

**Design of internationalization strategies, logistics and financial feasibility for the export of ceramic tiles from Tejar de Pescadero SAS to the Panamanian market**

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## Abstract

This paper analyzes the feasibility of internationalization of the Colombian MSME Tejar de Pescadero S.A.S., located in Cúcuta, Norte de Santander, to export glazed ceramic tiles to the Panamanian market, this project integrates three pillars, logistics, big data with artificial intelligence and financial projections, for this work a diagnosis of the logistics structure, national and international routes, FOB/CIF costs, warehousing, local distribution in Panama and mitigation strategies, FOB/CIF costs, warehousing, local distribution in Panama and logistics risk mitigation strategies, in addition to evaluating profitability through projected cash flow, balance sheet and IRR, thus resulting in an estimated profitability of 38% against a discount rate of 12%, For the analysis, tools such as the Scopus database were used, which allowed processing large volumes of FOB data, volume, prices and costs, in addition, visualization and prediction models were integrated with generative AI and descriptive analytics, which facilitated informed and results-oriented decision making. This analysis concludes that the project is viable, profitable and sustainable, offering recommendations to diversify ports of departure, digitize traceability and take advantage of Panama's strategic location as a regional hub.

**Keywords:** internationalization, logistics, artificial intelligence, artificial intelligence, Big Data, MSMEs.

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## **Introduction**

Internationalization has become a strategic way to strengthen the competitiveness of Colombian MSMEs. Tejar de Pescadero S.A. S is a company dedicated to the production of glazed ceramic tiles, seeks to expand its operations to the Panamanian market, a destination with high demand in the construction sector and potential for expansion to Central America and the Caribbean, this work comprehensively addresses the conceptualization of innovation in the supply chain, national and international logistics design, the use of Big Data tools for decision making, artificial intelligence and the financial evaluation of direct exports from Cúcuta Norte de Santander, via Barranquilla to Panama. This project responds to the need to provide the company with a strategic internationalization plan that guarantees sustainability, competitiveness and equity growth in the medium term, taking advantage of logistical, geographic and commercial advantages.

### **Justification**

The study is justified by the relevance of promoting the competitiveness of Colombian MSMEs through well-structured internationalization strategies, the Panamanian market represents a key opportunity thanks to its geographical proximity, the existence of favorable trade agreements and its role as a regional logistics hub, in addition the combination of a product with proven demand, consolidated production capabilities and a viable financial plan, supports the projection of Tejar de Pescadero S. A.S as a sustainable exporter, this work also provides a practical approach, integrating logistics analysis, supply chain, innovation, big data, artificial intelligence and financial evaluation, aligned with current trends in international trade.

## **Objectives**

### **General Objective**

Design and implement an integral strategy of internationalization, logistics and financial evaluation for the export of ceramic tiles from Tejar de Pescadero S.A.S. to the Panamanian market.

### **Specific Objectives**

Analyze national and international logistics feasibility to ensure supply chain efficiency.

Apply big data, artificial intelligence and data analysis tools to optimize strategic decision making.

Evaluate the financial profitability of the project through cash flow projections, income statement and balance sheet.

Propose improvements in logistics processes, market diversification and reinvestment strategies to strengthen the sustainability of the project.

## **Content of the work: Logistics Chains MIPYME Tejar de Pescadero SAS**

### **Company**

Tejar de Pescadero S.A.S.

### **Sector**

Ceramics and construction materials

### **Product**

Glazed ceramic tiles

### **Target Market**

Panamá

### **Project Start Year**

2025

### **Modality**

Direct export from Cúcuta via Barranquilla

Tejar de Pescadero S.A.S, a MSME located in Cúcuta, Norte de Santander, has developed experience in the production and marketing of ceramic tiles and slabs, this project proposes an internationalization strategy towards the Panamanian market, integrating logistics, supply chain and five-year financial projections to assess its viability, whose analysis is based on Big Data, artificial intelligence (AI) tools, for which a logistics strategy is designed that covers from the national supply chain to distribution in the destination country.

### ***Domestic Supply Chain***

Domestic supply chain includes the supply of raw materials (clay, feldspar, pigments), production at the plant located in Cúcuta, storage of the finished product, packaging for export and land transportation to the port of Barranquilla.

## **Suppliers**

**Raw Materials.** Clay, feldspar, kaolin and pigments, purchased mainly from local suppliers in Norte de Santander and other mineral-producing departments.

**Energy Inputs.** Natural gas or electric power for the firing kilns.

**Packaging.** Cardboard, protective plastic, and pallets (purchased regionally).

## **Internal Processes**

**Production.** At the Cúcuta plant, including molding, enameling, firing and quality control.

**Storage.** The final product is stored in conditioned warehouses to avoid humidity.

**Packing and Labeling.** The product is packed in batches with technical specifications and labels for export.

## **National Transportation**

**Land Route.** Cúcuta - Barranquilla (Port of departure).

**Type of Transport.** Transport of cargo by tractor-trailer or closed van truck.

**Estimated Time.** 2 to 3 days depending on weather and traffic.

**International Supply Chain.** From the port of Barranquilla, maritime shipments are made to the ports of Colón or Balboa in Panama, where they are nationalized or enter the free trade zone, stored and then distributed to local customers.

## **Port of Departure**

**Port.** Barranquilla maritime terminal.

**Port Logistics.** Includes customs inspection, payment of port taxes, cargo consolidation in containers and shipment.

## **International Transport**

***Mode of Transport.*** Maritime.

***Destination.*** Port of Balboa o Colón, Panamá.

***Length of Voyage.*** 2-4 días.

***Shipping.*** Singaporean flag vessel, according to the information on the document.

**Documentation Required.** Commercial invoice, packing list, certificate of origin, DIAN export declaration and BL (bill of lading).

### **Distribution in Panamá**

***Reception at Port.***

***Panamanian Customs Clearance.*** Payment of tariffs if applicable (Panama and Colombia have FTA).

Inspection by the sanitary and quality authority if required.

***Temporary Storage.*** In outsourced warehouses near the port or in free trade zones.

***Local Transportation.*** Small trucks for distribution to construction warehouses, hardware stores, wholesale distributors and final customers in the construction sector.

### **Additional Logistical Considerations**

***Freight and Insurance (FOB/CIF).*** In 2023 there will be high freight peaks and increased insurance costs; it is essential to negotiate competitive rates with shipping and insurance companies.

***Reinforced Packaging.*** Tiles are fragile, therefore, packaging resistant to vibrations and humidity is required.

***Digital Tracking.*** Use of traceability platforms and real-time tracking from the factory to delivery in Panama.

**Returns Management.** Define return policy and service channel in case of defective products.

### **Proposal for Logistic Improvement**

**Diversify Departure Ports.** Consider Cartagena or Santa Marta in case of congestion in Barranquilla.

**Contracts with Integrated Logistics Operators.** To handle the entire chain with lower cost and greater efficiency.

**Take advantage of Free Trade Zones in Panama.** To consolidate inventories and re-export to Central America or the Caribbean.

**Inventory Digitalization and CRM.** To forecast demand, optimize loads and better serve the end customer.

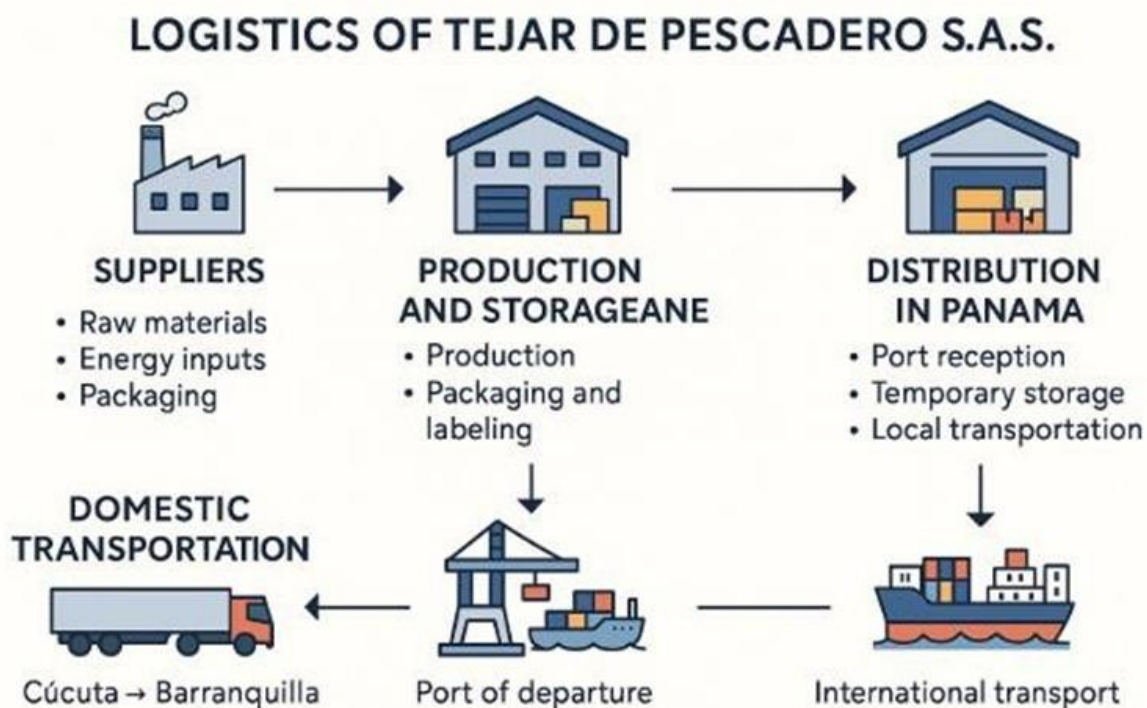
Regarding the international supply chain, from the Maritime Port of Barranquilla the cargo is consolidated and shipped to the Panamanian ports of Colon or Balboa, where the nationalization procedures are carried out, or entry into free trade zones, the respective payment of tariffs (if applicable), and inspection by health and quality authorities, and then the product is distributed from outsourced warehouses or free trade zones by local transportation to construction warehouses, hardware stores, wholesale distributors and end customers in the sector.

**Technological Tools Applied.** Tools such as databases like Scopus were used to analyze large volumes of FOB data, prices, volume and costs, thanks to descriptive analytics and generative artificial intelligence, optimizing decision making in terms of routes, costs and times, which directly impacts profitability and logistics efficiency, in addition, the incorporation of digital platforms for real-time traceability and inventory management through CRM is proposed.

**Logistical Considerations and Proposals for Improvement.** During the analysis, high freight costs and insurance increases in 2023 were detected, which makes it necessary to negotiate competitive rates with shipping companies and insurers; the need for reinforced packaging is also emphasized, given the fragility of the product, and as strategic measures it is proposed to diversify the ports of exit, evaluating options such as Cartagena or Santa Marta, contract integral logistics operators, take advantage of free trade zones in Panama to consolidate inventories and re-export to Central America and the Caribbean, as well as digitalize demand management and customer service.

**Figure 1**

*Logistics of Tejar de Pescadero S.A.S.*



*Source.* Own elaboration.

### **5-Year Financial Projection**

For the structuring of this section of the project, a literature review was conducted using the scientific database Scopus, which allowed identifying current trends and case studies related to the internationalization of ceramic manufacturing MSMEs, based on this analysis, key information was collected to support strategic decision-making around the five-year financial projections of the company Tejar de Pescadero SAS in order to anticipate risks and ensure sustainable development of the process in the short and long term.

In addition, Artificial Intelligence tools were incorporated to model the historical behavior of FOB prices, export volumes and logistics costs. These tools were used to apply predictive models and advanced data visualization that facilitated the construction of realistic and supported projections.

#### **Main Product**

Ceramic tiles

#### **Initial Annual Export Volume 2025**

100,000 kg

#### **FOB Price Per Kg USD**

1.50 USD

#### **Cost Per Kg (Production + Logistics)**

1.00 USD

#### **Initial Investment**

USD 50,000 (adjustments, machinery, international marketing)

#### **Sales Growth Rate**

10% per year

**Annual Fixed Costs**

USD 15,000

**Discount Rate**

12%

**Table 1***Projected income statement*

Year	Sales	Cost of sales	Gross profit	Fixed expenses	Net income
2025	150.000	100.000	50.000	15.000	35.000
2026	165.000	110.000	55.000	15.000	40.000
2027	181.500	121.000	60.500	15.000	45.500
2028	199.650	133.100	66.550	15.000	51.550
2029	219.615	146.410	73.205	15.000	58.205

*Source.* Own elaboration.

The table shows Tejar de Pescadero S.A.S.'s projected income statement (2025–2029), with steady growth in sales and net income. All values are in US dollars (USD).

**Table 2***Projected cash flow.*

Year	Net cash flow
2025	-15.000 (Initial investment - net income)
2026	40.000
2027	45.500
2028	51.550
2029	58.205

*Source.* Own elaboration

The table shows Tejar's projected cash flow (2025–2029), starting negative from initial investment and steadily increasing. All values are in *USD*. Source: own authorship.

**Table 3**

*Projected balance sheet (at the end of each year).*

Year	Total assets	Liabilities	Equity
2025	50.000	0	50.000
2026	90.000	0	90.000
2027	135.500	0	135.500
2028	187.050	0	187.050
2029	245.255	0	245.255

*Source.* Own elaboration

The table shows Tejar's projected balance sheet (2025–2029), with growing assets and equity, and no liabilities. All values are in USD. Source: own authorship.

### Assets

Cash and banks, inventories and fixed assets (depreciated to 5 linear years)

Liabilities and Equity

Loans, invested capital and retained earnings

**Table 4**

*Internal rate of return (IRR) Net cash flows.*

Year 0	-50.000 (initial investment)
Year 1	35.000
Year 2	40.000

Year 3	45.500
Year 4	51.550
Year 5	58.205

*Source.* Own elaboration

The table presents projected net cash flows and estimates an internal rate of return (IRR) of approximately 38%. All values are in USD. Source: own authorship.

In other words, this indicates that the project is highly profitable at a discount rate of 12%. Tejar de Pescadero S.A.S., an MSME in the ceramic sector located in Cúcuta, plans to start exporting 100,000 kg of ceramic tiles to Panama annually in 2025, with an FOB price of USD 1.50 per kg, a unit cost of USD 1.00, and an initial investment of USD 50,000 for machinery, adjustments and international marketing, the project contemplates a 10% annual sales growth, fixed expenses of USD 15,000 and a discount rate of 12%, in addition the financial projection shows that sales will increase from USD 150. 000 in 2025 to USD 219,615 in 2029, with a net profit that goes from USD 35,000 to USD 58,205, and free cash flows are positive from the second year and grow to USD 58,205, after a first year with -USD 15,000 for the initial investment, as for the balance sheet it projects an equity growth without liabilities, going from USD 50,000 to USD 245,255 in total assets over five years. The estimated internal rate of return (IRR) is 38%, which indicates a high profitability compared to the discount rate applied.

To support these projections, Artificial Intelligence tools were integrated to process and analyze the data collected, thus supporting strategic decision making such as sales projection, growth rate estimation, initial investment and IRR calculation. In addition, academic databases such as Scopus were used to identify similar cases, applicable methodologies and industry

references, thus ensuring sound financial planning, aligned with the objectives of sustainability and economic viability of the project.

The financial analysis concludes that the project is viable, profitable and sustainable, and its implementation is recommended in order to take advantage of Panama's strategic position as a regional logistics hub, reinvest profits to expand operations in Central America, and strengthen financial management to ensure compliance with projected results.

The analysis demonstrates the financial viability of the project, with solid indicators such as growing net income, positive free cash flow, an internal rate of return (IRR) of 38% and sustained equity growth, confirming its consistency and profitability.

The initial investment is quickly recouped thanks to positive cash flows from the second year onwards, which makes it possible to sustain operations and even reinvest. This profitability validates the project from a financial and strategic perspective. As recommendations, it is suggested to reinvest profits to expand the portfolio or open new markets, consider external financing alternatives that accelerate growth without compromising equity, and take advantage of Panama's strategic location as a logistics center to expand to other countries in Central America and the Caribbean.

## Conclusions

According to specific objective 01 on logistical feasibility, it is concluded that the company has a robust logistical structure to supply raw materials, produce, package and export to Panama, although it is recommended to diversify ports and strengthen alliances with integrated logistics operators.

Aligned with specific objective 02 on big data and strategic decisions, it is concluded that the incorporation of analytical tools makes it possible to anticipate price fluctuations, optimize loads and project demand, contributing to decisions based on real data.

Following specific objective 03 on financial profitability, it is concluded that the projection shows an IRR of 38%, with positive free cash flow from the second year and sustained equity growth, confirming economic viability.

Based on specific objective 04 on sustainable improvements, it is concluded that in order to consolidate the strategy it is suggested to reinvest profits, expand product lines, explore alternative markets in Central America and strengthen the digitalization of logistics and commercial processes.

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