles identify 33 OTs based on their application on BI and BD domains.

The second step was to conduct an in-depth reading and analysis of the papers to identify the contributions and the gaps for future research. All 65 articles were analyzed in detail according to how they have applied management theories to underpin the research.

The third and last step was to find the common organizational-level BI and BD impacts, and group the listed OTs accordingly.

3. THEORETICAL BACKGROUND

3.1 Big data

There is big hype around BD (Al-Qirim, Rouibah, Serhani, Tarhini, Khalil, Maqableh, & Gergely, 2019). BD is becoming an attractive field for scholars, practitioners, and policymakers around the world. However, BD is currently still in the preliminary stages. Therefore, BD is still complex due to its infancy as a field, and the limited understanding of what BD means for organizations.

BD is more than a technology (Braganza, Brooks, Nepelski, Ali, and Moro, 2017), and to be fully effective, it should be incorporated into organizational strategy (Mazzei, & Noble, 2017). Moreover, BD affects organizational culture (Gupta, & George, 2016); it converts firms to become data and evidence-based organizations (Braganza, Brooks, Nepelski, Ali, and Moro, 2017).

According to Al-Qirim et al. (2019), the convergence of IoT with BD and cloud computing has taken organizations to the next level of value creation.

Moving from 3 Vs into 5 Vs, and finally 7 Vs, our work adopts the updated definition of Fosso Wamba et al. (2015) of BD as "a holistic approach to manage, process and analyze the 7 Vs (i.e., volume, variety, velocity, veracity, value, valence, and variability) in order to create actionable insights for sustained value delivery, measuring performance, establishing competitive advantages, and becoming a source of innovation."

This work argues that BD initiatives provide value at several stages: knowledge, organizational performance, organizational agility and flexibility, value creation, innovation, competitive advantage, and decision-making.

3.2 Organizational theory

According to Sarkis et al. (2011) and Fiorini et al. (2018), defining and identifying OTs is not a simple task. Sarkis et al. (2011) defines OT as "a management insight that can help explain or describe organizational behaviors, designs, or structures". This definition is adopted for the purpose of this study.

Sarkis et al. (2011) argue that OT provides the ability to understand organizational activities, processes, and environments.

4. APPLICATION OF ORGANIZATIONAL THEORIES ON BUSINESS INTELLIGENCE AND BIG DATA DOMAINS

4.1 Organizational theories supporting business intelligence and big data

For the development of this theoretical study, bibliographical research was conducted, since it contributes to reflexive thinking that allows us to find new facts and relations.

With this effort, we bridge and extend the research on OT supporting BI and BD conducted by Fiorini et al. (2018) and Hazen et al. (2016), with the recent research in the field conducted by Walls & Barnard (2020) and Erevelles et al. (2016).

This study identifies thirty-three OTs based on their application on BI and BD domains. The following paragraphs provide an ordered list of these OTs, with a general description of each theory, and a list of BI and BD related studies:

1. Absorptive capability theory is the ability to recognize the value of new and external information, and use it for future commercial use (Walls & Barnard, 2020). Absorptive capacity can be a source of innovativeness, as it can be seen as a specific type of dynamic capability (Wang, Kung, & Byrd, 2018). BI and BD related studies include Braganza, Brooks, Nepelski, Ali, and Moro, 2017, Walls & Barnard, 2020, and Wang, Kung, & Byrd, 2018.
2. Actor-network theory considers organizations to be networks of heterogeneous actors. The theory addresses how these actors and organizations are constructed from the "bits and pieces out of which they are constructed" (Hazen, Skipper, Ezell, & Boone, 2016). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, and Hazen, Skipper, Ezell, & Boone, 2016.
3. Agency theory explains how to control the relationships in which one 'principal' delegates work to another, the 'agent' (Sarkis, Zhu, & Lai, 2011). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Nocker & Sena, 2019, Sarkis, Zhu, & Lai, 2011, and Waller & Fawcett, 2013.
4. Contingency theory addresses the effect of the environment's uncertainties on organizations (Dubey, Gunasekaran, & Childe, 2018). BI and BD related studies include Dubey, Gunasekaran, & Childe, 2018, Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Gupta, & George, 2016, and Waller & Fawcett, 2013.
5. Decomposed theory of planned behavior states that the behavioral intention is an antecedent of behavior and is determined by attitude, subjective norms and perceived behavioral control. In order to better understand the relationships between belief structures and the antecedents of intention, beliefs (attitude, subjective norms and perceived behavioral control) are decomposed into multidimensional constructs (Esteves & Curto, 2013). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, and Esteves & Curto, 2013.
6. Diffusion of innovation theory provides an understanding about the innovation diffusion process, and how and why new ideas and technologies are spread (Sarkis, Zhu, & Lai, 2011). Ahmad et al. (2016) examined how the innovative traits of BD can influence its successful implementation. Even more, it offers valuable insights into the characteristics of BI that influence its successful adoption. BI and BD related studies include Ahmad, Ahmad, & Hashim, 2016, Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Sarkis, Zhu, & Lai, 2011, and Soon, Lee, & Boursier, 2016.
7. Dynamic capabilities view refers to the firm's abilities to maintain and adapt its internal resources to environment changes to maintain sustainability of competitive advantages (Alnoukari & Hanano, 2017). It refers to the capability of acquiring new ways of competitive advantage. It also involves continuous search, innovation and adaptation of firm resources and capabilities to uncover and tape new sources of competitive advantages (Alnoukari & Hanano, 2017). BI and BD related studies include Alnoukari & Hanano, 2017, Braganza, Brooks, Nepelski, Ali, & Moro, 2017, Chen, Preston, & Swink, 2015, Côrte-Real, Oliveira, & Ruivo, 2017, Dubey, Gunasekaran, & Childe, 2018, Erevelles, Fukawa, Swayne 2016, Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Mikalef, Krogstie, Wetering, Pappas, & Giannakos, 2018, Mikalef, Pappas, Giannakos, Krogstie, & Lekakos, 2016, Fosso Wamba, Gunasekaran, Akter, Ren, Ji-fan., Dubey, & Childe, 2017, Gupta, & George, 2016, Hazen, Skipper, Ezell, & Boone, 2016, Lin & Kunnathur, 2019, Nocker & Sena,

2019, Prescott, 2014, Rialti, Zollo, Ferraris, & Alon, 2019, Shams, & Solima, 2019, Shan, Luo, Zhou, & Wei, 2018, and Walls & Barnard, 2020.

8. Ecological modernization describes a technology-based and innovation-oriented approach to environmental policy and politics (Sarkis, Zhu, & Lai, 2011). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Hazen, Skipper, Ezell, & Boone, 2016, and Sarkis, Zhu, & Lai, 2011.

9. Evolutionary perspective focuses on innovation, learning and competitive advantages (Du, Huang, Yeung, & Jian, 2016). BI and BD related studies include Du, Huang, Yeung, & Jian, 2016, and Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018.

10. Expectancy theory considers that individuals' performance is in accordance with rewards or inducements (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018). BI and BD related studies include Chang, Hsu, & Wu, 2015, and Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018.

11. Game theory applies analytical tools to predict, explain and prescribe what players with various degrees of rationality will do in specific situations (Liu, Shao, Gao, Hu, Li, & Zhou, 2017). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Fu & Zhu, 2017, Liu, Shao, Gao, Hu, Li, & Zhou, 2017, and Liu & Yi, 2017.

12. Goal contagion theory explains how individuals automatically adopt and pursue a goal of another person's behavior (Aarts, Gollwitzer, & Hassin, 2004). BI and BD related studies include Aarts, Gollwitzer, & Hassin, 2004, Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, and Lee, Li, Shin, & Kwon, 2016.

13. Ignorance based view relies on the fact that "what we don't know (i.e. ignorance) is actually more than what we know (i.e knowledge)." In other words, ignorance enables knowledge (Erevelles, Fukawa, Swayne 2016). BI and BD related studies include Erevelles, Fukawa, Swayne 2016.

14. Information systems participation theory explains what parameters used for designing systems involve users' participation (Silva, 2015). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018 and Silva, 2015.

15. Institutional theory explains the pressure effects from external environments on an organization's adoptions of certain practices and actions (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Hazen, Skipper, Ezell, & Boone, 2016, Kwon, Lee, & Shin, 2014, and Waller & Fawcett, 2013.

16. Knowledge management theory defines the process of using the value generated by intellectual capital transfer, where this value can be viewed as knowledge creation, acquisition, and sharing (Alnoukari, Alhawasli, Alnafea, & Zamreek, 2012). BI and BD related studies include Braganza, Brooks, Nepelski, Ali, and Moro, 2017, Du, Huang, Yeung, & Jian, 2016, and Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018.

17. Knowledge-based view states that knowledge and related intangibles are sources to competitive advantages (Gupta, & George, 2016; Herden, 2020). BI and BD related studies include Côrte-Real, Oliveira, & Ruivo, 2017, Erickson & Rothberg, 2017, Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Hazen, Skipper, Ezell, & Boone, 2016, Herden, 2020, and Gupta, & George, 2016.

18. Market-based view is a traditional approach to strategic management. According to this approach, an organization gains competitive advantages according to its industry attractiveness, and its relative positioning against competitors. Industry attractiveness is expressed by Porter's five competitive forces (Porter, 1980). BI and BD related studies include Bischof, Gabriel, Rabel, & Wilfinger, 2016.

19. Normalization process theory refers to the social processes through which new ideas and technologies are embedded within the working process. This theory fits well with macro approaches to innovation (Shin, 2016). BI and BD related studies include Shin, 2016.

20. Organizational information processing view states that effective utilization of data requires an appropriate, context-specific composition of information processing mechanisms (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018). BI and BDA are considered important information processing mechanisms for organizations. They can reduce uncertainty and equivocality in the decision-making process (Kowalczyk & Buxmann, 2014). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Hazen, Boone, Ezell, & Jones-Farmer, 2014, and Kowalczyk & Buxmann, 2014.

21. Practice based view focuses on practices that can create specific and actionable advice for practitioners while explaining firm behavior and the influence on organizational performance (Bromiley & Rau, 2014). BI and BD related studies include Wang, Kung, Wang, & Cegielski, 2018.

22. Resource based theory considers that resources are valuable, rare, inimitable, and non-substitutable; they are the main pillars of competitive advantages (Alnoukari, 2009). BI and BD related studies include Akter & Fosso Wamba, 2016, Akter, Fosso Wamba, Gunasekaran, Dubey, & Childe, 2016, Barbosa, Vicente, Ladeira, & Oliveira, 2018, Braganza, Brooks, Nepelski, Ali, and Moro, 2017, Cheah & Wang, 2017, Du, Huang, Yeung, & Jian, 2016, Erevelles, Fukawa, Swayne 2016, Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Fosso Wamba, Gunasekaran, Akter, Ren, Ji-fan., Dubey, & Childe, 2017, Gupta, & George, 2016, Hazen, Skipper, Ezell, & Boone, 2016, Mazzei, & Noble, 2020, Mikalef, Krogstie, Wetering, Pappas, & Giannakos, 2018, Mikalef, Pappas, Giannakos, Krogstie, Lekakos, 2016, Nocker & Sena, 2019, Shan, Luo, Zhou, & Wei, 2018, Suoniemi, Meyer-Waarden, & Munzel, 2017, Waller & Fawcett, 2013, and Walls & Barnard, 2020.

23. Resource dependence theory states that organizations attempt to reduce others' power over them, often simultaneously trying to increase their own power over others (Sarkis, Zhu, & Lai, 2011). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Hazen, Skipper, Ezell, & Boone, 2016, Prasad, Zakaria, & Altay, 2016, Sarkis, Zhu, & Lai, 2011, and Waller & Fawcett, 2013.

24. Service-dominant logic explains value co-creation between firms and customers. The theory considers service as the core component for economic exchange (Xie, Wu, Xiao, & Hu, 2016). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, and Xie, Wu, Xiao, & Hu, 2016.

25. Social capital theory provides the base for social networks; it premise is that the network provides value to its members by allowing them access to the network's social resources (Hazen, Skipper, Ezell, & Boone, 2016). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, and Hazen, Skipper, Ezell, & Boone, 2016.

26. Social comparison theory focuses on self-assessment by comparing individuals' own opinions and abilities with others (Lee, Li, Shin, & Kwon, 2016). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, and Lee, Li, Shin, & Kwon, 2016.

27. Social exchange theory assumes the existence of relatively long-term relationships of interest based on intrinsic and extrinsic benefits (Chang, Hsu, & Wu, 2015). It explains the motivational factors that lead managers to adopt BD solutions. Beneficial factors such as organizational rewards, reputation, and reciprocity encourage managers use BI effectively for BD solutions (Chang, Hsu, & Wu, 2015). BI and BD related studies include Chang, Hsu, & Wu, 2015, and Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018.

28. Sociomaterialism theory presents a balanced view by interlinking and enacting management, technology and human (Akter, Fosso Wamba, Gunasekaran, Dubey, & Childe, 2016). BI and BD related studies include Akter & Fosso Wamba, 2016, Akter, Fosso Wamba, Gunasekaran, Dubey, & Childe, 2016, and Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018.

29. Stakeholder theory suggests that companies produce externalities that affect both internal and external stakeholders (Wilburn, & Wilburn, 2016). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Sarkis, Zhu, & Lai, 2011, and Wilburn, & Wilburn, 2016.

30. Systems theory states that organizations interact with their environment, thus, evolve constantly (Hazen, Boone, Ezell, & Jones-Farmer, 2014). BI and BD related studies include Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, and Hazen, Boone, Ezell, & Jones-Farmer, 2014.

31. Technological, organizational, and environmental framework states that the firm's three elements (technological, organizational and environmental) have the ability to impact organizational innovation (Chen, Preston, & Swink, 2015). BI and BD related studies include Chen, Preston, & Swink, 2015, and Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018).

32. Technology acceptance model explains how to encourage users to accept and utilize new technology (Soon, Lee, & Boursier, 2016). BI and BD related studies include Fiorini,

Seles, Jabbour, Mariano, Jabbour, 2018, Liu, Dedehayir, & Katzy, 2015, and Soon, Lee, & Boursier, 2016.

33. Transaction cost economics considers the efforts and costs required to complete the activity between buyer and seller (Sarkis, Zhu, & Lai, 2011). BI and BD related studies include Akter & Fosso Wamba, 2016, Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018, Hazen, Boone, Ezell, & Jones-Farmer, 2014, Sarkis, Zhu, & Lai, 2011, and Waller & Fawcett, 2013.

4.2 Analysis of the organizational impact of business intelligence and big data according to the organizational theories

As listed in the previous section, 65 studies were conducted to investigate the role of OT in an understanding of BI and BD organizational impact. The next step of this work was to perform in-depth reading and analysis of the papers, discover the common organizational-level BI and BD impact, and group the listed OT accordingly.

This work analysis discovers six common BI and BD organizational impacts: performance, adoption, supply chain support, innovation, decision-making support, and agility. As value creation and competitive advantage are sources for improving organizational performance, they are all grouped under organizational performance.

The following sub-sections provide the results of the literature analysis in order to highlight each of the previous BI and BD impacts, with all the related OTs.

4.2.1 Performance

According to the literature analysis, most of the organizational theories were investigated to explain the effect of BI and BD on business performance (sixteen organizational theories).

Dubey et al. (2018) argue that dynamic capabilities view explains how BI and BD initiatives can be considered as a source of competitive advantage that improves organizational performance. Similarly, Du et al. (2016) argue that evolutionary perspective provides the framework to check how BD can affect organizational performance, and they further argue that knowledge management theory can explain how BD affects service innovation and a firm's performance (Du, Huang, Yeung, & Jian, 2016).

In their interesting study, Erevelles et al. (2016) suggested that an ignorance-based view coupled with inductive reasoning might lead to the discovery of hidden pattern, and future prediction, hence leading to enhance organizational performance.

Knowledge-based view explains how BI and BD can be considered a source of competitive advantage, thus enhances a firm's performance (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018; Herden, 2020). Furthermore, they observed that organizational information processing view considers BDA as important information processing mechanisms for organizations (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018). Moreover, they found that resource-based theory explains how BD can promote better performance and innovation (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018). However, from external perspectives, Bischof et al. (2016) observed that market-based view investigates the strategic relevance of BD, which results competitive advantages gain, hence improved strategic positioning in the market.

Waller & Fawcett (2013) observed that resource dependence theory could explain how BDA may increase a firm's performance. Furthermore, according to service-dominant logic, BD provides enhanced organizational performance by collecting customer data, improving communication with customers, and adapting to environment changes effectively (Xie, Wu, Xiao, & Hu, 2016).

Hazen et al. (2016) argue that social capital theory, in a supply chain context, explains the positive effects of interactions among members on value and norms acceptance, and enhances knowledge sharing, hence improving performance. Furthermore, they argue that systems theory investigates the impact of BD on supply chain performance through the measurement and control of data quality (Hazen, Boone, Ezell, & Jones-Farmer, 2014).

In their study, Akter et al. (2016) argue that sociomaterialism theory presents a balanced view of BDA capabilities by interlinking and enacting management, technology, and people to support a firm's performance. Whereas, Akter & Fosso Wamba (2016) noted that transaction cost economics explains how to use BI and BDA for e-commerce transactions, and enhance organizational performance by improving market transaction cost efficiency, managerial transaction cost efficiency and time cost efficiency.

In their recent research, Wang et al. (2018) observed that practice-based view investigates how to facilitate the implementation of BD to

contribute to business value, hence improving a firm's performance.

4.2.2 Adoption

According to the literature analysis, a good number of organizational theories were applied to foster BI and BD adoption (twelve OT).

Decomposed theory of planned behavior helps to predict the intention to adopt BD (Esteves & Curto, 2013). Similarly, Lee et al. (2016) noted that social comparison theory explains an organization's intention to adopt BD. Fiorini et al. (2018) argue that diffusion of innovation theory helps to understand the process for BI and BD adoption. They further argue that expectancy theory helps to understand how to accept and adopt BI and BD (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018). Additionally, they argue that goal contagion theory explains the intention to adopt innovative information technology such as BD with limited IT knowledge (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018). In the same vein, Silva (2015) found that information systems participation theory provides the grounds for successful BD adoption and implementation. In this context, Liu et al. (2015) argue that the technology acceptance model investigates the key factors influencing BD adoption. Hazen et al. (2016) noted that institutional theory explains how external pressures affect the decision to adopt BD for a sustainable supply chain. In the same context, they found that resource dependence theory helps explaining the adoption of BD in supply chain management (Hazen, Skipper, Ezell, & Boone, 2016). In the same vein, Shin (2016) found that normalization process theory helps analyzing how to adopt BD in organizations, and supply chains. Xie et al. (2016) argue that service-dominant logic can explain the effects of adopting BD by co-creating value with customers. Chang et al. (2015) observed that social exchange theory states the behavioral factors that lead managers to adopt BD.

4.2.3 Supply chain

According to the literature analysis, 12 organizational theories were used to examine the effect of BD on the supply chain.

Hazen et al. (2016) argue that actor-network theory can be used to examine the impact of BD on supply chain sustainability, as the theory provides the framework to describe the effect of changing a network (e.g. supply chain) on its actors. Furthermore, they argue that agency theory can be used to analyze BD impact on relationships in a supply chain context (Hazen, Skipper, Ezell, & Boone, 2016). They further argue that ecological modernization describes how BD can support supply chains (Hazen, Skipper, Ezell, & Boone, 2016). Hazen et al. (2016) highlight that institutional theory can explain how external pressures affect the decision to adopt BD for a sustainable supply chain. They further argue that a knowledge-based view highlights the importance of data quality for predictive BDA in supply chain management (Hazen, Skipper, Ezell, & Boone, 2016; Herden, 2020). In the same vein, they argue that resource dependence theory can explain the adoption of BD in supply chain management (Hazen, Skipper, Ezell, & Boone, 2016). Like the previous theories, they tested social capital theory in the supply chain context, and found it can explain the positive effects of interactions among members on value and norms acceptance, and enhance knowledge sharing, hence improving performance (Hazen, Skipper, Ezell, & Boone, 2016). Finally, they investigated systems theory, and argued that it can provide an understanding of the impact of BD on supply chain performance through the measurement and control of data quality (Hazen, Boone, Ezell, & Jones-Farmer, 2014).

Waller & Fawcett (2013) argue that contingency theory can be applied to explain how BD can help a supply chain to adapt to environmental changes. Whereas, Shin (2016) found that normalization process theory can help analyzing how to adopt BD in organizations, and supply chains.

Fiorini et al. (2018) argue that game theory can be used to find the pricing for a green supply chain. They further argue that resource-based theory can explain the impact of BD on supply chains (Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018).

4.2.4 Innovation

Four organizational theories were applied to examine the effect of BD on innovation: absorptive capacity, evolutionary perspective, knowledge management theory, and resource-based theory.

Wang et al. (2018) argue that absorptive capacity can be a source of innovation, as it can be seen as a specific type of dynamic capability. Whereas, Du et al. (2016) argue that evolutionary perspective provides the framework to check how BI and BD can affect service innovation performance. Similarly,

they found that knowledge management theory can explain how BI and BD affects service innovation and a firm's performance (Du, Huang, Yeung, & Jian, 2016).

Fiorini et al. (2018) argue that resource-based theory explains how BD can promote better performance and innovation.

4.2.5 Decision making

Four organizational theories were applied to examine the effect of BD on the decision-making process: game theory, organizational information processing view, stakeholder theory, and transaction cost economics.

According to Liu et al. (2017), game theory can be used to enhance the decision-making process. Hazen et al. (2016) argue that an organizational information processing view can help in assessing the use of BI and BD to reduce uncertainty in the decision-making process. They further argue that transaction cost economics provides the decision makers with the factors for evaluating "make versus buy" decisions concerning BI and BD initiatives (Hazen, Skipper, Ezell, & Boone, 2016).

Wilburn & Wilburn (2016) noted that stakeholder theory can explain how BDA can be used to better satisfy stakeholder expectations, and improve the decision-making process in regards to the organization's stakeholders.

4.2.6 Agility

According to the literature analysis, three organizational theories were used to examine the effect of BD on organizational agility to environment changes. These theories are: contingency theory, dynamic capabilities view, and service-dominant logic.

Waller & Fawcett (2013) argue that contingency theory can be applied to explain how BD can help organizations to adapt to environmental changes. Similarly, Braganza et al. (2017) argue that dynamic capabilities view states that BI and BD can help organizations to adapt to environment changes. Service-dominant logic also explains how BD can support an organization's adaption to environmental changes effectively (Xie, Wu, Xiao, & Hu, 2016).

5. FINDINGS AND DISCUSSION

In the course of this study, we have found and analyzed most of the recent literature on the topic of OT applications on BD. Several findings were made over the course of this research.

According to the literature analysis, both dynamic capability view and resource based theory are the most dominant OTs that have been used to investigate BI and BD issues (about twenty related papers).

Resource based theory was acknowledged as one of the most powerful theories that describes, combines and predicts organizational relationships (Gupta, & George, 2016). Unlike most of the OTs, resource-based theory is the only one that considers origination as a set of dissimilar resources, and by combining them the firm can achieve a competitive advantage (Gupta, & George, 2016). According to Braganza et al. (2017), this theory proposed that resources are tangible resources including data, technology and other basics resources (e.g., time and investment), human resources including managerial and technical skills (Shan, Luo, Zhou, & Wei, 2018), and intangible resources including data-driven culture and the intensity of organizational learning. However, Suoniemi et al. (2017) found that according to the empirical analysis results, BD analytics skills are the most critical domain of BI and BD resources. Hence, they confirm the concerns raised by scholars that a lack of talented people can be the greatest impediment to a BI and BD initiative's success (Nocker & Sena, 2019). Conversely, Braganza et al. (2017) argue that resource-based theory assumptions are not valid for BD and may not be able to explain the management of resources in BD initiatives. Data, the core resource in BI and BD, is not rare. Data may be sourced from many external providers, and can be accessed and used by everyone. The same arguments can be applied for physical resources such as hardware and servers. People with BI and BD skills are hard to find. Often, they are hired from outside the organization, and this may not be employed by the organization and therefor may not be utilized in this theory sense of the word. Braganza et al. (2017) confirm that not all aspects of BI and BD meet the theory requirements.

Dynamic capability view is the organization's ability to update and reconfigure by responding to changes in the external environment to develop sustainable competitive advantages (Erevelles, Fukawa, Swayne 2016). According to Dubey et al. (2018), dynamic capability view was raised due to the resource-based theory failure on providing explanations on the way the resources can

provide competitive advantages to the firm. Dynamic capability view is able to provide the explanation in a changing environment by arguing that the combination, transformation, and renewal of a firm's resources are the base for competitive advantages (Dubey, Gunasekaran, & Childe, 2018). Similarly, Fosso, Wamba et al. (2017) argue that BDA can be considered a dynamic capability that results from the organization's ability to reconfigure resources.

To highlight more findings, Table 1 provides insight into the BI and BD organizational impact with the related OTs.

According to Table 1, organizational performance was the most common BD outcome explained by OTs (fifteen theories). This result agrees with BI and BD literature that considers BI and BD initiatives the source of competitive advantage, which improve organizational performance (e.g. Walls & Barnard, 2020; Lin & Kunnathur, 2019; Nocker & Sena, 2019).

BI and BD adoption was investigated by many OTs (twelve theories; Table 1). Most of the related OTs help to understand how to accept and understand BI and BD adoption (e.g. Ahmad, Ahmad, & Hashim, 2016; Soon, Lee, & Boursier, 2016; Esteves & Curto, 2013; Hazen, Skipper, Ezell, & Boone, 2016).

Interestingly, supply chain sustainability was also highly connected to many OTs (12; Table 1), at the same level as BI and BD adoption. Most of the related OTs are used to examine the impact of BD on supply chain sustainability (e.g. Hazen, Skipper, Ezell, & Boone, 2016; Shin, 2016; Waller & Fawcett, 2013).

Four OTs investigated innovation. These theories explain how BI and BD can promote innovation (Du, Huang, Yeung, & Jian, 2016; Fiorini, Seles, Jabbour, Mariano, Jabbour, 2018; Wang, Kung, & Byrd, 2018).

Four OTs investigated decision-making. These theories explain how BI and BD can be used to enhance the decision-making process (Liu, Shao, Gao, Hu, Li, & Zhou, 2017; Hazen, Skipper, Ezell, & Boone, 2016; Wilburn, & Wilburn, 2016).

Three OTs investigated agility. These theories can be applied to explain how BI and BD can help organizations to adapt to environmental changes (Braganza, Brooks, Nepelski, Ali, & Moro, 2017; Waller & Fawcett, 2013; Xie, Wu, Xiao, & Hu, 2016).

Finally, we should note that some OTs have more than one impact on BI and BD domains

Table 1 Grouping OT according to BI and BD organizational impact.

BI and BD Impact	OT
Performance	Dynamic Capability View
	Evolutionary Perspective
	Ignorance Based View
	Knowledge-Based View
	Knowledge Management Theory
	Organizational Information Processing View
	Resource Dependence Theory
	Resource Based Theory
	Service-Dominant Logic
	Social Capital Theory
	Sociomaterialism Theory
	Systems Theory
	Transaction Cost Economics
	Practice Based View
	Market-Based View
Adoption	Decomposed Theory of Planned Behavior
	Diffusion of Innovation Theory
	Expectancy Theory
	Goal Contagion Theory
	Information Systems Participation Theory
	Institutional Theory
	Normalization Process Theory
	Resource Dependence Theory
	Service-Dominant Logic
	Social Comparison Theory
	Social Exchange Theory
	Technology Acceptance Model
Supply Chain	Actor-Network Theory
	Agency Theory
	Contengency Theory
	Ecological Modernization
	Game Theory
	Institutional Theory
	Knowledge-Based View
	Normalization Process Theory
	Resource Dependence Theory
	Resource Based Theory
	Social Capital Theory
	Systems Theory
Innovation	Absorptive Capability Theory
	Evolutionary Perspective
	Knowledge Management Theory
	Resource Based Theory
Decision Making	Game Theory
	Organizational Information Processing View
	Stakeholder Theory
	Transaction Cost Economics
Agility	Contengency Theory
	Dynamic Capability View
	Service-Dominant Logic

(Table 1). For example, contingency theory impacts the supply chain and agility, game theory impacts the supply chain and decision-making, evolutionary perspective impacts innovation and performance, resource-based

theory impacts the supply chain, innovation and performance, and dynamic capability view impacts performance and agility.

6. CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

This work was conducted to identity the organizational impact of BI and BD based on OTs. Recently, researchers argue that adopting BI and BD solutions enhances organizational performance and the decision-making process. The purpose of this work was to examine all other organizational impact when adopting BI and BD solutions. This goal was achieved by conducting a semi-systematic literature review to find all studies that relate OTs with BI and BD. Then, an analysis was done to understand the use of the OT in accordance with BI and BD. Finally, a grouping was conducted to assign each OT with its BI and BD related impacts.

This work concludes, from the extensive review carried out, that OT supports studies on BI and BD. The study demonstrates that even with the considerable number of OTs that impact BI and BD, they all share the same main characteristics in the BI and BD context: they help understanding BI and BD impact on organizational performance, adoption, support supply chain sustainability and management, innovation, decision-making support, and agility.

This study demonstrates an uneven distribution of OTs use with BI and BD. Although two dominant theories were investigated, resource-based theory and dynamic capability view, there is a need for more research on other important modern theories such as game theory, sociomaterialism theory, goal contagion theory, information systems participation theory, normalization process theory, and service-dominant logic.

This study highlights that OTs have different impact attentions on BI and BD. Organizational performance, BI and BD adoption and supply chain sustainability have the highest attention. The work suggests the need for future studies to focus more on other important directions including innovation, decision-making, and agility.

In term of implication, this work aims to list all up-to-date theories that have been used to support the use and development of BI and BD. Although most of the literature focuses more on the linkage between BD and OTs, BD and BDA can still be seen as a part of BI (Sun, Zou, & Strang, 2015). Hence, the results can be applied for BI accordingly. Exploring how the knowledge of BI and BD has used OTs helps to create innovative insights for theoretically original research in BI, BD and BDA and their impact on a firm's performance, innovation, adoption, agility, decision-making, and supply-chain support.

In term of limitations, this work has some limitations regarding its scope. The articles analyzed were mainly carried out from recent empirical studies including Fiorini et al (2018), and Hazen et al. (2016), and the recent researches in the field, which does not gather all the latest research in the field.

To conclude, we have outlined some avenues for future research in the area of BI and BD. We propose some opportunities for future studies in this promising research area. Future studies could focus on organizational behavior and structure in accordance with BI and BD implementation. Technological research of BI and BD dominates organizational culture studies, especially data-driven, organizational learning and knowledge sharing within BI and BD domains. Future studies could focus on BI and BD organizational culture.

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