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Data Mart Design to Improve the Decision-Making Process of the After-Sales Service

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Abstract

Companies are currently looking for ways to maintain and get new customers, one of the strategies is to maintain customer loyalty to the brand, product or service, which is known as loyalty; technological advances and social media use facilitate this. The research proposes the development of a Data Mart that allows the extraction of information from different sources, stores only the required information, eliminates those data that hinder the analysis and generates key reports and indicators that provide support to the process of decision-making and to respond quickly and efficiently to customer inquiries, requests or complaints. For the research, the Ralph Kimball methodology was used, due to the focus on the functional after-sales area of the company, dividing the life cycle by stages, where each stageswas evaluated and corrected promptly from planning to maintenance and growth of the Data Warehouse. As a result, it was possible to improve the obtaining of useful information for the business area by selecting the critical value data using an OLAP data model.

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1. Introduction

After-sales service is an excellent way to build customer loyalty and open up the possibility of getting new ones, especially nowadays, where customers are characterized by their disloyalty.

With the advancement of technologies, and increasing use social media use, the experience provided to customers will be what others hear about your brand, it can even become a source of income.

Therefore, the after-sales area for companies of the International Bank of

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Peru - Interbank, with the implementation of clear and precise strategies, must be able to respond quickly and efficiently to customer queries, requests, or complaints.

The after-sales area for companies of the International Bank of Peru - Interbank requires management indicators promptly for strategic, tactical, and operational decision-making for management, leadership, and supervision, respectively, and improving the after-sales serviceunder the strategic guidelines of the company.

The implementation of a Data Mart is proposed to give a solution to the problem, starting from the analysis carried out to the processes of the area, where several important points were evidenced, threeof which stand out [1]. a) The information required comes from different data sources, generating an operational burden for the user in obtaining and consolidating it. b) There is the dependency generated with the systems or IT area, due to the requests made by the different users, a bottleneck is generated and directly impacts the Service Level Agreement (SLA) of the area. c) The integrity of the information to support decision-making [2]. This implementation allows us to store only the information required and gradually eliminate the data that hinder the work of the analysis and deliver the information that is required in the most appropriate and timely manner, thus facilitating the decision-making process.

2. Problem statement

Currently, the after-sales service of the International Bank of Peru is divided into two main categories; after-sales for a natural person (retail) and after-sales for companies, known as Company Solution. To perform this last service, a series of processes are carried out that involve different areas, from the reception of the query, order or claim, to the attention, solution, and response.

Most customer inquiries, are referring to the products for companies that they acquired with the bank. They can also request information about any of their processes, fees, and consultancies.

The company solution has three channels to serve customers. Each channel has its SLA, as shown below:

- Email channel: This channel has three teams.
- Digital team: They attend to inquiries, orders, and general claims of almost all products for companies. The SLA is 2 hours for top clients and 4 hours for others.
- Specialized team: They attend inquiries, orders, and product claims for specialized companies; in others words, those that require greater detail or level of access. The SLA is 1 day.
- Leasing Team: There is a dedicated teamfor after-salesservice for the Leasing

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product because it requires certain treatments. The SLA is 1 day.
- Telephone Channel: This channel has only one team.
- Telephone team: The attend inquiries, orders, and claims of almost all products for companies through telephone banking. The SLA is 4.5 min per answer.
- WhatsApp Channel: This channel has only one team.
- WhatsApp Team: They attend inquiries, orders, and claims of almost all products for companies, besides to promoting sales. The SLA is 30 min per consultation.

The area where after-sales Data Mart implementation was carried out is seeking to increase client satisfaction and ensure the relationship with them [3] [4].

The area has an analyst and a practitioner who are responsible for the tasks: Identify and signal the queries that come from the top clients, and make reports and indicators of compliance with SLA, and productivity indicators, as [5] [6].

To carry out these tasks and provide reports and indicators to management [7],for optimal decision-making, they previously carry out activities to obtain the information. Among the main activities are the following:

- Extraction of data from the transactional base manually.
- Loading and updating the customer database, product database, user database.
- Manual execution of scripts to databases.
- Issuance of reports in spreadsheets to users who request.

The after-sales area for companies of the Interbank bank handles thousands of data records on customers, products, collaborators, sales and inquiries, orders, and customer complaints from different sources [6] [8], as shown in Figure 1.

Currently, there are three significant evidences around the problem: First, the extraction and consolidation of information is carried out manually and come from different data sources generating an operating load for the users. Second, there is a dependence on the ICT area, due to requests made by different users that generates a bottleneck and affects the SLA of the after-sales area. Finally, the processes are increasingly complex; therefore, integrity in decision-making process is deficient; managing both information and processes becomes more difficult [5] all of these can lead to errors. That's why decision-making is often done by expert judgment, and prevention strategies cannot be formulated quickly and effectively.

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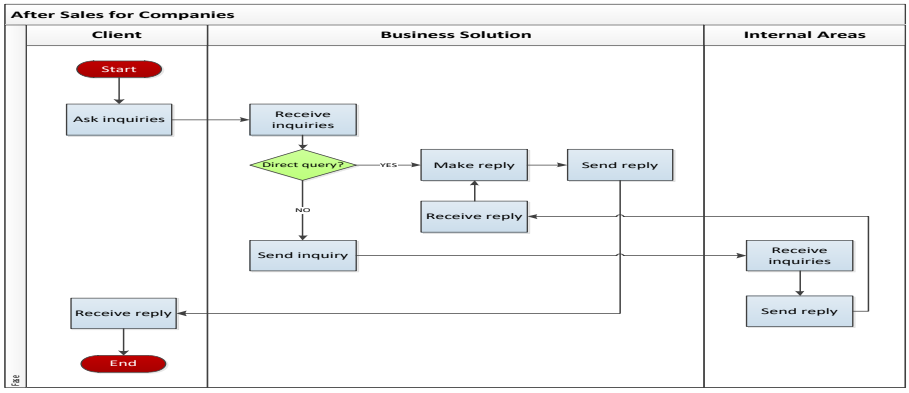

Figure 1: Business process

The area requires quick and online access to consolidated information and indicators [9] to streamline the data analysis process; and thus, in a timely and effective manner, strategic, tactical and operational decisions [10] are made for management, leadership, and supervision, respectively; therefore, improve the after-sales service [11] under the strategic guidelines of the company.

3. Materials and methods

3.1 Software

KNIME was initially developed by the department of bioinformatics and data mining at the University of Konstanz, Germany, under the supervision of Michael Berthold. The nodes implement different types of actions that can be performed on tables in different databases. A data flow is built by nodes and connecting them with other, and the data is transported between the nodes through the input and outputports, as showed in Figure 2, taking the ETL process.

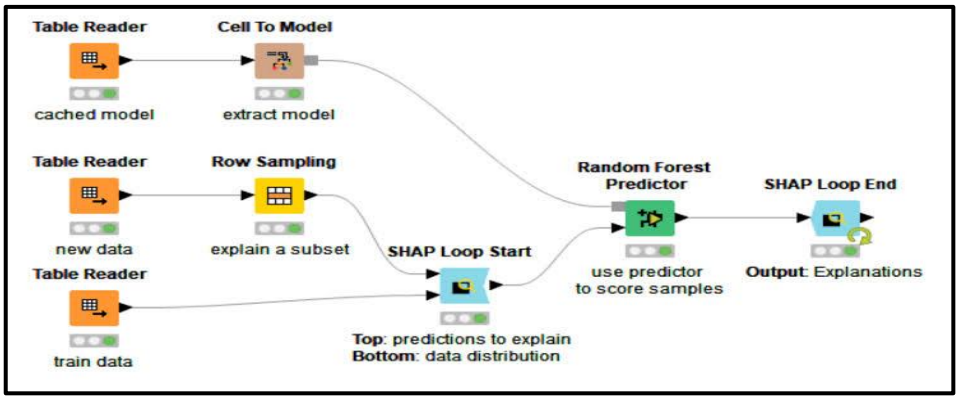

Figure 2: Run flow for report generation

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PENTAHO as an integrated BI tool that helps with reporting, data mining and ETL, use resources such as reports or dashboards, Tools to create and manage Dashboards, or Data Integration (PDI), to provide a manageable classification [12]. The usefulness for the project is to view the designed indicators or dashboard with the design and construction of reports; end users can consume that.

MicroStrategy is a platform written in Java language and developed at the University of Waikato, with machine learning and data mining.As an open architecture and comprehensive API suite, MicroStrategy 2019 enables developers to embed intelligence in customs or third-party applications with ease. It also is interoperable with languages as JavaScript, HTML, Java Python, Swift, Objective C, Net and more.For the project is important to enable analysts and teams involved to leverage enterprise data reliably, mix with other sources, and create content quickly without giving up their custom dashboard. This will serve in the BI application specification phase and application design as Figure 3.

- Relational Database Engine: Microsoft SQL Server 2016.
- ETL Tool: Microsoft Integration Services.
- Dimensional Analysis Tools: Microsoft Analyzes Services.
- Report generator: Power BI. (Figure 3)

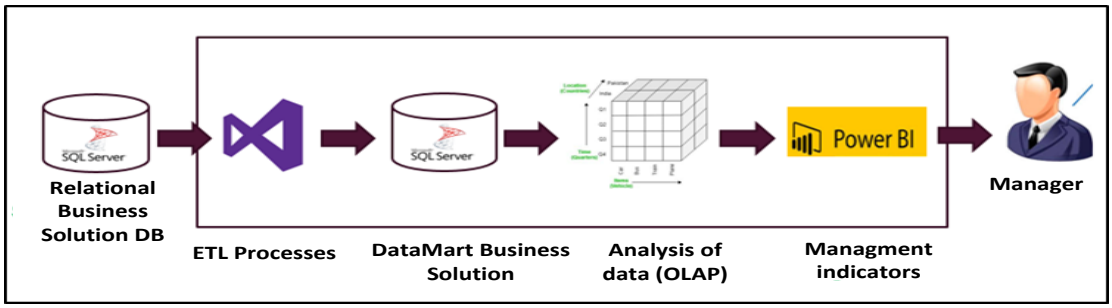

Figure 3. Enterprise Solution Business Intelligence Solution

3.2 Methodology

To select the most appropriate methods of the |data mart development and safeguarding needs and business limitations. The project must have well-defined stages because fast deliverables are required, extensive documentation is not required, and initial scope data mart of the area and later implement an incremental data warehouse will allow the implementation.

The following criteria are defined in Table 1,where methodologies are evaluated; "Data warehouse design by Bill Inmon", "Ralph Kimball Life Cycle", "HEFESTO," and "DWEP" using a scoring system [2]. In this case, the value 1 will be used when an individual “Yes” methodology meets a criterion and 0 otherwise.

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Table 1: Comparison of BI methodologies.

Criterion	Data warehouse design Bill Inmon	The life cycle of Ralph Kimball	HEFESTO	DWEP
Consider a development methodology by defined stages using a cascade model	Yes	Yes	Yes	Yes
Requires a medium-low level of detail	No	Yes	Yes	No
Medium range and can be used to expand the system	No	Yes	Yes	Yes
Implementation phase within its life cycle	No	Yes	No	Yes
Total score	**1**	**4**	**3**	**3**

From the results seen in Table 1, the Ralph Kimball Life Cycle methodology is chosen because it is better suited to the needs in the time and scope of this project.Based on the selected methodology, the process for the implementation of the DataMart is defined as the set of activities shown in the previous Table 1, and this proposal includes the business analysis carried out at the beginning of the project to identify both functional and non-functional requirements.In this section, we will detail Ralph Kimball's methodology, which is the one that we have proposed in this thesis for the implementation of the DataMart in the after-sales area of the Interbank bank. This methodology will allow meeting the objectives in research.[13]

Among the benefits there are various types of reports that will allow us to know about the types of inquiries that clients [14] make to advisors and assistants in the area; Likewise, it will be possible to know with what frequency these consultations are received, who are those most recurring clients and also identify the type of attention that is being given to "priority" clients. All this processed and detailed information will provide higher capacity and certainty to the moment that management and leadership need to make decisions, contributing to improve control of the area.The construction and implementation of a BI solution are both complex, and Kimball [15] proposes a methodology (life cycle) composed of tasks, as shown in Figure 4:

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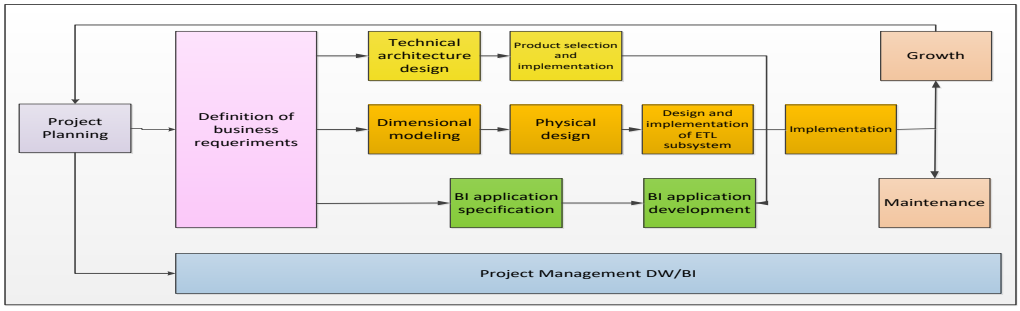

Figure 4. Tasks of the Ralph Kimball methodology called Business Dimensional Lifecycle (Kimball et al 98, 08, Mundy &Thornthwaite 06)

In figure above, we can see that for implementation, in the business requirements definition of the central process, is where we find 3 different areas, they are follows:

- The superior area is the architecture and technology to be used specifically.
- The middle area is where we will design the dimensional model and the information extraction, transformation, and loading subsystem (ETL) to the DataMart or data warehouse.
- The lower area is where the BI applications will be implemented. This area is designed for end-users.

4. Requirements and architecture

4.1 Requirements

Meetings are planned with business users and technicians, who have internal strategy reports access and they know that the organization must be analyzed in different contexts.

The interviews for the requirements, were conducted with management and the head.

After the analysis made on the interviews, the following indicators were obtained:

- Show how many queriesafter-sales area receivesper period
- Show how many clients are priority queries we receive
- Show how many inquiries are received for each bank
- Show which products and operations are the most consulted
- Show the percentage of compliance of the general service level (ANS overall)
- Show the percentage of compliance of the priority service level (ANS priority)

4.2 Dimensional model

The dimensions that have been determined are:

- Dim_Client: customer code, company code, company name, category, banking, email, classification SBS, classification FEVE.

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- Dim_Product: product code, product, operation.
- Dim_Channel: channel code, channel, SLA.
- Dim_Collaborator: collaborator code, name,area, team, email.
- Dim_Time: year, month, day, hour, minutes.
- Fact_Query: The fact table will be based on the Query table, which is where the queries made by clients were recorded, as shown in Figure 5. The measures identified are Number of Queries: is the number of cases associated with a contact with the client, where each case corresponds to a query. Contact duration: is the number of minutes in which a query takes to be answered, it is counted from its registration to its attention.

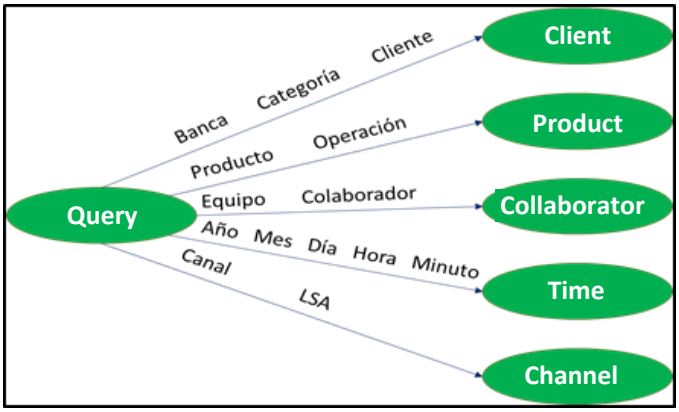

Figure 5: Start Net Diagram

Dimensional model vs Fact Table:
The Bus matrix shows the dimensions used by the Query Facts as shown in Table 2.

Table 2: Queries bus matrix. Own source.Technology Platform

	PRODUCT	CLIENT	COLLABORATOR	TIME	CHANNEL
Number of inquiries	X	X	X	X	X
Average Time	X	X	X	X	X
%SLA Compliance	X	X	X	X	X

The development is conducted through a business intelligence solution, where users will be able to quickly and duly update information, reports, and indicators through the Power BI tool.

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4.4 Physical Design

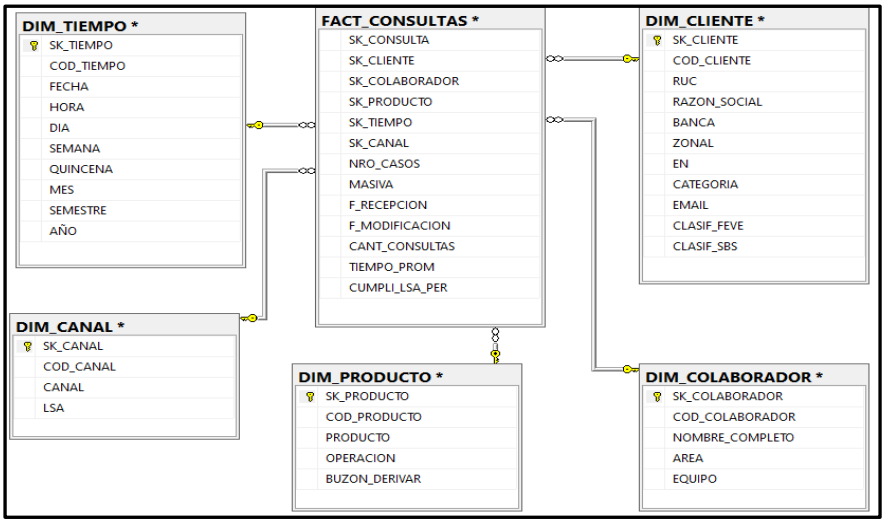

Figure 6: Star Model Queries. Own source.

4.5 Design and implementation of ETL subsystem

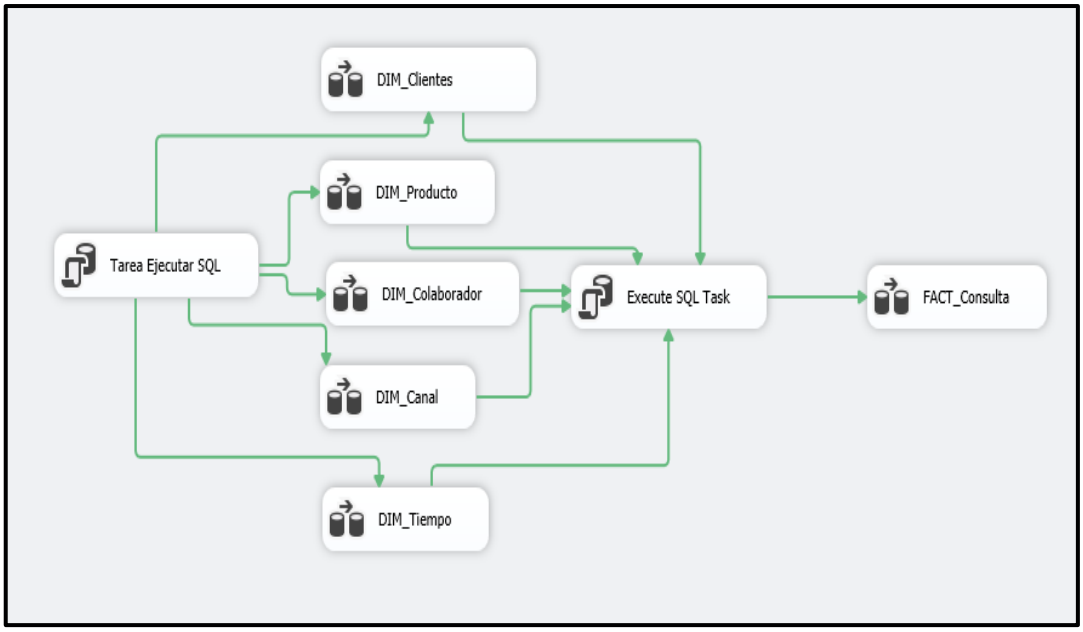

Figure 7: ETL subsystem

Standards were defined for the names of dimensions, fact tables, and in the ETL process. So that the BI system can grow and be understood by technicians without complications (Figure 7)

The standard for modeling:

- DIM Prefix for dimensions.
- FACT Prefix for fact tables.

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4.6 Architecture Design

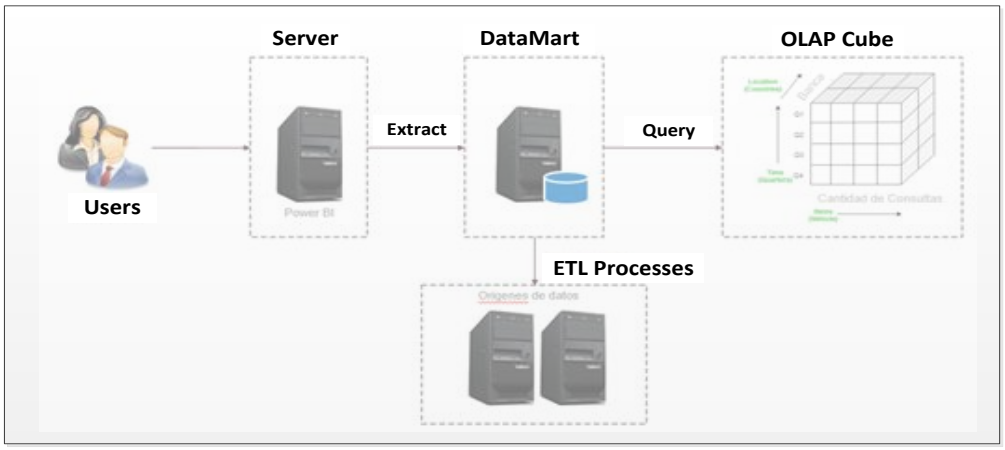

Figure 8. Enterprise Solution BI technical architecture

5. Testing

Project Testing Plan

The test plan is a formal product that defines the test objectives of a system, establishes and coordinates a work strategy, and provides the appropriate framework for developing step-by-step planning of test activities.

This document will serve as a guide for carrying out the tests (Test Case), which will verify that the system meets the needs established by the user, with outstanding quality guarantees [16].

6. Results

Among the phases of the methodology, in the planning phase, one of the activities or tasks that guaranteed the success of the project was the interviews with the users, it was very useful to planning DataMart for the Interbank bank's after-sales area, as results show Figure 9 y 10.

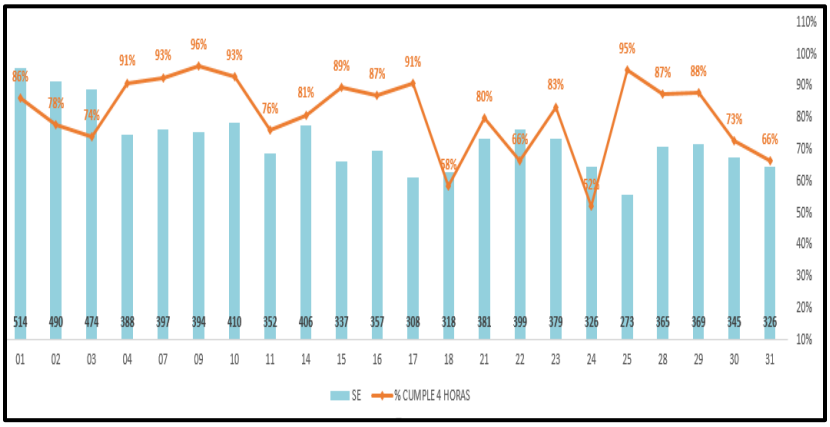

Figure 9: Number of general inquiries and percentage of compliance with the SLA

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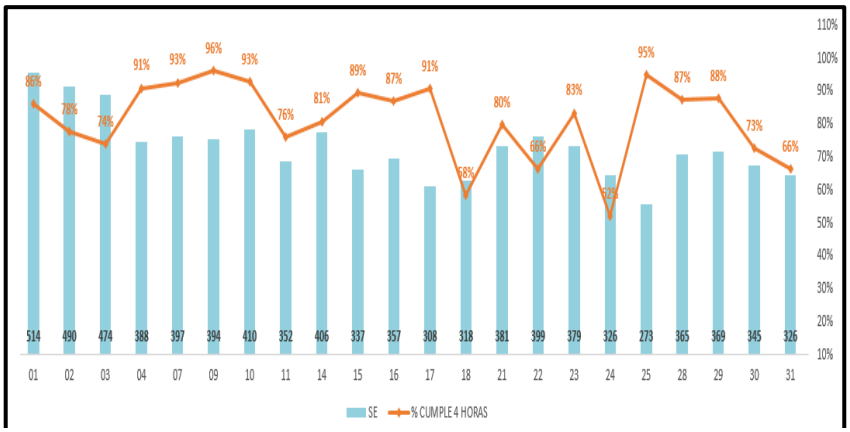

Figure 10: Number of priority customer inquiries and rate of accordance with the SLA

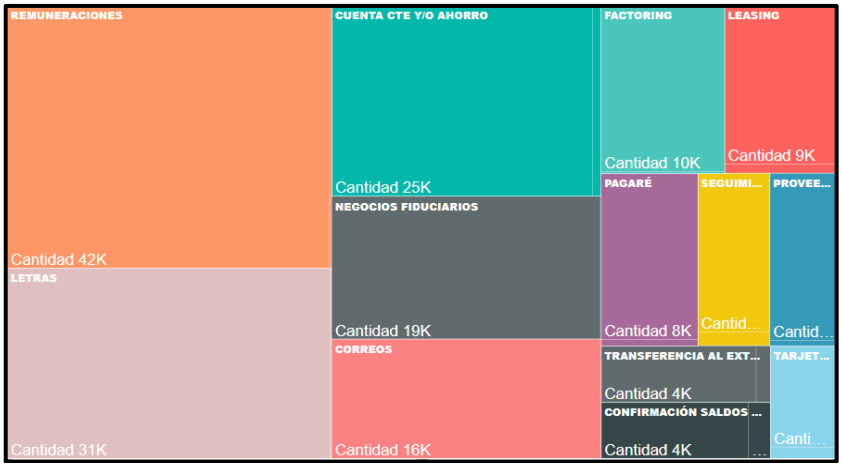

Figure 11: Number of inquiries per product

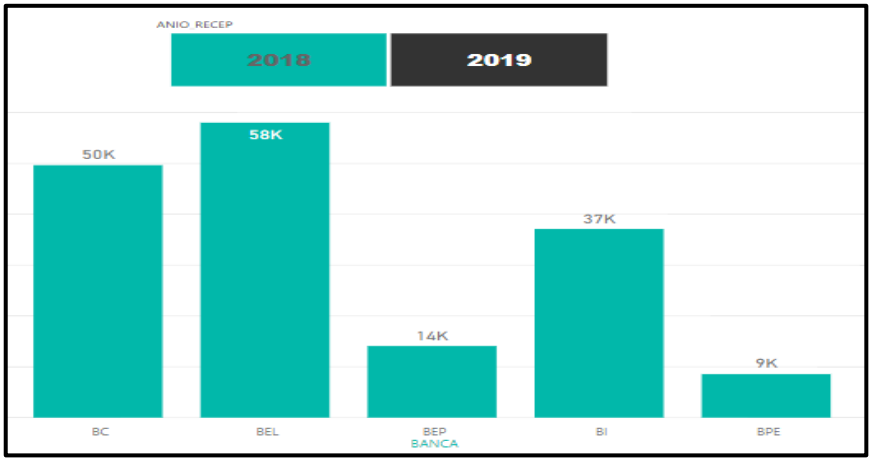

Figure 12: Report Number of inquiries per bank

The tools designed for the construction of the indicators required by the company allowed to carry out the process of strategies elaborating, apart from introducing it to specific

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objectives and measures. The indicators permitted the monitoring of the progress of the fulfillment of the strategic purposes defined and translated through the vision of the company, as the results are shown in Figures 11 and 12.

It can be deduced that indicators have a significant role in organizations since them guarantee the optimization of responses, the monitoring of the progress of the company's objectives, and ensure that all those involved can have access to information.

7. Acknowledgments

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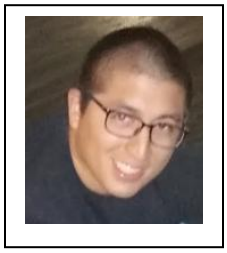

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