MANAGEMENT OF BUSINESS INTELLIGENCE TOOLS FOR THE DIAGNOSIS OF THE FOOD SAFETY CATEGORY IN AN ECUADORIAN BUSINESS ENVIRONMENT

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Summary. This research describes the management of Business Intelligence tools to evaluate the productive environment of an industrial trading company in Ecuador, specifically within the category of food safety. The study was descriptive and evaluative with a non-experimental and longitudinal design. From a census sample of 24 individuals (business advisors, technicians and managers), data was obtained through direct observation and the application of a survey of closed-ended dichotomous questions, with content validity through expert judgment and a good level of reliability ($\alpha = 0.91$; $p < 0.05$).the survey had content validity through expert judgment and a good level of reliability ($\alpha = 0.91$; $p < 0.05$), whose general analysis was carried out using the hypothetico-deductive method. The results showed that only 58% of the commercial intentions resulted in successful sales and, of the latter, 70% required at least two visits to the customer's premises. In addition, only 11% of the complaints corresponded to the areas evaluated (logistics). Through Business Intelligence it was possible to diagnose that the main non-conformities denoted interruptions in the company's transversal activities, due to the lack of established processes, management and performance indicators, as well as the lack of adequate technological tools. It was concluded that the company deserves a system oriented towards the optimization of the food safety category, administrative, commercial and continuous improvement processes, in order to guarantee greater economic sustainability.

Key words: business intelligence, quality tools, key performance indicators, continuous improvement, safety.

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GESTIÓN DE HERRAMIENTAS DE INTELIGENCIA DE NEGOCIOS PARA EL DIAGNÓSTICO DE LA CATEGORÍA COMERCIAL DE INOCUIDAD EN UN ENTORNO EMPRESARIAL ECUATORIANO

Resumen. Esta investigación describe la gestión de herramientas de Inteligencia de Negocios para evaluar el entorno productivo de una empresa comercializadora industrial de Ecuador, en específico, dentro de la categoría de inocuidad. El estudio fue de tipo descriptivo y evaluativo con la presentación de un diseño no-experimental y de corte longitudinal. De una muestra censal de 24 individuos (asesores comerciales, técnicos y directivos), se obtuvo una data mediante la observación directa y la aplicación de una encuesta de preguntas cerradas tipo dicotómicas, con validez de contenido mediante juicio de expertos y registro de buen nivel de confiabilidad ($\alpha = 0,91$; $p < 0,05$), cuyo análisis general se ejecutó mediante el método hipotético-deductivo. Los resultados reflejaron que solo el 58% de las intenciones comerciales se concretaron en ventas exitosas y, de estas últimas, el 70% precisó al menos de dos visitas a las instalaciones de clientes. Adicionalmente, solo el 11% de los reclamos correspondieron a las áreas evaluadas (logística). Por la Inteligencia de Negocios pudo diagnosticarse que las no conformidades principales denotaron interrupciones en las actividades transversales de la compañía, producto de la falta de procesos establecidos, indicadores de gestión y desempeño, igualmente por la carencia de herramientas tecnológicas adecuadas. Se concluyó que la empresa amerita de un sistema orientado hacia la optimización de la categoría de inocuidad, los procesos administrativos, comerciales y de mejora continua, con el fin de garantizar una mayor sostenibilidad económica.

Palabras clave: inteligencia de negocios, herramientas de calidad, indicadores claves de desempeño, mejora continua, inocuidad.

Introduction

The speed at which market demands evolve means that organizations must continuously keep themselves informed about the production, marketing and service environments they provide to their customer base. In addition to this reality, the current technological changes are accelerated and stand out as tools that make it possible to cope with economic fluctuations and limited resources. Companies have an imperative need to control the resources involved in their productive operations, whether they are manufacturing, services or mixed. The competitive advantages of a company are those that can be sustained by minimizing costs and resources negligently used (Project Management Institute, 2013).

In the particular context of companies in Ecuador, there are insufficient combined applications of agile project methodologies aimed at improvements in the commercial, input and safety categories. Verbigracia, extended and combined applications of methods, techniques and systems such as Six Sigma, Kanban, Lean and Business Intelligence are scarce within Ecuador's business environments. To date, the number of Ecuadorian mixed companies in the commercialization of goods and services that implement methodologies oriented towards continuous improvement continues to be modest.

This study focuses on the profile on the management of Business Intelligence tools, taking as a scenario for its application to the safety category of an industrial trading company in Ecuador. The intended business intelligence project for the company would aim to provide an organization with all the necessary planning mechanisms in order to obtain the information required to make decisions on the sustainability of the food safety category.

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Company under analysis

The object of study is an industrial trading company located in Quito, Ecuador (it explicitly requested anonymity). The company has forty employees on its active payroll and ten external collaborators. The areas of the company are: commercial/technical, logistics, accounting and purchasing. Each of the departments has a director, who is a management representative.

The company started operations more than twenty-five years ago, its operational activity is the commercialization of industrial inputs in four product categories: packaging, ingredients, machinery and food safety. However, safety is the last to be implemented in the commercial offer, reaching seven years of sales availability. Despite this period, the company has not been able to consolidate commercial plans and business strategies that would allow the competitive positioning of the category within the market. The average total annual turnover for the last few years has reached thirteen million US dollars (USD), while sales of the food safety line for the same period are approximately USD 200,000. There has been no increase in the annual amount of this category in the last five years, despite the fact that the company indicates an annual growth of at least 5% in the last five fiscal periods (Quality and Safety Department [DCI], 2021).

Business Intelligence and its technology solutions

Business Intelligence is understood as the various structured practices that can be applied for better decision making within the business. This set of tools allows to combine information for the identification and resolution of problems. After these evaluations, it is possible to identify opportunities for business growth in organizations, in which trends and major events are timely addressed and corrected (Rio, 2006).

The relevance of Business Intelligence is philosophically supported by the well-known phrase of W. Edward Deming (1900-1993): "You cannot improve what you do not control; you cannot control what you do not measure; you cannot measure what you do not define" (ISOTools, 2020, p.1). This is a critical reason why the tool promotes planning, the precise measurement of the results obtained from the commercial exercise, a verification and study of the variable nature of such results and an updated guide for timely decision making, both preventive and corrective.

Companies with a successful track record are those that, in their historical trajectory, have achieved a compatible and solid combination of decision-making within the framework of their general management and significant changes in management and supervision systems. In this way, the principles, values and organizational culture of companies are aligned, through Business Intelligence, with their own strategic operations, business ventures and technological adaptations in times of crisis and economic boom (López, 2015; Socconini, 2019). Today, a key strategy for companies is digital transformation. This is applied through innovation in technological tools, which allow us to take full advantage of the data obtained from operational management. (Chaudhuri et al., 2011).

There is a wide range of technological solutions that are an essential part of Business Intelligence, those selected should respond to the specific and contextual needs of each economic and social entity, but, in general, these alternatives seek to contribute to the sustainable and competitive improvement of the organization by making the best possible decisions, based on goals and key performance indicators (Curto, 2010). Due to

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the nature of the company under study, the following solutions are especially considered for diagnostic purposes:

- Business rules
- Balanced scorecard
- Knowledge management
- Data integration
- Control panels
- Enterprise Resource Planning (ERP) system
- Customer Relationship Management (CRM)

The business rules notably define the policy and operational management of the business entity, while the balanced scorecard represents a resource for charting objectives according to specific areas. Knowledge management enables problem solving by leveraging the experience and training of organizational members, while data integration combines information from diverse sources to transform it into useful data (Muñoz et al., 2016). Dashboards contribute to the detailed monitoring of situational indicators and performance ratios (their role is discussed below). The enterprise resource planning system involves a global management that unifies and marks traceability in all processes in the search for better optimization, planning and automation of the company's resources and areas (Chiesa, 2004). Finally, customer relationship management aims at an administrative organization of the company's contact portfolios, through which it is possible to condense all relevant data about consumers, as well as performance statistics on customer satisfaction (Montoya and Boyero, 2013).

Continuous improvement

Continuous improvement constitutes the segment of management focused on boosting greater positive indicators of effectiveness and efficiency within the company, which is generated by adjusting specific activities that require optimization (Aguirre, 2014). The projects that a company conceptualizes must be based on customer demands, supplier expectations, market fit, and correlated with time, product quality and financial return. This is why it is required that projects have a coordinated management in which the continuous improvement cycle is complied with: plan, do, check and act (PHVA). It starts with planning, execution, verification and action, which translates into the application of quality techniques and tools, the last ones allowing to settle these previous ones and turn them into phases applicable to the organization (Pineda and Cárdenas, 2021).

In order for this progress to be monitored as continuous improvement, it is essential to have indicators that allow both the reporting of activities and their evaluation through metrics. These indicators must be monitored, so companies must implement systems that allow them to make timely and accurate decisions regarding their operational outlook (Montero et al., 2015).

In the industrial trading company in this study, for example, growth is measured by the increase in monetary units received over a defined period of time. Reporting to senior management is presented in billings of the category's products in US dollars (USD) per month (DCI, 2021). Expenses per salesperson, logistics costs and other values are recorded at the accounting level, but the efficiency of the category is not evaluated, and no commercial objectives or projects derived from them are established to guarantee the sustainability of the business.

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At the time of the diagnosis, the company had electronic invoicing platforms that controlled inventories and sales at a monetary level. For the evaluation of data that would allow the integral governance of the organization, the application of Business Intelligence tools was proposed. In this way, it is expected to forge a continuous improvement sustained over time, i.e., a stable optimization of the quality of processes, products and services together with a reduction of production costs, already obtaining a potential and better quality of product and/or service (Escuela de Organización Industrial [EOI], 2021).

The Company and the safety category

The safety category is understood in the organization as the segment of products and services that guarantee the safety of the facilities, equipment and utensils, as well as the inclusion of operators of the client companies that are mainly engaged in the manufacture of food and cosmetic products. Safety is also accepted as the guarantee that a food, medicine and cosmetic, when ingested, will not cause harm, as long as the intended use is respected, i.e. the recommendations for preservation, preparation, consumption and final disposal provided by the manufacturer (Pan American Health Organization [PAHO], 2021).

The company under review is recognized as a supplier of industrial supplies in Ecuador's agribusiness sector. The food safety category markets the following products in its active catalog: chemical supplies, utensils and sanitary implements. In addition, we provide technical advice on cleaning and disinfection protocols and preventive plans derived from the operational needs of our customers. The line of food safety inputs is the most recently implemented in the sales catalog, so it is considered that it has yet to complete the market positioning cycle. A product positioned in the market must comply with the marketing life cycle: growth, maturity and decline (Loaiza, 2018).

Within companies engaged in the service sector, it is essential to understand that this cycle of goods is accompanied by stages of productive operations, which focus on the following aspects: a) implementation of technological tools, b) data collection and transformation, and c) application of business intelligence. The three phases lead sequentially to organizations being able to enter into the implementation of computer systems, data collection and implementation of previously established designs, based on the development of applications to meet the needs of business users, who are mainly customers, but not the only ones (Godás, 2006). Within the category of safety, the role of all stakeholders such as suppliers, regulatory bodies, end consumers, among others, is also relevant.

The company's business goal is to generate profitability, so providing the necessary information is substantial, since it allows the internal evaluation in terms of efficiency and effectiveness, prior to the technological planning of dispositions. Business Intelligence tools can be applied at different levels of the organization, from operational indicators to strategic results(Ríos-Carrión et al., 2021). All successful organizations, regardless of the industry they operate in, implement measurements as part of their daily activities, as they provide the necessary objective information for decision making (Gholami and Hign, 2010) (Gholami and Hign, 2010).

The Company, key performance indicators and dashboards

Key performance indicators are understood as measurements that provide the organization with the skills to manage and control projects. There are different ways to determine what to measure in the organization, the most efficient ones serve the business objectives and the information needs for decision making (Kenett and Baker, 2010). In

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the midst of such a process, control panels are also indispensable. These are graphic tools that enable constant monitoring of the company's operating efficiency, in a simple format that combines the elements analyzed and compared at different times of the business activity (Molina et al., 2020).

Measuring the organization's performance begins with the implementation of data collection and follow-up instruments. This instrumentation provides the company and its senior management with the data required to execute, in a timely manner, the changes that will consolidate a more profitable position. The indicators are presented as dashboards that constitute strategic tools, easily manageable and for monitoring in incipient businesses of a mixed nature, i.e., commercial ventures that combine services and products (Cordero, 2017). In this way, a control panel allows the regulation of processes, resource management, products and overall corporate performance.

Method

Design

The research was descriptive and evaluative, corresponding to a non-experimental field design, with a longitudinal cut and a mixed degree of data structuring (qualitative and quantitative). Descriptive hypotheses were considered for the following variables: 1) operational and logistical performance processes, 2) safety category, 3) management of business intelligence tools, and 4) continuous improvement of the company. Table 1 shows the process of operationalization of the research variables.

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Table 1
Table of operationalization of variables

Variables	Conceptual definition	Operational definition	Dimensions	Indicator 1	Indicator 2
Operational and logistical performance processes	Benefits provided by the processes of an organization's operational and logistic areas	Changes in the areas that allow standardization, implementation and improvement of processes	Process performance	Standardized processes/ processes carried out	Delays due to logistical processes
Safety category	Commercial category grouping together products that ensure food safety in client companies	Chemicals, implements and technical advice for intended use	Products of the category	Product Portfolio	Technical advisory services
Management of Business Intelligence tools	Tools that enable data to be turned into knowledge so that organizations can make better decisions	Dashboards, ERP, CRM and others that allow to analyze the information obtained in the company and make decisions in the commercial category	Business Intelligence Tools	Successful sales/ total sales	Number of visits to consolidate sales
Continuous improvement	Approach to process improvement based on the need to continuously review defects detected in operations and propose solutions to prevent errors from recurring	Strategy of planning, doing, verifying and acting to detect problems in the company and propose definitive solutions	Customer satisfaction	Claims by product	Service claims

The main hypothetical outline of the study is as follows the diagnosis of the productive performance and performance level of the company's food safety category will be established with greater technical criteria and precision, through the use of Business Intelligence tools. Through the hypothetical-hermeneutic method, the dimensions, sub-dimensions and indicators of the research variables could be established (Hernández et al., 2014).

Direct observation was used as the main data collection technique. The research began in August 2020, with monthly and preliminary data collection during the second half of this year. The application of the main primary data collection instrument was carried out from January to September 2021 (a total of nine records). A nine-month period was chosen for this process, since this is the annual cycle in which adjustments can be made to improve the company's business indicators. In the last quarter of the year, customers only make repurchases or replacements, since the food industry is at its

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production peak, so that proposals and product suitability tests can rarely be carried out in the final months of the year (they do not represent the bulk of commercial advances in the food safety category).

Participants

We worked with the totality of study units of the population involved in the line and safety category, as it was considered a manageable number of individuals (Moreno, 2017). The census sample consisted of 24 individuals, of whom twelve were commercial and technical advisors, eight were employees in the logistics area and four were representatives of the company's senior management.

As for sociodemographic data, 70.83% of the respondents were male and the remaining 29.17% were female. Of the respondents, 54.17% were in the 30-39 age range, followed by 20.83% in the 40-49 age range, 16.67% in the 50+ age range, and the remaining 8.33% in the 20-29 age range. On the other hand, 33.33% had a college degree in their academic training, another 33.33% as technologists, 25% with a master's degree and 8.33% with an engineering degree.

In descending order, 66.67% of the respondents reported 1 to 10 years of permanence in the company, followed by 20.83% who reported 21 to 30 years and about 12.50% who reported 11 to 20 years of permanence. Most of the respondents are located in the logistics area (37.50%), followed by positions in the commercial area (33.33%), then in the technical area (25%) and finally in the administrative area (4.17%). With regard to the modality of work, 37.50% is office-based management, followed by 33.33% located in warehouses, 12.50% in the form of visits to customers, another 12.50% in a hybrid position (office and visits) and, finally, the remaining 4.17% in the form of teleworking. While 79.17% of those consulted attended to all types of clients, the remaining 20.83% only did so with the company's strategic clients.

Instruments

The census sample was first asked an initial round of ten open-ended questions by means of an unstructured interview, in order to explore and identify the company's problems. Other data from direct observation were recorded by means of anecdotal records *in situ* at the point of sale on the following events: Technical-commercial visits with advisors and discussions with senior management.

The main data collection instrument included its identification, brief introduction, purpose and instructions for completion. The instrument was designed as a diagnostic survey of continuous improvement and processes of the commercial enterprise, with dichotomous closed questions (Yes/No), whose content validity was determined by expert judgment and the level of reliability obtained was acceptable internal consistency ($\alpha = 0.91$; $p < 0.05$). The instrument is made up of three main sections and a total of 60 items: a) administrative aspects (20 items), b) operational aspects (20 items) and c) continuous improvement aspects (20 items). The survey was applied in person and directly with each individual.

Regarding the operational aspects surveyed, the review indicators were aligned with the logistical levels of product shortages in the safety category, delays in product dispatch, distribution and reception times, and the recording of complaints due to confusion in the dispatch of the product. The technological solutions incorporated were business rules, knowledge management, ERP, CRM and control panels, already composing Stages 1 and 2 of the diagnosis.

With regard to administrative aspects, the indicators associated with the safety category were the monthly records of commercial attempts, coverage and customer service rates, products sold in terms of the resources invested to achieve these sales, as well as the final balance of successful sales. The technological solutions implemented in

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this opportunity were ERP, CRM, dashboards and data integration, as part of Stage 3 of the diagnosis.

The aspects of continuous improvement consulted revolve around product return records, the creation of credit notes and invoice cancellations. The technological solutions applied in these cases were ERP, data integration and balanced scorecard, already corresponding to Stage 4 of the diagnosis.

Data analysis

The processing of the data obtained from the survey was carried out with the support of the SPSS software, version 25, establishing as a general diagnosis that the company was oriented towards increasing sales of its different commercial categories, but nevertheless there are no business plans implemented in the food safety line. Based on the perception of the respondents, a total of ten (10) central processes were identified for subsequent evaluation with Business Intelligence tools, namely: a) four (04) of administrative order in accounting and purchasing activities, b) three (03) of technical order in consulting activities, c) two (02) of logistical order in dispatch activities and, d) one (01) of commercial order in sales activities. Figure 1 shows a synthesis of the flow carried out as a result of the diagnosis for the control panels.
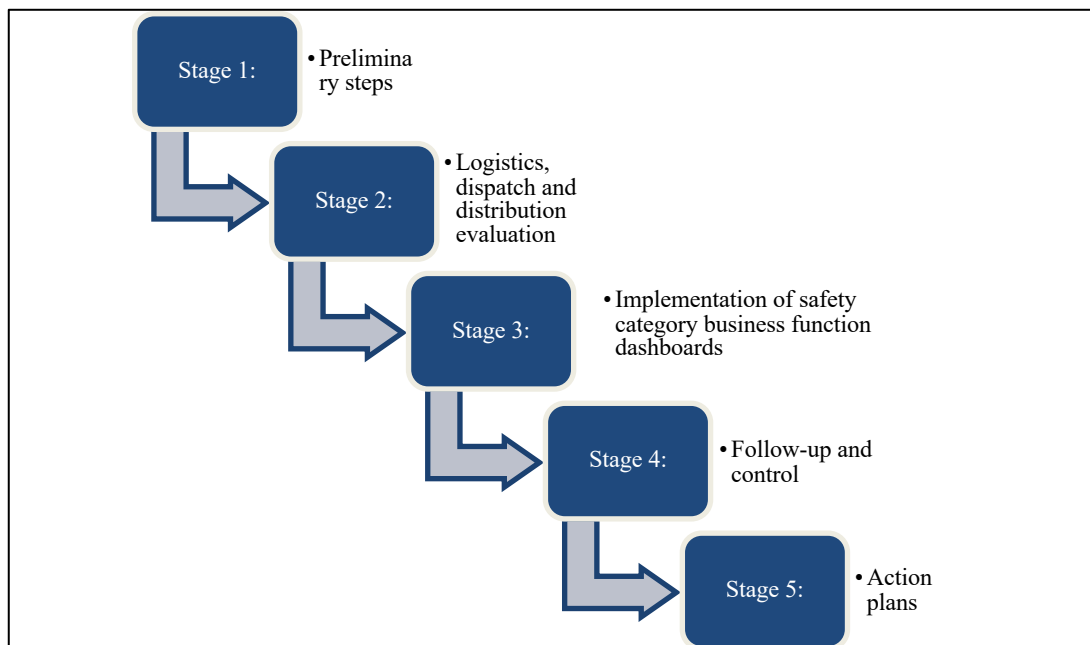

Figure 1. Design, construction and monitoring stages of control panels
Note: Source: Own elaboration (2021).

In Stage 1, the specific objectives of the model were established: 1) to achieve profitability and, 2) to ensure the sustainability of the safety category. A data model was structured and conceptualized with the construction of dashboards. These measures aimed at obtaining complete and quickly accessible data. The diagnosis determined that the information available was not objective, lacked usefulness, and did not allow for an in-depth analysis. In addition, it became evident that the *software* that the company maintained at the time was not aligned with the company's strategic, commercial or administrative plan.

In order to gather the data that would allow the application of the proposed tools, business indicators were established that were in line with the company's strategic plans and senior management. Based on these goals, the planned commercial dashboards were built, creating data that provides real information for closing sales of the food safety line,

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predicting patterns of habitual customer behavior, market variations, payment model and portfolio recovery. In this way, organizational policies are aligned with the company's business purpose. Figure 2 summarizes the sequence of activities applied in this stage.
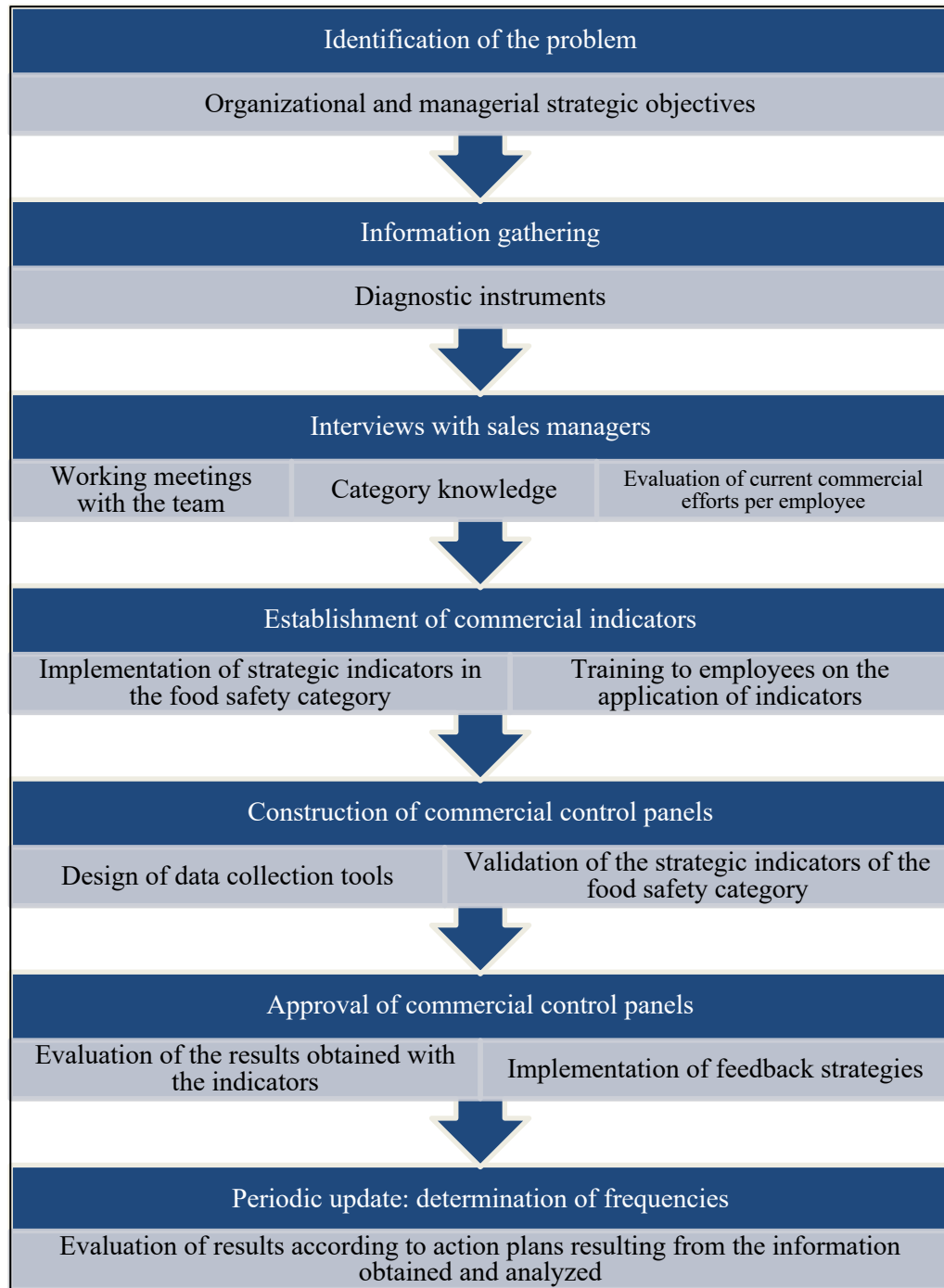
Identification of the problem
Organizational and managerial strategic objectives

⬇

Information gathering
Diagnostic instruments

⬇

Interviews with sales managers		
Working meetings with the team	Category knowledge	Evaluation of current commercial efforts per employee

⬇

Establishment of commercial indicators	
Implementation of strategic indicators in the food safety category	Training to employees on the application of indicators

⬇

Construction of commercial control panels	
Design of data collection tools	Validation of the strategic indicators of the food safety category

⬇

Approval of commercial control panels	
Evaluation of the results obtained with the indicators	Implementation of feedback strategies

⬇

Periodic update: determination of frequencies
Evaluation of results according to action plans resulting from the information obtained and analyzed

Figure 2. Preliminary steps for the development of control panels

Stage 2 involved a diagnostic assessment of the current state of the underlying and supporting processes, including logistics, dispatch and distribution. The department in charge of product packaging activities also applies safety programs, which include control elements at reception, both at the documentary and physical levels. For this stage, the cycle described in Figure 3 was followed.
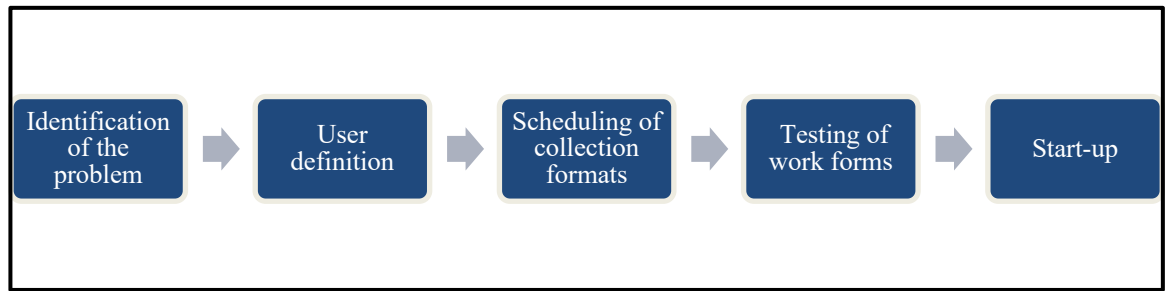
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Figure 3. Process followed for the logistics area

Table 2 shows the main drawbacks of the safety category diagnosed with the application of the survey.

Table 2
Main drawbacks in the support activities associated with the safety category

Inconvenience recorded	Committed team	Resources used	Customer complaint record
Shortage of products in the food safety category	Shopping Logistics Business leader in the food safety category	Money Staff time	Claims to commercial advisors for supply chain disruption
Delays in product reception times	Logistics Shopping	Products of the category Staff time	Delays in product stowage
Delays in dispatch and distribution	Logistics: dispatch and distribution	Products of the category Staff time External freight payments	Delays in product deliveries to customers
Confusion of product to be shipped	Logistics Business advisors in the food safety category	Products of the category Staff time Customer payment commitment	Complaints on product deliveries. Product returns Creation of credit notes or cancellation of invoices

Once the problems had been defined, the users who should have access to fill in the information were identified. The area manager, warehouse assistants and the inventory manager were included. Collection forms were programmed, for which the pertinent information to be filled out was determined. Once the tools were established, the working form tests were conducted. Finally, the instruments were put into operation. After the creation of the control panels, the next step was the drafting of reports, which made it possible to draw up action plans according to the teams: customer service, commercial, technical and logistics teams.

During Stage 3, commercial control panels were incorporated into the safety category. Table 2 3 shows the model of the logbook of visits to customers, which constitutes an information base that made it possible to generate the data for present and future follow-ups of the line's commercial opportunities.

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Table 3
Commercial activities control panel

Company name	Customer contact	Commercial interest	Work performed by commercial/technical agent	Visit/call activities	Pending from commercial/technical agent	Resources	Remarks

In Table 4, the visit log control chart model was outlined, which will be one of the *datadashboards (control charts)* that will be monitored by Senior Management and will allow generating commercial business plans in the short (monthly), medium (quarterly) and long term (one year).

Table 4
Visit log control chart

Indicator	Description
Commercial/technical agent	
Month of coverage	
Immediate commercial commitments	
Medium-term pending (more than one month)	
Visit number to define the purchase	
Customer's reasons for purchase	
Place from which the transmission is made	

Table 5 describes those elements that were included in the monitoring instruments.

Table 5
Proposed indicators and variables for commercial dashboards

Proposed indicator	Work area	Place of work	Number of reports transmitted per month	Average monthly transmissions	Tool productivity	Successful sales per month
Collaborator 1						
Collaborator 2						
Collaborator 3						

These indicators considered the employee, area, number of reports transmitted per month and place of work. These translate into the number of customer services that lead to successful sales. As part of the information to be monitored, it was considered important to establish a trend for each vendor, so an average number of monthly transmissions was recorded. In case of less than the average, the employee must indicate the reasons for the drop in sales, to be adjusted in the action plans for the new period. Finally, the productivity of the tool was highlighted as relevant, which is understood as the use of the registration forms in relation to the sales made and confirmed by each person. In this way, it was possible to monitor the commercial performance of each employee in the sales area of the food safety category with simple meters. The successful results of this sales event are perceived through effective sales with turnover achieved from commercial approaches of the line's sales force.

The update of dashboards and their follow-up was carried out on a quarterly basis. As a result of this evaluation and data collection, the need to generate new marketing channels for the food safety category was identified. The particularity of the reports

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chosen was that their reporting format allowed for an agile interpretation of the information, as well as a comprehensive review of the organizational landscape. The tabulated presentation of the data allowed the system to be defined as a support to be implemented in the company, giving a real production phase prior to the stabilization of the new Business Intelligence system.

Stage 4 consisted of an evaluation of the indicators, as well as individual follow-up with the commercial advisors. Within these boards, the different scopes that a figure has for the areas of the company were defined. For example, it was identified that monthly sales for the technical-sales team of the category represented the entire effort of orders generated and invoiced, while, for the financial management, only the amount covered in the credit portfolio approved for the tax year period was considered.

Complaints generated in the logistics area were recorded on nonconformity forms, which included the information gathered during the preliminary steps. This information comes from customers and internal logistics service users, such as commercial and technical advisors who consolidate category sales and who must deliver the product (added value for the company). These items are recorded as model nonconformities in Table 6.

Table 6
Non-conformities of products in the food safety category received by the logistics area

Non-conformity	Description	Person who generates/receives the complaint	Estimated time to resolve the nonconformity by logistics
Claims to commercial advisors for supply chain disruption			
Delays in product stowage			
Delays in product deliveries to customers			
Product returns			
Creation of credit notes or cancellation of invoices			

These are focused on the collaborators of the different areas that make up the company and its commercial aspect. These elements of timely decision making are part of the feedback and corrective actions that the company must implement to ensure category profitability.

During Stage 5, action plans were generated for each area analyzed. Firstly, the plans corresponding to the commercial/technical team: a pair that performs the functions of approaching customers on their premises, detecting their needs and contributing to the mixed component of management, by offering products and advising on their intended use. Secondly, there are the plans corresponding to the logistics team: as a missionary activity of the organization, logistics plays the role of complying with the physical supply chain of the inputs of the food safety line, so minimizing non-conformities and errors derived from its operations are fundamental provisions for business continuity.

Results

The use of commercial dashboards, as part of Business Intelligence, was carried out over a period of nine months, after which information from the proposed dashboards was obtained from the commercial and technical advisors. Initially, there was no way to

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evaluate the commercial performance of employees, as they had not been structured or applied in the company. The data obtained showed that, considering the twelve commercial advisors evaluated who carry out commercial activities in the category, only 58% have successful sales 58% had successful sales during the period in question.

It was established as was established as a successful sale to that commercial process that began with a visit or approach with the customer (through different telematic communication channels due to the COVID-19 pandemic). Figure 4 shows this distribution in the sales classification of the food safety category, considered in the period from January to September 2021.
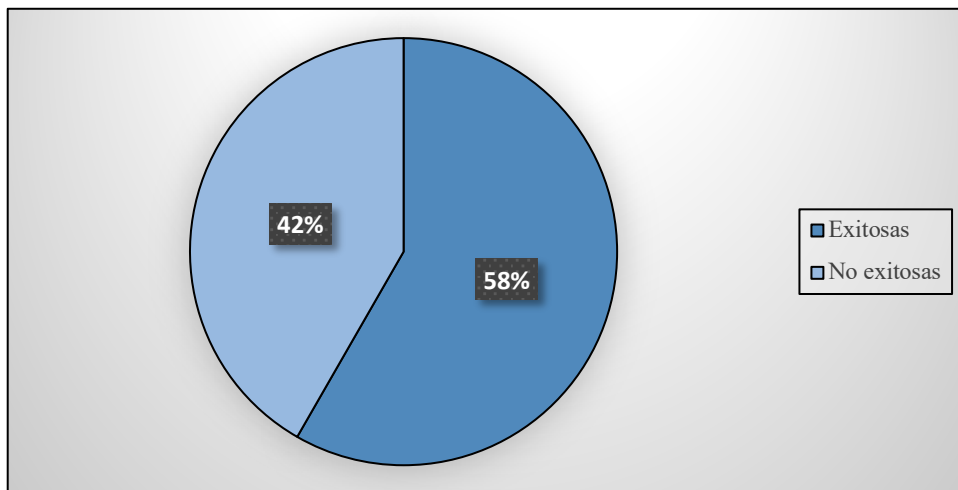
Figure 4. Safety category sales classification: January to September 2021

Figure 5 shows the results obtained for the number of visits necessary to achieve an effective purchase by customers.
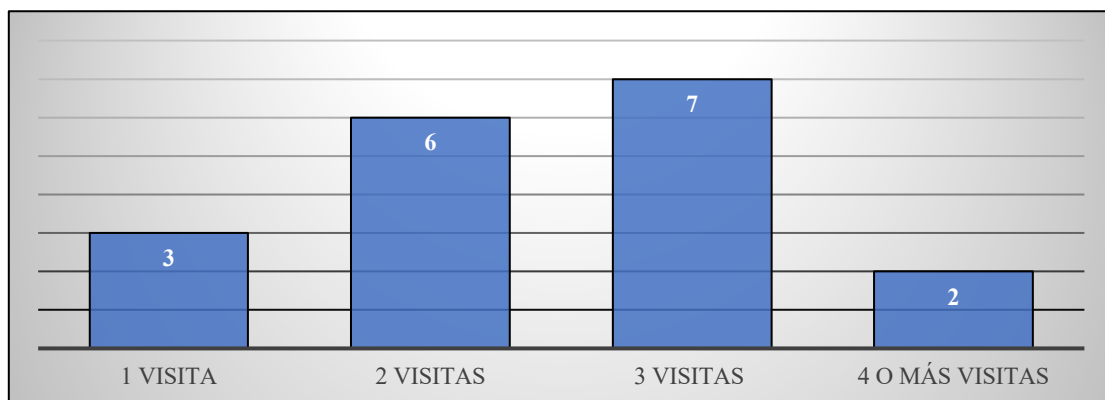

Figure 5. Number of commercial visits and techniques necessary to consolidate a successful sale.

The monthly average of successful sales in the category is eighteen (18). These are carried out by the twelve commercial and technical advisors. It is worth noting that, of these successful commercial efforts, more than 70% require two or three visits, which implies costs attributed to the category, which directly impacts the category's profitability. Figure 6 shows that only 17% of sales are successful with one visit, while more than 70%

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require two or three visits by commercial and technical advisors. Finally, it is evident that 11% of successful sales require four or more visits to consolidate.
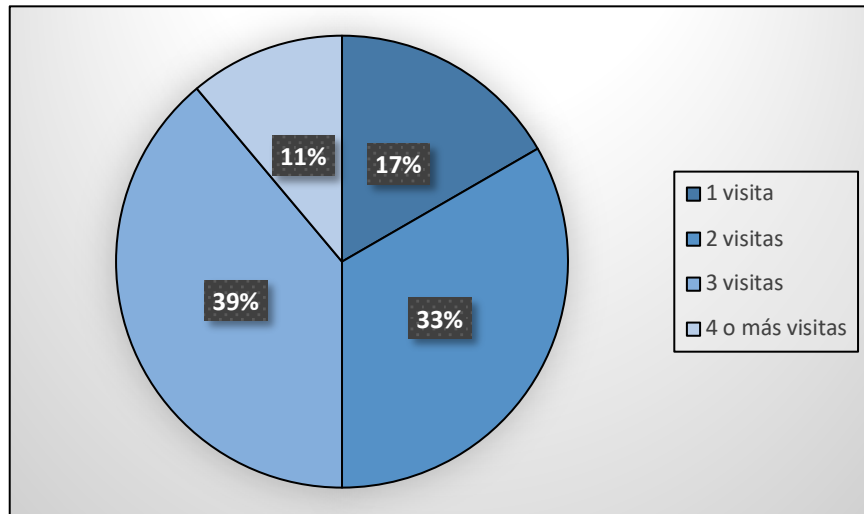

Figure 6. Representation of number of visits required for a successful sale

Figure 7 shows that 82% of the category's successful sales were made at the customer's premises, i.e. after an *on-site* visit. 11% of successful sales are executed at the company's point of sale, i.e. in the organization's demo room. Only 7% of invoices are issued after telematic interactions.
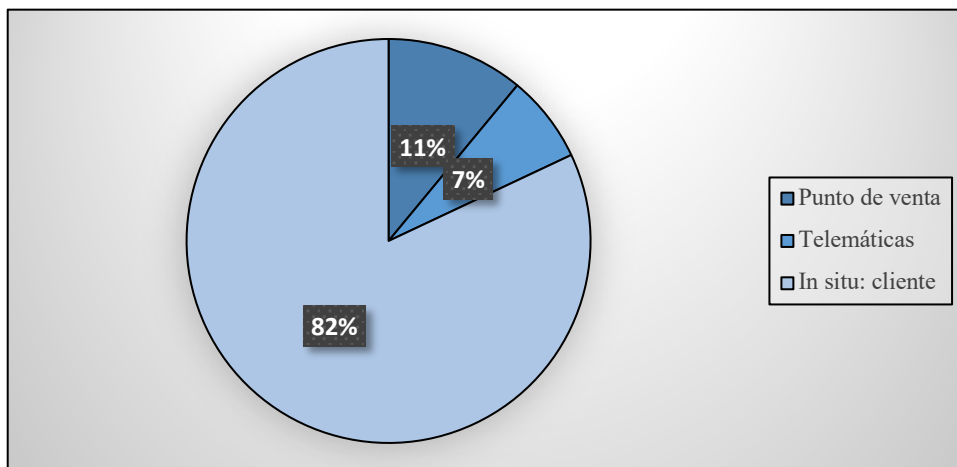

Figure 7. Place of attention of the effective sale.

From the data obtained from the diagnostic record, it can be deduced that delays in the delivery of products to customers and product returns were the most frequent nonconformities in the logistics area. These correspond to 65% of the total complaints received by the department, as shown in Table 6.

Table 6

Registration of non-conformities and complaints in the logistics area

Non-conformity	Claim frequency	Person receives the claim	Estimated time to resolve the nonconformity by logistics
Claims to commercial advisors for supply chain disruption	5	Commercial/technical advisor	Variable according to supplier availability
Delays in product stowage	3	Logistics	Variable according to the availability of logistics personnel
Delays in product deliveries to customers	28	Commercial/technical advisor	24 to 72 hours, depending on delivery point nationwide
Product returns	19	Logistics	24 to 72 hours, depending on point of departure nationwide
Creation of credit notes or cancellation of invoices	17	Logistics	Less than 24 hours after financial department approval

Documentary tax issues account for 26% of customer complaints, while supply chain disruption and logistics delays account for 11% of complaints, as shown in Figure 8 as shown in Figure 8.
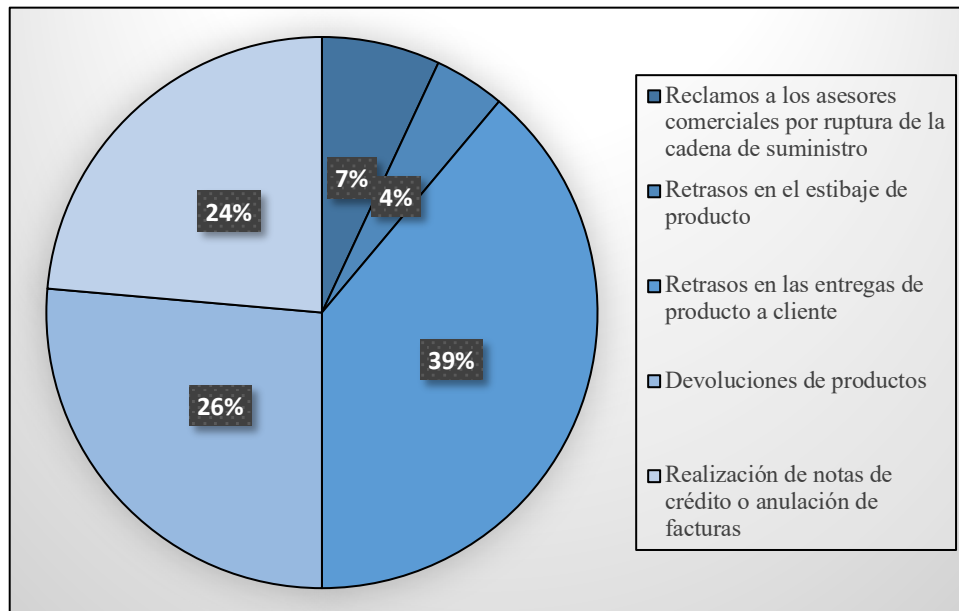

Figure 8. Proportion of safety category claims registered by the logistics area in the period January-September 2021.

It is worth mentioning that the claim resolution time is variable. The results show that the time to close the nonconformity will depend on aspects such as the place where the product must be shipped and delivered again or where it comes from in the case of a return. In addition, the tax documentation aspects require a different treatment since they depend on strategic departments such as financial management.

In summary, the technological solutions proposed made it possible, in the first place, to define the company's policy and guiding processes with respect to its food safety category. Secondly, performance indicators were constructed for this category and other key areas of the company. Thirdly, it was possible to draw a preliminary and unified line of processes associated with the category with planning criteria. In fourth and last place, the management of consumer profiles and their relationships with the company was also better achieved. In this way, the corroboration of the hypothesis regarding the diagnosis of the food safety category is established, through a better technical value and precision derived from the business intelligence tools.

Discussion and conclusions

Successful sales in the food safety category accounted for 58% of the commercial approaches of the company's sales force. This is attributable to the fact that there was no monitoring during the period analyzed and only referred to commercial and strategic information gathering. It is expected that by performing the relevant feedback with the frequency proposed in each indicator, despite market limitations, substantial improvements in the success rate of the commercial line through Business Intelligence will be achieved.

Successful sales require a high commercial effort, which directly impacts category costs. This translates into low efficiency of commercial efforts, which must be reiterative in order to achieve category turnover. The technical and commercial viability of the line is undermined by the opportunity cost of a positive result. It is necessary to generate an action plan to improve these commercial indicators.

It is important to emphasize that only 11% of the sales were consolidated at the company's point of sale, resulting in the fact that the line's demonstration room does not generate an important contribution at the moment to the turnover. Only 7% of sales were made through telematic contacts, which means that this method is not very effective for sales of products and services of this nature. 82% of successful sales were achieved through on-site visits. This was because the inputs had to be tested on the surfaces to be applied. In addition, the service must be complemented with the direct users of inputs and utilities, so it is remarkable that it must be carried out at the place where the final consumers of the products are located, who must be trained in the intended use of the goods.

As for the non-conformities received by the logistics area, these were based on internal aspects of the department, such as delays in product deliveries to customers and returns, as well as agents external to operations (supplier shortages), lack of logistics personnel (the responsibility of human resources) and tax documents (the responsibility of the finance department). From this we can conclude that logistics personnel go through several processes that need to be optimized, so that some claims and their respective closures can be expedited. In addition, it is presumed that product returns are due to confusion in nomenclature and intended use, and therefore the possibility of training internal personnel on the products marketed by the category is being considered.

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Based on the results obtained after the design and application of Business Intelligence tools in the food safety category of a trading company, it can be concluded that the organization requires the immediate development of management indicators, both at the commercial level and in the support operations that make possible the sales activities of the food safety line. The results of the research revealed shortcomings in the area of personnel training, as well as low efficiency in the sales effort. Their success lies in the turnover achieved after a commercial approach. However, without considering sales amounts in monetary units, it is possible to visualize that several visits are required to formalize an effective sale. It is necessary to generate an indicator of costs attributed to these commercial target shifts.

It is important to note that sales in the food safety category are mainly made at the customers' facilities. This is due to the fact that the products must be applied and tested on food contact surfaces, being these agro-industrial manufacturing companies the main customer of the industrial trading company. Such a fact becomes indispensable, since the technical advice of intended use must be oriented to the users of the products *on site*, which is why the combination of technical and commercial approach together is justified in order to position the line and build customer loyalty.

The complaints received by the logistics department indicate transversal causes in the organization, which not only depend on the aforementioned area, but also integrate responses from other collaborators and hierarchical levels. This reality proves that an action plan oriented towards the speedy resolution of conflicts and the closure of non-conformities is essential, with the goal of optimizing the commercial situation of the food safety category.

The current processes operated in the company require diagnostic and optimization tools, not only in the construction of data collection instruments, but also systems that allow the automation of the information obtained in real time. In terms of business development trends, the permanent adoption of systems that allow planning the resources of the food safety line, such as an *Enterprise Resource Planning* (ERP), a planning system that allows companies, through modular insertions, to control accounting, human resources, logistics and supply chain, projects, inventories, document management, sales and commercial management, quality management, foreign trade, among others, is relevant.

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