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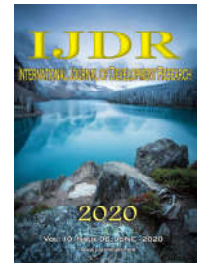
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RESEARCH ARTICLE

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THE IMPORTANCE OF USING A BUSINESS INTELLIGENCE TOOL FOR DECISION MAKING

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ABSTRACT

We seek to point out the importance, the main expectations and positive points in the use of a Business Intelligence (BI) tool for decision making, so that it can become a competitive advantage for the organization. Its main methodologies were bibliographic research, quantitative research and the case study of a fictitious company, as resources for collecting information, questionnaires were used in Google Forms, with quantitative analyzes of the data collected. As a result, we have the confirmation of the importance of using a Business Intelligence tool for operational growth, because the veracity of this data is fundamental for the construction of scenarios that can help during decision making and boost competitiveness, adding knowledge about the market to the company, it was concluded that data processing and the use of BI tools are extremely important for decision making, because in this way managers have assertive data in their hands and in an agile way gaining a competitive advantage in relation to organizations that do not use a BI tool.

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INTRODUCTION

In the current business environment, information is a particularly important factor in any organization as it is a totally necessary resource in the internal and external context of companies. The more truthful, timely and continuous this information is, the more competitive the organizations will be. To reach this goal, it is necessary to know the importance of using technology to its advantage to manage current problems and avoid the lack of information to make the most correct decision that favors the organization. Decision making is a continuous process in organizations and intense in information. Managers to guide sectors need to continuously make decisions and the greatest challenge is to feed decision processes with coherent and quality information and still know how to use them for good management. According to Lira et al. (2007), decision makers constantly work with large amounts of raw data, with little information, low added value and little knowledge acquired for decision making. Data analysis is extremely important for the organizational

environment, as it generates a huge variety of information that when analyzed can be useful to better understand the market, optimize productivity, make more assertive decisions and reduce risks. In other words, the analysis of information is indispensable for decision making, as it is based on highly relevant facts, and can contribute to better results. To facilitate decision making and data analysis, the BI concept transforms information into intelligence, providing the manager with an overview of the structure of his company. In this way, he can change the way of planning and processes that have little impact on the company's positive operational path. In other words, the manager will be able to better analyze the issues focused on profitability, productivity and competitiveness, and this is how the data analysis interferes in the strategic plan, since the results generated help to have a more dynamic, competent and effective management. There are several techniques that can be used for the extraction, analysis and control of this data, they are: Big Data, Data Warehouse and Data Mining. For BI, the most used technique is Data Warehouse, as it is a simple structure, offers quick access to data, easy to use, can separate decision operations from

production operations, etc. A strategic analysis based on this data and information contained in the Data Warehouse that the company has can enable managers to achieve goals and achieve objectives. So BI works on the analysis, structuring and organization of information to identify trends and behavior. Thenceforth, the data becomes essential for managers to make strategic decisions based on the analysis performed.

BIBLIOGRAPHIC REFERENCE

The methods used were bibliographic research that aimed to deepen the knowledge about the Qlik Sense tool, regarding the BI concept, the techniques that can be used for the good use of this concept and the tool in question. Therefore, several articles were searched, books, magazines focused on these subjects. Quantitative research, because we collect and analyze data from a database and a questionnaire made on Google Forms containing 15 multiple choice questions, targeting customers and managers. And finally, the case study, since we will work on a new tool that will be implemented to solve a problem that the company has when making decisions and analyzing the information that is collected by its rear-guard system, we will monitor throughout the implementation the improvements, positive and negative issues that will emerge during this process. With this concept we have the opportunity to identify future setbacks in different areas of the company, based on information collected from the past and current what can allow decisions to be made for the future. With various types of indicators delivered in an agile way to managers, it will be possible to make better company processes, improve productivity, anticipate trends, increase the competitiveness of the organization, making management dynamic and efficient, and reducing expenses with processes that are generating unnecessary costs for the company. The extraction process used by BI is ETL (Extract, Transform and Load), which transforms the extracted data into measures and / or dimensions, carrying all this information in a more lean and consolidated way, and storing this information in the DW (Data Warehouse) . According to KIMBALL (1998), ETL is the set of processes by which data from operational sources are transformed into the DW, and with that it becomes the most time-consuming process when building a DW.

Qlik Sense Tool: Qlik Sense assists in the visualization of information, explores all the data and shows all the necessary information in an intuitive way, this tool allows a deeper look at the data to understand the current situation of the company and everything that happens inside and, depending on the source data, which happens outside the company. It can be powered by various types of data, contains several pre-established connections with different banks (OracleSQL, PostgreSQL, MySQL, etc.) which facilitates its integration and deployment in different ERP systems. As the Qlik Sense accepts and contains several types of connections, it is also very dynamic in accepting file formats: Excel (.xls, .xlsx), text files (.txt), Access (.mdb), its proprietary extension (.qvd, .qvf), among others. QVDs are read only on the Qlik Sense and Qlik View platforms, and contain data extracted from the data source used, while QVFs are the graphical interfaces of the applications, being able to keep all the information and the model of the recorded data. This tool has several advantages, including intuitive data visualization: the Qlik Sense contains several types of tables, types of graphs and extensions, which leads to the infinite possibilities of data analysis. Data sharing

and simplified visualization make graphs easier to understand. Within the Qlik Sense there is the function of exporting spreadsheets from the filters made inside the Dashboard or from the folder in which the user is doing their analysis, bringing the information more quickly, efficiently, already filtered and prepared for delivery as reports to the managers. The intelligent search and agile loading of data bringing quick return to the searches and filters made, among other advantages of this tool.

Microsoft Access and Google Forms: We will use an Access file (.mdb), a Microsoft database application that is included in the Microsoft Office Professional package, which contains data for a specific company. This database contains product categories, customer records, order details, transport details, division in which the customer works, order data, product records and carrier records. In turn, Google Forms allows the assembly of personalized questionnaires with multiple choice options, checkbox, short answers, among other questionnaire formats. The questionnaires are easy, fast and responsive, and their results can be collected quickly and easily. This application is hosted by the Google company itself, generating no cost when it comes to server maintenance, hiring technicians, etc. Thus, this tool was used to build a questionnaire that was made available online to assemble the profile of the customers of the analyzed company containing 7 multiple choice questions, and 8 multiple choice questions asked to the managers, to verify what they expect from the tool that will be deployed. With these data we will carry out an analysis focused on the reality of the company, analyzing which customers buy more, which regions these customers belong to, what the company's average monthly turnover is, daily and annually, and which products are best sold by periods.

Data Warehouse: The Data Warehouse, or Data Warehouse, is used to build strategies with the company's stored information. It is extremely important in the BI environment, since it is from this base that the data will be treated, providing access to managers or access to the information elaborated. The Data Warehouse stores information in various sizes that will be analyzed and filtered according to its relevance to managers. Thus, the search for analysis of long periods of information becomes more efficient and agile. The Information Technology (IT) sector has a fundamental role for managers, as this sector will have to act by building tools so that data is safely and correctly stored for future extractions and analyzes. The IT sector has a strategic role within the company, acting together with managers in creating tools for decisions to be efficient and effective

Data Mining: Information is created quickly and at all times, it is therefore important to use this information to manage companies. One of the best ways to use storage locations is to analyze whether there is anything that adds value from what is hidden in them. A database of any company can include various information showing which products are the most sold, which customers buy the most and which branch they buy from, which are the dates on which these purchases occur, on which day of the week the branch usually sells more than the others, among other data. With this information, strategies can be generated to improve the company's profitable results. Data Mining is a process that uses several algorithms to process data and find valid and important standards for the company. However, it requires interaction with human analysts, who are primarily responsible for identifying these patterns, so that

targeting and exploiting this data is a task given mainly to human analysts.

MATERIALS AND METHODS

The methods used were: Bibliographic research that aimed to deepen knowledge in the Qlik Sense tool, about the BI concept, the techniques that can be used for the good use of that concept and the tool in question, for that, several articles, books, magazines focused on these subjects were searched. Quantitative research, because, we collect and analyze data from a database and a questionnaire made on Google Forms containing 15 multiple choice questions, targeting customers and managers. And finally, the case study, as we will work on a new tool that will be implemented to solve a problem that the company has when making decisions and analyzing the information that is collected by its rear system, we will monitor throughout the implementation the improvements, positive and negative points that will appear during this process. The following tools were used: Qlik Sense was used to extract, transform and structure the collected data, and to form the graphs to carry out an analysis of the company's performance. While Microsoft Access will be used to perform the initial extraction of company information. And we use Google Forms to conduct a search and build a customer profile for a company that operates in the wholesale and retail market. And also, to set up a questionnaire for the company's managers.

DISCUSSION OF RESULTS

Business Intelligence: We can say that BI is a process driven by technology to analyze data and display information to help managers make assertive business decisions, with consistent information. To this end, BI contains a variety of tools, applications and techniques that enable companies to collect data from internal systems and external sources, preparing them to carry out the analysis and develop queries regarding them. The BI tools can connect and analyze data by displaying results in reports and graphs, providing users with information about the company's current situation. BI gathers all your information in a place called Data Warehouse, so that the information, even from various data sources, such as ERP systems, spreadsheets or even text files, can be viewed together, helping to create indicators that help when making a decision. As for its operation, firstly, BI does not tell managers what to do and does not say what decision should be made, or what will happen if that particular decision is made, just as BI should not be seen only as a generator agile reporting. Instead, it offers an intuitive way to analyze information, understand trends and gain important insights related to the business market. BI tools facilitate and simplify the effort that managers would have to research and gather the most important information for effective decision making, minimizing the inherent risks. Some organizations start using BI thinking that they will find the right data and that everything is working correctly, and without errors. However, BI tools can also be used to check operational errors, launch errors, bottlenecks and information that do not exist or that have incorrect data. After analyzing this information and making the necessary adjustments, it is possible to obtain more relevant insights and decision making can be made using this data. Wholesalers and retailers need their managers to make quick decisions, so they don't fall behind the competition. However, these decisions need to be made carefully, analyzing the information that

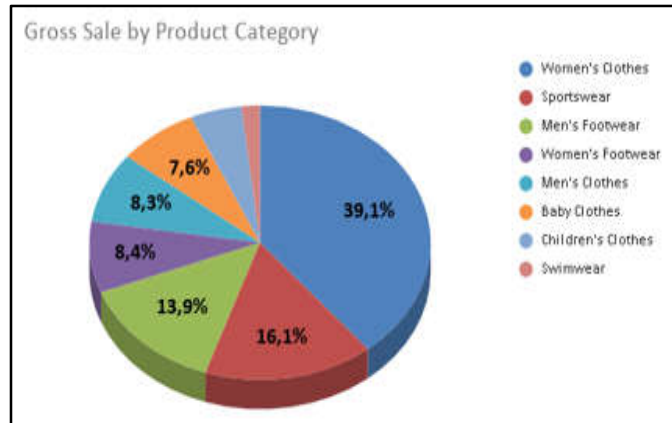
could bring positive results for the organization. Therefore, we will analyze a fictitious organization that is inserted in the wholesale and retail sector. This organization does not have BI tools that assist managers during their decision making, there is only the ERP System that will be used as a basis to generate the indicators, measures and dimensions to facilitate managers' access to information.

Data Analysis and Decision Making: Currently, organizations need to look for effective techniques to transform raw data into useful information, that is, they need to analyze data quickly, efficiently to use it to their advantage. The ability to analyze data and act based on the information contained therein is extremely important for companies that operate in environments that have a fast pace of change, due to the type of customers and the movements of the competition. With data analysis, we can understand the data evaluation process using logical and analytical reasoning, in addition to technological instruments that make it easier to search, collect and process information that is unstructured or minimally structured in several sources such as: ERP system, spreadsheets, text files, social networks, etc. An organization has a good data analysis strategy from the moment it uses instruments, techniques and trained people to analyze the information and transform this into conclusions, bringing results from the analysis. There are several techniques, methods, concepts that can be used to perform a data analysis, such as: data mining, big data, Business Intelligence, etc. Thus, organizations that perform a good data analysis can generate gains making the more practical processes, understanding your customers, creating more attractive promotions, anticipating the competition, keeping in mind the risks and strengths in a conscious, effective and agile way, among other advantages that a good data analysis can bring. The importance of creating a good data analysis brings several benefits, such as: the improvement in the company's competitiveness, because using predictive analysis, it is possible to understand what can happen in the market; minimizing costs by making assertive decisions and increasing the likelihood of positive results; the organization's operating expenses tend to fall, as well as the reduction of unnecessary investments. Also, there may be an increase in agility, as it becomes very easy to perceive the movements of the current market and classify them as opportunities or risks through the analysis of information, allowing a certain agility for reaction.

Construction of Indicators for Decision Making: The BI indicators are generated from the information collected, for example, from a company's internal system. By linking information from financial entries, tax and accounting entries, changes in inventory, the BI concept is able to establish comparisons between a huge amount of information, generating several reports and graphs that can be analyzed in different ways, among many other possibilities that will be available to the decision maker. In this respect, it is with the indicators that organizations are able to understand if they are moving towards their goals, and if they can go further and further in the market in which they operate. When generating an indicator, attention must be paid to its interpretation, as an indicator must have a simple interpretation so that different individuals understand in the same way what was proposed by the indicator. An example is an employee satisfaction scale whose options are "satisfied", "very satisfied", "not very satisfied", "not satisfied", the options presented are subjective and can be interpreted in a way by the employees who are

responding to questions and otherwise by who will analyze the information. Ideally, numerical options should be used where the understanding is at the same level. Another relevant point is the measurability, which represents the perception of value that the manager wants to scrutinize. The main purpose of measurement is to contribute so that the manager has the necessary information which shows the weak and strong points of his company, which will allow him to establish objectives and actions that improve his organization more and more.

Analyzing the Information: The following data is based on a bank already populated, the information contained in these graphs is fictitious and will be used only for the analysis and demonstration of the Qlik Sense tool.



Source: www.inl.com.br

Fig. 1. "Gross Sale by Product Category"

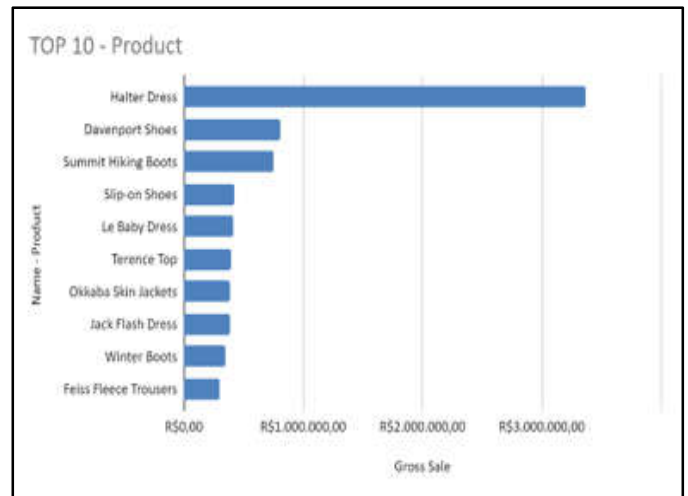
The Figure 1 shows one of the ways to demonstrate the information collected by Qlik Sense, this pie chart can bring the comparison made between a measure (sale value) and a dimension (product category). Analyzing it, we can see the percentage of sales that each category of products had. In this example, it appears that 39.1% of that company's sales are related to the "Women's Clothes" category, while the second-best seller is "Sportswear". With this information in hand, managers can assess the profile of the public that most buys in this company and bring more varieties to attract more and more of this clientele. In the same way, it is also possible to notice that products with the highest sales percentages contribute more to the sales of branches. Therefore, they are the products that cannot be missing at any time. It is always necessary to have them in stock so that when customers go to buy them, they are not in short supply.

City - Client	Gross Sale
Cunewalde	R\$1.565.952,80
London	R\$1.259.401,89
Cork	R\$1.017.731,95
México D.F.	R\$730.317,67
Lille	R\$705.570,79
Eugene	R\$666.576,57
Berlin	R\$622.023,03
København	R\$580.734,83
São Paulo	R\$579.660,67
Frankfurt A.M.	R\$545.346,36
Münster	R\$416.758,02
Salzburg	R\$366.954,57
Kirkland	R\$321.717,88
Luleå	R\$312.273,07
Aachen	R\$304.628,20
Brandenburg	R\$302.284,16
Rio De Janeiro	R\$277.126,24
München	R\$266.459,24

Source: www.inl.com.br

Fig. 2. "Sales value by Country and City"

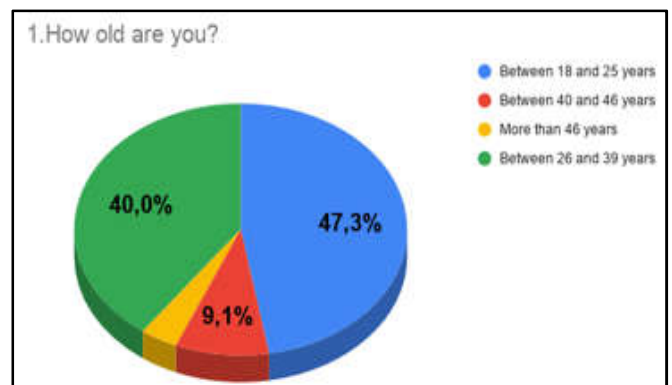
Figure 2 presents a table that is also one of the ways to display the information that was collected. As in Excel, this table contains data in rows and columns, and you can order them in the format that the manager decides (increasing or decreasing) and filtering the information according to the way he prefers to perform his analysis, in the case of this table filters can occur both by the country and by the customer's city. When filtering the Country or the City, the Qlik Sense tool will take care of bringing only the filtered information. When analyzing the table, the manager will notice that the city with the most sales is "Cunewalde" with R\$ 1,565,952.80 in sales. With this information, the manager will be able to make the decision to build another branch in that city, to improve service, attract more customers and thus increase his profit and expand his company more and more.



Source: www.inl.com.br

Fig. 3. "Top 10 Sales Value by Product"

In Figure 3 we have one of the most used forms of visualization, which are the bar graphs, in this graph we can also filter the information according to the way we will analyze, being able to perform the filters by product. In this figure we are showing only the TOP10 bestsellers, however if we click on the bar referring to "Others", it will display 10 more products that are below the TOP10 bestsellers. And when analyzing this graph, we can see that the item that has the largest share in sales is the "Halter Dress". With this information in hand, the manager can notice that this item cannot be missing from any of its branches, always having to have an extra stock so that it will not never missing when a customer will come to buy it.

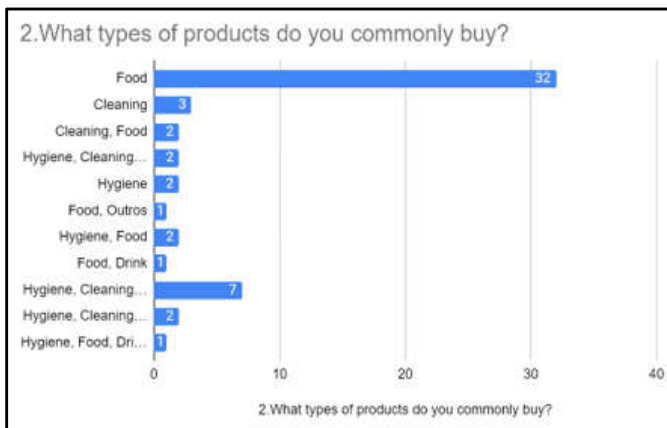


Source: Authors, (2020).

Fig. 4. "How old are you?"

Questionnaire Customers: The first questionnaire was conducted to build a customer profile for the city of Manaus. Fifty-five responses were collected from the general public. The first question was intended to organize the target audience according to age. Analyzing the graph, we can see that most of the answers came from people aged between 18 and 25 years and between 25 and 39 years old. From that, we can decide which products to buy and how to attract the attention of this segment of potential customers.

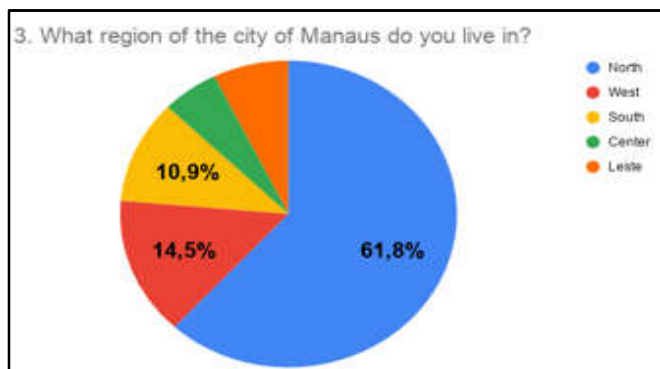
The second question asks what types of products the customer buys most. In this respect, firstly, food comes in general, then hygiene and cleanliness are tied. According to these data we will be able to decide what the main focus of the establishment will be.



Source: Authors, (2020).

Fig. 5. What types of products do you buy most?

The third question is intended to verify which region of Manaus the target customer lives in. Analyzing the graph, we can see that the largest public resides in the North Zone of the city and in the West Zone. This information can facilitate the decision on where to build a new branch or where to focus the establishment's marketing.

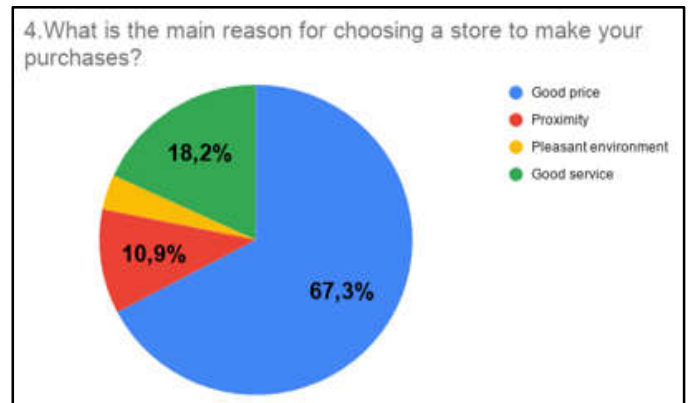


Source: Authors, (2020).

Fig. 6. "What region of the city of Manaus do you live in?"

The question number four asks what is the main reason for making purchases at the selected location. Most people replayed that the good price is what attracts the public the most. Right behind comes the good service. With this information in hand, managers can carry out promotions that attract customers, generating profit for the company and satisfying future customers. On the other hand, they may

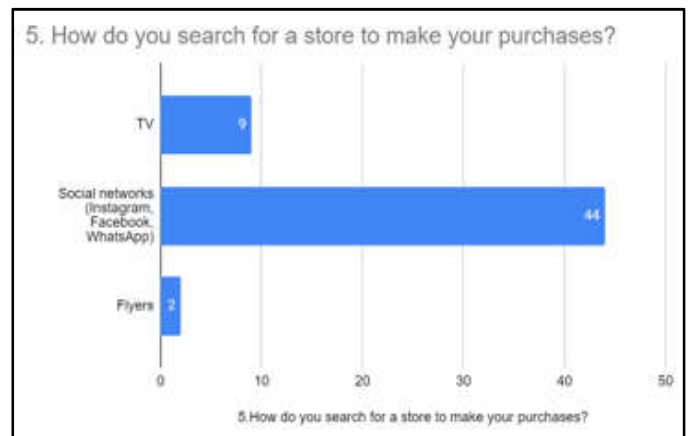
decide to train the attendants to perform a good service, qualifying them to always offer a good shopping experience to customers, making them return in the future and recommend the establishment to family, friends and acquaintances.



Source: Authors, (2020).

Fig. 7. "What is the main reason for choosing a store to make your purchases?"

The fifth question is directed to the company's marketing sector, asking customers which way they search where to buy, where they seek to know the establishments where they will buy what they need. The graph shows that customers search more on social networks and on television, so the marketing sector can focus on these social networks to attract customers, posting photos of the establishment, promotions that are taking place on it, among other information. On the other hand, promotions can be shown daily on television.



Source: Authors, (2020).

Fig. 8. "How do you search for a company to make your purchases?"

The last question is intended to confirm whether or not the customer would indicate a store he has already visited. In that question, most people answered yes. So, given all the items that were placed in the previous questions, it can be concluded that most of the customers who visited, tend to indicate the establishment frequented, which can result in increases in the number of possible customers and an increase in profits which should contribute to the expansion of the company.

Questionnaire Managers: The second questionnaire is directed to the managers of the company in which the BI concept will be implemented. This instrument aims to identify which managers will need training and knowledge recycling.

Otherwise, it seeks to observe what is the current situation of data analysis in the organization in order to seek improvements from the responses obtained.



Source: Authors, (2020).

Fig. 9. "Do you usually indicate stores that you go to?"

The first two questions have as the main purpose mapping which managers are or are not aware of the BI concept and verify if they have already used any of the BI tools. With these questions we can identify the managers who will need initial training and those who will need to acquire knowledge about the BI concept and tools. According to the first graph, 45.5% of managers will have to do some kind of training on the concept of BI while the other 54.5% will have to do some recycling on this knowledge. Meanwhile, according to the second graph, 54.5% of managers have already used some BI tool, and 45.5% have not used any of these tools yet. Therefore, these 45.5% must undergo introductory training on the use of this tool; however, 54.5% will be able to go to more advanced levels of use of the tool.



Source: Authors, (2020).

Fig.10 "Do you know about the Business Intelligence concept?"

The third question aims to verify which the conditions of access of managers in the case of data coming from two or more different sources, and how they would proceed to analyze this data. The question number four asks which tool is most used to generate various types of reports. Most managers (54.5%) use the company's own system. Having this information in hand, we can see that, during the end of the month, you may be overwhelmed due to the great demand of the monthly closing. Therefore, a BI tool would take that weight off the company's system (ERP), allowing information to flow better and bringing that information more easily.



Source: Authors, (2020).

Fig. 11. "Have you used any Business Intelligence tool?"



Source: Authors, (2020).

Fig.12 "If it is necessary to analyze information with more than one data source, how would you do the analysis?"

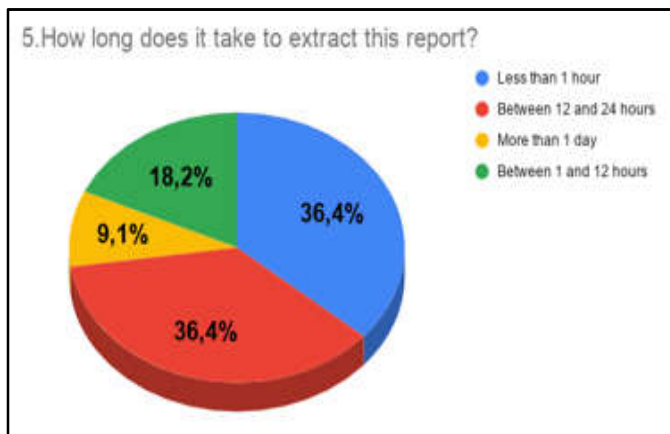


Source: Authors, (2020).

Fig. 13. "Currently, which tool is the most used by you at the moment when it is necessary to make a report?"

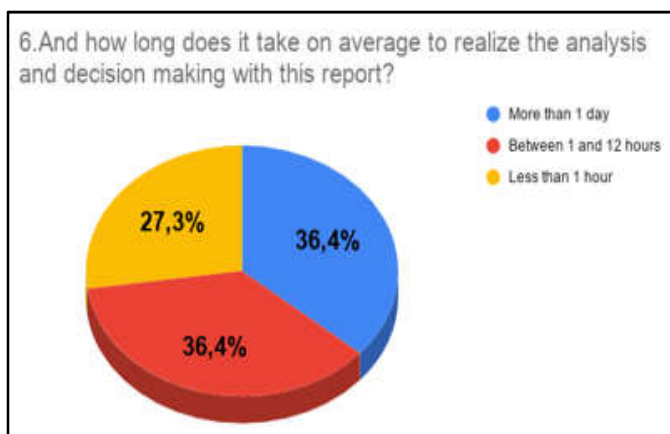
The questions five and six ask about the delay in extracting and analyzing the data. We observed that 36.4% of managers take between 12 and 24 hours to extract a report, in turn 36.4% take less than 1 hour to extract the same report. On the other hand, 36.4% take more than a day to carry out an analysis with these reports and only 27.3% of managers are able to carry out their analysis in less than 1 hour. Therefore, for managers who have reduced their productivity due to the delay in the

analysis, benefits can be obtained with the implementation of the BI tool, improving their view of the data and bringing only the data necessary for their analysis.



Source: Authors, (2020).

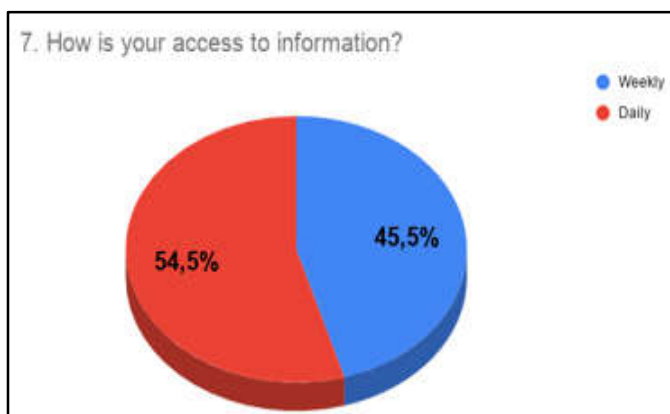
Fig. 14. “How long does it take to extract this report?”



Source: Authors, (2020).

Fig. 15 “And how long does it take on average to carry out the analysis and decision making with this report?”

The seventh question asks how often the manager accesses the data, and we note that no manager analyzes the information month by month. However, 54.5% need the information daily. Thus, it is evident that it is necessary that the information is updated daily to keep this public updated and always with the data in hand when necessary.



Source: Authors, (2020).

Fig. 16 “How is your access to information?”

The eighth question involves an important situation that occurs very often in several organizations, which are conflicting data.

In this analysis, we found that, in this organization, 81.8% of managers have already received conflicting data, and this interferes with their decision making, as the data lose reliability. Thus, decision-makers are left without true information, which may harm the organization. With BI, it is expected that this amount of incorrect data will decrease, and that the same data will be more accessible.



Source: Authors, (2020).

Fig.17. “Have you received conflicting data and didn't know which was correct?”

Conclusion

Based on what was presented, it was concluded that the importance of data processing is increasingly high, as new data are constantly emerging. These data have to be transformed into knowledge so that managers have adequate guidance and carry out decision making as soon as possible, with greater assertiveness and with a higher success rate. In this sense, BI tools become the main ways to make quick, accurate and secure decisions. This brings a positive point, which is the fact of increasing operational efficiency and helping to identify operational errors, as well as recognizing new opportunities in the market in which the company operates. In this way, BI is essential for organizational growth, as its tools help to analyze, extract, consolidate and transform data and transform it into a business advantage. Also, it was observed that, when analyzing the data contained in the dashboard of the graphs and tables in Qlik Sense, one perceives the usability of this tool, intuitive and simple that brings the information truthfully and quickly, at any time when it is needed. For that, it is necessary that the information has already been extracted and has been properly transformed for analysis.

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