

Business Intelligence and its Relationship with Sales' Increase in a Farinaceous Company at Callao

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Abstract

Nowadays, globally, the use of technological tools in business has driven a significant improvement in processes, reducing costs and increasing profits; one of those tools is business intelligence. However, its use of Peru is not so common, because it is associated with high implementation costs, in addition, its benefits are not yet clearly identified in Peruvian companies due to its poor implementation and the lack of research related to the subject. In this research, the benefits obtained after the implementation of business intelligence tools in a farinaceous industrial company in Callao were evaluated and be able to determine the relationship between the use of these tools and the increase in sales. The analysis consisted of the elaboration of a questionnaire to evaluate the perception of workers regarding the use of these tools; the results obtained were statistically analyzed, using the methodology proposed by Hernández. In addition, a comparison of sales amounts and quantities was made before and after the implementation of these tools. The results show that the workers of the organization perceive an improvement in their daily activities due to the support of business intelligence tools, also the amounts and quantities sold were increased, which is confirmed by the comparison of actual amounts and quantities analyzed. It was concluded that the use of business intelligence is positively related to the increase in sales, which is a similar benefit in research by international companies, demonstrating that in Peruvian companies these tools also help business growth.

Keywords: Business Intelligence; Farinaceous.

1. Introduction

Organizations are constantly looking for new techniques to increase their sales, these new techniques are associated with the use of technological tools [1]. Among the multiple technological tools that we can find today, business intelligence tools are considered an important factor for decision making that help determine new organizational strategies. [2]. These organizational strategies must be related to being able to know the customer, their perspectives and needs in order to influence their purchases, to not only provide a product or service, but a shopping experience. this is achieved by analyzing customer data in order to improve marketing strategies, both characteristics can be achieved using business intelligence tools [3].

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In general, the use of business intelligence tools provides a series of benefits as we can see in Table 1, in which we can highlight as more identified and more relevant benefits for this research, where it is appreciated that the improvement in decision making is a benefit found by ten authors, the increase in sales profit found by two authors, and the improvement in marketing strategies found in one investigation.

Table 1: Benefits of Business Intelligence.

Benefits	Authors
Improved decision-making.	[4, 5, 2, 6, 7, 8, 9, 10, 11, 12]
Increased sales.	[2, 7]
You get a single, consistent version of your organization's data.	[2, 7]
Improvement in marketing strategies.	[4]
Proactivity when communicating with the customer.	[4]
Reduce costs.	[7]
Improve productivity.	[7]
Gain complete knowledge of business processes.	[5]
Helps organizational change.	[5]

Together all these benefits are important in organizations because they help improve promotional and marketing strategies through the analysis of customers and the prediction of their purchase trends, so if implemented in small and medium-sized companies it would be possible to increase their sales [4], this is because with the use of business intelligence tools it will be possible to have a detailed analysis of the existing information in the organizations and also be able to make decisions that will generate competitive advantages and allow the organization to raise its performance [2].

It is important to mention, the factors to take into account to be able to successfully implement this type of tools within organizations, external factors such as competition, regulations, demand and supply that must be analyzed to determine how much they affect to achieve the objectives of the project and be able to enter them into data analysis [5]. You must also take into account the internal factors in the organizational environment that will influence decision-making and the use of business intelligence tools, which are variable, so the business intelligence system must be easily adaptable to these changes [7].

In Peru, the use of business intelligence tools in the Tai Loy company, managed to consolidate key information for the elaboration of key indicators for decision making and the implementation of business strategies without loss of time and money [13], in small and medium-sized enterprises (SMEs) business intelligence tools help analyze the data they generate during their daily operations and currently you can opt for a cloud implementation using free tools that considerably reduce the cost of implementation, in order to allow SMEs to integrate, analyze data to make better logistics decisions and reduce their losses [14].

This work determines the relationship that exists in the use of business intelligence tools and the increase in sales, in the farinaceous industrial company located in Callao, which entered a restructuring process when it realized that its computer systems were not helping to analyze the information that its modern production plants generated and did not allow an adequate analysis of customers, so they opted for the implementation of business intelligence tools.

In addition to evaluating the impact of business intelligence technology on organizations, this research also focuses on contributing to society in two important aspects, the first contributing to the creation of literature on business intelligence issues in Peru, in research [9], it can be seen that the research related to the topic of business intelligence and its contribution within organizations in Latin America in general is very low as we can see in Figure 1, being Peru one of the countries that has less scientific production on the subject, therefore this research work will serve to increase the related literature; the second aspect is that it will serve as a success story to motivate the use of business intelligence tools in Peruvian companies and so they can benefit from the benefits achieved with their use.

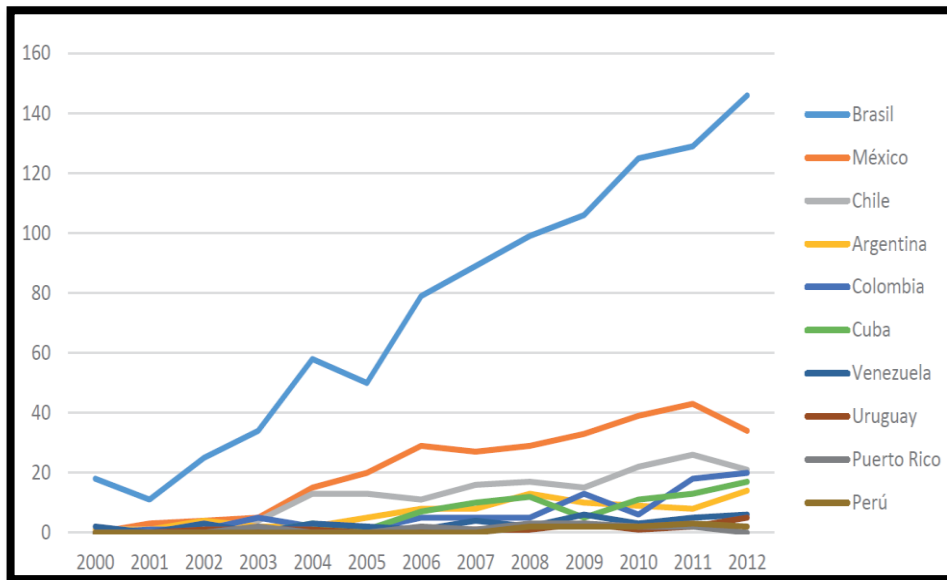


Figure 1: Contribution of business intelligence research by country.

2. Method

This research is of the applied type, it will not create new knowledge, but the validity of existing knowledge will be demonstrated [15]. It is of a quantitative approach, this because a problem is described, which will be analyzed and solved through a data analysis using surveys. The research has a correlational scope, the relationship that exists between two variables, business intelligence (independent) and sales (dependent) will be analyzed, it can also be classified with an explanatory scope, since it will explain the relationship that exists between these two variables [16]. The design of this work according to the theory of [16], it is non-experimental, it will not influence the variables, an analysis will be carried out to see if the business intelligence tools help to increase sales.

Non-experimental design can be divided according to [16], this research is a cross-sectional non-experimental design, it is considered so because the data was obtained in a single moment, after the implementation of the business intelligence tools and the influence it had with respect to the sales of the organization was analyzed. The design can continue to be subdivided, this research also has a classification of causal correlational, the relationship that exists between two variables (business intelligence and sales) is analyzed, our complete design would be non-experimental transversal correlational causal. The research method that was followed according to the theory of [17], is hypothetically deductive, this because it is hypothesized that business intelligence does positively influence sales and its validity will be demonstrated through data analysis. In Table 2 we can see a summary of the type and design of the research.

Table 2: Type and design of research.

Summary	Description
Type:	Applied (technological)
Approach:	Quantitative
Scope:	Explanatory correlation
Design:	No experimental transversal correlational causal
Method:	Hypothetical correlational deductive

2.1. Description and determination of the population

To determine the sample according to [17] there are two ways, a probabilistic sampling and non-probabilistic sampling, due to the characteristics of this research the sampling was non-probabilistic, determining a sample for convenience, in this case it was only the farinaceous industrial company located in Callao that has about 250 workers, of which 200 were surveyed.

2.2. Instrument and data collection

The process followed for the creation of the instrument can be seen in Figure 2, Figure 3 and Figure 4, is based on the methodology proposed by [16], in which we can appreciate the process followed for the creation and validation of the instrument as well as the planning for its application and testing was carried out.

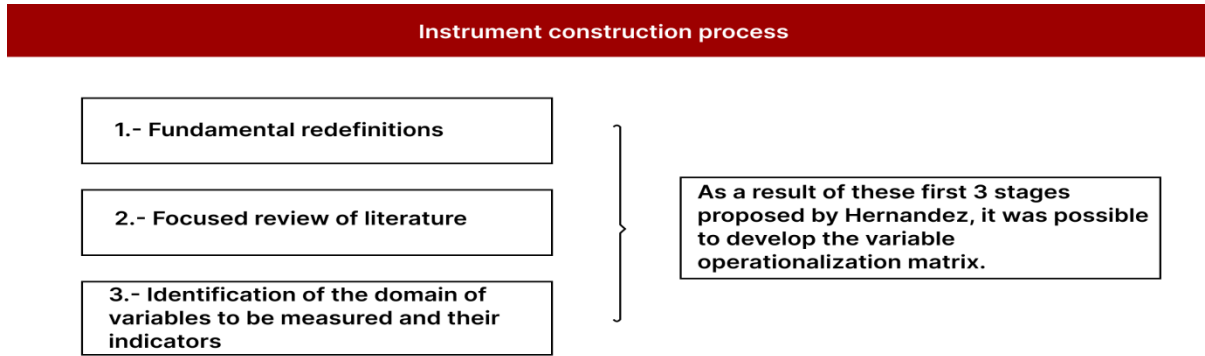


Figure 2: Instrument construction (stages 1-3).

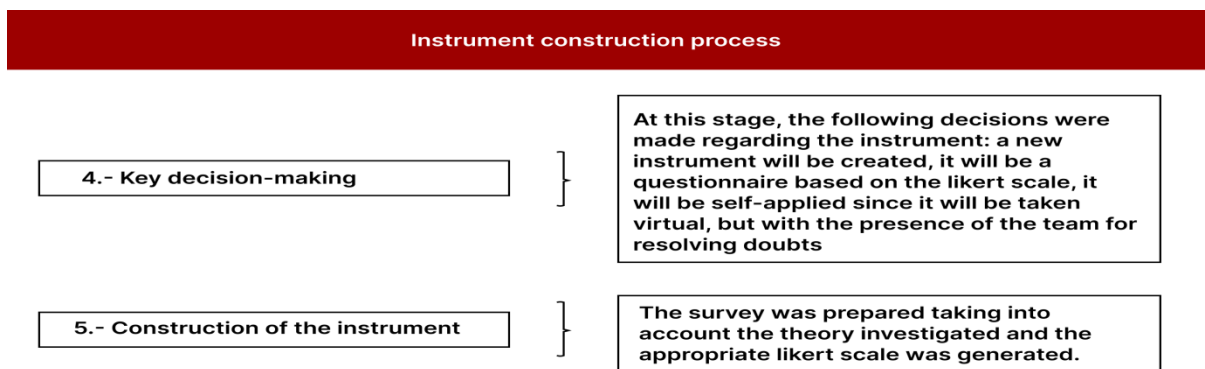


Figure 3: Instrument construction (stages 4-5).

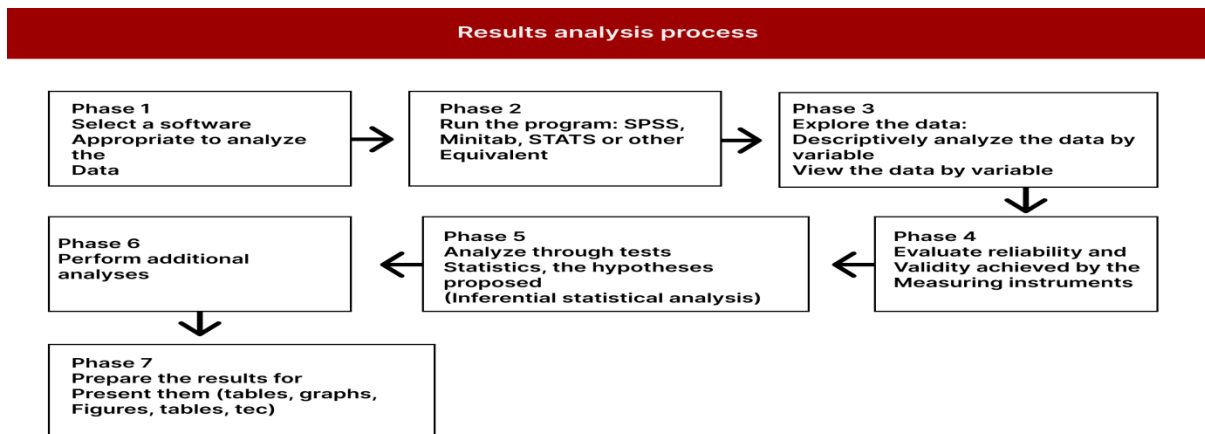


Figure 4: Instrument construction (stages 6-11).

2.3. Procedure for data analysis

For the analysis of the data, the statistical program SSPS, Excel and Python was used where the analysis was carried out to obtain the following results:

- The mean, variance, deviation, and standard error of the study variables were calculated.
- The average of the dimensions was calculated based on the indicators presented in the operationalization matrix.
- The validity and reliability of the instrument and the variables analyzed were verified using Cronbach alpha and factor analysis
- The results were interpreted, and the tests of the hypotheses raised were carried out

2.4. Ethical considerations

The work was carried out with permission to the company, but they request that no reference be made to its real business name.

3. Results

For the analysis of results, the methodology proposed by [16] that proposes the steps that can see in Figure 5. In each step the following activities were carried out:

- Phase one and Phase two: The SPSS software was chosen to be able to analyze the results since this software is one of the most used for the analysis of statistical data.
- Phase three: In this phase the two variables (business intelligence and the variable increase in sales) were analyzed, carrying out a descriptive statistical analysis with them.
- Phase four: Validity and reliability analysis was performed using Cronbach's alpha index and factor analysis
- Phase five: For the analysis of the hypotheses, chi-square was used
- Phase six and Phase seven: The analysis of the results will be carried out and the data presentation will be prepared

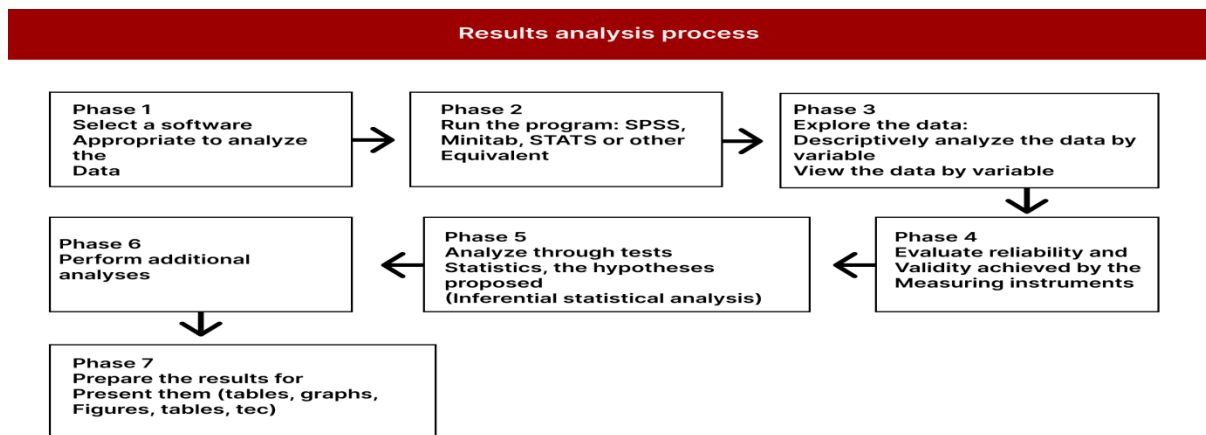


Figure 5: Results analysis process.

To determine the validity and reliability of the data [16] proposes to use Cronbach's alpha, for reliability and for validity the factor analysis and the KMO index that according to [16] are the most commonly used methods. The

variables to analyze are, business intelligence and increased sales, so the reliability and validity of the data collected for each of them must be calculated.

In Table 3 we can see the Cronbach's Alpha index of the variables of business intelligence and increase in sales which is greater than 0.7 which according to [18] is an accepted index to demonstrate the reliability of the instrument.

Table 3: Cronbach's Alpha Analysis.

Scale	Alfa de Cronbach	Element Nro
Increased sales	0.737	14
Business Intelligence	0.784	11

Table 4 shows the KMO index for the variables business intelligence and sales increase according to [18] it must be greater than 0.50 to be considered a valid instrument and both variables exceed that value so its validity is demonstrated.

Table 4: Index Kaiser-Meyer-Olkin (KMO)

Scale	Index KMO
Increased sales	0.710
Business Intelligence	0.772

For the contrast of hypotheses according to [16], parametric analyses and non-parametric analyses can be performed, in order to perform them, the following assumptions must be met, in the case of parametric analyses: The dependent variable must have a normal distribution, the level of measurement of the variables is by reason intervals; for non-parametric analysis, the following assumptions are taken into account: variables with free distributions (non-normal distributions) are accepted, nominal or ordinal data are analyzed, the variables must be categorical.

To determine that the data are in a normal distribution, the Shapiro, D'Agostino and Anderson-Darling normality test was performed, giving a negative result, therefore, it is not a normal distribution and parametric methods could not be used. Non-parametric analyses were used because it complies with the first validation, which is to accept data from free distributions and fulfills the second validation that they are categorical or enumerative variables.

One of the most used methods in non-parametric analysis is the Chi-Square, a statistical test that serves to evaluate the relationship between two categorical variables is used in correlational hypotheses, the level of measurement of the variables can be nominal or ordinal, or ratio intervals reduced to ordinal. This method was used when analyzing the hypotheses because they are relational, and the interval of measurements is ratio intervals reduced to ordinal. The level of significance used to reject the null hypothesis was 0.05 (5%). It is recommended to choose the level of 0.05 for consumer-related research projects.

Three specific hypotheses were proposed, which were analyzed using the null hypotheses which we detail below:

- Hypothesis specifies one: "Decision making due to the use of business intelligence improves promotional strategies, which helps increase sales, in the case study."
- Null hypothesis one: "Decision making due to the use of business intelligence does not improve promotional strategies, which does not help increase sales, in the case study."
- Hypotheses specify two: "The proper use of business intelligence applications and technologies achieves an increase in the amount and amounts sold, in the case study."
- Null hypothesis two: "The proper use of business intelligence applications and technologies does not achieve an increase in the amount and amounts sold, in the case study."
- Hypotheses specify three: "The use of business intelligence helps customer loyalty and segmentation, and this increases sales, in the case study."
- Null hypothesis three: "The use of business intelligence does not help customer loyalty and segmentation, and this does not increase sales, in the case study."

Using Table 5 as a reference we can determine the value of Chi-Square to validate the hypothesis specifies one, for this we use the Python programming language, obtaining the following results:

- Chi-Square: 5.50
- P-Value: 0.0000

Table 5: Chi square hypothesis specific 1.

Marketing strategies	Agree	Totally agree	All
Decision making			
Agree	7.89%	92.11%	100.00%
Totally agree	9.68%	90.32%	100.00%
All	9.00%	91.00%	100.00%

The significance value α is less than 0.01 which indicates a 99% confidence and 1% error, also has a Chi-Square value of 5.5, so the variables are significantly related. Because of this, the null hypothesis is discarded, and the hypothesis specifies one is accepted.

Using Table 6 we can determine the corresponding Chi-Square value to validate the hypothesis specifies two, for this we use the Python programming language obtaining the following results:

- Chi square: 21.4812
- P-Value: 0.0003

Table 6: Chi square hypothesis specific 2.

Quantity and amount sold	Neither agreement nor disagreement	Agree	Totally agree	All
Applications and technology				
Neither disagreement	0.00%	77.78%	22.22%	100.00%
Agree	0.00%	55.56%	44.44%	100.00%
Totally agree	10.08%	72.27%	17.65%	100.00%
All	6.00%	67.50%	26.50%	100.00%

The significance value is less than 0.01 which indicates a 99% confidence and 1% error, also has a Chi-Square value of 21.4812, it is determined that the variables are significantly related. Therefore, the null hypothesis is discarded, and the specific hypothesis is accepted.

Using Table 7 we can determine the value of Chi-Square to validate the specific hypothesis 3, it was calculated using the Python programming language, obtaining the following results:

- Chi square: 387.5949
- P-Value: 0.0000

Table 7: Chi square hypothesis specific 3.

Using Business Intelligence	Neither agreement nor disagreement	Agree	Totally agree	All
Loyalty and segment customers				
Neither disagreement	100.00%	0.00%	0.00%	100.00%
Agree	0.00%	95.00%	5.00 %	100.00%
Totally agree	0.00%	0.00%	100.00%	100.00%
All	2.00%	19.00%	79.00%	100.00%

The significance value is less than 0.01 which indicates a 99% confidence and 1% error, also has a Chi-Square value of 387.5949, which indicates that the variables are significantly related. Therefore, the null hypothesis is discarded and the specific hypothesis three is accepted.

4. Discussion of results

The three null hypotheses have been rejected, which implies that the use of business intelligence tools is closely

related to the use of business intelligence tools in industrial companies, specifically in the Farinaceous industrial company located in Callao. So, by using business intelligence tools you will achieve:

- Improve promotional strategies because business intelligence tools are a support for better decision making, which will make promotions have a better sustenance and make them more attractive, offering products and combinations of products that the customer needs, thus achieving that these promotions have a greater degree of acceptance therefore an increase in sales of the organization will be seen.
- Improvement in customer loyalty and segmentation, the business intelligence system allows to better analyze customers and find hidden shopping trends, so that they receive preferential treatment according to their needs.
- Increase in the amount and amounts sold, the improvement in marketing strategies and customer loyalty achieved by business intelligence tools will make the organization increase its sales and revenue. This can be verified by analyzing the sales in the different years (Figure 6) being the light blue the year in which the business intelligence system was used in which we see a significant increase in the quantities sold in tons.

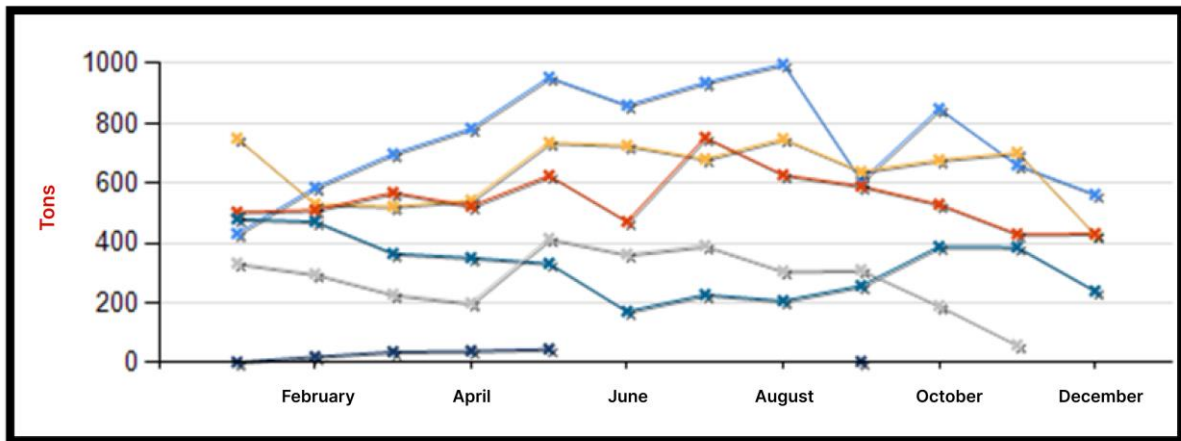


Figure 6: Annual sales trend by month.

5. Conclusions and recommendations

Finally, after demonstrating that business intelligence positively influences the increase in sales, we can conclude the following:

- When analyzing the relationship between business intelligence and promotional strategies in the case study, it is concluded that it was possible to increase sales since marketing strategies improved and managed to capture more revenue.
- When analyzing the relationship between business intelligence and the amounts sold in the case study, it is concluded that the use of business intelligence helped with data analysis and improved promotion makes the sales amounts higher.
- When evaluating the relationship between business intelligence with customer segmentation and loyalty in the case study, it is concluded that, by improving promotions, marketing, using business intelligence tools, the

customer can be happy and more willing so that they can continue to consume the company's products, in addition to giving good references about the company which attracts more customers.

All types of systems need to regularly measure their efficiency to ensure that they are always updated and comply with the processes of the organization, so also in business intelligence projects that cycle of control and continuous improvement is needed, so it is recommended:

- Periodically analyze the data to update sales promotions
- That based on the information collected, new product variants are generated in order to continue increasing sales levels
- Segment customers every six months to find better opportunities to offer them suitable services

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