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Relating Big Data, Value Creation, Performance and Decision-Making: Multiple Case Studies

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Abstract

This study aimed to understand how big data (BD) contributes to value creation in organisations and provides relevant, integrated, and timely information for the performance measurement/assessment model that supports top-management decision-making. The empirical study employs a qualitative methodology comprising five cases using the multiple-case study method. The data collection instrument was semi-structured interviews, and the MAXQDA software was used to treat and analyse the contents. The results show that BD creates value for organisations with positive effects on performance, namely on results, key indicators and turnover, confirming its contribution with relevant financial and non-financial information. It also highlights its innovative approach since the evidence found can be combined with the balanced scorecard (BSC) to identify the most appropriate and efficient key performance indicators (KPIs) for better organisational performance.

Keywords: *Big Data; Performance; Value Creation; Decision-Making; Multiple Case Studies.*

Introduction

Several authors (e.g. Akter et al., 2016; Batistic & van der Laken, 2019; Columbus, 2014; Dubey et al., 2019; Manyika et al., 2011; Maroufkhani et al., 2019; McAfee & Brynjolfsson, 2012; Mikalef et al., 2019; Müller et al., 2018) corroborate the existence of positive implications of using Big Data (BD) in performance and decision-making and validate the existence of effective gains from its use in strategic alignment. However, most existing works focus on analysing this theme from the perspective of the connection between knowledge management, BD and performance (Ferraris et al., 2019) or between the quality of information extracted from BD and performance (Wamba et al., 2019).

However, despite the above, there is no unanimity in the literature regarding the existence of a positive correlation between BD and performance (e.g., Chierici et al., 2019; Ferreira et al., 2020; Sebhatu, 2021; Shan et al., 2019; Vu, 2020). On the other hand, Farukhi et al. (2020) show that BD is transforming the business model of organisations and contributing to the creation of value. Almeida and Low-Choy (2021) argue that BD allows for identifying new business opportunities with greater efficiency and speed, while the study by Prescott (2016) advocates it as an essential tool available to organisations to increase their competitive advantage and performance. On the other hand, Ramadan et al. (2020) confirm BD as a new management paradigm.

In addition, there is also a lack of consistent empirical evidence, particularly in knowing how value in the organisation and competitive advantage can be created from BD (Troilo et al., 2017; Yoo et al., 2010) and how BD can serve to enable industrial innovation activities (Barrett et al., 2015; Jin et al., 2015; Provost & Fawcett, 2013; Witell et al., 2016), despite the appearance of some studies, but few along these lines (Teece & Linden, 2017; Urbinati et al., 2018). For Teece and Linden (2017), digitisation is a driver of next-generation competition, adding flexibility and accelerating the pace of competition between organisations.

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They argue that an adequate business model design requires a deep understanding of customer needs and the technological and organisational resources that can respond to them. Customer needs must thus be identified, and products developed following them. These actions involve learning cycles that contribute to the continuous adjustment of the business model to maintain the organisation's competitive edge. According to these authors, innovations also play a decisive role in gaining a competitive advantage. For Urbinati et al. (2018), BD allows the implementation of new key activities, as it allows changes to the product, how internal activities are supported, and the processes related to the customer. According to Svahn et al. (2017) and Nambisan et al. (2017), there is still a long way to go in research in this area. Grover and Kar (2017) report that few organisations use data for this purpose, and less than a quarter of structured data is effectively used in decision-making.

It is therefore urgent to study the challenges that organisations face in the way in which BD should be leveraged to create value in the business (Abbasi et al., 2016; Constantiou & Kallinikos, 2015; Kiron, 2017; Mikalef et al., 2018; Popovic et al., 2018; Sharma et al., 2014; Vidgen et al., 2017; Wamba et al., 2017) and identify new key performance indicators (Moll & Yigitbasioglu, 2019). This need arises from the incipient use of BD potential in organisations, either due to the lack of knowledge of algorithmic analysis and data mining techniques that can transform data into relevant information and, in turn, into knowledge (Braganza et al., 2017; Malik, 2013), or by the obstacles that emerge from the lack of strategic alignment with the strategy, with human resources and with a data-driven culture (Gupta & George, 2016).

Following these gaps, the present study aims to contribute to an expansion of the existing theory, on the one hand, filling the gaps identified in the literature and, on the other hand, contributing to grounded theory (Glaser & Strauss, 1967), privileging a closer connection between theory and the scenario that is intended to be investigated. Following the literature review conducted, the following research questions (RQ) emerge:

RQ1: What is the contribution of BD to organisations' value creation?

RQ2: What is the contribution of BD to improving organisational performance?

RQ3: What is the contribution of BD to improving the decision-making process?

In other words, it must be demonstrated that through BD, relevant and valuable information can be obtained, which can be converted into more efficient metrics and thus contribute to increasing the company's operational, financial, and economic performance.

This paper is structured as follows: in addition to the introduction, it presents the theoretical framework, the methodology and the method that will be used in the empirical study, the results and their discussion, and the conclusions, including limitations and directions for future investigations and conclusions.

Literature Review

We are witnessing an unprecedented immensity of data. This leads to the need to find new ways to support business, for organisations to reinvent themselves with the data they have and serve their decision-makers (Kwon et al., 2014). Calle (2008) reiterates that information has six generic strategies in mind: cost reduction, value creation, capacity for innovation, risk reduction, valuation, and product differentiation, contributing to quality decision-making and, therefore, a way to increase the competitiveness of organisations.

This study addresses BD as a repository of vast amounts of structured and unstructured data, the collection, management and use of which in analysis, mining and data processing techniques may be decisive in supporting the decision-making process (Ghasemaghaei & Calic, 2020). The three Vs outlook essentially characterises BD, although the most recent literature counts eight Vs and others even mention ten Vs and, in the very near future, more can certainly be added. These basic characteristics are volume, velocity, and variety, which require improved analysis and mining techniques to obtain data with quality and value (Alharthi et al., 2017). Based on this theoretical assumption, this investigation sought to find evidence that

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corroborates the thesis that, when combined with the appropriate technology and the organisation's strategy, BD undoubtedly contributes to greater insights regarding value creation and, consequently, improved performance and more effective decision-making.

BD and value creation

There are still few studies that effectively demonstrate the impact that BD can produce in terms of value creation in organisations (Gupta & George, 2016; Grover et al., 2018; Müller et al., 2018; Vidgen et al., 2017; Wamba et al., 2017). Tanwar et al. (2020) also argue that BD adds value to different dimensions of the organisation. Value in the organisation can be functional or symbolic. The most mentioned metrics in measuring functional value are cost and time reduction, product/service innovation, greater efficiency gains and improvements in productivity and financial performance (Ajah & Nweke, 2019; Grover et al., 2017). Functional value is demonstrated by improved performance because of the adoption of BD through market share indicators and financial performance (Grover et al., 2018). These authors also argue that, in addition to the functional value, the so-called symbolic value is reflected in the value associated with the organisation's brand image and reputation. BD also adds value to the business by generating new market opportunities, defining new competitive advantages, and fostering productivity and innovation in all areas of organisations (Behling et al., 2021).

Regarding the assessment of the relationship between BD and value creation, the first research question is as follows:

RQ1: What is the contribution of BD to organisations' value creation?

BD and performance

Measuring the performance of an organisation is fundamental, as it allows the reasons behind the results obtained to be known and the future performance of organisations to be improved (Neely, 2005). Performance assesses the activity of an organisation through a set of financial and non-financial indicators. The balance between these is fundamental for an adequate balance of measures because the performance and creation of value of an organisation depend on the combinations and interactions that are established at different levels, namely "the development and use of its intellectual capital, financial assets, investment in research and development and innovation, sector of activity and geographic location" (Hristov et al., 2019, p. 1).

BD has come to be seen as a differentiating element in the increase of organisational performance of organisations, although there are still few studies that corroborate this correlation; the few that exist confirm it, namely Akter et al. (2016), Chen et al. (2015), Wamba et al. (2017), Xiang et al. (2015) and Xie et al. (2017). BD can (1) bring a competitive advantage to organisations, (2) improve financial performance and, consequently, (3) influence decision-making (Gandomi & Haider, 2015; Worster et al., 2014).

The increasing speed with which an increasing amount of data is collected and processed is definitively transforming value chains and the management of business processes (Krajicek, 2014). McAfee et al. (2012) conclude that organisations that give more importance to the use and analysis of the data they have at their disposal have better financial performance, in addition to being more productive and more profitable than the others, 5% and 6%, respectively. They also noted that the ability of top managers to use data necessarily causes changes in management practices and the appreciation of experience, revolutionising how business is managed (McAfee et al., 2012).

From this perspective, Warren et al. (2015) state that BD can help identify metrics for performance measurement/evaluation systems, transforming them into monitoring systems and identifying motivational measures that increase productivity improvement. Curry et al. (2014) address the importance of BD in the value chain, while Bhimani and Willcocks (2014) and Queiroz and Pereira (2019) refer to an underutilisation of BD potential in performance evaluation. Kiron (2013) argues that BD reinforces customer relationship

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management (CRM), improves operations risk management, and increases operational efficiency and organisational performance.

The second research question was formulated to understand the relationship between BD and performance:

RQ2: What is the contribution of BD to improving organisational performance?

BD and decision-making

Not having all the necessary information in a timely manner may determine the occurrence of more significant risks for organisations when deciding on or choosing the best strategy to follow (Wilson, 1999). In addition to the quality of the information, its source is another criterion of great importance in the organisation and must come from the convergence of a set of characteristics, namely:

Relevance, that is, the degree of usefulness of the source in a given circumstance and that is related to the context, supporting the decision maker in situations of excess information (Calle, 2008);

Reliability, which consists of the user's ability and skills to solve problems and achieve defined results (Mintzberg, 1986);

Availability, in terms of time, which translates into the connection between the need for information and obtaining it (Calle, 2008);

Accuracy, which translates into rigour, objectivity, and specificity, which help to process information within the time that decision-makers have at their disposal (Calle, 2008); and lastly

Wealth of information, which is measured by the ability of an information transport channel to provide quick feedback and essential clues to the decision-making process (Calle, 2008).

McAfee and Brynjolfson (2012, p. 62) state that "because of big data, managers can measure, and hence know, radically more about their businesses, and directly translate that knowledge into improved decision-making and performance." The complexity of the decision-making process contains factors that are difficult to predict and control, resulting in the need to gather relevant information to minimise the risks associated with this extremely important task. The accessibility of information is one of the most important criteria in the organisation and consists of "the amount of effort required to locate a source and obtain the necessary information from it" (Calle, 2008, p. 57).

Decision-making is a constant action in everyone's life, and it is no different in organisations. It is a demanding task that requires the decision maker's ability and competence to quickly achieve a balance between complex situations, with many variables and different scenarios, at any time. It is necessary to know how to select the alternative that engenders the best results for the organisation, given the highly competitive environment of the current context of uncertainty in which we live (Estrela, 2014).

BD supports operational strategies through faster and more efficient decisions, incorporating data into decision-making (Li et al., 2018; Miller et al., 2018). Sagaert et al. (2018) conclude that BD provides greater security and speed in decisions of a strategic nature, leading to an increase in competitive advantage. Majeed et al. (2021) argue that BD is crucial in supporting the decision-making process, given the complexity and innovative nature of business management. For Alahakoon et al. (2020), BD combines data with the decision-making process using advanced technology for data extraction and analysis. Kache and Seuring (2017) also show that BD provides faster decision-making, productivity, and efficiency, allowing for smarter business strategies. Lastly, Yuda et al. (2020) conclude that BD creates and identifies essential elements or factors for immediate decision-making, not just oriented towards future, medium and long-term decisions.

In summary, using BD to support decision-making, in addition to being necessary and "inevitable" in the current business context, can become a differentiating factor and valuable for organisations, as the decision

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does not exist only at the strategic level, but is transversal at all levels of the organisation. BD transforms the decision-making process and highlights the processes and operations with the best performance (McAfee & Brynjolfsson, 2012). We have moved from a traditional approach where data is based on statistical methods to an approach where business analysis techniques are based on artificial intelligence (Schneider et al., 2015). The possession of information can become an incomparable competitive advantage, and it is crucial to know how BD can lead to better decisions. This leads to the third research question of the study:

RQ3: What is the contribution of BD to improving the decision-making process?

Methodology

In this study, a qualitative methodological approach was used, which, according to Denzin and Lincoln (1994, p. 4), consists of attributing greater importance to "processes and meanings that are neither examined nor measured (if they are measured at all) rigorously, in terms of quantity, volume, intensity or frequency". In qualitative research, "the data collected are called qualitative, which means rich in descriptive phenomena regarding people, places and conversations, and of complex statistical treatment" (Bogdan & Bilken, 1994, p. 16).

Silverman (2000) stated that the qualitative paradigm is primarily concerned with the meaning of the phenomenon rather than its measurement (Silverman, 2000). This interest in the complexity, description, understanding and depth of the meanings and attributes of the actors participating in the context characterises qualitative research more than obtaining results or quantifications of reality.

For Dubois and Gadde (2002), the apprehension of the connection between the phenomenon and the context in which it is inserted is greater when case studies are used, reinforcing Yin's (2002) idea that the "use of case studies, when the boundaries between the phenomenon and the context are not clearly evident" (Easton, 2000, p. 206), is the most appropriate in an investigation in which the how and the why of phenomena are investigated. The adoption of multiple case studies comes from the advantage of obtaining "different perspectives on the event" under analysis (Creswell & Poth, 2016, p. 75), in addition to the fact that this approach, oriented towards multiple case studies, is advantageous for the description and construction of theory and frameworks (Liket & Simaens, 2013).

Sample

The sample considered five case studies. The interviewees are management, banking and business consultants (except for one who is a logistics and distribution operator) who carry out their activity in organisations focusing on banking, logistics, distribution, telecommunications and retail and with specialised knowledge in BD. Interviews with experts allow for privileged information and enable the researcher to get to know the context of the investigation better and more quickly than would be possible if quantitative research methods were used instead (Bogner et al., 2018).

Regarding the number of cases used in this investigation, "although there is no ideal number, a number between 4 and 10 cases usually works well. With less than 4 cases, generating a complex theory is often difficult, and its empirical foundation will probably not be convincing (…). With more than 10 cases, it quickly becomes difficult to deal with the complexity and volume of the data." (Eisenhardt, 1989, p. 545). Yin (2005) also states that generalisations can be made if the conclusions are similar in two cases, so the goal should be to have at least two cases in the study.

Data collection

Flick (2004) highlights semi-structured interviews, among the most used because they are relatively open without following a pre-established order in formulating the questions. There is greater flexibility in the placement of the questions, as they can be placed at the most appropriate time, depending on the answers of those interviewed.

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Based on the literature, semi-structured interviews were used for data collection, which allowed the opinions and perceptions of the interviewees on the themes under study to be presented uniformly, allowing a better understanding and knowledge of the experienced realities. For this purpose, an interview guide was created, consisting of 17 questions with a maximum duration of 40 minutes. The interviews were conducted online via the Zoom platform. They started on April 8 and ended on April 26, 2022. Before the interview, the researcher informed the interviewee about the research objectives. The interview script guarantees comparability between the discourses of different experts (Aguinis & Solarino, 2019; Solarino & Aguinis, 2021).

Data analysis

Content analysis was performed using the MAXQDA *software,* which is considered to be helpful in qualitative content analysis (Liket & Simaens, 2013). At the same time, it allows the use of multiple analysis strategies, namely reading, reflection, writing/annotations, encoding, connecting, and viewing. We followed the procedures in the literature on the categorisation of the content of the interviews; namely, we carried out a (i) pre-analysis, (ii) exploration of the material and (iii) treatment of the results, inference, and interpretation (Bardin, 2011). After transcribing the interviews, the categories created were coded, and these, in turn, were segmented into units of meaning/context that represented descriptions of the practices reflected in the interviews (Graneheim & Lundman, 2004). In some categories, the perceptions were transmitted differently, but the sense and meaning were the same, according to Hamlin et al. (2011), reflecting the respective contextual realities.

Results

In this section, we present the results obtained in terms of the main contributions that BD brought from the perspective of the interviewees, namely the impact of BD on competitiveness, carrying out innovation activities and its determinants, in terms of the revolutionary, incremental or radical improvements triggered in the organisation, and gaining a competitive advantage in the context of adoption of BD.

The main contributions of BD in managing organisations are shown in Figure 1.

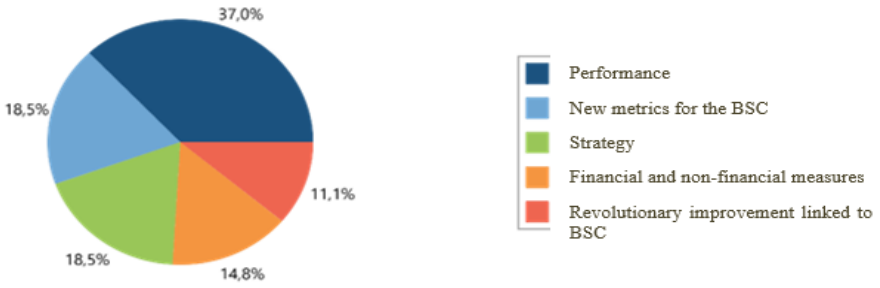

Figure 1. Main contributions of BD in the management of organisations

The most important contribution is in terms of performance, with 37.0%, followed by the incorporation of new metrics for the Balanced Scorecard *(*BSC) and strategy, both with 18.5%, of financial and non-financial measures (14.8%) and, finally, the contribution to a revolutionary improvement when combined with the BSC.

Despite the importance that BD had in aligning the organisation's strategy, the greatest impact of BD on the nature of the decisions taken by decision-makers is still at the operational level, despite the evidence that the contributions of BD to the strategic level are quite significant. In fact, the strategic alignment of the strategy with human resources and the implementation of a data-driven culture is crucial in obtaining

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greater gains in performance through the adoption of BD in the management of organisations, in line with the study by Gupta and George (2016). In Table 1, the main results of the contributions of BD to value creation are presented. Respondents are identified by IX, where I stands for the interviewee, and X is the assigned serial number.

Table 1. Extract from respondents' responses on the main contributions of BD to value creation.

Respondent	Empirical evidence
I3	*"We can only create value with data if we can communicate with the data and show what is at stake in terms of the decision or evaluation process."*
I3	*"(…) linked to strategy monitoring (or options, decisions). If we cannot create this pipeline (we have the data, how do we transform this data and create information and how this is linked to the evaluation of our business or our performance), we will never be able to create value for a company."*
I1	*"Today it is known that information, data-driven information, is a business reality, everyone knows the importance of information in the sense that it allows me to make more assertive decisions. Yes, BD must be understood as a source of value creation."*
I4	*"I usually say that the greatest value of our organisation is HR, and in fact, big data contributes to this value creation."*

Figure 2 shows the results regarding BD's impact on organisations' competitiveness.

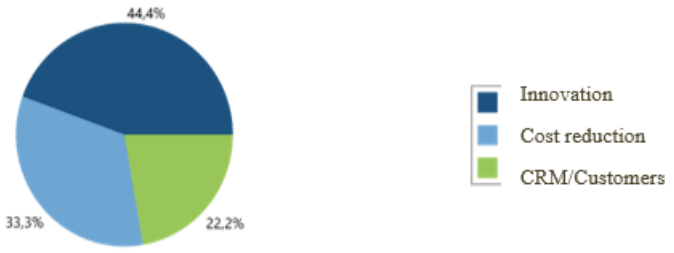

Figure 2. Impact of BD on the competitiveness of organisations

The factors that determined the improvement of competitiveness in organisations were the innovation activities carried out due to the adoption of BD (44.4%), the reduction in expenses observed (33.3%) and the improvement in the management of customer relationships (22.2%), which positively benefited from BD. According to the interviewees, these three dimensions reflect the positive impact of adopting BD. Figure 3 presents the determinants of innovation in a BD context.

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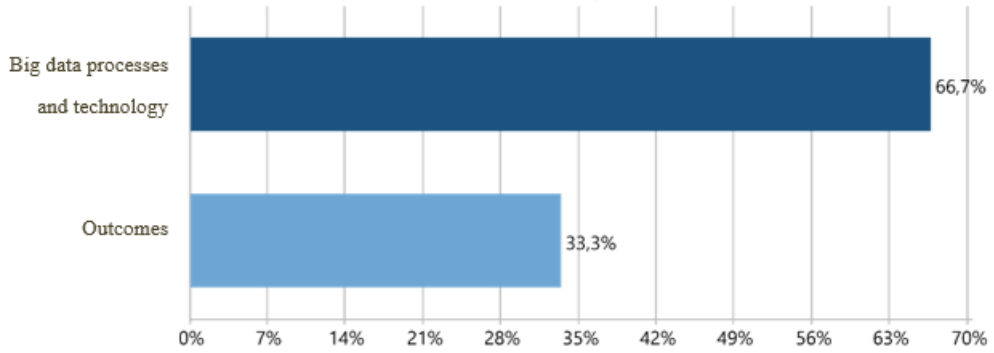

Figure 3. Determinants of innovation in a BD context

Regarding innovation, respondents consider that BD is the engine that triggers activities of this nature (66.7%), followed by the outcomes obtained with 33.3%.

Regarding the impact of BD on the improvements observed in the organisation, the following results were obtained, as per Figure 4.

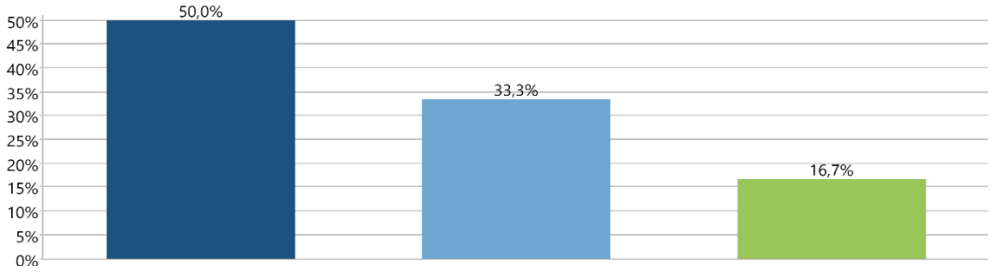

Figure 4. Impact of BD on organisation

In Figure 4, BD provided a greater impact in revolutionary improvements; that is, it allowed the application of new disruptive actions (50%) completely different from the processes and procedures organisations had adopted until then. The verification of radical improvements due to the adoption of BD stood at 33.3%, and incremental improvements at 16.7%.

Additionally, some excerpts from the interviews that allowed the corroboration of the previous results are shown in Table 2.

Table 2. Extract of respondents' responses on empirical innovation and organisational improvements.

Respondent	Empirical evidence
I4	*"This daily, day-to-day management of customer care is notable. It was absolutely fundamental. We no longer have departmental visibility and now have organisational visibility. So internally, between departments, there is a different dynamic and a different integration of what the processes are."* *"We had several disruptive innovations based on BD."*
I2	*"(…) BD gives us a dive into the data; that is, you can have a big picture and you can also make queries at any time …go to the details, go to a niche, and that allows you to think about a market in that niche and innovate in that area."*
I4	*"(….) we control all these processes that lead us to innovation actions and activities of this nature. There is, without a doubt, an improvement in competitiveness inherent to all these types of actions that we are doing."*

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I3	*"BD's contribution to improving competitiveness is always associated with innovation… it resides a lot in the processes… in the frameworks that are used, not only in the methodological frameworks, but also in the technological frameworks and then it also resides in the technological component."* *"BD, when well applied, always contributes to improvements (…). I don't know of any case where BD hasn't improved anything. But when it creates value for the organisation."*
I4	*"We have a frankly important innovative aspect, and we have this in all products and in all business areas."*
I5	*"Because innovation can really be grounded in this new data framework called BD."* *"(…) this current generation of data, coming from all types of sources, generates disruptive innovations."*

According to Porter (1985), organisations that perform better have identified and achieved a competitive advantage; that is, they have created value that sets them apart from the rest of the competition. In this sense, it was analysed how BD can enhance this competitive advantage as an explanatory variable of performance, which arises from the creation of value enhanced by BD (Figure 5).

Regarding competitive advantage, the interviewees were asked about three dimensions regarding the contributions of BD: impact, source, and type of data.

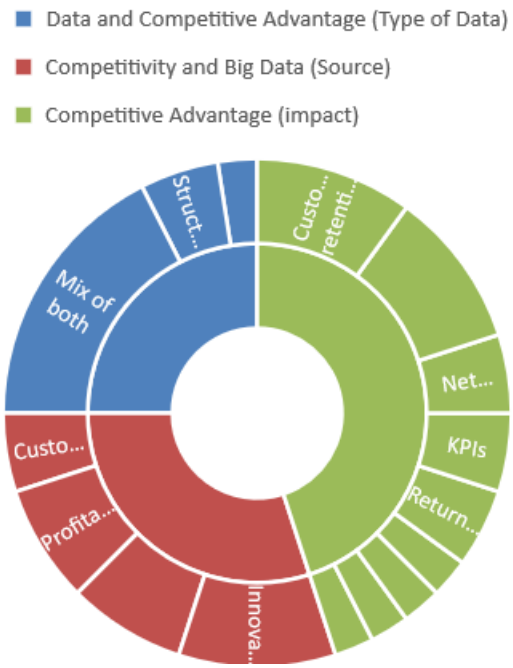

Figure 5. Contributions of BD: impact, source, and type of data

As can be seen in Figure 5, regarding the data source, innovation stands out as the main source of competitiveness associated with BD. Regarding the remaining categories of data sources (results, CRM, and cost savings), these are mentioned twice each, revealing that they are recognised by some of the interviewees, albeit negligibly.

Regarding data typology, companies do not seem to make distinctions concerning data if they observe the Vs of BD and have recurrence or a historical series, regardless of whether they are structured or unstructured. Table 3 contains some extracts from the interviews conducted.

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Table 3. Extract of respondents' responses on competitive advantage and BD data typology in organisations.

Respondent	Empirical evidence
I5	*"Structured data has great potential, especially because it is already in an architected form. It is documented and unstructured data is data that occurs in that concept of daily growth and very fast response time, low latency, almost in real time. It is the composition of these two that brings the greatest insights and competitive advantage."*
I5	*"(…) whether they are structured or not is simply a matter of architecture… it is not because it is more structured that it generates more insight, or unstructured that it generates less."*
I3	*"(…) any type of data is the target of creating a competitive advantage for a company, if it has volume, speed and all those Vs concepts associated with what BD is. What is important is the recurrence of the data, it is the persistence of the data, regardless of whether it is qualitative, quantitative, structured, or unstructured."*

The value of the data is crucial, regardless of being quantitative or qualitative, structured or unstructured, as long as BD Vs are reviewed (Table 3). Any data is likely to generate greater competitive advantage, although it is recognised that the source of greater insights can reside in unstructured data.

Regarding impact, the areas of competitive advantage most frequently highlighted by respondents are related to cost reduction and customer retention. When analysing other areas of competitive advantage highlighted in the literature, the interviewees reference each of them, but in a very insignificant way. In most cases, only one reference is made to each of these areas. We highlight the following segments of the interviews:

Table 4. Extract of respondents' responses on the areas of greatest impact in terms of competitive advantage in organisations.

Respondent	Empirical evidence
I5	*"(…) that whole part of customer retention is the most valuable."*
I2	*"The company came to understand that this change in processes would give it a competitive advantage; that is, it started to have less expenses that it would not have if it did not use BD."*
I4	*"(…) there is a visualisation of the cost per second … we can, from the moment this integration is made in the system, we can see exactly how much volume we will have, that is, based on the euro/m³ we will know which is the benefit that we're going to get from that planning operation, versus the cost of the routes. Of course, yes. (…) there is an improvement in costs."*

From the analysis of Table 4, it can be inferred that the areas of greatest impact of BD in terms of competitive advantage focused on customer retention, changing processes, reducing expenses, and obtaining useful and relevant information in real time.

Regarding the relationship between BD and value creation, the following results were obtained (Figures 6 and 7):

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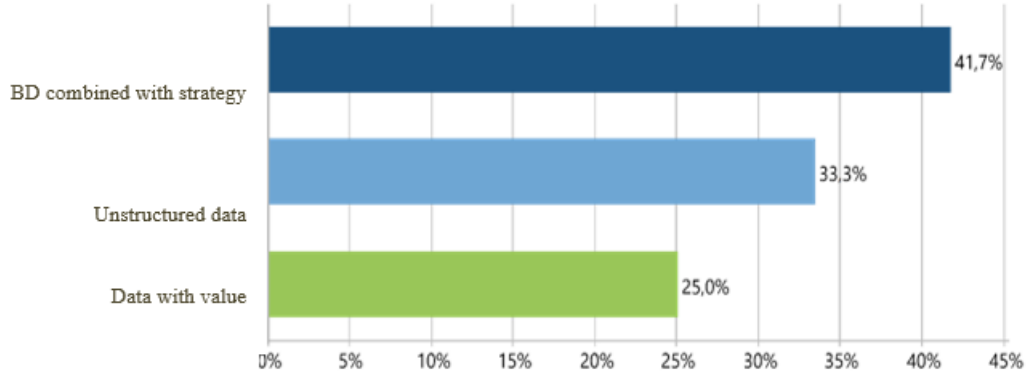

Figure 6. Value origin

As shown in Figure 6, BD, when combined with the organisation's strategy, contributes to the creation of value (41.7%), while unstructured data and data with value or quality contribute 33.3 % and 25%, respectively, to the origin of value verified in the organisations. This result confirms the importance of BD as a source of value generation in the organisations under analysis, in addition to the focus on unstructured data, as those that contribute, compared to structured data, to the origin of value. Valuing data is another element highlighted in these results, in accordance with one of the Vs of BD, value, which, for the interviewees, is essential for value creation.

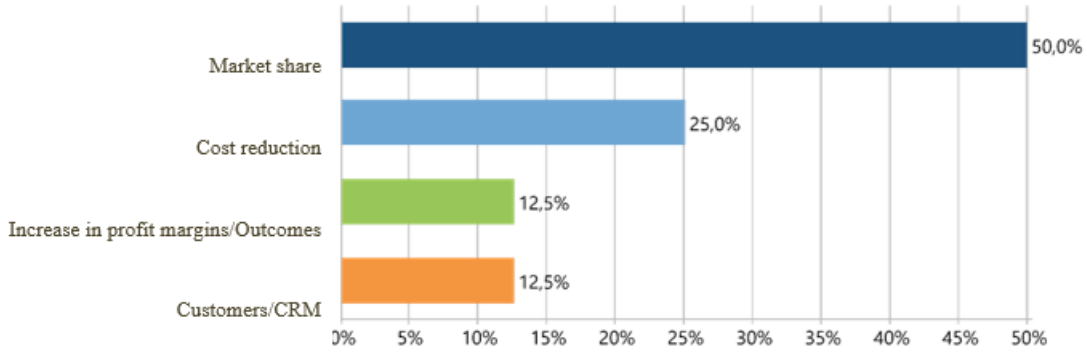

Figure 7. Value creation

Figure 7 shows the dimensions in which BD contributes to value creation. According to the interviewees, very substantial improvements were achieved in market share with the adoption of BD (50%), and it is the indicator where there was the greatest impact in terms of value creation, followed by the reduction in the cost structure (25%). The increase in margins and outcomes and customer relationship management (CRM) was at 12.5% in both. In fact, market share was identified as a factor in which the adoption of BD had a strong impact (Figure 8).

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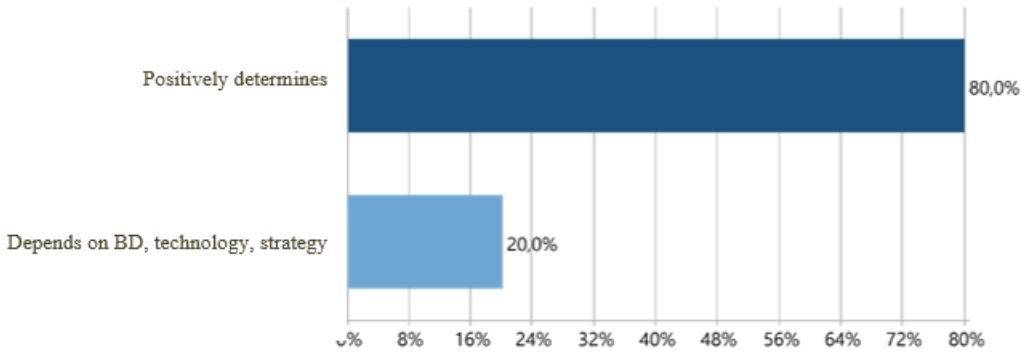

Figure 8. Impact of BD on Market Share

As evidenced by Figure 8, BD positively determines market share according to respondents (80%), while the relationship between BD and technology and strategy (20%) is key to positively determining market share. Once again, the alignment of BD with strategy is referred to as being fundamental for increasing market share.

Regarding the results obtained with the coded segments of the interviews regarding the origin and creation of value enhanced by the adoption of BD, in Table 5, some passages are shown.

Table 5. Extract of the respondents' responses on the origin and creation of value in organisations.

Respondent	Empirical Evidence
I2	*"(…) unstructured data, these imply a level of resources such that the techniques of data mining and the use of BD will bring a much greater benefit, without a doubt."*
I3	*"(…) if we didn't have unstructured data, we would never be able to do anything, but it is based on it that we create value."*
I4	*"(…)BD contributes to this value creation. But this type of action, technological evolution, and training, allows us to create value for the organisation. And I would say that was the key factor that we had."*
I5	*"(…) unstructured data provide insights into what happens in the field, in the day-to-day operations."*
I4	*"(…) there are not many logistics operators that have this (…) and there is an improvement, in fact, compared to what are the competition rates and what is the entry into the markets."*
I1	*"(…) if it hadn't been for the use of BD, I would have lost the entire market share. And that is clear to me, as a company manager and sometimes as a consultant it is important to inform companies of this: attention that if it wasn't for BD, I would have lost much more."*
I2	*"(…) the potential that exists to improve market share is great, insofar as there was a lowering of expenses and a decrease in the market price of that company."*
I5	*"BD helps a lot to establish quota and close anti-competitive flanks."*

Table 5 emphasises the importance of BD, especially of unstructured data, in the origin and creation of value and expanding the market share for this value creation.

Regarding the relationship between BD and organisational performance, we analysed three different perspectives, namely the factors that trigger better organisational performance, the dimensions in which there were positive effects of BD on performance and the type of data that positively promotes performance. Figure 9 shows the results obtained for the analysis of the first optic.

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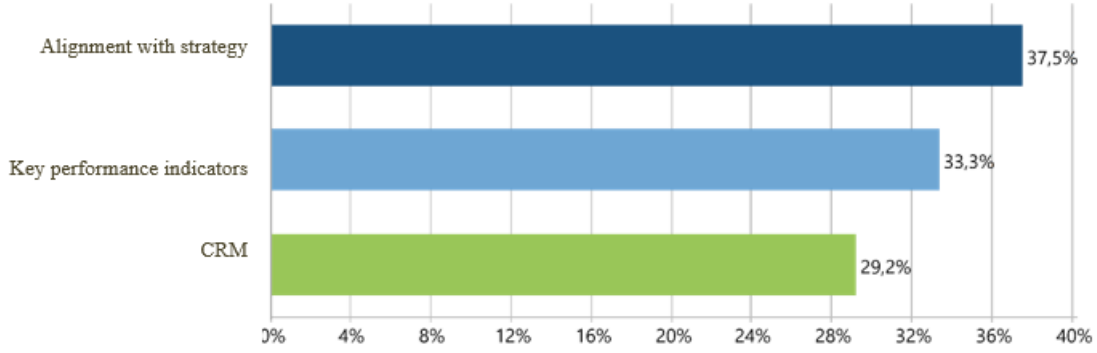

Figure 9. Factors that trigger better performance

The factors that determine better performance are alignment with strategy, identification of the most appropriate key performance indicators (KPI) capable of measuring the evolution of goals and objectives, and good customer relationship management (CRM), as seen in Figure 9.

Customer relationship management is one of the factors most mentioned by respondents, as can be seen in Table 6:

Table 6. Extract of respondents' responses on the impact of BD customer relationship management.

Respondent	Empirical evidence
I5	*"BD makes it possible, even if you already have a statistical design of the predictive model, to retain your best customers. (…) What BD does is to bring other insights from this market dynamics, showing that that point outside the ideal customer cluster can be a point to pursue. I may have a lot of work, but I will achieve a higher ROI."*
I4	*"(…) in terms of customer retention, the contracts we have with our top 10 customers are two- to three-year contracts and with 90% of them we have been for eight years and some for 12 years. The increase in performance at the management level with customers is clear."*
I4	*"(…) the market is experiencing a brutal evolution… The fact that we are in this continuous process of improvement means that all customers look at the logistics operator with the natural feeling that we already have this type of technological process."*
I3	*"(…) if we repeatedly measure customer satisfaction levels, we will be able to understand if we are going to have to internally improve any of our teams to increase performance to have more loyal customers. If there is no permanent measurement of customer satisfaction, we will never be able to understand where we are going to improve or if we are doing well against the standard."*
I5	*"I believe the main beneficiary of increased performance is the customer relationship issue."*
I1	*"(…) companies do not realise that their competitive advantage is often in interpersonal relationships."*
I1	*"If I had the opportunity (…) I would incorporate cultural variables that are normally outside and that are fundamental in customer retention. These are small flaws that can also be parameterised via BD and the BSC. I can have financial and non-financial measures. And this is fundamental, and I don't understand why it isn't done."*
I1	*"Undoubtedly. It is even in the customer relationship system (…). And even in the identification of their needs and limitations because I would be able to incorporate the needs and limitations resulting from a broader analysis that BD allows me (…). Suddenly I realise facts that until then were completely unknown to me."*

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Table 6 clearly shows that the concern with creating value for customers thus promoting their satisfaction and loyalty is fundamental for the increase in results (Figure 10) and, therefore, in improving organisational performance.

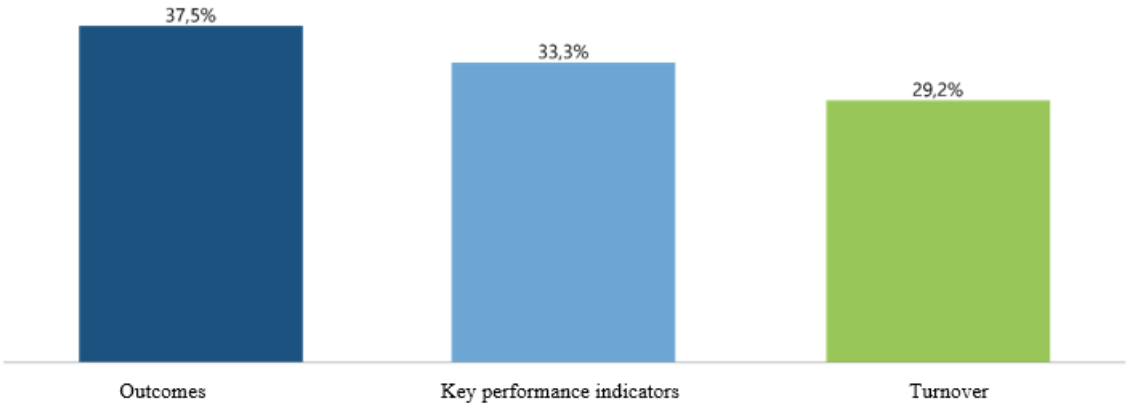

Figure 10. Impact of BD on Performance

Regarding performance, respondents are unanimous on the existence of a positive correlation between BD and performance. In fact, there were very positive effects in terms of the organisations' performance, namely in terms of three dimensions: outcomes (37.5%), with very remarkable growth, the improvement of key indicators (33.3%) that will serve to execute and measure the objectives defined by the organisations, and turnover (29.2%), registering growth in the order of two digits.

In Table 7, some testimonies are listed from the interviewees on how BD produces positive effects on performance, highlighting the metrics in which this impact was found and the respective areas:

Table 7. Extract from respondents' responses on the positive effects of BD on performance

Respondent	Empirical evidence
I4	*"(…) In terms of indicators, all of them registered a very positive effect since the use of BD, normally a growth in the order of two digits per year. We always have a budget that is based on the planning of strategies that are reflected in that budget and that are associated with an improvement plan (action or cost reduction). And these improvement plans, with the increase in sales, also lead to improvement in percentages and we recorded two-digit growth and all indicators also recorded two-digit growth."*
I1	*"I'm very pragmatic here: it's RL. (…) With BD we obtained better results."*
I2	*"(…) these results were found both in the sales indicators and in the company's results."*
I3	*"Yes, in all areas. Data can help boost performance in all areas."*
I5	*"(…) the ROI. It has been proven that the ROI is medium/high, and therefore, it really improves the company's competitiveness and performance."*
I5	*"It contributes to the creation of company value, because from the moment it is created, it becomes simpler to measure performance."*
I4	*"Of course, BD boosts sales, because doors are opening, and markets are opening up."*

In Table 7, it can be seen that BD provided significant increases in the indicators of results, volume of business, ROI, creation of value and opening to new markets, and a notable reduction in expenses.

When asked about the type of data that drives performance improvements, Figure 11 shows the results obtained:

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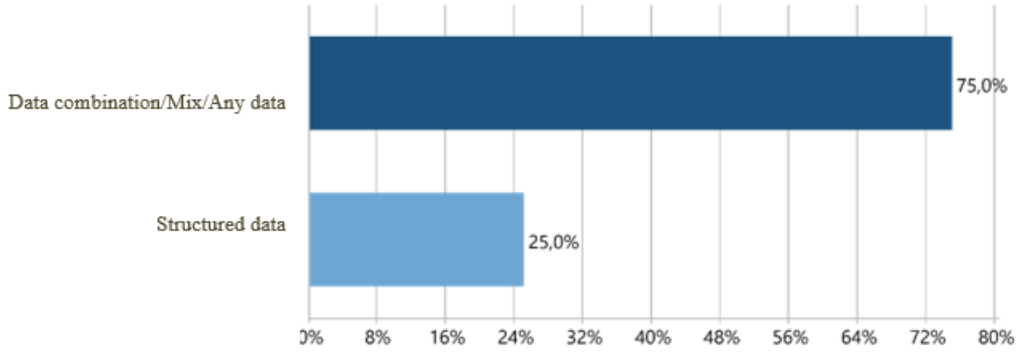

Figure 11. Data Type and Performance

It was found that the combination of structured and unstructured data promotes greater insights into organisational performance (75%), while the structured data type only registers 25%. This last component is still very much related to the information provided by accounting, which is still seen by many as financial information, and therefore structured, par excellence and essential for the issuance of reports and economic-financial analysis aimed at decision-making.

It should also be noted that the interviewees reiterated that the positive benefits of BD on performance result from the alignment of BD with the organisation's strategy, without which it would not have been possible to obtain the results presented.

Regarding the relationship between BD and decision-making, we obtained the following results:

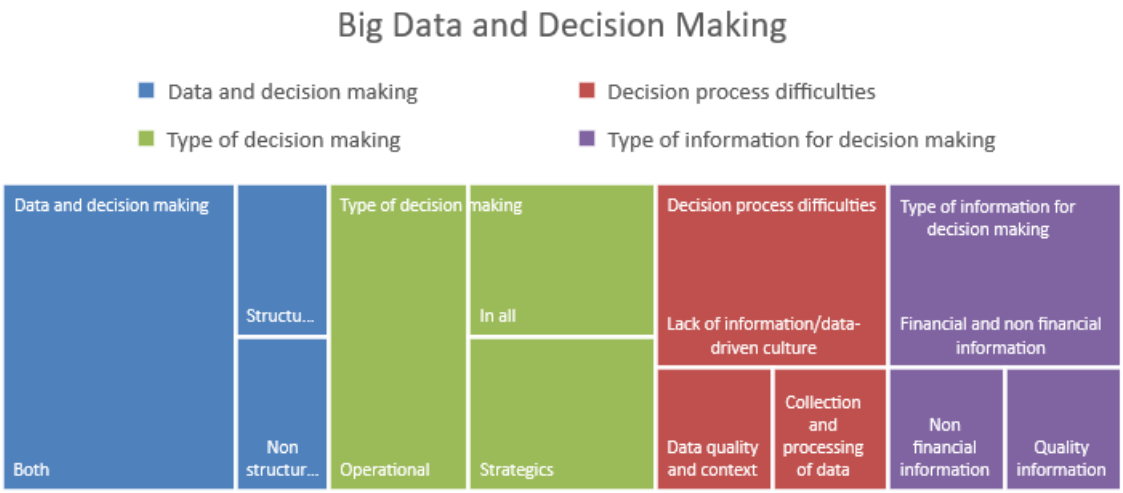

Figure 12. BD and Decision-Making

The size of the rectangles indicates the number of times that the point under analysis was mentioned in the interviews. Four perspectives were analysed in the relationship between BD and the decision-making process, namely BD and the type of data, BD and the nature of decisions, BD and the nature of information, and, finally, the most significant difficulties felt in the decision-making process itself. The first and second dimensions, BD's relationship with the decision-making process and BD and the nature of decisions, present a higher absolute frequency compared to the other two dimensions, BD and the nature of information and the difficulties felt during the decision-making process. We found that, without exception, the interviewees do not distinguish between the typology of data (structured or unstructured) and regard it as important for decision-making, evidencing that organisations will be equally focused on creating

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processes for the treatment of both data types. In the figures that follow, each of the dimensions will be analysed individually.

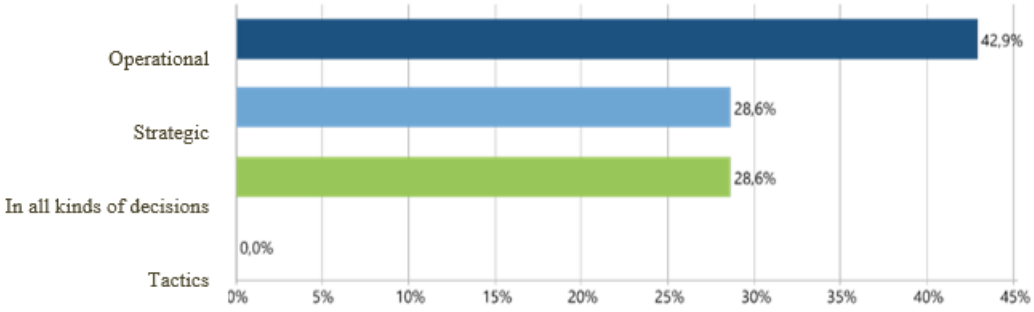

Figure 13. BD and nature of decision-making

It can be concluded from Figure 13 that operational or short-term decisions benefit most from the adoption of BD (42.9%). However, decisions of a strategic nature immediately emerge with 28.6% and with the same percentage of all decisions, whether operational, tactical, or strategic. None of the interviewees indicated the exclusive impact of BD on tactical decisions.

In fact, the type of decision-making that stands out as the basis for using BD is operational. Strategic decisions also seem to greatly benefit from BD, although tactics (intermediate level) are being neglected regarding BD's use in this decision process.

As for the type of data used in the decision-making process, Figure 14 shows the results.

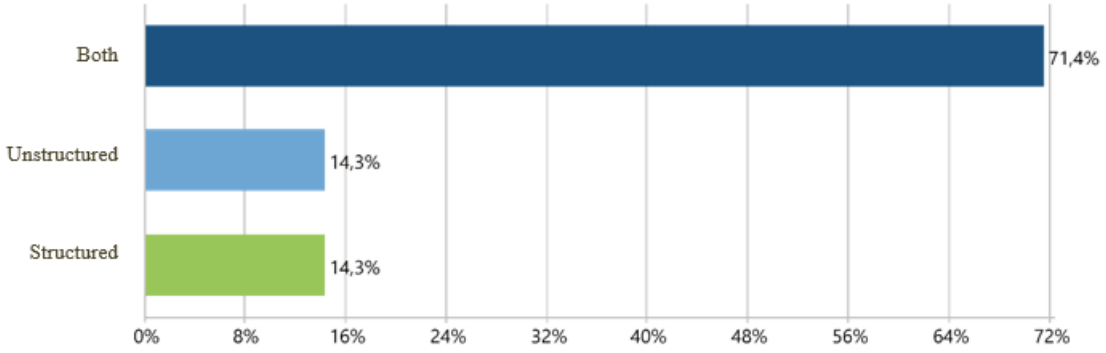

Figure 14. Type of data for decision-making

The combination of structured and unstructured data dominates among respondents with 71.4%, while unstructured data and structured data are 14.3%. The conclusion is that, without exception, the interviewees do not distinguish between the typology of data (structured or unstructured) and its importance for decision-making, evidencing that companies will be equally focused on creating processes to treat both data types. In other words, they are all determinants for decision-making. Table 8 summarises some of the testimonies of the interviewees.

Table 1 Extract of respondents' responses on the type of data and decision-making in organisations

Respondent	Empirical evidence
I1	*"I would say they are all important. In other words, each of them has importance in matters of confirmation, exploration or even alteration."*

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I3	*"I would say everyone. When, for example, we work with clients and we work with sentiment analysis and our data source comes from social networks, and it is unstructured data, but it is from there that we can apply processes of transformation of this unstructured data to be able to create knowledge, but if we didn't have the unstructured data, we would never be able to do anything."*
I3	*"Everyone is important. The structured ones and other situations where it is not…and we have to work with the unstructured data."*
I4	*"We are back to having a mix of data. Having tools that tell us exactly the numbers we are going to have, given the decision we are trying to make, gives us tremendous ease in deciding."*
I5	*"I went through PwC, which is a competitor of Accenture and Deloitte, and the successful projects of BD, cloud analytic, data lake, always point out that the hybrid model is the most successful."*
I4	*"Distribution is where we feel the most need for this data processing… we had structured and unstructured data and that this technological evolution allowed us to make a decision and a very big competitive advantage."*

From Table 8, it is possible to conclude that all data are important when it comes to their application in the decision-making process. One might add that to decide, the data must be a carrier of value (Figure 6), because only then will it enhance value creation. In other words, the data must be useful and relevant and allow for the generation of insights since having many data is not synonymous with value creation but the value that the data can generate for the organisation. Figure 15 shows the nature of the information used in the decision-making process.

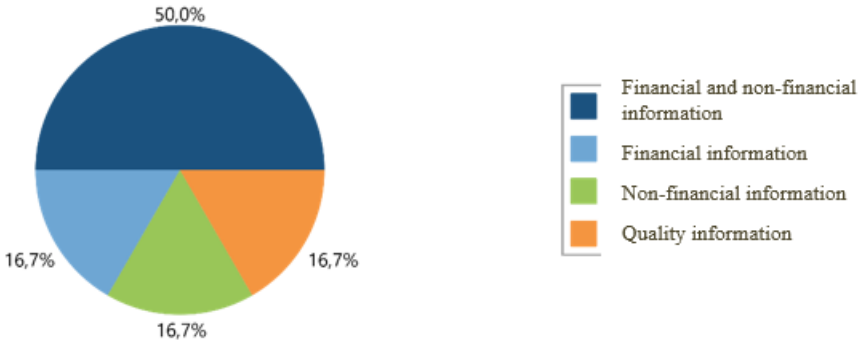

Figure 1 Nature of information for decision-making

Regarding the nature of the information used in the link between BD and the BSC, there is a mix of financial and non-financial information (50%), financial information and non-financial information with 16.7% respectively and, finally, quality information, regardless of its financial or non-financial nature, also with 16.7%.

In the BD universe, financial data continue to be used because they are structured and/or systematised (accounting is the source par excellence of this type of information). Even so, unstructured data appears to have a recognised value for decision-making (only one of the interviewees does not refer to non-financial information), which reveals the importance of BD in the decision-making process.

Regarding the difficulties experienced during the decision-making process, Figure 16 summarises the results.

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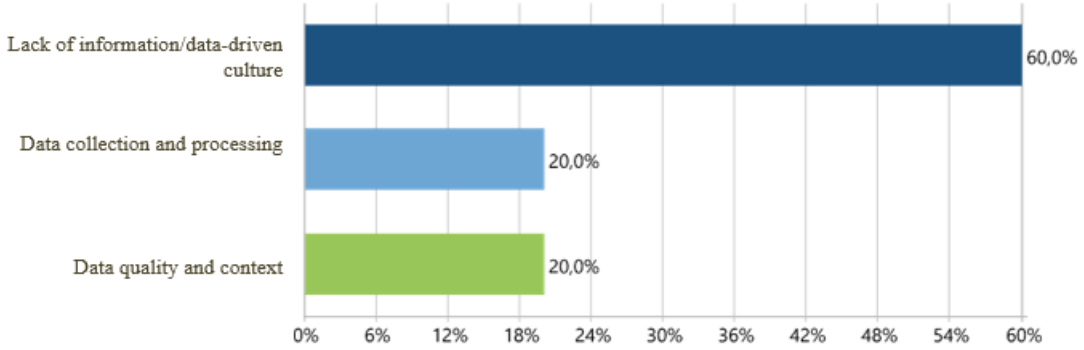

Figure 2 Difficulties experienced in decision-making

In terms of difficulties and obstacles in the decision-making process, the obstacles mentioned in the literature, although mentioned by the interviewees (collection and statistical treatment and quality and context of data), seem to be fading, which may reveal that nowadays companies will be better able in terms of human resources and information systems to deal with these two phases of the BD analytical process. Regarding the data-driven culture, this is the difficulty most pointed out by the interviewees (60%), showing that, on the one hand, companies are aware of the importance of creating this culture, but on the other hand, they have difficulties in implementing it. It should also be noted that interviewees I1 and I5 are the only ones who do not mention difficulties in this area; they should study in the future whether the sectoral areas in which they performed consultancy are not problems on which these companies should work or if it is a lack of knowledge of the importance BD-oriented culture.

Figure 17 represents a word cloud that summarises the four dimensions explored in the relationship between BD and decision-making:

Figure 3 Word cloud about BD and decision-making

The size of each word indicates the number of times it was mentioned in the interviews (units of analysis or context). That is, the interviewees corroborate the existence of better decisions with BD through a mix of structured and unstructured data, significantly influencing operational decisions and, therefore, strategic ones.

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In the following figures, a comparative analysis of a model with two cases is established, which aims to highlight what each interviewee has in common. The size of the labels reflects the greater or lesser importance.

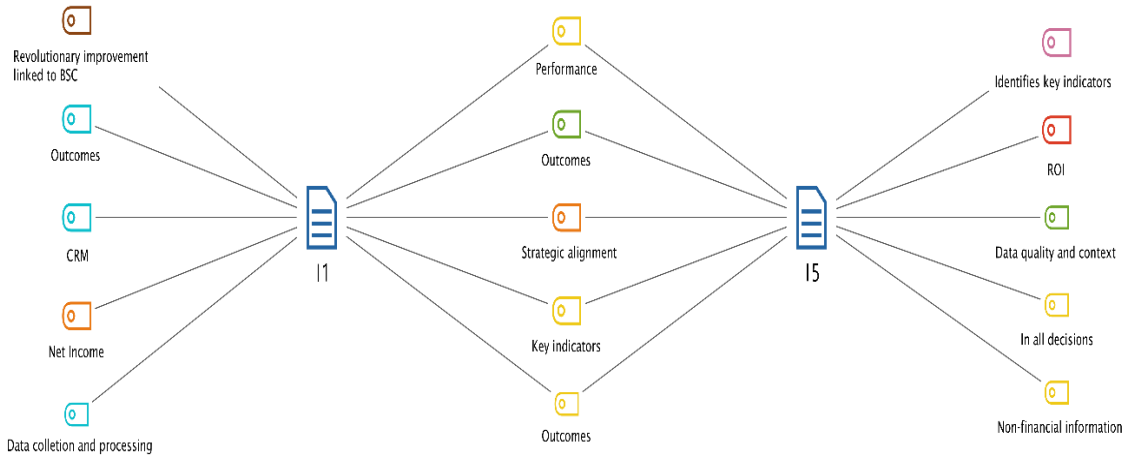

Figure 4 Comparative analysis between I1 and I5

As can be seen, the central labels are the factors or elements identified that the two interviewees have in common. The size of the label, smaller or bigger, indicates the greater or lesser importance, respectively, with which these elements or factors were verified in the respective organisations. In this case, the common elements were performance, outcomes, strategic alignment, and key indicators. Figure 19 refers to interviewees I3 and I4.

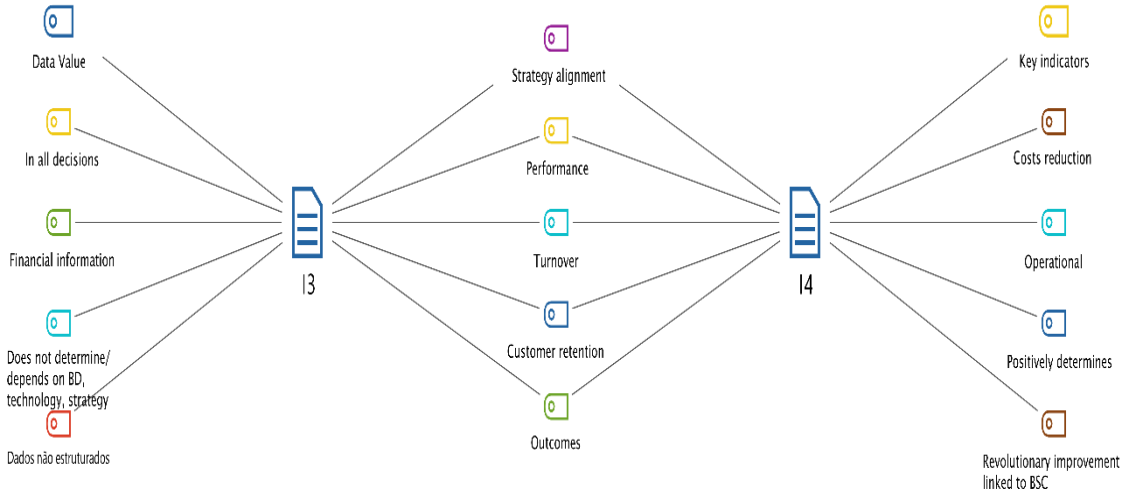

Figure 5 Comparative analysis between I3 and I4

Comparing the results in common between I3 and I4, it is noticeable that the strategic alignment of BD, performance, and outcomes are mentioned again, as seen in Figure 18, adding turnover and customer retention as two factors also mentioned by both interviewees.

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Figure 20, represents the comparative analysis between interviewees I2 and I5.

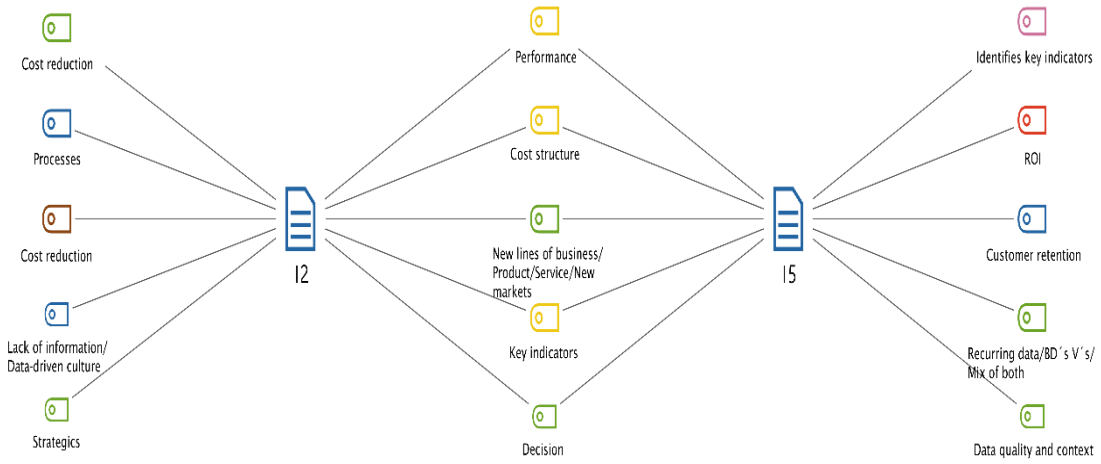

Figure 6 Comparative analysis between I2 and I5

In this comparative model, again, the performance in evidence, the structure of expenses, the key indicators, and the new lines of business/products/services/new markets were the elements that most benefited from BD and then, with a smaller label, comes decision-making.

In Figure 21, a comparison between interviewees I5 and I4 is made.

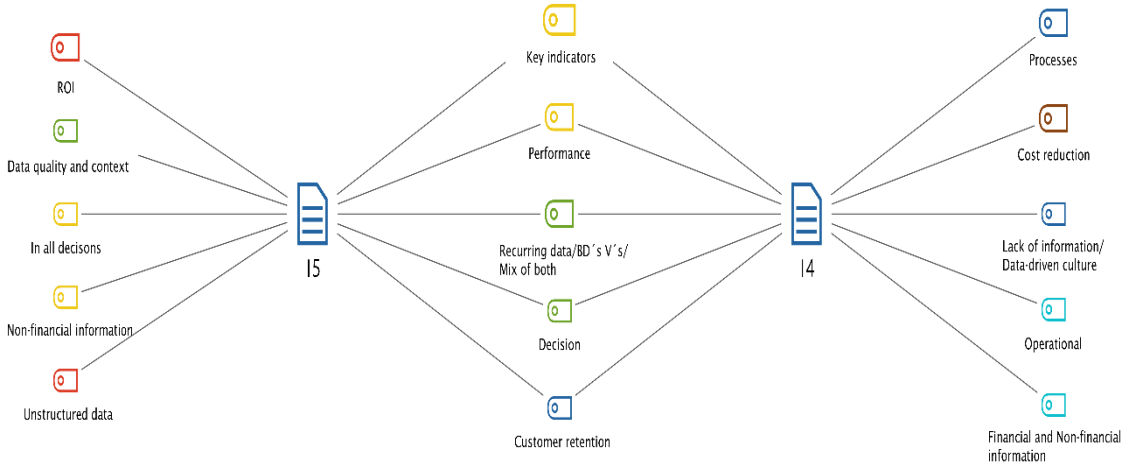

Figure 7 Comparative analysis between I5 and I4

In the previous figure, the key indicators are what stands out against the remaining elements, then performance, also related to the key indicators, and BD data that present the characteristics of BD V's, regardless of whether they are structured or unstructured. Finally, the smallest label is for decision-making and customer retention.

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Figure 22 represents the comparison between interviewees I2 and I1.

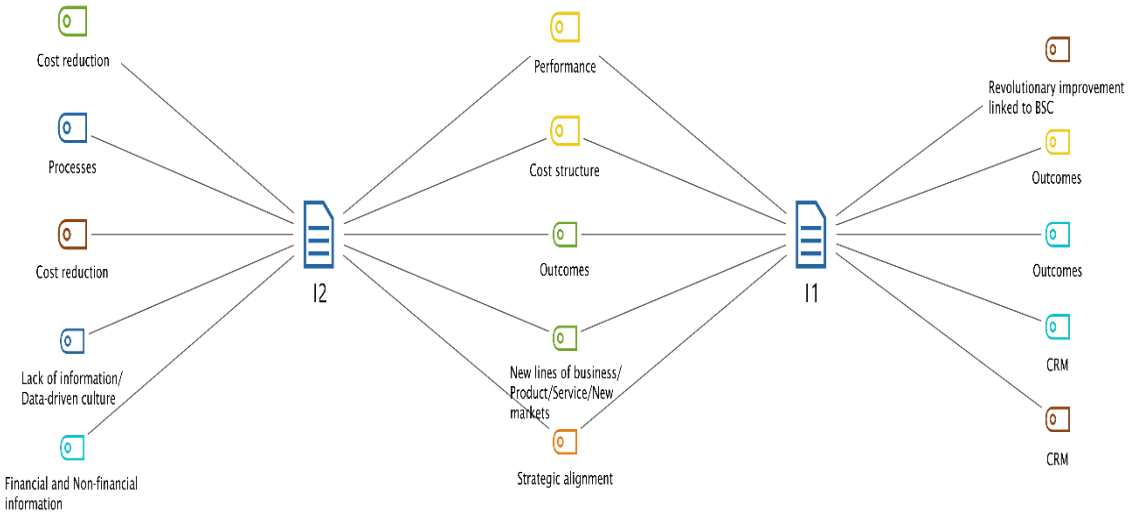

Figure 8 Comparative analysis between I2 and I1

In Figure 22, once again, performance appears with the largest label and the cost structure, followed by outcomes, new lines of business/products/services/new markets and alignment with the strategy.

Finally, Figure 23 shows the comparison between interviewees I3 and I5.

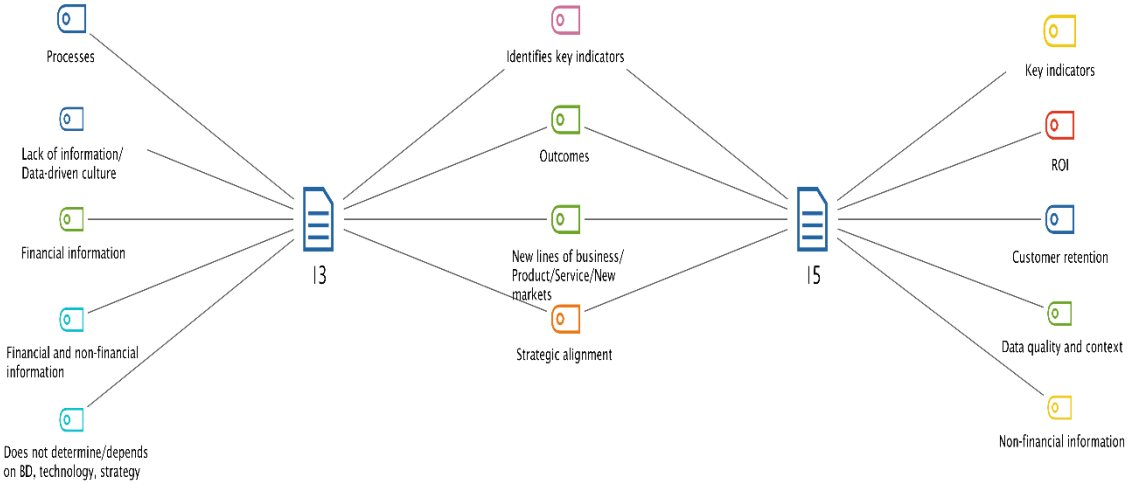

Figure 9 Comparative analysis between I3 and I5

Figure 23 shows that key indicators, results, new lines of business/products/services/new markets and alignment with strategy are the dimensions in which BD produced the most significant effects.

In short, we found that performance, key performance indicators, results, alignment with the strategy and cost reduction are the dimensions most frequently mentioned in the comparative analysis carried out in a two-case model.

Discussion of Results

This section includes a detailed analysis of each of the research questions based on the results obtained.

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Regarding the first research question, BD's contribution to the creation of value in organisations is that whenever BD is aligned with strategy, it creates value in the organisation. This was the main source of value the interviewees pointed out. We can thus say that BD contributes to this strategic alignment of the organisation, vital for the creation of value, a position, in fact, corroborated by Dubey et al. (2019), Maroufkhani et al. (2019) and Müller et al. (2018). Among the vast amount of data that can be found in BD, the interviewees also highlighted the importance of unstructured data in generating more insights that lead to this value creation. It was also mentioned that any data, if it is data with value, one of the three Vs of BD, is a generator of value creation. The interviewees indicated which dimensions of this value creation were more evident: improving market share, reducing the expenditure structure, increasing results and/or profit margins, retaining customers, and managing customer relationships. In short, given the results obtained, the first research question can be validated; that is, BD influences value creation. This evidence converges with the literature review carried out (Batistic van der Laken, 2019; Farukhi et al., 2020; Gupta & George, 2016; Mikalef et al., 2019; Tanwar et al., 2020; Yuda et al., 2020).

Regarding the second research question, that is, whether BD contributes to the improvement of organisational performance, we found that there was an increase in the results in the KPIs identified with the support of BD, the objective of which is to effectively monitor and measure the gains tending to obtain those results, and in the volume of business. This is in line with the findings of Akter et al. (2016), Chen et al. (2015), Wamba et al. (2017), Xiang et al. (2015) and Xie et al. (2017). However, it goes against the conclusions of Chierici et al. (2019), Ferreira et al. (2020), Queiroz and Pereira (2019), Sebhatu (2021) and Vu (2000), as our results indicate that BD improves organisational performance.

For this improved performance to be verified via BD, the results again demonstrate that strategic alignment is crucial in obtaining performance gains for the organisation, as well as a correct definition of KPIs and good customer relationship management. This last conclusion is corroborated by Kiron (2013), who refers to the importance of CRM in increasing organisational performance.

In summary, the second research question can be validated; that is, BD contributes to improving organisational performance through BD's strategic alignment and the definition and identification of the most efficient KPIs for the organisation. This identification will make it possible to include KPIs that are more suitable and, therefore, more efficient for the organisation according to the four perspectives of the BSC in order to fully monitor organisational performance through different perspectives, such as customers, finance, internal processes and learning and growth. According to interviewee I3, "BD is based on KPIs. The topic of KPIs is crucial, has always been crucial and remains crucial, and is closely associated with data. What supports the KPIs are the data (…), and that is the contribution of BD". In fact, the BSC works with performance indicators and the performance indicators are based on data, so BD's contribution in identifying KPIs leads to a better definition of the goal and objective to be achieved and optimised, hence based on the results. As an example, in air carriers, BD helped to identify one of the main KPIs, namely how many employees there are on the ground for each plane that is flying; that is, what BD came to show is that it is not the occupancy cost of the plane, nor the cost associated with the distance travelled, in kilometres, the main metric of this organisation. BD made it possible to identify this metric, which has been ignored until now, and these are the metrics that will guide the business on the path to greater results and better organisational performance. In fact, this "discovery" allowed the airline to become more competitive, contributing to the rejuvenation of the fleet and lower maintenance costs, all supported by BD technology. Identifying KPIs and the new lines of business that BD enables converge with Li et al. (2018) and Miller et al. (2018).

Finally, the third research question was to assess whether BD improves the decision-making process. The results reveal that BD indelibly influences operational decisions (about 43%), but decisions of a strategic nature are also mentioned by the interviewees (28.6%), although in the background, as being equally benefited by BD if this is in line with the strategy. It was found that any type of data, structured and unstructured, contributes to decision-making; therefore, financial and non-financial information is necessary for the decision-making process. This evidence converges with Yuda et al. (2020) when they state that BD supports short-term decisions of an operational nature. It is also in line with the studies by Li et

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al. (2018) and Miller et al. (2018), who argue that BD supports the decision-making process by incorporating essential data into operational decision-making.

In conclusion, BD influences decision-making, especially that of an operational nature, but with clear evidence also at the level of strategic decisions. This evidence is consistent with the results we obtained that BD allows for strategic alignment, and when this is the case – that is, BD is aligned with the business strategy – there is better organisational performance and more value creation. We understand, however, that unstructured data may have a more incisive impact at the level of the decision-making process, as it was a factor mentioned by the interviewees as relevant for the creation of value and that could determine more efficient decisions in an even more positive way.

Based on the results obtained, we present a relational model between BD and the BSC that reflects the conclusions drawn from the analysis and discussion of the research questions. The proposed relational model is based on the Vs of BD, with special emphasis on the value of the data, in which the competitive advantage, reflected in greater customer retention, reduction of expenses and innovation activities, drives the creation of value and supports the decision-making process, culminating in greater gains in organisational performance.

We suggest the construction of a BD and BSC relational model that is based on three basic foundations, namely (1) innovation, the main source of competitive advantage according to the results obtained, (2) customer retention and (3) cost reduction, as the dimensions that are most benefited by competitive advantage. At the origin, value creation is boosted by unstructured data and is reflected in better market shares. BD-based decision-making contributes to faster and more effective operational decisions and indelibly marks strategic decisions when BD is aligned with business strategy.

Competitive advantage, value creation and decision-making are based on BD data, that is, on data with value, variety, and velocity. The value of the data, as we have seen, is a crucial element for better performance. It is the triangulation of these vectors, competitiveness, value creation, and decision-making based on BD, that leads to the improvement of organisational performance. The BSC uses performance metrics whose data source comes from BD and, as these bearers of value, they will contribute to the identification of more efficient performance indicators that will lead to better results. Finally, the financial and non-financial information that characterises the metrics of the BSC found in BD is an enriching source of qualitative and quantitative, unstructured, and structured data fundamental for the greater solidity of the BSC.

Conclusion

Final considerations

BD's contributions to value creation, performance improvement and the organisational decision-making process are evident. Identifying a positive relationship between BD and organisational performance was possible, which is one of the gaps we identified in the literature review. Indeed, we obtained evidence that the quality of information extracted from BD positively determines performance.

BD supports the decision-making process, especially at the operational decision-making level, but there is also evidence that it supports decisions of a strategic nature if BD is aligned with the business strategy. This is a common point of the BSC that establishes a link between short-term and medium to long-term performance. Evidence that all data, if they are data with value, are important for the decision-making process and the combinatorial use of financial and non-financial, qualitative and quantitative measures, is also a common element between BD and the BSC.

It was confirmed that BD is effectively transforming the business model of organisations, allowing the generation of new lines of business, fostering innovative activities and improving customer relationship management, in addition to contributing to the identification of the KPIs of each industry that will determine the definition of the most appropriate and efficient performance metrics. It is BD that supports

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the KPIs. The determining factors of organisational performance are based on KPI, and BD brings new insights at this level, which can leverage the different perspectives of the BSC, namely in terms of customers, processes and financial perspectives.

We understand that BD can positively affect the BSC to the extent that the techniques for collecting, storing, managing, distributing, and analysing the data it provides meet the needs of the indicators compiled in the BSC, providing useful, timely and relevant information. A connection between BD and the BSC makes perfect sense, as BD can contribute to suppressing the deficiencies of the BSC and serve as a facilitating element of communication at the different levels of management within the organisation.

BD must be aligned with the organisation's strategy and involve all employees in the pursuit of the objectives based on its adoption. Human resources and their understanding of the importance that BD can bring to the organisation as a driver of better financial results is equally crucial for BD to be successful. Aligning BD with strategy is essential, and to this end, it is crucial to have the best technology at hand, so the concern for matters related to machine learning and artificial intelligence are currently the most studied topics by organisations.

In short, the persistence of some internal obstacles in organisations, largely due to the conservatism of the status quo and the lack of technical skills that allow the best potential of BD to be recognised, continue to be the main obstacles to better use of BD. The importance of unstructured data and the need to recognise the value of the data must be further promoted within organisations, as only then can there be even more remarkable contributions to the management of organisations.

Theoretical contributions

This study highlights BD's importance in organisations by reorienting the business model towards data and the need to identify those that have value and can encourage more effective decision-making. This reorientation based on the contributions of BD is a new phenomenon in the literature. There are also no studies that highlight the contribution of BD to greater organisational visibility in a holistic way, promoting organisational transformation and the adoption of new work methodologies.

It also makes important contributions to how value creation is generated through BD, something that still does not appear clearly and unequivocally in the literature. In the literature, there are also no references to the type of organisational improvements that are most impacted by the adoption of BD and how they contribute to the performance of innovation activities that drive the creation of value. The greatest innovative capacity in organisations is based on BD. Contrary to the literature review that mentions the moderate effects of BD on performance, the present study clearly shows a causal relationship between the two, verifying effective gains in terms of organisational performance and identifying the factors that determine it.

This investigation provides new trends for the literature through evidence that corroborates the inclusion of new metrics in the BSC from BD, such as the "cultural variables" that would allow even more competitive advantage to be gained through customer retention, surpassing some of the inefficiencies that the BSC still suffers from, and which is omitted in the literature.

Furthermore, it demonstrates how BD facilitates the identification of KPIs at an organisational and sectoral level. The novelty is not in BD "feeding" the KPIs with data, as the literature already mentions, but in BD's ability to redefine KPIs, making them more assertive, contributing to new metrics that adhere more to the context of the business model of organisations. BD "revolutionises" the definition of new metrics and incorporates them into the BSC dimensions.

Another innovative contribution to the literature is the benefits that unstructured data brings to value creation. In fact, BD allows greater insights if the unstructured data deserves greater prominence on the part of BD professionals since it is unanimous among the organisations under study that these create more value and "feed" the BSC with non-financial metrics that promote greater results. These conclusions make

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exciting news for organisations that, due to ignorance or lack of technical skills, are still afraid to implement BD.

The present study reveals yet another innovative contribution by checking the noticeable increase in ROI (return on investment) in organisations, highlighting the advantages of adopting BD in boosting their results, improving customer relationship management, and increasing customer retention and market share, as well as increasing results and the volume of business. In other words, BD is revealed as a management tool that combines the operational aspect with the strategic aspect and combines the short-term and medium to long-term; that is, it supports the goals and objectives outlined by the organisations. These correlations integrated in a single study are unprecedented in the current literature.

BD allows for exploratory analysis using unstructured data, scrutinising the potential of various clusters, customers, products, services, and others, which can leverage competitive advantage and create value. It is the trilogy of BD, strategy and technology that allows processes to be optimised and differentiated, organisational improvements to be made, along with innovation, value creation, retained customers and increased organisational performance. The intersection of these three concepts is a new concept in the literature because although the individual importance of each is referred to in scattered studies, integrating these three dimensions is innovative in the current literature.

Practical Contributions

The correlation between BD and performance improvement can be seen in how some organisations track and analyse customer/consumer behaviour and how customers move around in a commercial space, for example.

The proliferation of sensor data in the most diverse activities and sectors implies that, presently, it has become possible to collect information that can positively determine organisational performance. We understand that the use of unstructured data, recognised as an enabler of greater value creation and consequently of obtaining improvements in the organisation's performance, will allow the monitoring of customers' online behaviour and how customers navigate on websites, what they read, share or comment on and what they recommend on social media. From the analysis of the results, we understand that training should be given to human resources to start talking about the importance of unstructured data, given that four of the five interviewees recognise that they foster more insights regarding value creation.

Limitations and future lines of investigation

The present study has some limitations, namely the sample size, given that the nature of the subjects analysed is sensitive in providing information critical for the organisations involved. We were subject to various constraints and faced many "closed doors" regarding the involvement of some organisations.

Also, most respondents are consultants and not top managers, except for one interviewee, which limits the results to a certain extent. On the other hand, the study did not focus on one particular sector; that is, it did not study the research problem in the light of one or more sectors of activity.

Regarding data processing, although the software globally corresponds to the research needs, we still identified some limitations, namely in comparing two cases, as it did not allow us to carry out a comparative analysis considering the five selected interviews. In this field, it is also possible to enumerate other limitations, namely the constructs used and the difficulties experienced in the data collection. Respondents were not always assertive in their responses, and it was necessary to question and clarify them several times to focus on the issue objectively and avoid useless digressions. Therefore, the results cannot be theoretically generalised and must be limited exclusively to the study.

This study results in some recommendations for future investigations. It is recommended that quantitative studies be carried out addressing the same research problems, which, due to limited time, was not possible here, enhancing methodological complementarity (qualitative versus quantitative).

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The interviewees attribute indisputable importance to the value of BD data and highlight its importance as a precious asset in the organisations in which they were involved. However, there were some obstacles, so, a set of good practices should be identified in creating a data-driven culture to create a road map in organisations so that this type of culture becomes an effective reality.

The suggestion is that further investigations be directed towards the expansion of the information and nature of the data used, which are necessary to define the decision-making process based on BD. This is still a very sensitive area in which respondents fear sharing information, as it is vulnerable information related to critical areas of the core business. These vulnerabilities may be the subject of future studies to obtain a more detailed understanding of this problem.

On the other hand, it would be interesting for future investigations to analyse the same research questions addressed in this study but applied to public organisations. The recommendation is to perform cross-cultural studies to assess whether the cultural dimension can lead to different results in different contexts.

There is also a need to study specific organisations of certain segments of economic activity (industry, services, technology, others), as well as to study the same problem considering the size of the companies involved in the study so that they can be compared with other studies carried out around the world. The reason the results differ depending on the country to which the organisations belong should also be investigated.

Comparative analysis at the level of Iberian organisations could also be undertaken to assess the stage of adopting management practices based on a data-driven culture and assess the factors that determined the adoption of BD.

Studying BD and considering its impact on different performance dimensions, namely financial, marketing, human resources, customer performance, and operational performance, can also open new perspectives for research on the subject. Finally, studying cultural variables' impact on organisational performance and financial performance based on unstructured data such as social networks may be an important contribution to the digital economy.

Interview guide

Available upon request

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Competing interests

The authors report that there are no competing interests to declare.

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