Business Intelligence's Contribution to Decision Making Processes – An Empirical

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Abstract

The function of information and its management technologies in decision-making processes has undergone constant evolution over time, aligned with the strategic goals of organizations, leading the company to its objectives, united efforts, internal and external measures for its fulfillment. This study aims to identify the contribution of business intelligence in the distribution of information in a strategic way, in decision-making processes within companies. The methodology is presented as a qualitative exploratory research using bibliographic procedures, using a multiple case study strategy, with data collection processes through semi-structured interviews with employees of medium and large companies. size of the state of Rio Grande do Sul, which adopt business intelligence solutions and software in their corporate activity and data analysis is done through content analysis. The research highlights business intelligence as a tool for distributing information strategically in decision-making processes within companies.

Keywords: Business Intelligence; Information; Decision Making Process.

1. Introduction

The concern with correct decision making in environments of constant transformation has brought with it the need to find factual subsidies to reduce the uncertainties generated by the possible lack of knowledge on the part of decision makers. Such professionals are constantly concerned with these environments, since what is understood as efficiency, especially in the private sectors of the economy, permeates the understanding of the maximum use of the resources in their possession, since as a precept, organizations seek growth and increase of their capital, outlining strategies that lead them to these goals.

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Information emerges as an important resource in possession of companies to achieve these goals, not only as an external asset to be exploited, but also as an internal asset, since organizations must have their own information, seeking such efficiency as a source of competitive advantage. Having information as an important asset, the need for its correct exploitation is evident, since globalization has brought with it an increase in the demand for technologies that work with large amounts of data. This work aims to identify the contribution of business intelligence in the decision making processes within companies.

2. Theoretical reference

This section presents the fundamental concepts of this study, addressing the various theories and authors who originated and describe the concepts of business intelligence as well as its structure, tools, barriers faced and advantages gained by choosing its methodology.

2.1. Business intelligence, backgrounds and concepts

The concept of business intelligence emerged in the 1980s by the Gartner Group [1], as a solution to the concerns felt by companies in relation to the management of corporate data. Quickly the term became a reference in relation to the intelligent process of data treatment, organization, evaluation and distribution of data, from information systems composed of several interdependent components, which consolidate, analyze and offer access to large amounts of data, through intercommunication and interaction of these parts, which make up the informational collection of an organization [2,3,4].The first conceptions of business intelligence date back to 1958, from the article written by Hans Petter Luhn [5], for the IBM Journal, entitled "A Business Intelligence System", which aimed to conceptualize a new system with the ability to learn data interrelationships, when observing a concern about the growing amount of data generated by a corporation, as well as its ability to manage such databases in an effective and agile manner [5]. Such agility, according to [6], improves the decision making processes, this being one of the main competitive differentials, as the decision makers may have in their possession large amounts of catalogued information, which in the past they could only count on their professional experiences. Soon, the term was widely adopted by market research and data mining experts as an efficient tool in propagating data and results to decision-makers, Gartner Group [1], holder of the paternity of the term, defines: "Analytics and Business Intelligence (ABI) is an umbrella term that includes applications, infrastructure, tools, and best practices that enable the access and analysis of information to improve and optimize decisions." Among these specialists [7], defines business intelligence as a set of information management systems that provide access in a simplified way to the information needed for the formulation of an organization's strategy. *For [8, p. 27] "business intelligence is an umbrella term that includes architectures, tools, databases, applications and methodologies", and adds, as main objectives:*

- Interactive access to databases, often in real time;
- Manipulation and visualization of this data, offering a competitive advantage to business analysts. and performance."

2.1.1. Business advantages

Business intelligence offers great advantages in relation to efficiency in the management of information for decision making in competitive environments, through the channeling of this information to those who really need to know it, performing a multiple integration of sectors and promoting corporate synergy [5,9]. This synergy is promoted in corporate environments and provides, through the management and retrieval of information, the opportunity to monitor the organization, through the diagnosis of its capabilities, competencies and actions, its performance before the consumer market [8]. The performance of corporate management goes through a series of needs and concerns to ensure its effectiveness, among them, the effective use of information crossing methods and measurement systems that mark out and align the organizational activity, guiding the actions taken towards the organization's objectives, directly impacting its daily governance practices, client relationships, etc. [4,10]. In the corporate context, business excellence has as one of the major criteria the ability of organizations to collect, analyze and implement the results of research, integrating them into the organization's continuous improvement processes [11]. In a complementary way [12] emphasize that business intelligence offers business analysts:

- Easy access to data, through browsers and tools;
- Multiple data and information cross-referencing, offering a consolidated, analytical and agile view of the organization's situation.

Therefore, the concern with the agile recovery of information in operational systems should be treated with great concern about its consistency, accuracy, relevance and agility, enabling the realization of multiple experiments of prediction and hypothesis, through the crossing of data [13,14].

2.1.2. Tools and Structures

Business intelligence tools compete a series of structures aligned with corporate activities, with the purpose of providing data analysis from different angles [4]. In this scenario of building results and evaluating metrics, [13] attributes to microcomputers the function of performing simulations in order to understand the organization's future impacts.

2.1.3. Special Information Storage Structures

Special information storage structures enable the construction of an intelligence layer, composed of a base of informational resources, submitted to segmentation processes and transformation of these resources into useful matter for decision makers [4,15].

a) ODS (Operational Data Store): These are tools for generating limited and specific operational reports, by means of databases that have not yet received any deeper analysis treatments [16].

b) ETL (Extration Transformation Load): This backend tool is responsible for extracting and compiling data from the company's different operational sources, coming from the most different formats, performing a cleaning and transforming them into a single format [4,12].

c) DW (Data Warehouse): The data warehouse are logical structures that integrate the data once worked on by ETL, to serve in the future as a tool for analytical research for decision making. They were designed to assimilate information from the company's knowledge bases, even with different platforms or specific structures [17,18].

d) DM (Data Mart): In the same way that the data warehouse fulfills the function of data storage worked by ETL, the data mart is a repository built to serve specific areas of an organization, where its extraction metrics are directed to meet the requirements of these areas or departments where such data will be explored [4,12,17].

2.1.4. Data processing applications

These are analytical tools that perform multiple dimensional combinations, and enable simplified and dynamic visualization of organizational data [4]. These analytical tools aim to offer relevant information to the decision making process, intended for professionals constantly overloaded with a lot of information, who seek support in their decision making [6].

a) OLAP (Online Analytical Processing): This set of tools allows the data generated by the various sectors to be visualized and manipulated in multiple dimensional combinations, developing documents and reports useful for analysis. Among these reports we have the dashboards, a useful tool for a comprehensive visualization of organizational health, which works with various metrics and indicators according to the need for studies [8,12,17].

b) DDS (Decision Support Systems): DDS offer an ideal environment for testing and creating hypotheses about thoughtful business strategies [13]. They are considered complex systems as a basis for modeling problems and simulating scenarios to aid in decision making [4].

c) Data mining: It consists of a data mining tool, responsible for identifying patterns through analytical methods applied to the large database, presenting relationships and similarities with the intended contents [19,20].

d) EIS (Executive Information Systems): This tool, developed by MIT (Massachusetts Institute of Technology), was born with the purpose of presenting the set of corporate information in an attractive and simple way for decision makers, being an efficient way to organize such data to be worked as an analysis tool and knowledge base [4].

Besides these, BI environments count on other tools, responsible for monitoring information for management purposes, among them:

a) BAM (Business Activity Monitoring): This tool monitors critical performance data in real time of the operator's routine operations [4].

b) BPM (Business Performance Management/Measurement): Responsible for demonstrating the balance of the organization's financial and operational measures, operating through the balanced scorecard (BSC) methodology, it offers connective structures between the company's objectives and goals,

according to the long-term business strategies. The tool relies on KPIs to demonstrate the results of actions taken, by reconciling multiple information, in order to assess the overall performance of the organization [4,6,12,21].

2.1.5. Barried and implementation steps

The great difficulty for organizations in the process of implementing business intelligence is the correct integration of human capital to the new processes, because the tool proposes a change in the ways of managing knowledge within companies, and when this change in behavior does not accompany the deployment, there is the risk of it becoming just an IT tool [4]. In line with this observation [22] states that one of the major obstacles to corporate growth is the lack of resilience of employees to changes in the environment. The executives' inability to deal with new information is confirmed by [6] and [13], for managers often do not have all the necessary prior knowledge to understand the information received, and it is vitally important to build such knowledge so that there is an understanding of the message transmitted. For [23], accompanied by the continuous change in organizational dynamics, his collaborators must continuously realize what expectations the corporation expects of them in terms of their technical capabilities and aptitudes to face new challenges. As a tool for collecting and disseminating information, business intelligence offers a great competitive advantage to organizations, however, its implementation must occur in the most appropriate way, avoiding possible gaps through the adoption of practices that contribute to the effective functionality of the tool [8]. The insertion of a BI tool requires a correct application to avoid future problems arising from the disrespect of recommended practices, correctly integrating data sources in their information repositories [4,24]. For [24], the implementation process can be sequenced into 5 steps:

- Stakeholder Mobilization: As a first step, one should gather all stakeholders and those impacted by the company's actions;
- Understanding of the needs: Next, it is necessary to raise the insufficiencies and informational needs of the managers, in view of their decision making process;
- Scheme of the data sources: In possession of the information needs, the work of mapping its flow begins, destining the operational data to its correct recipients;
- Production of the BI structure: In this stage, the longest of all, it consists in building the whole solution ordering, as well as the course of the data, elaborating reliability tests to ensure the proper functioning;
- Availability to action points: Once the testing phase is concluded, the tool is then made available to the users, offering, if necessary, training and qualification to the interested collaborators;

2.2. Relationship between business intelligence and decision-making processes

Business intelligence systems have the mission of offering support information for the most varied activities of the organization, and the capacity of the organization to correctly treat its internal data represents a great competitive advantage, because they offer subsidies for effective decision making processes, considering the strategic alignments of the organization [5,6,25].

2.2.1. Formation of strategic planning from a set of information

For [25] strategic planning is based on the identification of future opportunities and threats, through the construction of information bases about the company's current situation, which will be used for the exploration of opportunities and threats by decision makers. [26] presents us with some points to be observed for the purpose of business diagnosis, among them:

- Strengths: Controllable internal variables, and their timely relationship with the environment;
- Weaknesses: controllable internal variables, and their untimely relationship with the environment, partially catastrophic;
- Opportunities: Uncontrollable external variables, which may create opportune conditions for the company, as long as it has the capacity to use them;
- Threats; Uncontrollable external variables, capable of creating an uncomfortable relationship with the environment.

The availability of access to organizational data and their interactive manipulation contribute to the proper diagnosis of the organization, because it offers the possibility of analysis by managers and decision makers of the organization, being possible to draw insights that will serve as decision-making bases for the entire organization [8]. Business intelligence emerges as an expression of information management in terms of the interactive manipulation of internal data, also contributing to the construction of competitive intelligence, which is concerned with the understanding of data from the marketing environment, incorporating such data in the processes of analysis of the environment where the company is inserted [27,28]. From this standpoint, it is important to consider an internal culture aimed at demanding evidence to support its decision-making processes, otherwise there is no justification for adopting systemic functions responsible for information management in the company [4]. A network of collaborators with access to information contributes, according to [6], to the creation of a favorable environment for the construction of knowledge articulated in a community of users, exercising the multiple synergistic learning among themselves. In these environments, top-level decision makers always need the most updated and consolidated information possible, where, in its absence, may lead to poorly formulated decisions and shallow analysis of the organization's strategic issues [29].

2.2.2. The decision-making process and its importance in the organization

Decision is a process that develops when a problem occurs within an environment, demanding necessary attitudes to deal with it, according to the manifested and detectable symptoms [13]. For [4], the effectiveness of the decisions made is a consequence of the knowledge built from data and information, so that the choice for the best possibility is based on this knowledge about the environment from which the decision is submitted. This production of knowledge is the result of creative processes occurring within the organization, converting tacit knowledge into explicit knowledge, necessary for informed decision making [30]. The authors offer a conceptual model for this knowledge production, called the SECI system, which consists of:

- Socialization: sharing of tacit information among participants;

- Externalization: Compels reflection in groups about a given topic;
- Combination: Work done to systematize knowledge;
- Internalization: Adoption of the built knowledge and its dissemination in the organization.

In this context, the construction of competitive intelligence emerges as a useful process in the formulation of strategic goals for decision making, being concerned with the acquisition, analysis and dissemination of knowledge generated previously, understanding the information about the environment in which the organization is inserted [6]. For [6, p. 79] "a competitive intelligence system must seek simplicity, valuing results more than infrastructure. Thus, the emphasis is on finding information that adds value to the decision-making process." However, the nature of business environments is much more complex and comprehensive than simple logics built from expert reasoning, requiring a more open and factual approach about the multiple aspects involved [13]. Such an approach is understood as a flow of several events, that is, several occurrences that take place in different individuals inserted in a social context, which will perform the production of intelligence, through the dynamic introduction of such thoughts assimilated to reality [6]. According to [31], when the administrator has in hand the knowledge arising from information, fruits of past sales analysis, performance coefficients, as well as internal reflections, it is possible the attribution of probabilities as to the commercial results of the corporation, considering the various events that influence these results.

2.2.3. The influence of strategic planning on the decision-making process

In any business environment, decisions must be made in order to meet the organization's strategic objectives, which are paths and action plans so that the company gets to where it wants to get [26]. In this constructive process of information base, for strategic planning purposes, the mapping of the current performance in comparison to the desired one is fundamental to guide the organization's decision making, where technological tools may offer more reliable feedback about the company's current position [8,28,32]. Therefore, having the correct information in the shortest possible time has become synonymous with competitive advantage, and its possession enables great chances of success in the decisions taken, provided that it is available to executives committed to the strategic alignments of the organization [4,33]. On the other hand, [34] considers that the major concern of strategic planning is based not only on decisions taken in the future, but also on the implications of such decisions in the present. As decision makers, organizations need to think about the probabilities of their actions, since the consequences must be measured, so that planning is effective [35].

3. Research method

Research methodology makes use of several methods, created by science for its application in the development of scientific research, using the objectives pointed out to promote the evolution of knowledge [36,37].

3.1. Research design

The research was developed in qualitative nature of exploratory level, using bibliographic referential procedures, making use of a multiple case study strategy [37,38,39,40]. While qualitative, the research is

intended to subject the obtained responses to argumentative interpretations, in order to deepen the detail of the interaction of such responses with the world object of the research [37,40]. At the exploratory level, it is concerned with deepening the knowledge about the problem raised, crossing such answers with various bibliographic bases, coming from the various theoretical authors of the area studied [37,38]. Being a case study, the research is concerned with the investigation of phenomena that occurred in the context object of exploration, limiting the boundaries of the area studied [39].

3.2. Participants of the study

The research was applied in 6 medium and large sized companies in the state of Rio Grande do Sul, which adopt business intelligence solutions and software in their corporate activities. From these companies, 7 employees who have direct contact with the tool, and who use it for the most diverse purposes, were chosen. Individual A, develops his professional activity as an information technology manager, while individual B develops them as a commercial coordinator at a furniture company with average annual revenues of 70 million reais, located in Serra Gaúcha, which operates in the national and international market that adopts the Power BI tool. Individual C, develops his professional activity as a cost analyst at a company in the locks and hardware industry with average annual sales of 480 million reais, located in Serra Gaucha, which operates in the domestic and international markets that adopts the Power BI tool. Individual D, develops his professional activity in the relationship marketing sector, at a company in the locks and hardware industry with average annual sales of 480 million reais, located in Serra Gaucha, which operates in the domestic and international markets that adopts the Power BI tool. Individual E, develops his professional activity as an information technology analyst, in a credit cooperative from Santa Catarina, which manages an average of 1 billion and 700 million reais in total assets, which adopts the BIMachine tool. Individual F, develops his professional activity as an information technology analyst at a company in the rubber industry, with average annual sales of 1 billion 680 million reais, which operates in the domestic and international market that adopts the Power BI tool. Individual G, develops his activities as an information and control analyst at a company in the field of plastic artifacts, with average annual sales of 120 million reais, operating in the domestic and international markets, which adopts the BIMachine tool.

3.3. Data collection process and analysis

The data collection process was carried out through semi-structured interviews between September 23 and September 30, 2020, with the objective of gathering information about facts that occurred in real environments [37]. This research used 6 questions of qualitative nature, seeking to develop the respondents' view about the reasons for using business intelligence tools, as well as the barriers faced in the implementation process and the differences perceived after implementation, then, it was sought to understand how the business intelligence collaborated in the processes of strategic monitoring, subsequent evaluation of decisions taken and, finally, the degree of relevance of the tool in the decision-making process as a whole.

4. Analysis and discussion of the results

This item presents the analysis and interpretation of the results of the research conducted.

4.1. Reasons for the adoption of business intelligence tools by the company as perceived by the interviewees

The main objective was to have a central tool for analysis to support strategic decisions, thus avoiding the famous scenario where each manager has a version of the facts and data. (INTERVIEWEE A) For data manipulation and report generation to support decision making. Also for the generation and updating of KPI's for monitoring performance and goals set. (INTERVIEWEE B) For the information to be ready and displayed in a more agile manner. Currently the correct and quickly received information helps a lot for the growth of a company. (INTERVIEWEE C) The idea has always been to have the data concentrated in a single place, in an easy, simple, fast and complete manner to facilitate the moments of analysis and decision making. (INTERVIEWEE D) To map the processes, work with excellence and better use of data. (INTERVIEWEE E) Every company needs to have an intelligent view on the information it has, performing various crossings and analysis so that important points of the company are shown, and in several cases discovered from tools that serve for this, and one of them is the BI. (INTERVIEWEE F) Noting the need to convert the large volume of data generated into relevant information for the business. (INTERVIEWEE G) Interviewee A is in line with [6] and [13], when stating the lack of resilience of some executives to rely on subjective values and past experiences as influencers for decision making, the result of the lack of analytical tools for the treatment of large amounts of data and for not having or ignoring the technical knowledge necessary for the understanding of certain scenarios. Interviewee B confirms [8], when citing data manipulation and report generation for decision making as objectives of business intelligence tools, in complement to [4], emphasizing the role of KPI's, acting as a monitor of the actions and activities performed by the organization. Interviewees C and F are in line with [13] and [14], when reiterating the importance of the agility of the information retrieval process, so that one can create proper crossings for the correct diagnosis of the organization. Also, interviewee C will confirm [6], when he states that agility in information retrieval improves decision-making processes. *Interviewee D reiterates the statement of [6],* because the adoption of business intelligence tools was conceived in view of the concentration of information in a single place, providing the creation of an environment formed by a community of users, exercising learning among themselves. Interviewee E confirms [11], when he reiterates the need for excellence in the collection, analysis, mapping, and use of organizational data, giving them their due importance as a competitive advantage. Finally, interviewee G is in line with [2] and [29], when confirming the usefulness of business intelligence tools for the treatment of large amounts of data, which are received daily by the organization's decision makers. They may face great difficulty in viewing this information due to its large quantity.

4.2. Barriers faced during the implementation of the tool from the interviewees' perspective

Yes, this project was born, died and was reborn about 5 times. Today I can say that the culture of its use is already well propagated and the tool already has very interesting proportions that permeate all business areas. (INTERVIEWEE A) Yes, some of them refer to the ERP communication with the I.B. system that we use.

(INTERVIEWEE B) The biggest barriers faced were the technological ones, the identification of the best tool, since it is a value-added product. (INTERVIEWEE C) It was a lengthy process, due to the complexity of integration with our ERP (TOTVs). (INTERVIEWEE D) Yes, because changing from a long term method to a totally different method generated resistance with the employees. (INTERVIEWEE E) The main barriers are, the correct definition of the data model and the lack of definition of which minimum questions the manager wants to answer. The other points are very interesting in the implementation, since the information that will be used already starts to present business ideas to the analysts. An important point is also to make users understand that BI is used for business intelligence and not for reporting. (INTERVIEWEE F) Not in general, the company is adherent to new technologies and projects, however, there is a growing maturity for decision making based on information and analysis. (INTERVIEWEE G) Interviewees A, E and G agree with [4] when they state that the major barrier faced in the implementation of BI solutions is the integration of human capital to the new methodologies adopted, since a change in the way knowledge is internally managed is required. The author also states, in line with the answers of interviewees A and G, the need to create an internal culture of demanding evidence to support the decision-making processes. Interviewees A and E also agree with [22], in stating as an obstacle to corporate growth, the executives' lack of resilience, and their inability to deal with changes in the environment. The interviewees B, C, D and F are in line with [8], when confirming the difficulty of communication of the technological tools existing in the corporation with the BI solutions, the author states that the implementation must occur in an appropriate and effective way as to the data collection processes. This is also in line with [24], who cites among the business intelligence implementation processes, the correct mapping of the company's entire information flow and its subsequent formatting.

4.3. Main differences noticed post implementation from the perspective of the interviewees

Actually, the differences take time to be noticed. The process is gradual and growing. When the tool starts to scale and gain notoriety it becomes visible the importance and the difference in people's behavior during the decision making processes. Ex: Previously, we would have to search the data, clean it, compile and build an analysis, and only then we could use it as a basis for a business decision. Today, everything is ready, it is up to the managers to analyze and based on this data take the necessary measures/actions. (INTERVIEWEE A) Easiness and agility to make decisions, improved information visualization and KPI'S follow-up. (INTERVIEWEE B) The ease of finding the information, speed in creating reports and practical views. (INTERVIEWEE C) The main difference was that through Power BI we spent much more time analyzing the data and information than generating the data and charts. Previously this time was reversed. (INTERVIEWEE D) Improved data collection and analysis. (INTERVIEWEE E) A huge gain in reliability and speed in presenting results. (INTERVIEWEE F) Not in general, the company is adherent to new technologies and projects, however, it is observed a growing maturity for decision making based on information and analysis. (INTERVIEWEE G) Interviewee A is in line with [5] and [25], when stating the gains obtained in the decision-making processes, having the BI the function of providing the necessary support for the various organizational activities, aligned to the organizational strategies. Interviewee A also reports the great change in people's behavior within the organization, being in line with [4]. Interviewee B is in line with [4], by confirming the effectiveness of multiple visualization tools for monitoring business performance, citing KPI as a post-implementation gain, as it provides percentage tracking information of the results obtained from certain actions.

Interviewees C, D, E and G confirm [8], when citing the gains obtained in the time dedicated to the collection of information and its analysis in real time, stating the ease in manipulating data and its interactive access. Respondents F and G state that the big difference obtained was the gain in reliability and assertiveness, confirming [9,28] and [32], when they state that technological tools contribute to the reduction of uncertainties regarding the compilation of internal and external information, mapping the current and desired performance of the corporation and monitoring of competitive intelligence.

4.4. Collaboration of business intelligence in monitoring strategies and goals outlined within the organization from the interviewees' perspective

Currently it is our main control tool since all the company's KPIs are structured in a central Dashboard. (INTERVIEWEE A) Mainly by generating and keeping updated the pre-established KPIs for monitoring the company's performance. Generating custom reports that are not available in the ERP. (INTERVIEWEE B) After creating a report and validating the information, it is no longer necessary to change it, this contributes to facilitating the completion of spreadsheets and the viewing of the desired information. (INTERVIEWEE C) All the main indicators that the company works are monitored through the tool and are always "online" for when you need to consult them (e.g.: Target billing, margins, revenue ...) (INTERVIEWER D) Through the complete analysis with BI, we trace paths for the future or decisions for the company. With it we analyze the right time and how much to invest or save on new structures or investments. (INTERVIEWEE E) Basically, the goals are defined and BI shows how you can reach them. It is also possible to verify at various times that the goals should be adjusted, since its cycle is short, especially soon after implementation. (INTERVIEWEE F) It is closely linked to the monitoring of business performance indicators, enabling the monitoring of results in real time. (INTERVIEWEE G) Interviewee A confirms [8], by stating the effectiveness of dashboards in visualizing business information, structured according to the metrics desired by the corporation. It is also in line with [12] and [17], who report in their works the effectiveness of OLAP tools as multidimensional data manipulators for scenario control and simulation. Interviewee B is in line with [4], who cites BPM tools, used for visualization of multiple information, being focused mainly as business manager and business diagnosis, subsidizing the decision-making processes using KPI. Interviewees C and D prove what [8], says when citing the importance of creating insights into business performance, stating that the possession of "online" and real-time information, as well as its interactive manipulation are of great value for measuring corporate performance. Interviewee E confirms [26], when reporting his integration with the directions set for the future, which are nothing more than the strategic goals consolidated in the organization, i.e., the paths set and the actions to be taken to achieve these goals. Interviewee F relates the characteristics brought by [6] and [8], who talk about the BSC methodology applied to BPM tools, offering reconciliation of multiple information and clear visualization between the organization's goals and the business strategies outlined in the long term. Interviewee G is in line with [4], when citing the characteristics found in BAM tools, used for monitoring the corporation's business activities, offering the most critical data and in real time regarding the company's routine operations.

4.5. Business intelligence collaboration for further evaluation of decisions made from the respondents' perspective

As I mentioned before, the effort and results are directed to the data. If there is no change in behavior after their application, it is already explicit that the efforts or the method is not correct, thus requiring a reevaluation of the posture adopted. (INTERVIEWEE A) Providing and organizing data for the generation of analytical reports, and updating the company's main KPI's after each action taken, or during the performance of the actions we have defined. At each step taken, a check is made on these KPI's. (INTERVIEWEE B) Through the information grouped and extracted by the BI it is possible to analyze whether they gave positive or negative feedback, and with that, decide to maintain or not an action, for example. (INTERVIEWEE C) There was no response from the interviewee. (INTERVIEWEE D) Comparing processes through time or returns as to the actions analyzed by the BI. (INTERVIEWEE E) It will show whether the decision was correct or not, and this analysis will make the decision maker have conviction about the decision taken. (INTERVIEWEE F) Through the monitoring of results. (INTERVIEWEE G) Interviewee A is in line with [8,28] and [32], when he reports the evaluation process by monitoring the behaviors of the decisions taken, a characteristic cited by the authors with regard to technological tools, which offer the mapping of the current and desired performances of the corporation. The interviewee F also confirms [8,28] and [32], who confirms the effectiveness of information systems with respect to the measurement of the results obtained from the decisions taken, having these the role of demonstrating their effectiveness before the strategic plan adopted in the company. Interviewee B confirms [12], citing the ease offered by BI systems in terms of monitoring the performance of the actions taken, through multiple crossing analytical reports. Interviewees C, E and G confirm [10], by using result evaluation metrics as a marker for organizational activities.

4.6. Degree of importance of business intelligence in the decision making process from the interviewees' perspective

The importance of smart business for companies in their decision-making can be seen in the interviewees' statements. The interviewees' perceptions are described below:

Nowadays, it has a central relevance in the decision making process, being used by the whole administrative body of the company. Its current importance to our company is unquestionable. (INTERVIEWEE A) Total importance, because it is a tool that helps you organize data quickly, transforming it into information in a way that you can organize as you want. It also allows us to cross-reference data where we can generate reports according to our needs. The IB is mainly a tool that transforms data into information. (INTERVIEWEE B) In my opinion it is extremely necessary, given its facilities, amount of grouped information and accuracy of information. (INTERVIEWEE C) Extremely important! (INTERVIEWEE D) Of great importance, due to the results that the BI analyzes and presents over time. (INTERVIEWEE E) Extremely important, and can set the course of the company, whether it be success or failure. (INTERVIEWEE F) Very important, since BI is a powerful tool for converting data into relevant information, being essential to a coherent and assertive decision making process. (INTERVIEWEE G) Interviewee A confirms [4], when confirming the importance that the knowledge arising from data and information has in the decision making processes. Interviewees B and G agree with [7], stating that business intelligence is a powerful tool in the organization of relevant data and information, which can be managed and distributed by systemic solutions about the business activities of the entire corporation. Interviewee C confirms [27] by pointing out the need for the correct treatment of information for

strategic formulations. Interviewees D and E are in line with [9], who state the importance of business intelligence in data analysis processes to gain competitive advantage over the competition. Interviewee F agrees with [4] and [33], when they state that the success or failure of the organization depends on the possession and processing of information in the shortest possible time, offering subsidies for correct decision making.

5. Final Considerations

Information has become a high-value item in today's world, constituting one of the most important assets within organizations to obtain success in their activities. Therefore, any concerns about its correct treatment will arouse the interest of decision-makers, since they need to use it in the most interactive, agile, and up-to-date way possible. Business intelligence emerges as an answer to such concerns, because its concept was modeled on these demands, remaining in constant technological evolution over time. The tool offers solutions for data access, treatment, and management, as well as process mapping and business vision, through visual indicators. The objective was to conduct a study about the main concepts of business intelligence and its contribution to the decision making processes, aligned to corporate strategies. In this study, it was possible to understand, through research carried out in organizations that adhere to the business intelligence methodology, the high satisfaction in relation to its practical application on a daily basis, as well as the appreciation of information as a whole, as an essential guide in the decision making process. The research was correctly aligned to the proposed theme, proving it through multiple analyses that correlated the bibliographic survey with the answers obtained by the participants, regarding the application of the tool, barriers faced, and the collaboration of business intelligence both in the subsequent evaluation of the decisions made and in strategic monitoring. The respondents also reported how much the organization's culture has evolved with regard to the treatment and distribution of information, both in its use as a basis for any decision to be taken, and for the construction of intellectual capital, through the multiple interaction of data users in the corporate and technological environments. Thus, it is observed the fulfillment of the general objective of this study, being proven the importance of business intelligence tools in strategic planning and corporate decision-making processes. A limitation of the study was that the research was conducted during the pandemic period, which made it difficult to conduct the interviews in face-to-face.

References

[1].   GARTNER, I. Business Intelligence (BI). Gartner IT Glossary. Disponível em: <https://www.gartner.com/en/information-technology/glossary/business-intelligence-bi>. Acesso em 20 mai 2020.

[2].   RAINER, Kelly; CEGIELSKI, Casey. Introdução a sistemas de informação. Rio de Janeiro: Elsevier, 2011.

[3].   O'BRIEN, James. Administração de sistemas da informação. Ed 15°. Porto Alegre: AMGH, 2013.

[4].   PRIMAK, Fábio Vinicius da Silva. Decisões com B.I. (Business Intelligence). Rio de Janeiro: Editora Ciência Moderna LTDA, 2008.

[5].   LUHN, Hans Peter. A Business Intelligence System. USA: IBM Journal of Research and Develoment, 1958.

[6].   STAREC, Claudio; GOMES, Elisabeth Braz Pereira; CHAVES, Jorge Bezerra Lopes (Org.). Gestão estratégica da informação e inteligência competitiva. São Paulo: Saraiva, 2005.

[7].   ALCÂNTARA, S. Business Intelligence (BI) como auxílio à gestão de negócios. In: CUNHA, I. B. de A.; PEREIRA, F. C. M.; NEVES, J. T. de R.; Análises do Fluxo Informacional Presente em uma empresa do segmento de serviços de valor agregado (SVA). v. 20. Belo Horizonte: Perspectivas em Ciência da Informação, 2015.

[8].   TURBAN, Enfraim; SHARDA, Ramesh; ARONSON, Jay E.; KING, David. Business Intelligence: um enfoque gerencial para a inteligência do negócio. Porto Alegre: Bookman. 2009.

[9].   KIMBALL, Ralph; ROSS, Margy. The Data Warehouse Tollkit. In MONTEIRO, A. V. G.; PINTO, M. P. O.; COSTA, R. M. E. M. da. Uma aplicação de Data Warehouse para apoiar negócios. Cadernos do IME: Série Informática Vol. 16. Rio de Janeiro: Universidade do Estado do Rio de Janeiro, 2004.

[10].   PACE, E. S. U.; BASSO, L. F. C.; SILVA, M. A.; Indicadores de Desempenho como Direcionadores de Valor. v. 7. n. 1. Curitiba: Revista de Administração Contemporânea, 2003. p. 37-65.

[11].   SAPIRO, Arão. Inteligência empresarial: a revolução informacional da ação competitiva. v. 33, n. 3. São Paulo: Revista de Administração de Empresas, 1993. p. 106-124.

[12].   TURBAN, Efrain; RAINER JR, Rainer K.; POTTER, Richard E. Administração de tecnologia da informação: teoria e prática. Rio de Janeiro: Elsevier, 2005.

[13].   ANDRADE, Eduardo Leopoldino de. Introdução à pesquisa operacional: métodos e modelos para análise de decisões. 4 ed. Rio de Janeiro: LTC, 2012.

[14].   PINHEIRO, Lena Vania Ribeiro; FERREZ, Helena Dodd. Tesauro Brasileiro de Ciência da Informação. Instituto Brasileiro de informação em Ciência e Tecnologia. 25 out 2018. Disponível em: <https://ibict.br/publicacoes-e-institucionais/tesauro-brasileiro-de-ciencia-da-informacao> Acesso em 08 set 2020.

[15].   KAHANER, L., Competitive Intelligence: How to Gather, Analyse and Use Information to Move your Business to the Top in STAREC, Claudio; GOMES, Elisabeth Braz Pereira; CHAVES, Jorge Bezerra Lopes (Org.). Gestão estratégica da informação e inteligência competitiva. São Paulo: Saraiva, 2005.

[16].   MONTEIRO, A. V. G.; PINTO, M. P. O.; COSTA, R. M. E. M. da. Uma aplicação de Data Warehouse para apoiar negócios. Cadernos do IME: Série Informática Vol. 16. Rio de Janeiro: Universidade do Estado do Rio de Janeiro, 2004.

[17].   OLIVEIRA, D. T.; PEREIRA, O. J. Um estudo do Business Intelligence no ambiente empresarial. São Paulo: Atlas, 2008.

[18].   BARBIERI, Carlos. Bi2 - Business Intelligence: modelagem & qualidade. Rio de Janeiro: Elsevier, 2011.

[19].   CAVIQUE, Luiz. Uma nova taxonomia em Data Science. Seção IV, Maximus Report, 2014. p. 92.

[20].   LINHARES, K. S. C. Aspectos teóricos do data mining: descoberta do conhecimento em medicina. Florianópolis: Universidade Federal de Santa Catarina, 2003.

[21].   WERNKE, Rodney. Gestão de Custos: uma abordagem prática. 2 ed. São Paulo: Atlas, 2008.

[22].   DRUCKER, Peter F. Administração: tarefas, responsabilidades e práticas. Vol. 1. São Paulo:

Pioneira. 1975.

[23]. GRAEML, Alexandre Reis. Sistemas de Informação: O alinhamento da estratégia de TI com a estratégia corporativa. 2ª ed. São Paulo: Atlas, 2003

[24]. ELIAS, Diego. As 5 etapas do processo de Business Intelligence BI. Canaltech. 2014. Disponível em: <http://corporate.canaltech.com.br/noticia/business-intelligence/As-5-etapas-do-processo-de-Business-Intelligence-BI/> Acesso em: 21 mai 2020.

[25]. STEINER, George A. Strategic Planning. Londres: Collier Macmillan, 1979. p. 12-14

[26]. OLIVEIRA, D. de P. R. de. Planejamento Estratégico: conceitos, metodologias e práticas. 30ª ed. São Paulo: Atlas, 2012.

[27]. REZENDE, Yara. Informação para negócios: os novos agentes do conhecimento e a gestão do capital intelectual. Brasília: Ci. Inf. Brasília, 2002. p. 120-128.

[28]. OROZCO, E. La inteligência organizacional en la industria biofarmaceutica. Vol. 28, n. 1. Brasília: In Ciência da Informação, 1999.

[29]. MINTZBERG, Henry. What is planning anyway. Strategic Management Journal. In OLIVEIRA, D. de P. R. de. Planejamento Estratégico: conceitos, metodologias e práticas. 30ª ed. São Paulo: Atlas, 2012.

[30]. TAKEUCHI, Hirotaka; NONAKA, Ikujiro. Gestão do Conhecimento. São Paulo: Bookman, 2008.

[31]. HAMBURG, Morris. Statistical analysis for decision making. New York: Harcourt, Brace & World, 1970.

[32]. CORTEZ, A. D. Construindo um modelo estratégico na área de marketing a partir do sistema de informações gerenciais apoiado pela inteligência competitiva e pelo monitoramento ambiental. Dissertação (mestrado em ciências da informação. Rio de Janeiro: CNPq/ IBICT-UFRJ/ECO, 2002.

[33]. BOWER, Marwin. The will to manage. New York: McGraw-Hill. 1966.

[34]. DRUKER, Petter F. Prática de Administração de Empresas. 1 ed. Rio de Janeiro: Fundo Cultura. 1963. p. 131.

[35]. RUBIN, Robert. Qualidade das decisões é o diferencial. São Paulo: O Estado de São Paulo, Caderno da Economia, 1999. p.12.

[36]. GALLIANO, A. G. O método científico: teoria e prática In MATIAS-PEREIRA, José. Manual de metodologia da pesquisa científica. 4ª ed. São Paulo: Atlas, 2019.

[37]. MICHEL, Maria Helena. Metodologia e pesquisa científica em ciências sociais: um guia prático para acompanhamento da disciplina e elaboração de trabalhos monográficos. 3ª Ed. São Paulo: Atlas, 2015

[38]. GIL, Antonio Carlos. Métodos e técnicas de pesquisa social. São Paulo: Atlas, 1994.

[39]. BRESSAN, Flávio. O método do estudo de caso. São Paulo: FECAP/USP, vol 1. 2000.

[40]. MATIAS-PEREIRA, José. Manual de metodologia da pesquisa científica. 4ª ed. São Paulo: Atlas, 2019.