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USE OF KEY PERFORMANCE INDICATORS (KPIS) FOR THE EVALUATION OF OPERATIONAL EFFICIENCY IN SMES: APPLICATION IN CONTAWEB-BI

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Abstract
Small and medium-sized enterprises face structural challenges in managing their operational efficiency, particularly due to the lack of tools that facilitate the strategic analysis of financial data. This study evaluates the impact of using key performance indicators implemented in the ContaWeb-BI platform as a mechanism for improving decision-making in Colombian SMEs. The research adopts a quantitative, non-experimental, and cross-sectional approach, based on the analysis of anonymized business data generated in real-life operating environments. Key features of the platform were analyzed, such as the automated calculation of financial key performance indicators, sales projection, purchase estimation, supplier grouping, and the detection of irregular activities. The results show that the continuous use of these indicators allows companies to identify structural inefficiencies, improve profit margins, optimize supplier relations, and reduce financial risks. It is concluded that the systematic use of business intelligence platforms such as ContaWeb-BI, adapted to the scale and complexity of SMEs, promotes an effective digital transformation based on informed, measurable, and replicable decisions.

Keywords: business intelligence; operational efficiency; SMEs; decision-making; ContaWeb-BI; financial analytics.

Introduction

Small and medium-sized enterprises (SMEs) are the economic engine of many nations. In Latin America, for example, they represent more than 90% of all businesses and generate more than 60% of formal employment (Algan, 2019). However, their sustainability and competitiveness are often threatened by poor decision-making, limited digitalization, and a lack of systematic mechanisms for evaluating organizational performance (Martínez-Peláez et al., 2024). In this context, the implementation of Business Intelligence (BI) platforms, which facilitate performance measurement through key performance indicators (KPIs),

becomes a key option for achieving operational efficiency that, in turn, enables evidence-based management (Marr, 2018).

Likewise, several authors have proven that the strategic use of KPIs is directly linked to increased operational efficiency and the adaptability of SMEs in dynamic environments (Kerzner, 2023). Along these lines, Ogbuefi et al. (2024) highlight that the real-time visualization of financial and operational data through BI tools allows SMEs to make better decisions, eliminate redundancies, and maximize the use of resources. Similarly, Pallas (Pallas, 2024) concludes that the implementation of KPIs through digital solutions supports transparency in internal processes and helps increase the monitoring of strategic objectives in technology-based companies.

Despite the documented advantages, many SMEs lack tools that integrate the capture, analysis, and visualization of key indicators (Doyle & Cosgrove, 2019). In Colombia, this reality is even more pronounced in traditional sectors such as commerce and accounting, where technology adoption is low and decisions are based more on intuition than on verifiable data (Burgos, 2018). Unfortunately, this lack of operational control prevents the detection of bottlenecks, the allocation of correct resources, and the predictability of critical scenarios. The lack of platforms adapted to their scale and specific needs hinders their progress and sustainability.

The purpose of this paper is to assess how the use of KPIs implemented in the ContaWeb-BI platform can promote the improvement of the operational efficiency of SMEs, in order to evaluate the potential usefulness of the analysis modules provided by the platform, evaluate the practical applicability and its impact on strategic decision-making in small and medium-sized business environments.

Furthermore, the relevance of this study lies in the fact that it offers empirical and contextualized evidence of the use of BI systems in Latin American SMEs, where these types of solutions are still in their infancy. Unlike large corporations, SMEs require tools adapted to their technical, financial, and human capital needs. Evaluating the impact of the ContaWeb-BI system, a locally oriented platform developed by the University of Cartagena and Colciencias, helps close this technological gap and guide replicable models to similar contexts.

The main contributions of this work are: validating the use of KPIs as adequate mechanisms to facilitate the improvement of operational processes, identifying among them which are the indicators with the greatest effect on the daily management of an SME since a replicable methodological model is presented for the purposes of applying BI platforms such as the ContaWeb-BI system in emerging business contexts and present practical recommendations about technological integration in the operational management of small businesses.

Theoretical Framework

Understanding the interrelationship between KPIs, operational performance, and business BI tools in the context of SMEs requires a solid conceptual foundation. This section presents the theoretical foundations that support the use of KPIs as control and continuous improvement mechanisms in business environments. It also addresses models that explain how digitalization through BI platforms, such as ContaWeb-BI, can facilitate the analysis of operational performance and enhance strategic decisions based on objective data.

1. Key Performance Indicators (KPIs) and their strategic role

KPIs, also known as key performance indicators, refer to quantifiable metrics that show the extent to which the desired level of achievement is being met in organizational aspects such as finance, operations, marketing, human resources, among others (Aithal&Aithal, 2023). In the opinion of Hristov and Chirico (2019), KPIs serve to translate organizational strategy into operational action, that is, a set of activities programmed based on the formulation of each objective; they can also be used to visualize the difference or gap between what is being achieved at the time of the analysis and what is planned as the desired objective.

From this perspective, KPIs become key tools for business performance management, very useful in complex and dynamic environments, since efficiency and responsiveness constitute characteristics of an organization's competitive advantage. In small and medium-sized organizations, KPIs have been associated not only with improvements in operational efficiency but also with greater clarity in resource allocation and real-time monitoring of productivity (Hamdan&Braendle, 2024). This is especially relevant in sectors where margins for error are small and decision-making must be based on concrete data rather than intuition or accumulated experience.

2. Operational Efficiency in SMEs

Operational efficiency refers to a company's ability to maximize production and minimize waste through the efficient use of material, human, and financial resources, according to Kerzner (2020); efficiency is presented in the speed and effectiveness with which an organization can execute its key processes. Operational efficiency depends on the performance controls exercised over operational processes in performance measurement systems to ultimately determine the usefulness of a process (Neely, 1999).

For SMEs, whose systems are less formalized and therefore more susceptible to inefficiencies, KPIs offer the opportunity to identify redundant processes and bottlenecks, as well as identify opportunities for continuous improvement (Er et al., 2024). The study of efficiency not only impacts the profitability of the company but also the long-term sustainability and scalability of a company's operations in different competitive environments (Jabłoński, 2016).

3. Business Intelligence as a support for decision-making

The concept of BI can be defined as the component that incorporates tools, processes, and technologies that allow the transformation of operational data into valuable information that supports strategic decision-making in organizations (Ranjan, 2009). Santos and Oliveira (2025) warn that current BI is not limited to the practice of retrospective analysis, which includes predictive and prescriptive functionalities, facilitating proactive management of organizational performance.

Along these lines, the implementation of BI platforms, designed to meet SME needs, allows for the integration of multiple data sources (sales, inventory, human resources, finance, among others), and the automatic generation of visualizations and reports for different key indicators. The result is more informed and agile decision-making, with a direct impact on operational efficiency and adaptability (Pallas, 2024).

4. Integrative theoretical approach

The theoretical model that supports this research is based on the integration of three conceptual frameworks: The Performance Management Theory, which explains how organizations evaluate and control their results through the use of KPIs (Marr, 2018). The Resource-Based View theory, which states that competitive advantages derive from internal resources, such as analytical knowledge and the use of adapted technological tools (Kerzner, 2023), and the approach to digital transformation in SMEs, which presents the extent to which it is essential for them to be able to adapt to digital transformation in order to sustain competitiveness and efficiency in highly changing environments (Santos & Oliveira, 2025).

Methodology

This study is an applied research study with a quantitative approach and a non-experimental descriptive-explanatory design. This research is applied research since it seeks to utilize theoretical knowledge, in this case, on KPIs and operational efficiency, to solve a practical problem: evaluating how the use of KPIs implemented in the ContaWeb-BI platform can improve the operational efficiency of SMEs. Applied research is distinguished by its focus on solving specific problems through the application of theories or analytical tools in real-life scenarios (Hernández et al., 2014).

The approach is quantitative because the research works with measurable indicators derived from the actual use of the system (Sánchez & Murillo, 2021). Opinion collection, interviews, or subjective judgments will not be used, but rather anonymous financial and operational data already processed by the system. The design is non-experimental and cross-sectional because variables are not manipulated; rather, phenomena are observed and analyzed as they occur in real business environments. This type of design is appropriate when the objective is to describe relations between variables and evaluate behaviors within a specific time frame (Creswell & Creswell, 2017).

The target population consists of SMEs that have implemented the ContaWeb-BI platform in their accounting and financial operations. No direct sampling was performed, nor was personal information accessed. Instead, anonymous data generated by the system, previously recorded, corresponding to transactions, KPI reports, and internal efficiency metrics, were used. Case studies were selected based on functional representativeness criteria, selecting those companies that have comprehensively used the analytical modules (KPIs, projections, supplier analysis, etc.) to illustrate their practical applicability.

The data was collected from reports generated by the ContaWeb-BI platform. Specifically, the following elements were analyzed: KPIs such as current ratio, asset turnover, margin of safety, operating efficiency, and debt ratio; anonymized historical records of sales projections; supplier and purchasing behavior analysis; and supplier grouping tables and metrics derived from automated strategic decisions.

The analysis was documentary and descriptive statistical, complemented by a functional analysis of the platform. Data visualizations and dashboards were used to illustrate how KPIs can improve decision-making. This type of analysis has been validated in similar research focused on BI platforms without direct experimental intervention (Hamdan & Braendle, 2024). The central instrument is the ContaWeb-BI platform itself, which acts as a source of structured and anonymized data. Captures, report exports, and functional simulations with real analog data (without identifying specific customers, suppliers, or

companies) are used. Data integrity was guaranteed through internal system validations and record traceability.

This study adheres to the principles of the Declaration of Helsinki and international ethical standards for secondary data research. No sensitive, identifiable, or personal information was used. All data are sourced from the platform's internal registration systems, which are anonymized and have controlled access. No interventions were made on human subjects or direct contact with companies. The purpose of data use is demonstrative, not evaluative, and the confidentiality of sources is guaranteed. Therefore, the study does not require approval from an ethics committee, as it involves no risks or direct interactions.

On the other hand, the study has some limitations. For example, by using only functional cases of companies that already implement ContaWeb-BI, the findings may not be applicable to all SMEs or to contexts without digitalization. Furthermore, user opinions or subjective criteria are not evaluated, which limits the understanding of cultural or technological barriers. Additionally, the study is limited to existing ContaWeb-BI functionalities, so its applicability to similar tools is limited.

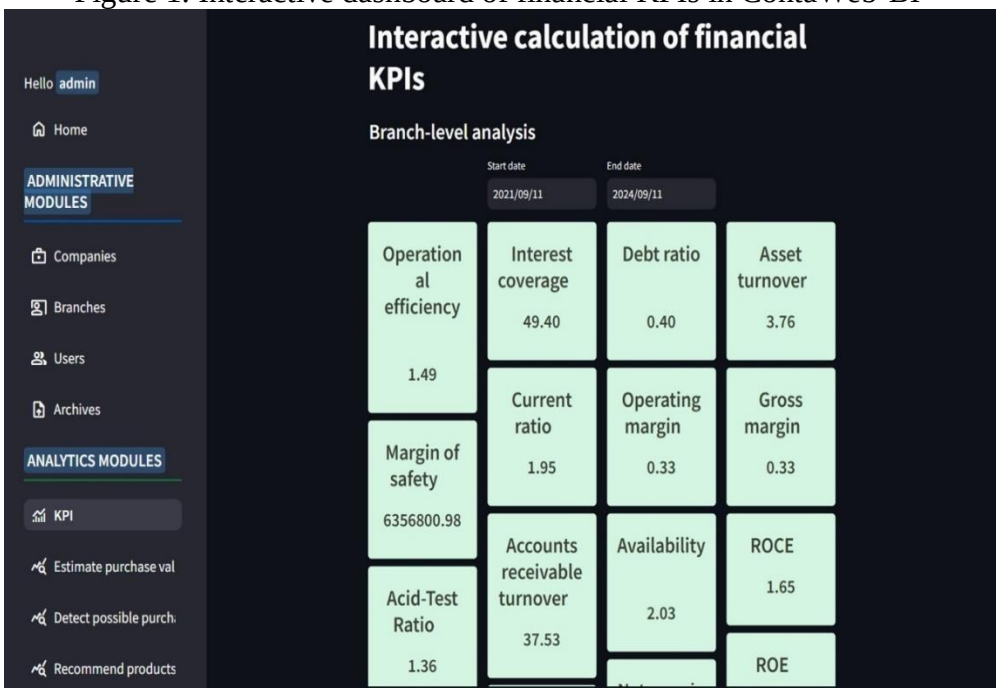
Results

This section presents the main results found in the functional analysis of the ContaWeb-BI platform, with special emphasis on the module for calculating, visualizing, and applying KPIs in SMEs. Based on the analysis of the platform's operation and the use of anonymous company data, it is shown how the platform's modules are useful for auditing operational efficiency, detecting risks, and making projections. The functionalities are demonstrated through figures extracted from the system that show its real applicability and alignment with data-oriented management standards.

First, the ContaWeb-BI platform, as a key element for analyzing SME performance, integrates an automated measurement system of 18 KPIs necessary for continuously monitoring the financial and operational efficiency of SMEs. The indicators are calculated from uploaded files (sales and purchases) and are dynamic, based on the periods the user wishes to consult. The KPIs cover dimensions such as: Liquidity (Acid test, Current ratio, Availability), Profitability (ROE, ROA, Net margin, Gross margin), Operating Efficiency (Asset turnover, Inventory turnover, Operating margin), and Debt (Interest coverage, Debt ratio, Debt-to-equity).

Figure 1 illustrates the ContaWeb-BI analytical module for automatically calculating financial KPIs. It displays an interface structured in the form of visual blocks in which each KPI is presented individually, reflecting its respective value without the need for manual calculations by the user. This formalized visualization contributes to executive understanding of the company's operational and financial performance, as it facilitates rapid decision-making based on accurate and up-to-date data. The minimalist interface structure and categorization enhance the system's usability in non-technical environments.

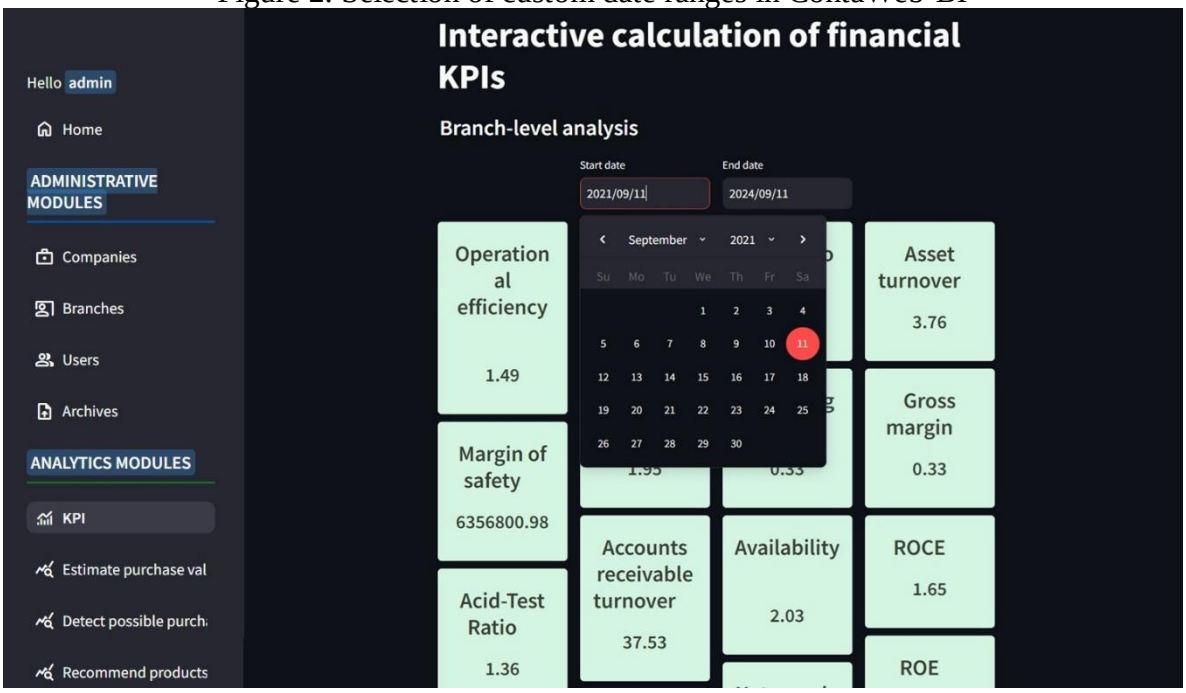
Figure 1. Interactive dashboard of financial KPIs in ContaWeb-BI



Source: Authors

A notable feature is the selection of customizable date ranges (start and end dates) for calculating KPIs, as shown in Figure 2. This allows analyses to be tailored to quarterly, monthly, or seasonal operating cycles. This capability enables SMEs to perform comparative analyses before and after strategic interventions.

Figure 2. Selection of custom date ranges in ContaWeb-BI



Source: Authors

Furthermore, three real-life (anonymized) scenarios were replicated on the platform. These three business scenarios reflect typical cases of SMEs with financial and operational management issues. Each case was processed through the ContaWeb-BI platform using anonymized data to analyze how automatically calculated KPIs can help make strategic decisions.

As shown in Table 1, for Company A, despite having high revenue, the Current ratio indicator (initial value: 0.8) showed that the company was unable to meet its short-term obligations. The intervention, based on the KPI analysis, consisted of optimizing the collection cycles to promote cash flow, raising the current ratio to 1.3 (which improves the operational security threshold).

Company B had a low Net Margin (2.1%), which meant that, even with the revenue generated, the costs associated with operating the business ate up almost all of the profits received. By reviewing the recommendations suggested by the system and analyzing expenses by supplier, the supply base was rationalized. This restructuring increased the margin to 7.6%, reflecting how KPI analysis directly impacted profitability.

Finally, Company C had a Debt-to-equity ratio of 2.9, which revealed a level of over-indebtedness that could be detrimental. Through the analysis of this KPI, the evolution of debt over time was analyzed, concluding that a plan to gradually reduce the level of obligations was necessary. Thus, the ratio was reduced to 1.5, positioning itself at sustainable debt levels in accordance with the company's financial structure.

Table 1. Functional results derived from data analysis

Company	**Operationalobservation**	**KPI used**	**Observedimpact**
A	High Revenue but low Liquidity	Current ratio (0.8)	Adjustment in collection cycles improved the indicator to 1.3
B	High costs with no return	Net margin (2.1%)	Reduction of suppliers and restructuring increased the margin to 7.6%
C	Structuralover-indebtedness	Debt-to-equity ratio (2.9)	The liability reduction plan brought the ratio to 1.5

Source: Authors

The above examples clearly indicate that the continuous use of KPIs through analytics platforms allows SMEs to detect certain structural imbalances, monitor their correction over time, and validate strategic decisions based on numerical data. In this way, operational efficiency will cease to be abstract and become a set of measurable and targeted actions.

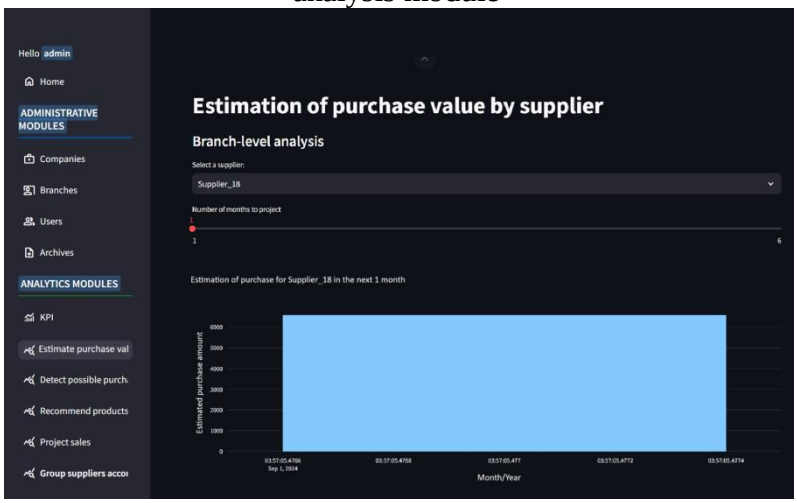
Beyond traditional KPIs, ContaWeb-BI can perform actions such as estimating future purchase value based on historical data; classifying suppliers based on purchasing behavior, grouping them by volume or payment method; and projecting sales based on past patterns.

Figure 3 presents the ContaWeb-BI predictive analytics module for estimating the value of future purchases, broken down by supplier. At the top, the user selects a specific supplier from a drop-down list, followed by a slider that allows setting the projection horizon in months. In this case, a 1-month projection has been configured. The bar graph at the bottom visually presents the estimated value of future purchases from that supplier using

algorithms based on historical consumption trends recorded within the system. This analysis serves as a financial planning tool for SMEs, allowing them to anticipate supply needs and adjust cash flow according to expected future commitments.

From a strategic perspective, this feature provides decision-makers with a quantitative reference to anticipate spending levels, optimize negotiations with key suppliers, and avoid stockouts or excess products. Furthermore, the fact that this estimate is automatically generated based on historical data increases operational efficiency by reducing uncertainty in purchasing planning.

Figure 3. Estimation of the purchase value by supplier of the ContaWeb-BI predictive analysis module



Source: Authors

On the other hand, Figure 4 corresponds to the supplier analysis module of the ContaWeb-BI platform, which allows suppliers to be classified according to their purchasing behavior, using criteria such as the total amount purchased, the frequency of transactions, and the type of payment (cash or credit). A scatter plot-type graphical distribution is shown at the top, where each point represents a supplier and its location reflects quantitative variables such as the amount of purchases versus the number of transactions carried out.

The lower panel presents the grouping detail table, which summarizes the most relevant suppliers with data such as frequency, total amount, payment method, and assigned cluster. This classification facilitates the identification of strategic suppliers, as well as those whose commercial relation could be optimized or renegotiated. From an operational perspective, this feature allows SMEs to establish differentiated policies by supplier segment, identify excessive dependencies on certain supply actors, and optimize payment terms based on historical behavior. Furthermore, the visualization facilitates a quick reading of the commercial relation map, reinforcing the efficiency of supply management and improving negotiation capacity based on empirical evidence.

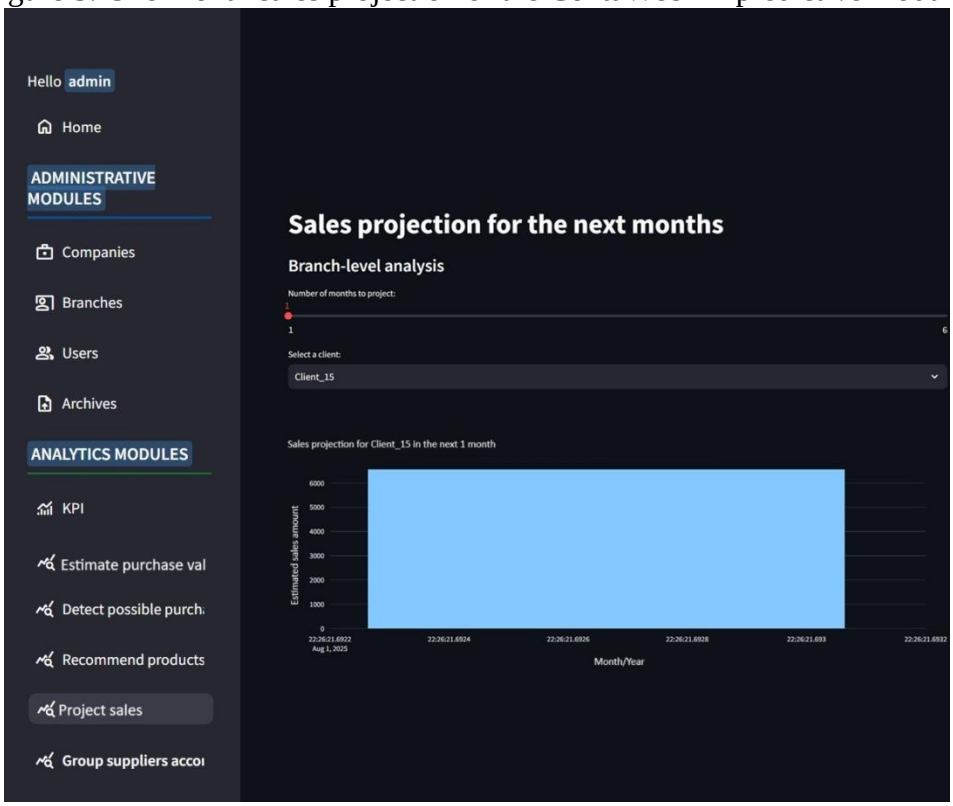
Figure 4. Supplier grouping of the supplier analysis module of the ContaWeb-BI platform

Source: Authors

Continuing with the results, Figures 5 and 6 show ContaWeb-BI's predictive module focused on sales projections, which estimates future revenue behavior based on historical purchasing patterns by customer. At the top of the interface, the user can select a specific customer and adjust the number of months to project using a slider, allowing the analysis to be customized according to the strategic needs of the business.

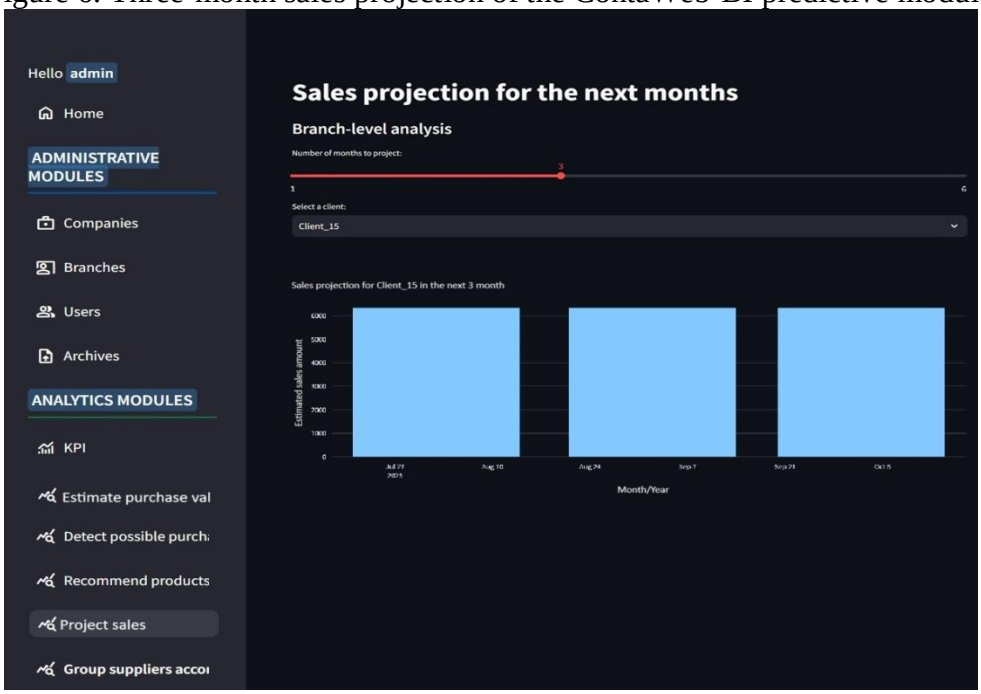
The generated graphs present estimated future sales values in horizontal bar format, distributed by month. In Figure 5, the projection corresponds to a single month, while Figure 6 shows a visualization extended to three consecutive months. This structured representation makes it easier for the user to monitor expected trends and anticipate commercial scenarios. Furthermore, this module allows SMEs to forecast customer demand for products, adjust inventory levels and operational capacity, optimize commercial strategies and loyalty campaigns, and make financial decisions based on projected revenue. This type of tool is especially valuable in companies with seasonal sales cycles, as it reduces uncertainty and improves efficiency in resource planning.

Figure 5. One-month sales projection of the ContaWeb-BI predictive module



Source: Authors

Figure 6. Three-month sales projection of the ContaWeb-BI predictive module



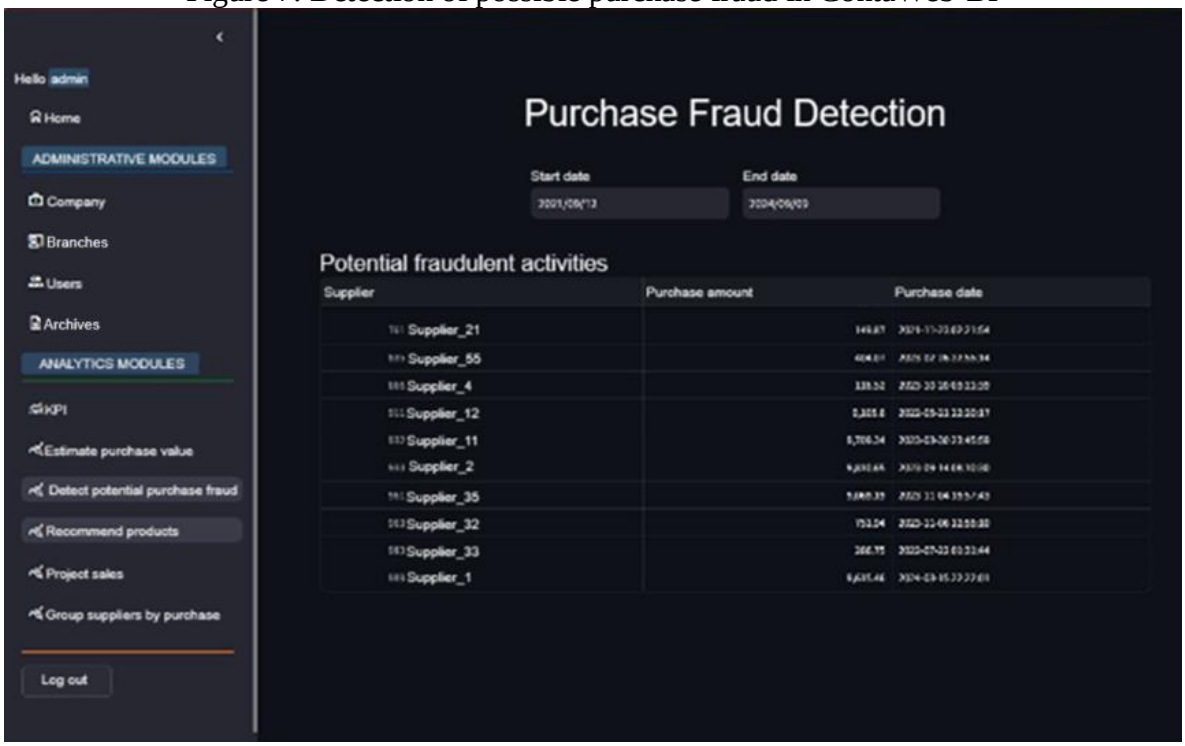
Source: Authors

Another notable feature of the ContaWeb-BI platform is the detection of irregular activities and operational risks. The fraud detection module implements transactional behavior algorithms to identify anomalies in purchases, such as atypical amounts, duplicate dates, or suppliers with suspicious activity.

Figure 7 shows the interface of the ContaWeb-BI financial risk analysis module, which is designed to display fraudulent activities related to purchasing processes. At the top, a date range selector is available that allows for setting the analysis period. This feature aims to make the diagnostic information more precise, limiting the analysis to periods where irregularities are suspected. The central section displays a pivot table automatically generated by the system, presenting potentially irregular transactions. Each row in this table indicates the supplier's code and name, the transaction amount, and the exact purchase date.

The system's algorithm detects infringing activities based on irregular behavior patterns, such as unusual repetition, amounts that don't match the average, or temporary concentrations where purchases occur outside the supplier's normal cycle. This feature is especially advantageous for SMEs with a simple accounting structure, as it can help reduce the risk of financial losses, increase internal controls, and anticipate decisions before conducting a formal audit. Furthermore, the automatic generation of the report allows for proactive, rather than reactive, action in the face of potential vulnerabilities, which directly contributes to the efficiency and transparency of financial operations.

Figure 7. Detection of possible purchase fraud in ContaWeb-BI



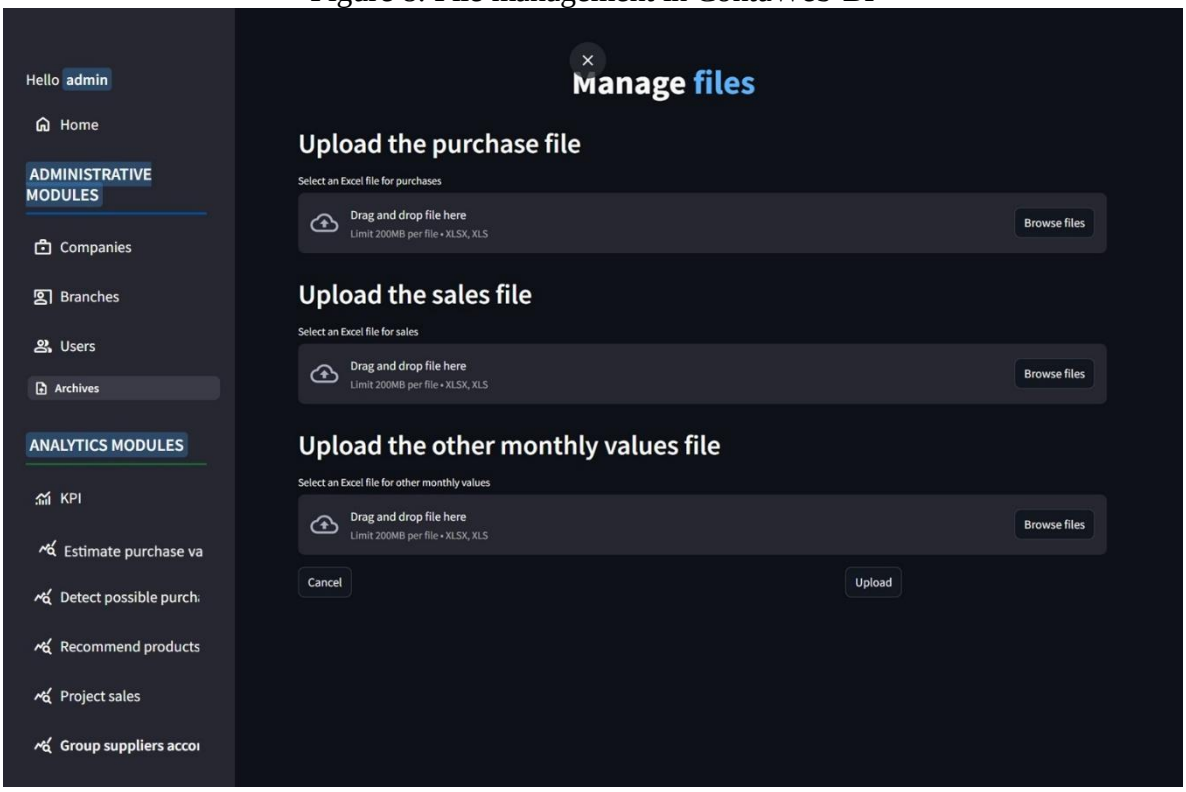
Source: Authors

One of the system's most powerful aspects comes from its visual and dynamic design. Users are presented with dashboards with all the indicators online, ready to be exported or compared. Figure 8 shows the "Manage Files" module of the ContaWeb-BI platform, where users can upload documents that feed the analytical system. Three sections are highlighted

here, focused on uploading purchase, sales, and KPI files, all in Excel format (.xlsx, .xls). The interface is intuitive, allowing for drag-and-drop functionality or manual searches from the user's computer.

From a methodological perspective, this function represents the operational starting point of the system, as it eliminates manual data entry, ensures the integrity of the source information, and introduces the possibility of standardizing the analysis base for any user company. For SMEs, this automated functionality is key because it saves operational time, minimizes human error in report creation, and facilitates the adoption of analytical tools without advanced technical requirements.

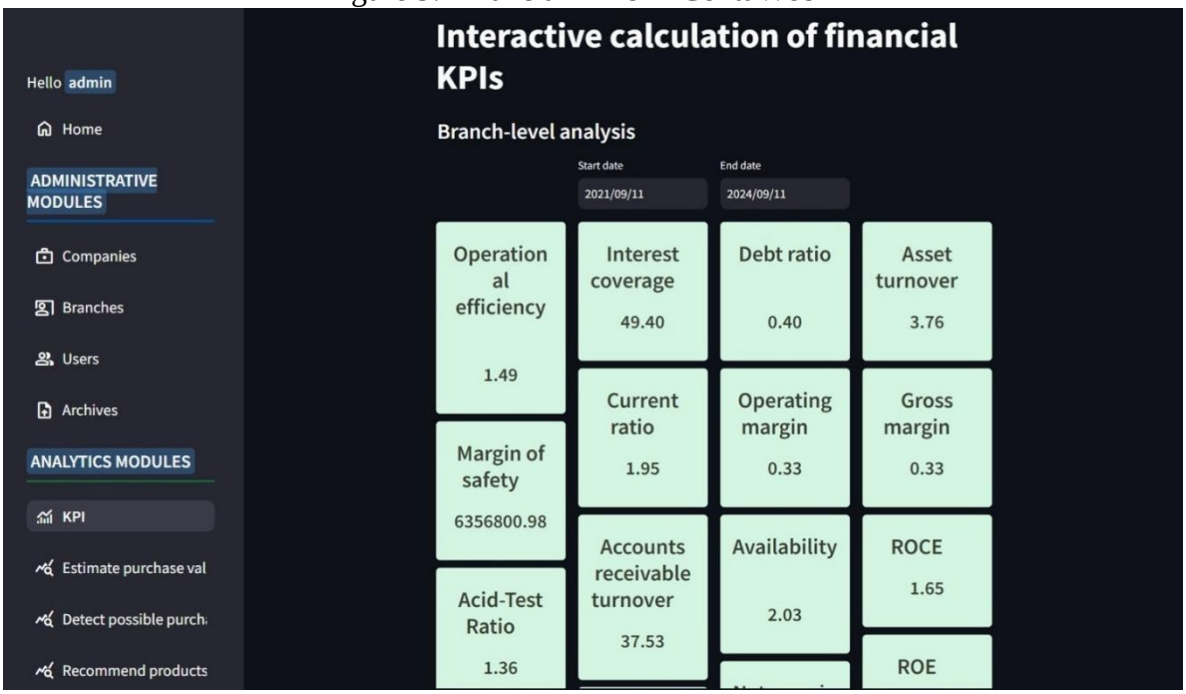
Figure 8. File management in ContaWeb-BI



Source: Authors

Once uploaded, the files can be processed using the "Finish Analysis" button, which initiates the automatic integration of the data into the platform's analytics modules. This stage is critical, as it allows static accounting records to be transformed into dynamic, viewable information, giving rise to KPIs as shown in Figure 9: projections, fraud analysis, and supplier segmentation.

Figure 9. Financial KPIs in ContaWeb-BI



Source: Authors

The results presented demonstrate the usefulness of ContaWeb-BI as a comprehensive analysis tool for SMEs, which can automatically calculate KPIs, visualize trends, identify risks, and project future scenarios. A range of functionalities, such as those that allow for sales projections, purchase estimates by supplier, fraud detection, and supplier grouping based on their transactional behavior, provide a useful and robust interface for decision-making.

The use of anonymized real-world data and simulations based on representative business cases show that it is not just a matter of building reports, but can also enable a data-driven management model in which financial information is transformed into intelligence used strategically. This facilitates not only the monitoring of operational performance but also early intervention to correct deviations and optimize results. Based on all the above, it can be affirmed that the systematic use of KPIs through BI tools such as ContaWeb-BI can be a key factor in increasing the sustainability, competitiveness, and adaptability of small and medium-sized businesses.

Discussions

The results of the functional analysis of ContaWeb-BI corroborate the strategic value of combining BI tools and systems that include KPIs to achieve improved operational efficiency in SMEs. This discussion focuses specifically on comparing these results and finding parallels with the arguments in the current scientific literature. Furthermore, it assesses the potential impact of the systematic use of digital KPIs in highly dynamic business environments.

To begin with, the automation of KPI calculation and its real-time visualization, as is the case with ContaWeb-BI, would be in line with the results of Panchal et al. (2024), which identify that SMEs that incorporate data analytics and KPI monitoring clearly amplify their capacity to react to operational and economic changes. The ease of identifying deviations and relating them to strategic decisions provides managers with a significant competitive advantage, particularly in resource-limited environments.

Similarly, the sales projection and purchase estimate modules constitute a predictive intelligence model that, as Vukovic (2020) and Tsiu et al. (2025) point out, allows SMEs to transform historical data into actionable predictions, improving logistical and financial planning. Predicting reduces the need for managerial intuition and strengthens evidence-based decision-making, which is a more common need in situations of uncertainty.

The fraud detection module of the ContaWeb-BI system is a good representation of what Llave (2017) considers defensive BI, that is, one that is oriented not only to improve performance but also to prevent financial and operational risks from anomalous patterns in the data. In this sense, the system acts not only as a control panel but as an expert system capable of alerting users to unusual transactions.

On the other hand, grouping suppliers based on purchasing behavior allows for segmentation based on the principles of operational efficiency described by Hoang and Bui (2023), who consider that supplier analytics based on transactional KPIs improves profitability by modifying the negotiation of conditions, reducing redundant costs, and improving sustainable business relations. It has also been shown in the scientific literature that the implementation of BI systems in SMEs may not be without challenges, since these can range from resistance to cultural change to a lack of digital skills in the initial phases in which this technology begins to be used (Gauzelin&Bentz, 2017).

However, being a type of interface that is designed for non-technical users and characterized by its degree of ease of use, the ContaWeb-BI tool seems to greatly reduce some of the established barriers, and, therefore, makes its use more viable in companies that are in the process of incipient digital transformation. Finally, this work contributes to reinforcing the hypothesis that was raised by Raj et al. (2016), who consider that BI platforms adapted to SMEs change not only performance monitoring, but also generate sustainable organizational knowledge when they are accompanied by a strategy of continuous process improvement supported by data from real indicators.

Conclusions

The findings extracted from the analysis carried out on the ContaWeb-BI platform support the importance of integrating BI tools aimed at automating the calculation of KPIs as a factor for improving the operational management of SMEs. The use of financial KPIs such as the current ratio, net margin, and debt ratio presented the benefit of being able to highlight crisis situations in simulated scenarios, which were improved through strategic decisions based on data from the information system.

Furthermore, additional modules such as sales estimation, purchase estimation by supplier, and automated fraud detection prove to be key tools for planning and prevention in highly variable environments. The supplier grouping functionality based on transactional behavior, in particular, demonstrated a concrete strategic perspective for managing commercial relations, optimizing costs, and improving negotiating power.

From a methodological perspective, the results obtained in the study indicated that the adoption of accessible technologies focused on non-technical users allows for the elimination of some adoption barriers historically associated with BI solutions in the context of SMEs, such as, for example, the lack of specialized personnel or resistance to digital adoption.

Finally, the research experience leads to considering ContaWeb-BI as a real, scalable, and high-performance alternative for SMEs that are interested in moving towards data-driven management models. Its systematic application is also a way to improve financial performance and the path to an organizational transformation based on operational intelligence.

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